



**Ground and Environmental
Investigation Limited**

**8 Wapping Lane
Marton
Gainsborough
Lincolnshire
DN21 5AJ**

01522 412058

**Land at 362 Oxford Road
Reading
RG30 1AQ**

Phase 2 Contamination Assessment

On behalf of S Chick Investigations Ltd



Site: Land at 362 Oxford Road, Reading, RG30 1AQ

Document Reference No: 25-975/2

Quality Management

Authorised by:	 Marc Pearson BSc MSc MEnvSc - Director
Date	December 2025
Revision	0
Contact	Marc Pearson (marc@groundenvironmental.com)

Ground and Environmental Investigation Ltd is a specialist geo-environmental consultancy and ground investigation company operating nationally.

Our approach to all of projects is to provide our clients with cost-effective solution to potential geo-environmental hazards, essential considerations before site acquisition, or prior to final development scheme design.

We offer a full range of geo-environmental services from initial due diligence site assessments through to engineering and ground remediation design.

Table of Contents

1	INTRODUCTION	1
1.1	LIMITATIONS.....	1
2	SITE LOCATION AND LAYOUT	1
3	ENVIRONMENTAL SETTING.....	2
3.1	GEOLOGY	2
3.2	GROUNDWATER	2
4	PRELIMINARY CONCEPTUAL SITE MODEL	3
5	INTRUSIVE INVESTIGATION.....	5
5.1	FIELDWORK.....	5
5.2	GROUNDWATER	6
6	LABORATORY TESTING.....	7
6.1	ANALYTICAL TESTING	7
7	GROUND CONDITIONS	8
7.1	SOIL PARAMETERS	8
8	GROUND CONTAMINATION ASSESSMENT	9
8.1	SOIL QUALITY.....	9
8.1.1	Toxic Metals	10
8.1.2	Phytotoxic Metals.....	10
8.1.3	Organic Compounds	10
8.2	SOIL GAS	11
8.3	WATCHING BRIEF AND DISCOVERY STRATEGY	11
9	CONTAMINATION RISK ASSESSMENT	13
9.1	CONTAMINANT SOURCES.....	14
9.2	RISK TO HUMAN HEALTH	14
9.3	RISKS TO WATER RESOURCES	15
9.4	RISKS TO PLANTS	15

9.5	RISKS TO BUILDINGS & SERVICES.....	16
9.6	GAS RISK ASSESSMENT	16
10	CONCEPTUAL SITE MODEL.....	18
11	CONCLUSIONS AND RECOMMENDATIONS	21

Appendices

1. Limitations
2. Factual Report of Investigation
3. Guidelines on Contamination Levels

1 INTRODUCTION

Ground and Environmental Investigation Ltd (GEI) was commissioned by S Chick Investigations Ltd to undertake a Phase 2 Contamination Risk Assessment on a proposed development site on land at 362 Oxford Road, Reading, RG30 1AQ.

It was understood that the site is to comprise a mixed-use development of 2no. commercial units on the ground floor, 26no. residential units, associated landscaping, car and cycle parking.

The purpose of this report is to provide a risk assessment identifying any potential contamination arising from the site's former and current use, and any risks which may arise from such contamination. In addition, a conceptual model of the site will show the relationship between any sources of contamination, potential receptors, and the pathways for any contamination on site.

A Phase 1 Contamination Risk Assessment was previously undertaken by GEI (Reference 25-975r1, November 2025) which should be read in conjunction with this report.

1.1 LIMITATIONS

Notes on limitations associated with this assessment are provided in Appendix 1.

2 SITE LOCATION AND LAYOUT

The site is situated to the north of Oxford Road and south of Curzon Street at approximate Grid Reference SU 697 737 in a predominantly residential urban area and occupies an area of approximately 0.15 hectares.

The following features surround the site:

- To the north, the site is bound by Curzon Street beyond which are residential properties;
- To the west, the site is bound by car parking and a pedestrian area relating to a mixed commercial and residential property;
- To the south, the site is bound by mixed use commercial and residential properties.
- To the east, the site is bound by residential properties of Curzon Street and Battle Place.

At the time of this report, the site comprised an undeveloped area predominantly laid to grass and scrub vegetation with some larger trees and shrubs present.

3 ENVIRONMENTAL SETTING

3.1 GEOLOGY

Reference to the British Geological Survey online geological map of the area indicates that the geology underlying the site comprises Superficial Deposits of the Taplow Gravel Member over solid geology of the Seaford and Newhaven Chalk Formations of the White Chalk Subgroup.

The geological memoir for the area described these strata as follows:

Taplow Gravel Member

Sand and gravel, locally with lenses of silt, clay or peat.

White Chalk Subgroup

Chalk with flints. With discrete marl seams, nodular chalk, sponge-rich and flint seams throughout.

Previous Ground Investigations

A ground investigation undertaken on the 8th and 9th September 2025 indicated the presence of Made Ground comprising brown clayey sandy gravelly fill with brick over black slag with glass to a depth of 2.0m.

3.2 GROUNDWATER

Reference to the British Geological Survey 1:50,000 scale Aquifer Designation Dataset, shows the site to be set upon a Secondary A Aquifer with respect to the superficial deposits and a Principal Aquifer with respect to the solid geology.

Principal Aquifers are highly permeable formations. They are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

Secondary Aquifers include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types.

Secondary A - are also permeable layers capable of supporting water supplies at a local scale and may be an important source of base flow to rivers. These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage.

Secondary B –tend to be lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

Secondary Undifferentiated – are not attributed either category A or B status. Generally, these layers were previously designated as both minor and non-aquifer dependant on local geology.

Unproductive Strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

The site is not situated within an Environment Agency-designated Groundwater Source Protection Zone.

4 PRELIMINARY CONCEPTUAL SITE MODEL

At the time of the Phase 1 report, the site comprised an undeveloped area predominantly laid to grass and scrub vegetation with some larger trees and shrubs present.

The site was noted as being within the curtilage of a Workhouse and later Hospital since the earliest available mapping (1878). An Infectious Diseases/Isolation Hospital is mapped approximately 75m to the north.

A building was mapped across the northern boundary of the site between the late 1800s and early 2000s, having undergone various small-scale redevelopment however the majority of the site area has remained undeveloped throughout the recorded history.

Slope gradients are mapped across the eastern site area from the 1950s until the early 2000s. The purpose of these gradients is unknown.

Potential contaminant sources related to historic hospital sites can comprise medical waste, fuel tanks, ash/clinker, asbestos and heavy metals. Whilst limited structures have been identified during the historical mapping review, Made Ground is anticipated to be present across the site and has been proven to a depth of 2.0m in a previous geotechnical site investigation.

It was therefore considered that potential contamination may have arisen from the site's historic uses and from an unknown quantity of Made Ground likely to be present beneath the site.

The geology underlying the site comprises superficial deposits of the Taplow Gravel Member over solid geology of the Seaford and Newhaven Chalk Formations of the White Chalk Subgroup. A previous geotechnical site investigation indicated the presence of Made Ground to 2m depth.

Land at 362 Oxford Road, Reading, RG30 1AQ
Phase 2 Contamination Risk Assessment



The site is underlain by a Secondary A Aquifer with respect to the superficial deposits and a Principal Aquifer with respect to the solid geology. The site is not located within a Source Protection Zone.

5 INTRUSIVE INVESTIGATION

5.1 FIELDWORK

The intrusive site works were carried out on the 28th November and 12th December 2025 and comprised the following:

- Window Sampling;
- Hand Trial Pitting; and
- Groundwater and Soil Gas Monitoring.

The positions of the above works on the site are indicated in Appendix 2.

All intrusive fieldwork was generally executed in accordance with the recommendations given in British Standard BS 5930:2015+A1:2020, "Code of Practice for Site Investigations".

Contamination sampling was undertaken in accordance with BS 10175, "Code of Practice for the Investigation of Potentially Contaminated Sites".

Window Sample Boreholes

Two window sample holes (BH2 and BH3) were excavated to depths of 3.0m using a track mounted Archway Dart window sampling rig.

The soils and materials encountered in the holes were logged and representative samples recovered for laboratory analysis. The boreholes were installed with a 50mm ID HDPE standpipe.

Window sample logs are presented in Appendix 2.

Hand Trial Pits

Two hand dug trial pits were excavated to a depth of 0.5m in order to obtain samples for laboratory analysis.

