Ground and Environmental
Investigation Limited

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Land to the rear of 259 Noak Hill Road
Billericay
CM12 9UN

Phase 2 Contamination Risk Assessment

On behalf of Soil Investigation Eastern Ltd

Document Reference: 23-464/2

November 2023

Site: Land to the rear of 259 Noak Hill Road, Billericay, CM12 9UN

Document Reference No: 23-464/2

Quality Management

Authorised by:	 Marc Pearson BSc (Hons) MSc MIEnvSc Director
Date	November 2023
Revision	0
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About us

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.

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1 INTRODUCTION

Ground and Environmental Investigation Ltd (GEI) was commissioned by Soil Investigation Eastern Ltd to undertake a Phase 2 Contamination Risk Assessment on land to the rear of 259 Noak Hill Road, Billericay, CM12 9UN.

It was understood that the development of the site is proposed to comprise the demolition of existing buildings and hardstanding in the rear of the site and the construction of one new dwelling with associated soft landscaping.

The objectives of this assessment were to provide identification of environmental liabilities associated with the site and delineation of any potential areas of contamination resulting from the sites previous and current usage.

A Phase 1 Contamination Risk Assessment has been undertaken for the site by GEI (Ref: 23-464, September 2023) which should be read in conjunction with this report.

2 SITE LOCATION AND LAYOUT

The site is situated to the northeast of Noak Hill Road, Billericay to the rear of 259 Noak Hill Road in a mixed residential and agricultural setting. The site is located at approximate Grid Reference TQ 684 911 and occupies an area of approximately 0.58 hectares.

The following features surround the site:

- To the north, the site is bound by residential properties and associated gardens of Noak Hill Road;
- To the west, the site is bound by Noak Hill Road beyond which are residential properties;
- To the south, the site is bound by the River Crouch beyond which are fields in agricultural production; and
- To the east, the site is bound by commercial buildings previously used as a commercial fishery.

At the time of the site investigation, the site comprised an area of cleared ground given over to scrub and hardcore. It was estimated that hardcore covered approximately one third of the land. Topsoil had been cleared on some areas of the site. Numerous piles of hardcore and crushed builders waste were noted.

No significant visual or olfactory signs of contamination were noted across the site. The site was broadly level.

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 Alluvium over solid geology of the London Clay Formation.

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

Alluvium

Alluvium is a general term for clay, silt, sand and gravel. It is the unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope.

London Clay Formation

The London Clay mainly comprises bioturbated or poorly laminated, blue-grey or grey brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occurs in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels.

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 Unproductive strata with regard to the solid geology.

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.

3.3 PHASE 1 – POTENTIAL CONTAMINANT SOURCES

The site was undeveloped from the earliest mapping available (1870) until the 1930s when a small building was noted in the south of the site. In the 1960s to 1970s 259 Noak Hill Road was constructed along with a number of small buildings across the site. Demolition of these buildings occurred in the 1990s and 2000s.

The site walkover indicated the presence of stockpiles present across the site, possibly from demolition of previous buildings and hardstanding. The presence of Made Ground could not be discounted.

The Made Ground and stockpiles have an unknown potential for contamination.

It was not considered that the surrounding land use was likely to have caused significant contamination to the site.

4 INTRUSIVE INVESTIGATION

4.1 FIELDWORK

The intrusive site works were carried out by Soil Investigation Eastern Ltd on the 16th October 2023 and comprised:

- Hand Dug Trial Pitting.

The positions of the above works on the site are indicated on Figure 1 Exploratory Hole Location Plan.

All intrusive fieldwork was undertaken by Soil Investigation Eastern Limited and generally executed in accordance with the recommendations given in British Standard BS 5930:1999, "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".

Hand Dug Trial Pits

Eight hand dug trial pits were excavated in order to provide near surface sampling of the soil for laboratory analysis. The trial pits were excavated to depths of 0.4m.

Trial pit logs are presented in Appendix 2.

4.2 GROUNDWATER

Groundwater was not noted during the intrusive works.

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.

5 LABORATORY TESTING

5.1 ANALYTICAL TESTING

Eight soil samples were selected and scheduled for chemical analysis which was undertaken by The Environmental Laboratory 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

In addition, two samples were submitted for Waste Acceptance Criteria Testing.