Groundwater Level and Soil Gas Monitoring

A soil vapour survey was undertaken at the site and comprised the monitoring of the atmosphere within the installed boreholes. Portable gas monitoring equipment (GA5000) was used to monitor the standpipe for concentrations of carbon dioxide (CO₂), methane (CH₄), Carbon Monoxide (CO), Hydrogen Sulphide (H₂S) and oxygen (O₂).

The monitoring results are presented in Appendix 2.

5.2 GROUNDWATER

No groundwater was noted during the period of fieldwork or post-fieldwork monitoring.

It should be noted that groundwater levels may vary due to seasonal fluctuations in rainfall, but in the shorter term, can be affected by antecedent weather conditions or other causes.

6 LABORATORY TESTING

6.1 ANALYTICAL TESTING

Six soil samples were selected and scheduled for chemical analysis which was undertaken by Chemtech Environmental Ltd. All soil samples were analysed for a general screening suite of contaminants considered appropriate to the current usage and past history of the site and surrounding area.

Toxic Metals	Phytotoxic Metals	Inorganic Compounds	Organic Compounds
Arsenic Cadmium Chromium Lead Mercury Nickel Selenium	Water Soluble Boron Copper Nickel Zinc	Water Soluble Sulphate pH Asbestos	Total Polyaromatic Hydrocarbons (PAH) Mineral oils Total Petroleum Hydrocarbons (TPH) BTEX

Environmental samples were stored in appropriate containers as specified within BS10175. The containers comprised of 0.5 kg capacity plastic containers with fitted lids.

Where organic compounds were to be determined, inert containers, which prevent loss by absorption, or volatilization, i.e. wide-mouthed amber glass containers, were used.

Samples were stored in appropriately cooled cool boxes and were transported to the laboratory as quickly as possible in order to minimize any potential for chemical and biological changes to take place.

The results of the analytical testing are presented in Appendix 2.

7 GROUND CONDITIONS

7.1 SOIL PARAMETERS

The soils encountered during this investigation are described in the Window Sample borehole and trial pit logs presented in Appendix 2. The ground profile encountered at the site comprised Made Ground over soils consistent with the Taplow Gravel Member.

Made Ground

Made Ground was encountered at all locations to depths of between 1.1m and 1.2m. A previous borehole drilled at the site indicated the presence of Made Ground to a depth of 2.0m.

The Made Ground comprised brown clayey sandy gravelly fill with brick over black slag with glass, and brown clayey sandy silt with brick rubble and gravels.

No significant visual or olfactory evidence of contamination was noted in the investigation locations.

Taplow Gravel Member

Soils typical of the Taplow Gravel Member were encountered beneath the Made Ground at locations BH2 and BH3 and comprised orange brown sandy gravelly clay with partings of orange silt and fine sand, and orange brown sand and gravel.

The base of the formation was not encountered in window sampling boreholes BH2 and BH3.

8 GROUND CONTAMINATION ASSESSMENT

The current guidelines used for this contamination assessment are presented within Appendix 3.

The contaminant concentrations encountered as part of this investigation have been compared against either Land Quality Management Generic Assessment Criteria (LQM GAC) for a residential development, the Chartered Institute of Environmental Health's (CIEH) Suitable for Use Levels (S4USL), or where available against published Category 4 Screening Levels (C4SLs) for a residential end use (without home grown produce). Where neither guidelines have limit values, Contaminated Land Exposure Assessment (CLEA) framework guideline limit values have been assessed.

Category 4 Screening Levels (C4SLs) have currently been published for six substances as per the table below.

Substance	Residential (with home- grown produce)	Residential (without home- grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37	40	49	640	79	170
Benzene	0.87	3.3	0.18	98	140	230
Benzo(a)Pyrene	5.0	5.3	5.7	77	10	21
Cadmium	22	150	3.9	410	220	880
Chromium VI	21	21	170	49	21	250
Lead	200	310	80	2300	630	1300

All concentrations expressed in mg/kg.

This table should be read in conjunction with the Final C4SL R&D Report

8.1 SOIL QUALITY

In terms of any proposed redevelopment of the site, the results of the analysis of the selected soil samples recovered during the site investigation indicated that the concentrations of *metals and metalloids* considered to be potentially toxic to humans were below the respective guideline values for all samples tested.

Organic contamination across the site was generally low and concentrations which may be considered to pose an unacceptable risk to human health should any viable pathway exist were not encountered with the exception of a single minor elevated PAH species.

No Asbestos Containing Materials were identified.

A comprehensive description of the soil quality as measured as part of the intrusive site investigation is given below.

8.1.1 Toxic Metals

Concentrations of toxic metals arsenic, cadmium, chromium, lead, mercury, nickel, selenium, and zinc were all below their respective soil guidance values for either a residential development under the CLEA/LQM GAC guidelines and the C4SL/S4USL guideline values for residential end use (without home grown produce) where appropriate in all samples tested.

8.1.2 Phytotoxic Metals

Concentrations of phytotoxic metals copper, zinc and nickel were compared against the maximum permissible concentrations in the Sewage Sludge (Use in Agriculture) Regulations 1989.

All concentrations for copper, nickel and zinc were found to be below the maximum permissible concentration for the relevant pH level.

8.1.3 Organic Compounds

Polycyclic Aromatic Hydrocarbons (PAH)

Concentrations of PAH were found to be below the inert waste acceptance criteria of 100 mg/kg as detailed in the Landfill (England and Wales) (Amended) Regulations 2004 in all of the samples tested.

Speciated PAH

The specific PAH compound concentrations were below their relevant guideline values in all samples tested with the exception of dibenzo(a,h)anthracene in location BH3 (0.3-0.5m) at a concentration of 0.339mg/kg. The guideline value for a conservative soil organic matter of 1% is 0.3mg/kg.

Total Petroleum Hydrocarbons

Concentrations of TPH were below the inert waste acceptance criteria of 500 mg/kg as detailed within the Landfill (England and Wales) Regulations 2004 in all soil samples tested.

Generic Assessment Criteria (GAC) for total petroleum hydrocarbons according to both their molecular weight and chemical structure and also for a range of soil organic matter (SOM) content values have been derived using CLEA software. The LQM CIEH GACs are presented according to their soil organic matter content and proposed end use of the land.

The maximum TPH concentration recorded on site during the site investigation was at location BH3 (0.3-0.5m) comprising of 163mg/kg (TPH >C10-C40) and would therefore not be considered to pose a significant risk of significant harm to human health.

8.2 SOIL GAS

Three gas monitoring visits were undertaken between the 28th November and 12th December 2025 where a soil vapour survey was undertaken across the site and comprised the monitoring of the atmosphere within the purposely installed monitoring standpipe. Portable gas monitoring equipment (GA5000) was used to monitor the standpipes for concentrations of carbon dioxide (CO₂), methane (CH₄), oxygen (O₂), carbon monoxide (CO), and hydrogen sulphide (H₂S).

For determining the gas protection measures which may be required in low rise buildings with a beam and block floor there is published guidance from the NHBC for use on residential developments which utilises a traffic light system of classification. For larger buildings the guidance in CIRIA 665 and BS8485 is used.

Reference has also been made to the British Standard Code of Practice BS8485:2015, *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings* and regard has been given to the recommendations presented therein. The processes set out in BS8485 represent good practice and is based on the CIRIA C665 document.

In addition, CIRIA document C735, *Good practice on the testing and verification of protection systems for buildings against hazardous ground gases* has also been referenced.

The results obtained from the short-term soil gas monitoring undertaken indicated that elevated concentrations of soil gas are not present in the soils underlying the site. The soil gas results are attached at Appendix 2.

The results obtained from the soil gas survey undertaken indicated that elevated carbon dioxide concentrations were not recorded at the site above the action level of 5%. Elevated methane concentrations above the action level of 1% were not recorded.

Measurement of both borehole pressure and gas emission rates indicates that no significant gas flows are present. The maximum gas flow rate measured on site was 0.7 l/hr.

8.3 WATCHING BRIEF AND DISCOVERY STRATEGY

Whilst no significantly elevated contaminant concentrations were encountered as part of this site investigation should discreet hotspots be encountered which were not previously detected during the site clearance or groundworks these should be dealt with accordingly by informing all parties involved with the site and drafting new contamination proposals if

necessary. A number of options are available for handling any such material, which include:

- The removal from site and disposal to a suitably licensed landfill of all material suspected of being contaminated.
- Short-term storage of the suspected material while undertaking verification testing for suspected contamination. The storage area should be a contained area to ensure that contamination does not migrate and affect other areas of the site. Depending upon the amounts of material under consideration, this could be either a skip or a lined area.
- Treatment of the identified contamination as discussed above.
- Having a suitably experienced Environmental Engineer either on-call or with a watching brief for the visual and olfactory assessment of the material, and sampling for verification purposes.

Should a new source of contamination be suspected or identified then the relevant local authorities would be informed. A report indicating the nature of contamination and how this is to be dealt with would be submitted to their department and for their agreement. Any necessary remediation would then be detailed and verified in a supplementary remediation statement.

GEI can confirm that such a watching brief should exist on this site during any demolition/construction works and should any contamination or potentially contaminative sources be discovered during the proposed demolition/enabling works all site works would cease, and suitably competent consultants/engineers will attend site.

9 CONTAMINATION RISK ASSESSMENT

This risk assessment has been undertaken with due regard to the advice relating to groundwater as provided in the Environment Agency's "Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources", the advice provided in the Contaminated Land (England) Regulations 2000, and the associated statutory guidance. The guidance defines contaminated land as any land that is in such a condition that by reason of substances in, on or under the land:

- significant harm is being caused or there is a significant possibility of such harm being caused; or
- pollution of controlled water is being, or is likely to be, caused.

This definition is based on the principles of risk assessment defined as a combination of the probability (or frequency) of occurrence of a defined hazard and the magnitude (including the seriousness) of the consequences. Central to the risk assessment process is the concept of pollutant linkage, that is a linkage between a contaminant and a receptor by means of a pathway.

Statutory definitions relating to pollution linkage.	
Contaminant	"a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters."
Receptor	"a living organism, a group of living organisms, and ecological system or a piece of property" which meets given criteria. "controlled waters which are, or could be, polluted by a contaminant".
Pathway	"one or more routes or means by, or through, which a receptor: • is being exposed to, or affected by, a contaminant, or • could be so exposed or affected".

The relationship between these components is discussed below in order to identify the existence of any source-pathway-receptor linkage on the site, and hence the potential risks associated with any contamination.

This risk assessment is based on the proposed development of the site comprising the construction of a mixed-use development of 2no. commercial units on the ground floor, 26no. residential units, associated landscaping, car and cycle parking.

The significance of the risks to the receptors/targets identified is based on an evaluation of the potential pathways between the contaminant source and receptors based on the most sensitive end use, i.e. a residential without plant uptake end use.

Potential receptors/targets at the site and in the area in which the site is located include:

- future occupants and the general public;
- construction/maintenance workers;
- groundwater resources; and
- underground services in and around the site.

9.1 CONTAMINANT SOURCES

Potential on site sources of contamination include:

- Potential Made Ground; and
- Historic site use.

The analytical testing of soils retrieved as part of the intrusive investigation did not reveal significantly elevated contaminant concentrations.

9.2 RISK TO HUMAN HEALTH

Toxic Metals

Concentrations of toxic metals arsenic, cadmium, chromium, lead, mercury, nickel, selenium, and zinc were all below their respective soil guidance values for a residential with plant uptake end use in all samples tested in this site investigation, therefore the risks to human health from these contaminants is considered to be low.

Organic Compounds

Concentrations of the organic compounds total PAH and total TPH, were consistently low across the site and would therefore not be considered to pose a significant risk of significant harm to human health.

Elevated specific PAH compounds were not encountered across the site apart from a minor elevated specific PAH compound (dibenzo(a,h)anthracene). As the concentration was only very slightly over the guideline limit, and the location will be beneath a proposed building and therefore no source to receptor pathway exists there is not considered to be a significant risk of significant harm to human health.

Inorganic Compounds

Asbestos containing material (ACM) was not encountered at the site.

On the balance of the toxicological risks posed by the ground contamination encountered as part of the intrusive investigation undertaken, it is considered that the potential risks to site workers and future occupants could be adequately controlled as follows:

Site Workers

- Provision of appropriate personal protective equipment and hygiene facilities.
- Good working practice in line with current legislation when safely handling and disposing of soils.
- Provision of appropriate dust suppression, to minimise the generation of potentially contaminated suspended particulates during site works in the vicinity of the landfilled ground.

Future Occupants

- The site is not considered to pose a potential risk of significant harm to human health in the context of Part 2A.
- With regard to the areas which may be set to soft landscaping in the proposed development it is noted that given the absence of such on site, suitable growth media would need to be imported into these areas of the site. Any such imported growth media would require analytical testing to confirm its suitability as growth media and its compliance with their relevant SGVs.
- Following the enabling works in the proposed soft landscaped areas, material will be excavated and certified clean sub soils and topsoil imported.
- A simple cover system of approximately 600mm soils would be suitable. Typically, 150 mm topsoil over approximately 450 mm clean free draining subsoils would generally be considered sufficient. Where deep rooting shrubs / trees are proposed in any landscaping it may be necessary to locally deepen the clean cover to accommodate a healthy root bowl.
- In areas which are to be covered by either buildings or hard standing, no such clean cover layer is required to sever the source to receptor pathway.

9.3 RISKS TO WATER RESOURCES

The site is underlain by a Secondary A Aquifer with respect to the superficial deposits and a Principal Aquifer with respect to the solid geology. The site is not situated within an Environment Agency-designated Groundwater Source Protection Zone.

Significant levels of potentially soluble and therefore mobile organic contaminant sources were not measured on site within the samples tested. It is therefore considered risks to groundwater resources are considered to be classed as low across the site.

9.4 RISKS TO PLANTS

Significantly elevated concentrations of phytotoxic metals which could be considered harmful to plants were not encountered on site.

Given the absence of such on site, any soft landscaped areas will require the importation of suitable clean subsoil and topsoil. Any such growth media would require analytical testing to confirm its suitability as growth media and its compliance with their relevant SGVs.

9.5 RISKS TO BUILDINGS & SERVICES

The risks to buried services from organic contamination such as TPH, which can degrade/permeate plastics and other polymer materials used to supply potable water is considered to be moderate.

Based on current guidance, the need to protect incoming water supplies in any new development, e.g. by the use of barrier pipes, is considered likely given the contaminant levels encountered as part of this investigation; however, it is always advisable that confirmation from utility suppliers should be sought.

9.6 GAS RISK ASSESSMENT

The levels of soil gas underlying the site have been monitored as part of a short-term soil gas monitoring programme carried out across the site during November and December 2025.

The results obtained from the soil gas survey indicate that elevated levels of soil gas, which may require gas protection measures to be incorporated into the development are not present on site. No significantly elevated gas flow rates were recorded during the monitoring.

The highest carbon dioxide concentration encountered on site during this current investigation was measured in BH2 at 0.5% which is below the relevant guideline limit of 5%.

The highest methane concentration was encountered at BH3 at 0.4% which is below the relevant guideline limit of 1%.

Measurement of both borehole pressure and gas emission rates indicates that no significant gas flows are present, the highest measured flow rate was 0.7 l/hr. GEI have used a gas flow rate of 1.0l/hr in the following calculations as a conservative measure.

Based on BS 8485:2015 and C716, we have assessed the site based on the gas monitoring undertaken as part of the site investigation in order to calculate a Characteristic Gas Situation (CS).

Based on the worst-case gas characteristic situation, the worst-case implied CS derived by combining the maximum observed concentrations from different borehole standpipes during any monitoring event and a worst-case flow rate of 1.0 l/h are as follows.

Land at 362 Oxford Road, Reading, RG30 1AQ
Phase 2 Contamination Risk Assessment



Flow Rate (l/h)	CH4 (%)	CO2 (%)	GSV – CH4 (l/h)	GSV – CO2 (l/h)	Implied CH4 CS	Implied CO2 CS
1.0	0.4	0.5	0.004	0.005	1	1

On the basis of the measurements in the table above, the GSV is taken to be 0.005 l/h, which is the worst case for methane and carbon dioxide. A GSV of 0.005 l/h lies within the GSV values for CS1 (<0.07 l/h) which has a very low hazard potential.

BS 8485:2015 enables the minimum level gas protection (score) for the site or zones to be determined based on the determined CS and the type of proposed building. As a conservative approach, a Type A building has been used for calculating the appropriate gas protection score.

A type A building (residential) in a Site with a CS1 ground gas regime characterisation, does not require gas protection measures as per BS8485:2015 guidance.

10 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a system diagram identifying contaminant sources, routes of exposure (pathways), and which receptors are affected by contaminants moving along those pathways.