Environmental samples were stored in appropriate containers as specified within BS10175. The containers comprised of 1 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 3.

6 EVALUATION OF GROUND CONDITIONS

The soils encountered during this investigation are described in the trial pit logs presented in Appendix 2. The ground profile encountered at the site comprised Made Ground over soils consistent with Alluvium.

Made Ground

Made Ground was found to depths of between 0.12 and 0.15m below ground level in all locations.

The Made Ground comprised mid brown slightly gravelly silty clay with brick and carbon fragments. No visual or olfactory evidence of contamination was noted.

Alluvium

Soils typical of Alluvium were encountered in all locations and comprised mid brown silty clay with partings of orange silt and fine sand.

7 GROUND CONTAMINATION ASSESSMENT

The current guidelines used for this contamination assessment are presented within Appendix 4.

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 with plant uptake end use. 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

7.1 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 generally below the respective guideline values in all samples tested with the exception of a single minor elevated lead concentration.

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 generally not encountered.

No Asbestos Containing Materials (ACM) were encountered.

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

7.1.1 Toxic Metals

Concentrations of toxic metals arsenic, cadmium, chromium, 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 (with home grown produce) where appropriate in all samples tested.

A single lead concentrations above the 200 mg/kg Category 4 Screening Level was encountered at location TP3 (0.20m) at a concentration of 399mg/kg.

All other samples had contaminant concentrations below their relevant guideline values.

7.1.2 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.

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

7.1.3 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

No exceedances of the relevant guideline values for specific PAH compounds were noted across the site.

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 and also within the UK Water Industry Research (UKWIR) 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 TP3 (0.20m) comprising of 29mg/kg within the aromatic C21-C35 range. The GAC for this range for a residential site is 1400mg/kg and therefore it is not considered that the soils present on site pose a significant risk of significant harm to human health.

BTEX

No BTEX concentrations above the laboratory detection limit of 10 µg/kg were identified.

Phenols

No phenols above the laboratory detection limit of 1 mg/kg were identified.

7.1.4 Asbestos

Asbestos screening of the soil samples did not identify any Asbestos Containing Material (ACM).

7.2 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.

8 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 a residential with plant uptake use of the site.

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 with 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;
- underground services in and around the site;
- plants in any future proposed soft landscaped areas.

8.1 CONTAMINANT SOURCES

The following general potential contaminant sources have been identified at the site and in the surrounding area:

Potential Source	Source Description	Principal Contaminants of Concern
Current and Historic Site Use	Near surface Made Ground of unknown origin.	PAH, TPH, Metals, ACM

In general, the analytical testing of soils retrieved as part of the intrusive investigation did not reveal significantly elevated contaminant concentrations with the exception of a single elevated lead concentration.

8.2 RISK TO HUMAN HEALTH

Toxic Metals

Concentrations of toxic metals arsenic, cadmium, chromium, mercury, nickel, selenium, and zinc were all below their respective soil guidance values for a residential without plant uptake use in all samples tested in this site investigation, therefore the risks to human health from these contaminants is considered to be low.

One out of eight soil samples tested contained lead concentrations above the C4SL guidance level of 200 mg/kg.

The average concentration of lead across the site was 106 mg/kg and therefore below the C4SL guidance level of 200mg/kg. Furthermore, the Made Ground the sample was taken from is likely to be removed as part of site enabling works.

It is therefore not considered that the elevated lead concentration would pose a significant risk of significant harm to human health.

Organic Compounds

Concentrations of the total and specific 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.

Inorganic Compounds

Asbestos containing material (ACM) was not encountered at the site. The presence of ACM across the site cannot be discounted and a watching brief should be undertaken during site clearance/enabling works.

On the balance of the toxicological risks posed by the ground contamination encountered as part of the intrusive investigation undertaken by GEI, 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 asbestos material.

Future Occupants

- The site is not considered to pose a potential risk of significant harm to human health in the context of Part 2A for future occupants.

8.3 RISKS TO WATER RESOURCES

The site is underlain by a Secondary A Aquifer with respect to the Superficial Deposits and Unproductive strata with regard to the solid geology.