The model is produced to identify the zones of the site with different potential contaminations characteristics (e.g. whether contaminants in the soil are likely to be on the surface or at depth, distributed over an entire area or in localised 'hot spots').

The conceptual site model presented in the table below is based on the findings of the site investigation undertaken.

Land at 362 Oxford Road, Reading, RG30 1AQ
Phase 2 Contamination Risk Assessment



Source	Pollutant		Pathway	Hazard		Receptor	Observations/ Recommendations	Assessed Risk
Contaminated ground	Metals, organic (hydrocarbons) could be present	→	Direct contact, ingestion, inhalation.	Health risks including skin irritation.	→	Humans: site workers and future occupants	Normal health and safety precautions. Imported soils required in soft landscaped areas.	Low
			Surface run off.	Lateral movement to surface watercourses.	→	Aquatic resources, ecology and subsequent users including humans.	No significantly elevated mobile contaminant concentrations encountered.	Low
			Leaching/ Dispersion.	Downward migration to groundwater.	→	Aquatic resources – Groundwater, abstraction wells) / surface waters.	No significantly elevated contaminant concentrations encountered. Site located above Secondary A Aquifer and not within a groundwater SPZ.	Low
			Uptake by plants.	Phytotoxic effects.	→	Soft landscaped areas / plants.	No elevated contaminant concentrations encountered.	Low
			Direct contact	Aggressive chemical attack	→	Building structures and services	It is considered that protection of services is likely to be required on this site however advice should be sought from Statutory Providers especially as to whether potable water pipes should be protected.	Low

Land at 362 Oxford Road, Reading, RG30 1AQ
Phase 2 Contamination Risk Assessment



Source	Pollutant	Pathway	Hazard	Receptor	Observations/ Recommendations	Assessed Risk
Liquid contaminant sources	Diesel, Petrol and Oils.	Direct contact; ingestion, inhalation.	Health risks including skin irritation. Lateral and vertical migration of contaminants.	Humans: site workers. Groundwater and surface water.	No significantly elevated contaminant concentrations encountered.	Low
Redundant Waste, Demolition Waste		Dermal Contact/ingestion. Potential for migration via surface water run-off	Health Risks	Humans: Site workers	All waste on site is to be removed from site during site preparatory works and disposed of in accordance with current legislation.	Low

11 CONCLUSIONS AND RECOMMENDATIONS

Based on the site investigation, intrusive works and subsequent data assessment, the following conclusions and recommendations have been drawn in respect of the proposed development on land at 362 Oxford Road, Reading, RG30 1AQ.

- At the time of this report, the site comprised an undeveloped area predominantly laid to grass and scrub vegetation with some larger trees and shrubs present.
- The site is underlain by a Secondary A Aquifer in the superficial deposits, a Principal Aquifer in the solid geology and is not located within an Environment Agency-designated Groundwater Source Protection Zone.
- Concentrations of toxic metals were found to be consistently below their respective soil guideline values.
- Concentrations of TPH and PAH were low within soil across the site and would therefore not be considered to pose a significant risk of significant harm to human health.
- Elevated specific PAH compounds were not encountered across the site apart from a single minor elevated specific PAH compound. As the concentration was only very slightly over the guideline limit, and the location will be beneath a proposed building and therefore no source to receptor pathway exists there is not considered to be a significant risk of significant harm to human health.
- Asbestos containing material (ACM) was not encountered on site.
- Any areas of the site set to be covered by buildings and hardstanding would not pose a significant risk of significant harm to human health as they would sever any potential pollutant pathway and therefore no further action will be required.
- Given the absence of such on site, any soft landscaped areas will require the importation of suitable clean subsoil and topsoil. Any such growth media would require analytical testing to confirm its suitability as growth media and its compliance with their relevant SGVs.
- The risks posed to workers involved in any future redevelopment of the site are not considered significant providing standard health and hygiene practices are adopted.
- Based on concentrations of PAH found across the site it is likely that any potential new services, in particular potable water, will require protection, however it is advisable to seek service provider confirmation of this.
- The risks to groundwater and surface water are considered to be low due to the lack of any significant mobile organic contamination.
- The proposed development considered to consist of a Type A (residential) building in a Site with a CS1 ground gas regime characterisation would not require ground gas protection measures in any new buildings.

- It is recommended that a watching brief is implemented on this site during enabling works and should any contamination or potentially contaminative sources be discovered during the proposed enabling works all site works would cease, and suitably competent consultants/engineers will attend site to agree a formal remediation strategy.

Based on the principles and definitions outlined under section 57 of the Environment Act 1995 and following the recommended remedial measures, the site would not be considered to be “Contaminated Land” based on a residential without plant uptake end use.

APPENDIX 1

LIMITATIONS

The recommendations contained in this Report represent GEI's professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant.

GEI does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

GEI obtained, reviewed and evaluated information in preparing this Report from the Client and others. GEI's conclusions, opinions and recommendations has been determined using this information. GEI does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which GEI has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by GEI for the sole and exclusive use of the Client and for the specific purpose for which GEI was instructed.

Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and GEI, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party.

In particular, GEI does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client.

Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless GEI from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of / or resulting from the performance of the work by the Consultant.

APPENDIX 2

FACTUAL REPORT OF INVESTIGATION

S CHICK INVESTIGATIONS LTD



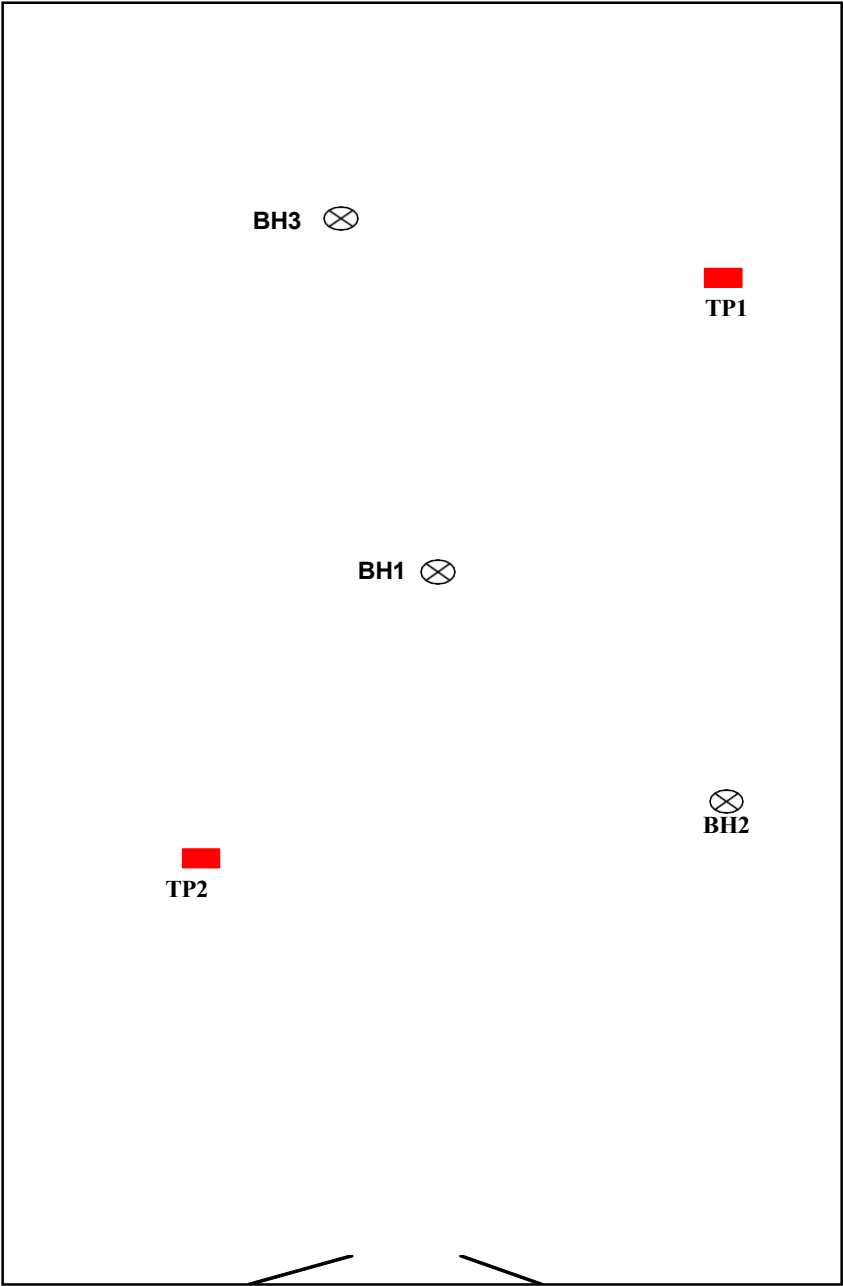
Factual Report of Investigation

AT: 362 Oxford Road, Reading

ON: 28/11/25

FOR: Bauhaus

SITE PLAN	Sheet: 1 of 1	 SCI
	Client: Bauhaus	
	Date: 28/11/2025	Reading



Curzon Street

M
o
u
l
s
f
o
r
d

M
e
w
s

Shops

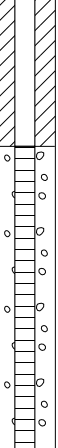
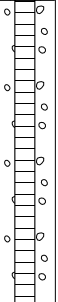
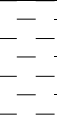
Existing Flats