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

8.4 RISKS TO PLANTS

Elevated concentrations of phytotoxic metals which could be considered harmful to plants were not encountered on site and therefore the risk to plant health is considered to be low.

8.5 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 low.

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

8.6 WASTE DISPOSAL

Should an excess volume of soil be required to be disposed of off-site then a waste classification may be required.

For a waste classification to be undertaken, materials may need to be subjected to chemical testing which would give an indication to the contaminants present and, therefore those most toxic to the environment in the waste. Following the assessment of the waste as hazardous or non-hazardous waste acceptance criteria leachate testing allows the appropriate disposal pathway to a suitably licensed disposal facility to be further determined.

Waste acceptance criteria (WAC) leachate testing was carried out on two soil sample from site. The results are attached at Appendix 3 and show that leachable content in excess of the inert limit values was not noted within the samples tested.

As preliminary waste assessment based on the results of materials tested to date, it is considered that the majority of any surplus soils requiring off-site disposal would be classified as EWC 17 05 04 stable non-reactive hazardous waste and acceptable at a waste facility licenced to accept inert material.

9 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.

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. Slightly elevated concentrations encountered, not considered significant risk of significant harm. Elevated contaminant concentrations present in soils likely to be removed from site during site preparatory works.	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 mobile 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 significantly elevated contaminant concentrations encountered.	Low
			Direct contact	Aggressive chemical attack	➔	Building structures and services	It is considered that protection of any new services is unlikely 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

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.	Significantly elevated contaminant concentrations not encountered.	Low
Asbestos	Asbestos fibres within made ground and waste on site	➔	Inhalation.	Health risks including asbestosis, mesothelioma, and lung cancer.	➔	Humans: site workers and future occupants.	Appropriate PPE should be worn during site works. No ACM encountered within soil samples.	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 and disposed of in accordance with current legislation.	Low

10 CONCLUSIONS AND RECOMMENDATIONS

Based on the site investigation and subsequent data assessment, the following conclusions and recommendations have been drawn in respect of the land to the rear of 259 Noak Hill Road, Billericay, CM12 9UN.

- The ground investigation found Made Ground over soils consistent with the Alluvium.
- The site is located above a Secondary A Aquifer in the Superficial Deposits and Unproductive strata with respect to the solid geology. The site is not located within an Environment Agency defined groundwater Source Protection Zone.
- Concentrations of toxic metals were found to be below their respective soil guideline values in all locations with the exception of a single minor elevated lead concentration.
- Concentrations of TPH, total PAH and specific 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.
- Asbestos containing material (ACM) was not encountered on site.
- As the elevated concentrations were minor and the impacted soils likely to be removed during site clearance/enabling works it was not considered that the soils present on site represent a significant risk of significant harm to human health.
- 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 unlikely that any potential new services, in particular potable water, will require protection, however it is advisable to seek service provider confirmation of this.
- The risk to plant health is considered to be low.
- The risks to groundwater and surface water are considered to be low due to the lack of any significant mobile organic contamination.
- 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.
- It was considered that the majority of any surplus soils requiring off-site disposal would be classified as EWC 17 05 04 stable non-reactive hazardous waste and acceptable at a waste facility licenced to accept inert material.

Based on the principles and definitions outlined under section 57 of the Environment Act 1995, the site would not be considered to be “Contaminated Land” based on a residential with plant uptake end use.