REMARKS:				
Logged:	Checked:	Approved:	Scale: NTS	Weather:

BH2
Sheet 1 of 1

Sheet 1 of 1

Client Bauhaus	Contractor S Chick Investigations	Consultant
--------------------------	---	-------------------

Inst/ Backfill		Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata		
			Depth (m)	Type/ Ref	Results			Legend	Description	
			0.30 - 0.50 0.30 - 0.50	ES J			(1.10)		Made Ground, Brown, clayey, sandy, SILT, with brick rubble and gravels.	0.5 1.0
			1.20 - 1.50 1.20 - 1.50	ES J			1.10		Firm, Orange brown, Sandy, gravelly, CLAY, with partings of orange silt/fine sand.	1.5
							(0.90)			2.0
			2.00				Medium Dense, orange brown, SAND & GRAVEL.	2.5		
						(1.00)				3.0
						3.00	End of Borehole at 3.00m			3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0

Remarks	Method, Plant, Stability, Dimensions	Logger
	0.00 - 3.00m HP Hand Tools Stable $L = 0.40m$  $W = 0.40m$	C Allingham
	0.00 - 3.00m BH Window Sampler Stable $L = 0.10m$  $W = 0.10m$	C Allingham

		Borehole Log					BH3		
							Sheet 1 of 1		
		Hole Type BH		Easting	Northing	Ground Level (m)	Scale 1:50		
Project Name 362 Oxford Road Reading		Project No. 28112025		Start Date 2025-11-28		End Date 2025-11-28			
Client Bauhaus		Contractor S Chick Investigations			Consultant				
Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results			Legend	Description	
		0.30 - 0.50 0.30 - 0.50	ES J			(0.90)		Made Ground, Brown, clayey, sandy, SILT, with brick rubble and gravels.	0.5
		1.20 - 1.50 1.20 - 1.50	ES J			0.90 (0.30) 1.20		Black Slag, with Glass.	1.0
						(0.80)		Firm, Orange brown, Sandy, gravelly, CLAY, with partings of orange silt/fine sand.	1.5
						2.00 (1.00) 3.00		Medium Dense, orange brown, SAND & GRAVEL.	2.0
								End of Borehole at 3.00m	3.0
									3.5
									4.0
									4.5
									5.0
									5.5
									6.0
									6.5
									7.0
									7.5
									8.0
									8.5
									9.0
									9.5
									10.0
Remarks							Method, Plant, Stability, Dimensions		Logger
							0.00 - 3.00m HP Hand Tools		C Allingham
							Stable		
							L = 0.40m		
									W = 0.40m
							0.00 - 3.00m BH Window Sampler		C Allingham
							Stable		
							L = 0.10m		
									W = 0.10m

					Hand Pit					TP1		
										Sheet 1 of 1		
					Hole Type HP		Easting		Northing		Ground Level (m)	
Project Name 362 Oxford Road Reading					Project No. 28112025		Start Date 2025-11-28		End Date 2025-11-28			
Client Bauhaus					Contractor S Chick Investigations					Consultant		
Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata					
		Depth (m)	Type/ Ref	Results			Legend	Description				
		0.30 - 0.50 0.30 - 0.50	ES J			(0.50) 0.50		Made Ground, Brown, clayey, sandy, SILT, with brick rubble and gravels.				
								End of Trial Pit at 0.50m	0.5			
									1.0			
									1.5			
									2.0			
									2.5			
									3.0			
									3.5			
									4.0			
									4.5			
									5.0			
Remarks							Method, Plant, Stability, Dimensions			Logger		
							0.00 - 0.50m HP Hand Tools			C Allingham		
							Stable					
							L = 0.40m W = 0.40m					

					Hand Pit					TP2		
										Sheet 1 of 1		
					Hole Type HP		Easting		Northing		Ground Level (m)	
Project Name 362 Oxford Road Reading					Project No. 28112025		Start Date 2025-11-28		End Date 2025-11-28			
Client Bauhaus					Contractor S Chick Investigations					Consultant		
Inst/ Backfill	Water Levels	Samples and Tests			Level (m)	Depth (thickness) (m)	Strata					
		Depth (m)	Type/ Ref	Results			Legend	Description				
		0.30 - 0.50 0.30 - 0.50	ES J			(0.50) 0.50		Made Ground, Brown, clayey, sandy, SILT, with brick rubble and gravels.				
								End of Trial Pit at 0.50m	0.5			
									1.0			
									1.5			
									2.0			
									2.5			
									3.0			
									3.5			
									4.0			
									4.5			
									5.0			
Remarks							Method, Plant, Stability, Dimensions			Logger		
							0.00 - 0.50m HP Hand Tools			C Allingham		
							Stable L = 0.40m 			W = 0.40m		

GROUND GAS AND GROUNDWATER LOGGING SHEET

Site Name	362 Oxford Road Reading	Recorded By	Craig	Visit Number	1	Start Time	12.30pm
Job Number	28112025	Weather Conditions	Dry			Finish Time	1.15pm
Date	28/11/2025	Barometric Start	1002	Barometric Finish	1002	Kit Used	GA5000

[illegible]

ANALYTICAL TEST REPORT

Report Number 25-12082, issue number 1

Contract name: 362 Oxford Road Reading

Client reference: Not Supplied

Clients name: S Chick Investigations Limited

Clients address: S Chick Investigations Limited
26 Ferraro Close
Heston
TW5 0UL

Samples received: 08/12/2025

Analysis started: 09/12/2025

Analysis completed: 16/12/2025

Report issued: 16/12/2025

Key

U UKAS accredited test

M MCERTS & UKAS accredited test

(B) Analysis performed at Southampton Site

I/S Insufficient sample to carry out test

U/S Sample not suitable for testing

NAD No Asbestos Detected

Full key available on Information page



Approved by: Sam Rogerson
Receipt and Reporting Manager

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

% Moisture reported as MCERTS drying at 30°C

Lab ref	Sample ID	Depth (m)	Sample description	Material removed	% Removed	% Moisture
80011	BH2	0.3 - 0.5	Brown Clayey Sand with Gravel and Vegetation.	-	-	9.7
80012	BH2	1.2 - 1.5	Brown Sandy Clay with Gravel and Vegetation.	-	-	13.0
80013	BH3	0.3 - 0.5	Brown Loamy Sand with Gravel and Vegetation.	-	-	11.0
80014	BH3	1.2 - 1.5	Brown Sandy Clay with Gravel and Vegetation.	-	-	14.8
80015	TP1	0.3 - 0.5	Brown Sandy Clay with Gravel and Vegetation.	-	-	11.5
80016	TP2	0.3 - 0.5	Brown Sand with Gravel and Vegetation.	-	-	11.4

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

- a Sampling date not provided
- b Sampling time not provided (waters only)
- c Sample not received in appropriate containers
- d Storage Temperature
- e Headspace present in sample container
- f Sample exceeded sampling to receipt
- g Sample exceeded holding time(s)

Lab ref	Sample ID	Depth (m)	Deviating	Tests (Reason for deviation)
80011	BH2	0.3 - 0.5	Y	Sulphide By DA in Soil(g)
80012	BH2	1.2 - 1.5	Y	Sulphide By DA in Soil(g)
80013	BH3	0.3 - 0.5	Y	Sulphide By DA in Soil(g)
80014	BH3	1.2 - 1.5	Y	Sulphide By DA in Soil(g)
80015	TP1	0.3 - 0.5	Y	PAH in Soil(c), Sulphide By DA in Soil(g), EPH in Soil(c)
80016	TP2	0.3 - 0.5	Y	Sulphide By DA in Soil(g)