DRAWINGS

1. SITE LOCATION PLAN

Site Location Plan

Sheet: 1 of 1

Job No: RJ4304.2

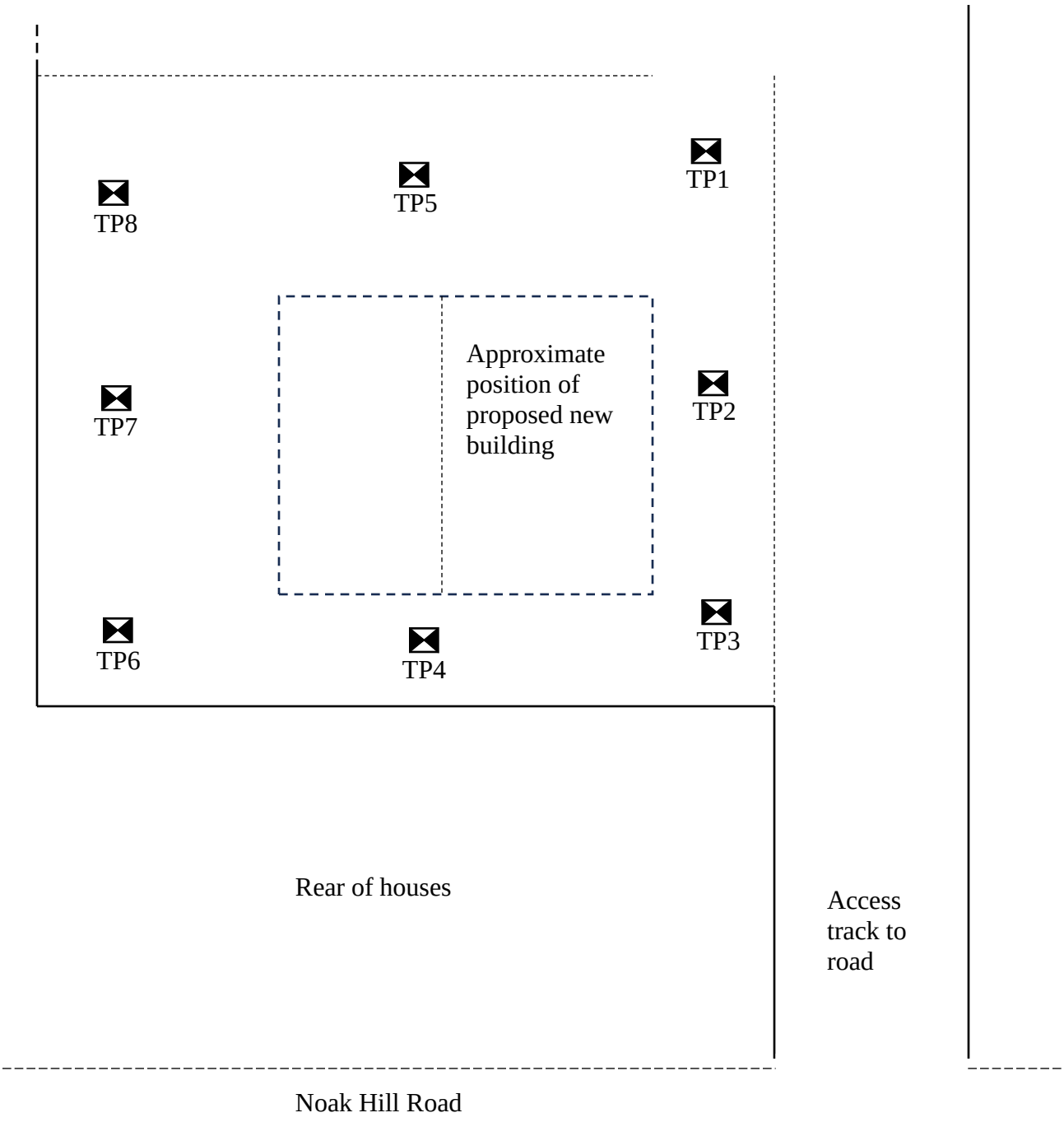
Scale: Not to scale

Date: 16/10/2023

Client: GNB Developments Ltd

SOIL INVESTIGATION EASTERN LIMITED
Tel/Fax 01245 237555 Mobile 07810 820620

Site: 259 Noak Hill Road, Billericay. CM12 9UN



Remarks: ON SITE TREE IDENTIFICATION FOR GUIDANCE ONLY. NOT AUTHENTICATED

Key:
- Trial Pit
- MH Man Hole
- Borehole
- G Gulley
- SVP Soil Vent Pipe
- RWP Rain Water Pipe
- Tree / Bush (approx. ht. in m)

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

TRIAL PIT LOGS

Trial Pit No: 1	Sheet: 1 of 1	SOIL INVESTIGATION EASTERN LIMITED Tel/Fax 01245 237555 Mobile 07810 820620
	Job No: RJ4304.2	
Boring Method: Hand Tools	Date: 16/10/2023	
Client: GNB Developments Ltd.		Site: 259 Noak Hill Road, Billericay

Depth (mm/m)	Description of Strata	Thick-Ness (mm/m)	Legend	Sample	Test Type	Test Result	Depth (mm/m)	Field Records/ Comments	Depth to water (mm/m)
G.L.	MADE GROUND: Mid brown, slightly gravelly, silty, CLAY, with brick fragments.	120		•	Tub & Jar		100	100 Occasional hair & fibrous roots to 200mm.	
120	Mid brown, silty, CLAY, with partings of orange silt & fine sand.	280						No roots observed below 200mm.	
400	Trial pit ends at 400mm								

Remarks: Trial pit dry & open on completion.