SOILS

Lab Number					80011	80012	80013	80014	80015
Client Reference					SOIL	SOIL	SOIL	SOIL	SOIL
Sample ID					BH2	BH2	BH3	BH3	TP1
Depth (m)					0.3 - 0.5	1.2 - 1.5	0.3 - 0.5	1.2 - 1.5	0.3 - 0.5
Sampling Date					03/12/2025	03/12/2025	03/12/2025	03/12/2025	03/12/2025
Test	Method	Accred	LoD	Units					
Asbestos									
Asbestos Identification	SUBCO N	SU	0	-	NAD	NAD	NAD	NAD	NAD
Metals									
Water Soluble Boron	CE063	N	0.5	mg/kg	0.54	0.93	0.76	1.18	0.65
Arsenic	CE264	U	1.8	mg/kg	36.5	19.0	21.7	17.8	24.6
Cadmium	CE264	M	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Chromium	CE264	U	2	mg/kg	31.4	22.7	21.8	21.5	20.2
Copper	CE264	U	1.6	mg/kg	26.3	22.8	27.2	22.6	31.6
Lead	CE264	U	2.3	mg/kg	82.1	41.4	85.3	65.4	86.1
Mercury	CE264	U	0.7	mg/kg	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Nickel	CE264	M	2.1	mg/kg	28.4	22.1	25.5	21.1	24.6
Selenium	CE264	U	3	mg/kg	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Zinc	CE264	M	4	mg/kg	98.8	48.7	78.6	52.2	77.5
Colourimetric									
Water Soluble Sulphate	CE261	U	1.8	mg/l	14.4	11.5	6.58	9.03	9.73
Total Monohydric Phenols	CE078	N	0.5	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Cyanide	CE077	N	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphide	CE284	N	4	mg/kg	g 6	g 12	g 11	g 8	g 6
Combustion									
Moisture Content	CE001	N	0.1	%	9.7	13.0	11.0	14.8	11.5
Total Organic Carbon	CE197	M	0.1	%	1.28	1.02	2.00	1.27	1.49
Polyaromatic hydrocarbons									
Naphthalene	CE087	M	0.016	mg/kg	0.019	< 0.016	0.065	< 0.016	c 0.048
Acenaphthylene	CE087	M	0.015	mg/kg	0.037	< 0.015	0.130	< 0.015	c 0.068
Acenaphthene	CE087	M	0.013	mg/kg	0.014	< 0.013	0.029	< 0.013	c < 0.013
Fluorene	CE087	U	0.013	mg/kg	0.013	< 0.013	0.047	< 0.013	c 0.015
Phenanthrene	CE087	M	0.014	mg/kg	0.377	0.031	1.13	< 0.014	c 0.343
Anthracene	CE087	U	0.017	mg/kg	0.104	< 0.017	0.277	< 0.017	c 0.097
Fluoranthene	CE087	M	0.017	mg/kg	1.02	< 0.017	3.41	< 0.017	c 1.32
Pyrene	CE087	M	0.016	mg/kg	0.918	0.016	2.97	< 0.016	c 1.18
Benzo(a)anthracene	CE087	U	0.012	mg/kg	0.571	0.020	1.72	< 0.012	c 0.725

SOILS

Lab Number					80011	80012	80013	80014	80015
Client Reference					SOIL	SOIL	SOIL	SOIL	SOIL
Sample ID					BH2	BH2	BH3	BH3	TP1
Depth (m)					0.3 - 0.5	1.2 - 1.5	0.3 - 0.5	1.2 - 1.5	0.3 - 0.5
Sampling Date					03/12/2025	03/12/2025	03/12/2025	03/12/2025	03/12/2025
Test	Method	Accred	LoD	Units					
Chrysene	CE087	M	0.028	mg/kg	0.500	< 0.028	1.54	< 0.028	c 0.700
Benzo(b)fluoranthene	CE087	M	0.02	mg/kg	0.845	< 0.020	2.39	< 0.020	c 1.06
Benzo(k)fluoranthene	CE087	M	0.025	mg/kg	0.320	< 0.025	0.903	< 0.025	c 0.394
Benzo(a)pyrene	CE087	U	0.019	mg/kg	0.682	< 0.019	2.03	< 0.019	c 0.880
Indeno(1,2,3-cd)pyrene	CE087	M	0.019	mg/kg	0.660	< 0.019	1.80	< 0.019	c 0.789
Dibenzo(a,h)anthracene	CE087	M	0.017	mg/kg	0.116	< 0.017	0.339	< 0.017	c 0.139
Benzo(g,h,i)perylene	CE087	M	0.019	mg/kg	0.505	< 0.019	1.49	< 0.019	c 0.628
Total PAH(16)	CE087	N	0.28	mg/kg	6.70	< 0.280	20.3	< 0.280	c 8.39
Total Petroleum Hydrocarbons									
>C10-C40 Soil (EH_1D_Total)	CE033	M	19	mg/kg	114	< 19.0	163	< 19.0	c 83.4
Wet Chem									
pH	CE004	M	0.1	pH units	8.2	8.1	8.1	7.6	7.9

SOILS

Lab Number					80016
Client Reference					SOIL
Sample ID					TP2
Depth (m)					0.3 - 0.5
Sampling Date					03/12/2025
Test	Method	Accred	LoD	Units	
Asbestos					
Asbestos Identification	SUBCO N	SU	0	-	NAD
Metals					
Water Soluble Boron	CE063	N	0.5	mg/kg	0.85
Arsenic	CE264	U	1.8	mg/kg	38.0
Cadmium	CE264	M	1.6	mg/kg	< 1.6
Chromium	CE264	U	2	mg/kg	23.5
Copper	CE264	U	1.6	mg/kg	33.1
Lead	CE264	U	2.3	mg/kg	109
Mercury	CE264	U	0.7	mg/kg	< 0.7
Nickel	CE264	M	2.1	mg/kg	27.7
Selenium	CE264	U	3	mg/kg	< 3.0
Zinc	CE264	M	4	mg/kg	95.1
Colourimetric					
Water Soluble Sulphate	CE261	U	1.8	mg/l	8.04
Total Monohydric Phenols	CE078	N	0.5	mg/kg	< 0.50
Total Cyanide	CE077	N	1	mg/kg	< 1.0
Total Sulphide	CE284	N	4	mg/kg	g < 4
Combustion					
Moisture Content	CE001	N	0.1	%	11.4
Total Organic Carbon	CE197	M	0.1	%	2.12
Polyaromatic hydrocarbons					
Naphthalene	CE087	M	0.016	mg/kg	0.086
Acenaphthylene	CE087	M	0.015	mg/kg	0.250
Acenaphthene	CE087	M	0.013	mg/kg	0.109
Fluorene	CE087	U	0.013	mg/kg	0.231
Phenanthrene	CE087	M	0.014	mg/kg	4.55
Anthracene	CE087	U	0.017	mg/kg	1.05
Fluoranthene	CE087	M	0.017	mg/kg	7.04
Pyrene	CE087	M	0.016	mg/kg	5.80
Benzo(a)anthracene	CE087	U	0.012	mg/kg	2.98

SOILS

Lab Number					80016
Client Reference					SOIL
Sample ID					TP2
Depth (m)					0.3 - 0.5
Sampling Date					03/12/2025
Test	Method	Accred	LoD	Units	
Chrysene	CE087	M	0.028	mg/kg	2.77
Benzo(b)fluoranthene	CE087	M	0.02	mg/kg	4.55
Benzo(k)fluoranthene	CE087	M	0.025	mg/kg	1.63
Benzo(a)pyrene	CE087	U	0.019	mg/kg	3.85
Indeno(1,2,3-cd)pyrene	CE087	M	0.019	mg/kg	3.73
Dibenzo(a,h)anthracene	CE087	M	0.017	mg/kg	0.698
Benzo(g,h,i)perylene	CE087	M	0.019	mg/kg	3.11
Total PAH(16)	CE087	N	0.28	mg/kg	42.4
Total Petroleum Hydrocarbons					
>C10-C40 Soil (EH_1D_Total)	CE033	M	19	mg/kg	90.6
Wet Chem					
pH	CE004	M	0.1	pH units	7.9

METHOD DETAILS

METHOD	TESTNAME	METHOD SUMMARY	ANALYSIS BASIS
SUBCON	Asbestos Soil	HSG248	Air Dried Sample
CE033	EPH in Soil	Acetone:Hexane Extraction and GCFID	As submitted sample
CE063	Water soluble boron	ICPOES	Air dried sample
CE264	Metals by ICP in Soil	ICPOES	Air dried sample
CE261	Anions by Discrete Analyser in Soils	Gallery	Air dried sample
CE087	PAH in Soil	DCM Extraction and GCMS	As submitted sample
CE078	Phenols in Soil	Continuous Flow Analyser	As submitted sample
CE077	Cyanides in Soils	Continuous Flow Analyser	As submitted sample
CE284	Sulphide By DA in Soil	Gallery Discrete Analyser	Air dried sample
CE197	Primacs in Soil	Primacs	Air dried sample

REPORT INFORMATION

Report No.:25-12082, issue number 1

Key	
U	ISO17025 Accredited Result
M	ISO17025 and MCERTS Accredited Result
N	Do not currently hold accreditation
^	MCERTS accreditation not applicable for sample matrix
*	ISO17025 accreditation not applicable for sample matrix
S	Subcontracted
I/S	Insufficient Sample
U/S	Unsuitable sample
N/T	Not tested
<	Means "less than"
>	Means "greater than"

LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.