Key:

- • Small disturbed sample
- **B** Bulk disturbed sample
- **U** Undisturbed sample(U100)
- **W** Water sample
- **J** Jar sample
- **V** Pilcon Vane (kPa)
- **I** Mackintosh Probe
- **S** Standard penetration test
- **N** SPT blow count

Trial Pit No: 2	Sheet: 1 of 1	SOIL INVESTIGATION EASTERN LIMITED
	Job No: RJ4304.2	Tel/Fax 01245 237555 Mobile 07810 820620
Boring Method: Hand Tools	Date: 16/10/2023	
Client: GNB Developments Ltd.		Site: 259 Noak Hill Road, Billericay

Depth (mm/m)	Description of Strata	Thick-Ness (mm/m)	Legend	Sample	Test Type	Test Result	Depth (mm/m)	Field Records/ Comments	Depth to water (mm/m)
G.L.	MADE GROUND: Mid brown, slightly gravelly, silty, CLAY, with brick & carbon fragments.	150		•	Tub & Jar		G.L. to 150	50 Occasional roots of live appearance to 5mmø to 100 Occasional hair & fibrous roots to 300mm.	
150	Mid brown, silty, CLAY, with partings of orange & brown silt & fine sand.	250						No roots observed below 300mm.	
400	Trial pit ends at 400mm								

Remarks: Trial pit dry & open on completion.

Key:

- • Small disturbed sample
- **B** Bulk disturbed sample
- **U** Undisturbed sample(U100)
- **W** Water sample
- **J** Jar sample
- **V** Pilcon Vane (kPa)
- **I** Mackintosh Probe
- **S** Standard penetration test
- **N** SPT blow count

Trial Pit No: 3	Sheet: 1 of 1	SOIL INVESTIGATION EASTERN LIMITED Tel/Fax 01245 237555 Mobile 07810 820620
	Job No: RJ4304.2	
Boring Method: Hand Tools	Date: 16/10/2023	
Client: GNB Developments Ltd.		Site: 259 Noak Hill Road, Billericay

Depth (mm/m)	Description of Strata	Thick-Ness (mm/m)	Legend	Sample	Test Type	Test Result	Depth (mm/m)	Field Records/ Comments	Depth to water (mm/m)
G.L.	MADE GROUND: Mid brown, slightly gravelly, silty, CLAY, with brick & carbon fragments.	150						100 Occasional hair & fibrous roots to 200mm.	
150	Mid brown, silty, CLAY, with partings of orange & brown silt & fine sand.	250		•	Tub & Jar		200	No roots observed below 200mm.	
400	Trial pit ends at 400mm								

Remarks: Trial pit dry & open on completion.

Key:

- • Small disturbed sample
- B Bulk disturbed sample
- U Undisturbed sample(U100)
- W Water sample
- J Jar sample
- V Pilcon Vane (kPa)
- I Mackintosh Probe
- S Standard penetration test
- N SPT blow count

Trial Pit No: 4	Sheet: 1 of 1	SOIL INVESTIGATION EASTERN LIMITED
	Job No: RJ4304.2	Tel/Fax 01245 237555 Mobile 07810 820620
Boring Method: Hand Tools	Date: 16/10/2023	
Client: GNB Developments Ltd.		Site: 259 Noak Hill Road, Billericay

Depth (mm/m)	Description of Strata	Thick-Ness (mm/m)	Legend	Sample	Test Type	Test Result	Depth (mm/m)	Field Records/ Comments	Depth to water (mm/m)
G.L.	MADE GROUND: Mid brown, slightly gravelly, silty, CLAY, with brick fragments.	120						100 Occasional hair & fibrous roots to 200mm.	
120	Mid brown, silty, CLAY, with partings of orange silt & fine sand.	280		•	Tub & Jar		200	No roots observed below 200mm.	
400	Trial pit ends at 400mm			•	Tub & Jar		1.0		

Remarks: Trial pit dry & open on completion.