This report shall not be reproduced except in full, without prior written approval.

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

The results relate only to the sample received.

Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Moisture Content Calculated on a Wet Weight basis (at 30°C)

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

Where sampling was undertaken by Chemtech Environmental Limited it is outside the UKAS accreditation scope.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

For soils and solids, all results are reported on a dry basis (30°C). Samples dried at no more than 30°C in a drying cabinet.

For soils and solids, analytical results are inclusive of stones and 'inert' material, where applicable.

'Client Reference', 'Sample ID', 'Sample Location', 'Sample Type', 'Depth', 'Sample Date' and 'Sample Time' information is provided by the customer

Sample Retention and Disposal

All soil samples will be retained for a period of 4 weeks from the point of receipt

All water samples will be retained for a period of 2 weeks from the point of Reporting

Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

Unless specifically identified (noted as "(B)" in analyte name) all internal analysis performed at Durham site

Vat Reg No. 772 5703 18 Registered in England number 4284013

APPENDIX 3
GUIDELNE ON CONTAMINATION LEVELS

Human Health

CLEA Soil Guideline values (SGV)

The UK's primary contaminated land guidance is contained within the Contaminated Land Exposure Assessment (CLEA) framework. Within this framework a number of Soil Guideline Values (SGVs) were published for key contaminants along with toxicological guideline values relating to intake thresholds. The soil guideline values provided by the CLEA model represent intervention values for end uses based upon potential human exposure and soil concentrations of a contaminant above these values might represent an unacceptable risk to the health of the site users. The Environment Agency had an ongoing programme of SGV publication with associated toxicological information for key contaminants. Where SGVs are available then they should be used as the basis for any human health risk assessment.

All CLEA SGVs were withdrawn for use by the Environment Agency in 2008 whilst they are under review and pending the availability of new toxicological data. To date, new SGV values have been set for benzene, toluene, ethylbenzene and xylene and mercury and selenium. In the absence of the new SGVs and toxicological report data, GEI have used appropriate screening tools or Generic Assessment Criteria Levels as assessment criteria guidelines for those determinands not currently assigned SGVs. It should be noted that the former SGVs for metals were in general agreement with those site specific levels generated by RBCA and other similar computer model based risk assessment tools.

The GEI screening assessment of contaminants within samples has been carried out using these model generated values in the absence of any other values or guidelines. The version of the CLEA model, v1.06, was used. The published SGVs are shown below. Nickel SGV has been withdrawn (2015) pending an assessment of the toxicological data used in the model for nickel. Published SGV values.

Land use	Soil Guideline Value (mg kg ⁻¹)		
	Residential	Allotment	Commercial
Inorganic arsenic	32	43	640
Nickel	130	230	1,800
Cadmium	10	1.8	230
Phenol	420	280	3200
Elemental Hg	1	26	26
Inorganic Hg	170	80	3600
Methyl Hg	11	8	410
Selenium	350	120	13,000
Benzene	0.33	0.07	95
Toluene	610	120	4400
Ethylbenzene	350	90	2800
o-Xylene	250	160	2600
r-Xylene	240	180	3500
m-Xylene	230	160	3200

Based on a sandy loam soil as defined in Environment Agency (2009b) and 6% SOM.

Guidelines on Contamination Levels



DEFRA Category four screening level (C4SL)

In addition to the SGVs, guideline screening values proposed in the DEFRA document SP1010- Development of Category 4 Screening Levels for Assessment of Land affected by Contamination Final Project Report (C4SL) are considered along with the suitable for use levels (S4USL) derived by the Chartered Institute of Environmental Health (CIEH) in partnership with the Land Quality Management Organization (LQM). The screening levels are given for residential, commercial, allotment or public open space end uses.

PARAMETER	Residential		Commercial	Allotment	Public open Space near residential POS _{resi}	Public park land POS _{park}	Sources
	With Plant uptake	Without Plant uptake					
Inorganics - mg/kg unless stated							
Arsenic (inorganic)	37	40	640	49	79	170	DEFRA C4SL
Beryllium	1.7	1.7	12	35	2.2	63	LQM/S4USL
Boron	290	11,000	240,000	45	21,000	46,000	LQM/CIEH
Cadmium	22	150	410	3.9	220	880	LQM/S4USL
Chromium III	910	910	8,600	18,000	1,500	33,000	LQM/CIEH
Chromium VI	21	21	49	170	21	250	LQM/S4USL
Copper	2,400	7,100	68,000	520	12,000	44,000	LQM/CIEH
lead	200	310	2,300	80	630	1,300	DEFRA C4SL
Mercury (Inorganic)	40	56	1,100	19	120	240	LQM/CIEH
Nickel	180	180	980	230	230	3,400	LQM/CIEH
Selenium	250	430	12,000	88	1,100	1,800	LQM/CIEH
Vanadium	410	1,200	9,000	91	2,000	5,000	LQM/CIEH
Zinc	3,700	40,000	730,000	620	81,000	170,000	LQM/CIEH
Total sulphate	2400	2400	2400	2400	2400	2400	BRE (2005)
Water-soluble sulphate (g/l)	0.5	0.5	0.5	0.5	0.5	0.5	BRE (2005)
pH	<5	<5	<5	<5	<5	<5	-

CLEA does not currently provide guidance for total Polycyclic Aromatic Hydrocarbons (PAHs). A standalone Defra C4SL for benzo(a)pyrene has been assigned and is shown below. In addition, the Chartered Institute of Environmental Health (CIEH) in partnership with the Land Quality Management Organization (LQM) used CLEA software to derive Generic Assessment Criteria (GAC) and Assessment Sub Criteria (ASC) for the following PAH compounds:

Guidelines on Contamination Levels



PARAMETER	Residential												PO S resi	PO S park	Source
	With Plant uptake			Without Plant uptake											
	SOM %	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5			
Organics - mg/kg unless stated															
Acenaphthene	200	490	1080	2000	3600	5200	75000	92000	100000	34	85	202			CLEA/LQM CIEH
Acenaphthylene	170	400	900	2000	3600	5200	76000	92000	100000	28	68	163			CLEA/LQM CIEH
Anthracene	2300	5400	10700	30000	34000	36000	520000	530000	540000	380	947	2230			CLEA/LQM CIEH
Benzo(a)anthracene	7.5	11	13	12	14	15	170	170	180	2.9	6.5	13			CLEA/LQM CIEH
Benzo(a)pyrene C4SL			5			5.3			77			5.7	10	21	DEFRA C4SL
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	35	35	36	3.6	3.7	3.7			CLEA/LQM CIEH
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	44	45	45	1	2.2	3.9			CLEA/LQM CIEH
Benzo(g,h,i)perylene	315	340	350	360	360	360	3900	4000	4000	290	480	646			CLEA/LQM CIEH
Benzo(k)fluoranthene	77	93	100	110	110	110	1200	1200	1200	37	76	129			CLEA/LQM CIEH
Chrysene	15	22	27	30	31	32	350	350	350	4.1	9.5	19			CLEA/LQM CIEH
Dibenzo(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	3.5	3.6	3.6	0.14	0.27	0.44			CLEA/LQM CIEH
Fluoranthene	280	560	890	1500	1600	1600	23000	23000	23000	52	127	288			CLEA/LQM CIEH
Fluorene	165	390	850	2200	3400	4200	60000	67000	70000	27	67	158			CLEA/LQM CIEH
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	500	510	510	9.5	21	40			CLEA/LQM CIEH
Naphthalene	1	2.3	5.5	1	2.4	6	100	260	600	4	9.8	23			CLEA/LQM CIEH
Phenanthrene	95	220	440	1300	1400	1500	22000	22000	23000	15	38	90			CLEA/LQM CIEH
Pyrene	620	1200	2000	3700	3800	3800	54000	54000	55000	11	271	620			CLEA/LQM CIEH

Petroleum Hydrocarbons represent a complex situation being a mixture of a range of compounds, the relative concentrations of which may change over time.

As discussed above, Generic Assessment Criteria (GAC) for total petroleum hydrocarbons according to both their molecular weight and chemical structure and also for a range of soil organic matter (SOM) content values have been derived using CLEA software.

The LQM CIEH GACs are again presented according to their soil organic matter content and proposed end use of the land. The generic assessment criteria for a 1%, 2.5% and 6% SOM content are tabulated below and presented according to the proposed end use.

Guidelines on Contamination Levels



SOM %	LQM CIEH Generic Assessment Criteria (mg/kg dry weight soil)											
	Residential						Allotment Land Use			Commercial Land Use		
	With Plant Uptake			Without Plant Uptake								
	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6
Aliphatic												
EC 5 – 6	24	40	80	24	40	80	752	1730	3900	2400	4000	8000
EC > 6 – 8	52	110	250	52	110	250	2304	5580	13000	5200	11000	25000
EC > 8 – 10	13	30	70	13	30	70	321	770	1700	1300	3000	7000
EC > 10 – 12	60	150	360	60	150	360	2153	4300	7150	6000	15000	32000
EC > 12 – 16	500	1200	2600	500	1200	2600	10800	12400	13200	42000	72000	90000
EC > 16 – 35	4100 0	6900 0	94000	41000	6900 0	9400 0	240000	260000	260000	140000	160000	180000
EC > 35 – 44	4100 0	6900 0	94000	41000	6900 0	9400 0	240000	260000	260000	140000	160000	180000
Aromatic												
EC 5 – 7 (benzene)	50	110	240	155	300	630	12	25	57	15000	28000	55000
EC > 7 – 8 (toluene)	100	240	550	370	800	1800	21	50	117	33000	68000	130000
EC > 8 – 10	20	50	110	20	53	125	8.6	21	50	2000	5000	120000
EC > 10 – 12	63	150	340	120	280	650	12.5	31	74	11000	22000	31000
EC > 12 – 16	140	320	660	1100	1900	2300	23	57	134	35000	37000	38000
EC > 16 – 21	260	540	930	1800	1900	1900	47	112	260	28000	28000	28000
EC > 21 – 35	1100	1400	1700	1900	1900	1900	370	820	1500	28000	28000	28000
EC > 35 – 44	1100	1400	1700	1900	1900	1900	370	820	1500	28000	28000	28000
Benzene DEFRA C4SL	0.06	0.13	0.3 (0.87)	0.16	0.3	0.64 (3.3)	0.016	0.033	0.073 (0.18)	15	28	57 (98)
Toluene	104	240	550	370	830	1800	22	50	117	33000	68000	130000
Ethylbenzene	30	62	150	34	81	190	16	38	91	3200	7000	16000
o-xylene	30	70	170	40	90	200	28	67	160	3700	8000	19000
m-xylene	30	70	160	34	80	190	30	74	170	3400	8000	18000
p-xylene	30	70	160	33	80	180	28	69	160	3200	8000	17000

POS _{re} si	POS _p ark
140	230

TPH values calculated using CLEA v1.06 with parameter changes in accord with DEFRA (2014) C4SL and LQM/CIEH (2015)

Inert Material

The limit values for inert waste are given in the EC Landfill Directive 1999/31/EC as applied under the Environmental Permitting (England and Wales) (Amendment) (EU Exit) Regulations 2019 (SI 2019/39) and as defined by the council decision establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC(2003/33/EC).

The regulations and associated guidance provide waste acceptance criteria, which set the limits of contaminants permitted in various waste categories going to landfill. These criteria are of particular use where CLEA guidance or DEFRA Screening values has not yet been provided.

Guidelines on Contamination Levels

Inert waste is defined as waste which contains insignificant potential for pollution and does not endanger the quality of surface water or groundwater. The Landfill Directive states that inert waste will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health.

For risk assessment purposes we would consider that any materials (soils) containing concentrations of potential contaminants that would result in them being classified as inert would be considered as uncontaminated and therefore representing a low risk to human health.

Similarly, such material would not be considered to represent a significant risk to water resources.

Where CLEA or Defra screening values exist, these would always be used in preference to inert waste values when assessing risks to human health.

Selected inert waste acceptance criteria as given in Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills for the Landfill Directive are given below.

Landfill acceptance criteria for inert waste (mg/kg)	
Total organic carbon (TOC)	30,000
BTEX compounds	6
Mineral oils (C10 – C40)	500
PCBs	1
PAH	100

Risks to Plants

The CLEA framework does not provide a method for the assessment of phytotoxic risks to plants. However maximum permissible concentrations have been published in the Sludge (Use in Agriculture) Regulations 1989 (SI 1989, No. 1263). This legislation enforces the provisions of the EC Directive 86/278/EEC for potentially toxic elements (PTEs) on soils for agricultural use where sewage sludge has been applied (see table below). These limits relate to the potential risk to plants and not human health for which CLEA is the overriding risk assessment model.

Maximum permissible concentration in agricultural soils following sewage sludge application (mg/kg).				
	pH 5.0<5.5	pH 5.5<6.0	pH 6.0-7.0	pH >7.0
Zinc	200	250	300	450
Copper	80	100	135	200
Nickel	50	60	75	110

Risks to buried concrete

The potential risks to buried concrete can be assessed by reference to the BRE Special Digest 1 (SD1) entitled 'Concrete in Aggressive Ground'. This document provides a methodology for the specification of concrete based on the ground conditions encountered and is based upon chemical analysis and associated factors (e.g. groundwater). The guidance provides a Design Sulphate Class (DS) based upon the ground conditions and it is considered that a low concentration of sulphate and pH (i.e. DS – 1 and DS – 2) is considered to represent a low risk to buildings.

Risks to buried services

In addition, where water is supplied in plastic pipes which could come into contact with contaminated ground then this can lead to premature failures, resulting in leakage and loss of water quality. Risks to water supply pipes are assessed using guidance published by the UK Water Industry Research (UKWIR) entitled '*Guidance for the Selection of Water Pipes to be used in Brownfield Sites*' (Report Ref. No. 10/WM/03/21). This is known as the UKWIR guidance.

Previous guidance from WRAS has been withdrawn but may still be in use by certain water supply companies. In general water companies have adopted a common set of guidelines as given in the ***Contaminated Land Assessment Guidance from January 2014***.

Additional threshold values for determining pipe material have also been published by certain water supply companies. If these threshold values are exceeded then consideration should be given to the selection of pipe material or to the use of barrier pipes. The UKWIR threshold values, together with those of certain water supply companies are presented in the table below for a range of potential hazards.

Guidelines on Contamination Levels



Substance ⁽¹⁾	Water UK Guidance	Thames Water
Total VOC	0.5	-
Total BTEX & MTBE	0.1	0.1 or either
Total SVOC	2	-
EC5-EC10 aliphatic and aromatic hydrocarbons	2	-
EC5-EC12 aliphatic hydrocarbons		0.5
EC5-EC12 aromatic hydrocarbons		0.5
EC10-EC16 aliphatic and aromatic hydrocarbons	10	-
EC12-EC21 aliphatic hydrocarbons		10
EC12-EC21 aromatic hydrocarbons		10
EC16-EC40 aliphatic and aromatic hydrocarbons	500	-
EC21-EC35 aliphatic hydrocarbons		500
EC21-EC35 aromatic hydrocarbons		500
Phenols	2	5*
Cresols and chlorinated phenols	2	2
Naphthalene	-	5
Ethers	0.5	-
Nitrobenzene	0.5	-
Ketones	0.5	-
Aldehydes	0.5	-
Amines	0	-
Corrosives pH and EC	#	
	##	

All units mg kg⁻¹ in soil;

pH <7 for wrapped steel, pH <5 wrapped ductile iron and copper and ##EC >400µS/cm;

*Phenol limit at 2mg/kg in presence of BTEX.