Key:

- • Small disturbed sample
- **B** Bulk disturbed sample
- **U** Undisturbed sample(U100)
- **W** Water sample
- **J** Jar sample
- **V** Pilcon Vane (kPa)
- **I** Mackintosh Probe
- **S** Standard penetration test
- **N** SPT blow count

Trial Pit No: 5	Sheet: 1 of 1	SOIL INVESTIGATION EASTERN LIMITED Tel/Fax 01245 237555 Mobile 07810 820620
	Job No: RJ4304.2	
Boring Method: Hand Tools	Date: 16/10/2023	
Client: GNB Developments Ltd.		Site: 259 Noak Hill Road, Billericay

Depth (mm/m)	Description of Strata	Thick-Ness (mm/m)	Legend	Sample	Test Type	Test Result	Depth (mm/m)	Field Records/ Comments	Depth to water (mm/m)
G.L.	MADE GROUND: Mid brown, slightly gravelly, silty, CLAY, with brick fragments.	120						100 Occasional hair & fibrous roots to 200mm.	
120	Mid brown, silty, CLAY, with partings of orange silt & fine sand.	280		•	Tub & Jar		150	No roots observed below 200mm.	
400	Trial pit ends at 400mm								

Remarks: Trial pit dry & open on completion.

Key:

- • Small disturbed sample
- B Bulk disturbed sample
- U Undisturbed sample(U100)
- W Water sample
- J Jar sample
- V Pilcon Vane (kPa)
- I Mackintosh Probe
- S Standard penetration test
- N SPT blow count

Trial Pit No: 6	Sheet: 1 of 1	SOIL INVESTIGATION EASTERN LIMITED Tel/Fax 01245 237555 Mobile 07810 820620
	Job No: RJ4304.2	
Boring Method: Hand Tools	Date: 16/10/2023	
Client: GNB Developments Ltd.		Site: 259 Noak Hill Road, Billericay

Depth (mm/m)	Description of Strata	Thick-Ness (mm/m)	Legend	Sample	Test Type	Test Result	Depth (mm/m)	Field Records/ Comments	Depth to water (mm/m)
G.L.	MADE GROUND: Mid brown, slightly gravelly, silty, CLAY, with brick fragments.	120		•	Tub & Jar		G.L. to 100	100 Occasional hair & fibrous roots to 200mm.	
120	Mid brown, silty, CLAY, with partings of orange silt & fine sand.	280						No roots observed below 200mm.	
400	Trial pit ends at 400mm								

Remarks: Trial pit dry & open on completion.

Key:

- • Small disturbed sample
- B Bulk disturbed sample
- U Undisturbed sample(U100)
- W Water sample
- J Jar sample
- V Pilcon Vane (kPa)
- I Mackintosh Probe
- S Standard penetration test
- N SPT blow count

Trial Pit No: 7	Sheet: 1 of 1	SOIL INVESTIGATION EASTERN LIMITED Tel/Fax 01245 237555 Mobile 07810 820620
	Job No: RJ4304.2	
Boring Method: Hand Tools	Date: 16/10/2023	
Client: GNB Developments Ltd.		Site: 259 Noak Hill Road, Billericay

Depth (mm/m)	Description of Strata	Thick-Ness (mm/m)	Legend	Sample	Test Type	Test Result	Depth (mm/m)	Field Records/ Comments	Depth to water (mm/m)
G.L.	MADE GROUND: Mid brown, slightly gravelly, silty, CLAY, with brick fragments.	120		•	Tub & Jar		G.L. to 100	100 Occasional hair & fibrous roots to 200mm.	
120	Mid brown, silty, CLAY, with partings of orange silt & fine sand.	280						No roots observed below 200mm.	
400	Trial pit ends at 400mm			•	Tub & Jar		1.0		

Remarks: Trial pit dry & open on completion.

Key:

- • Small disturbed sample
- B Bulk disturbed sample
- U Undisturbed sample(U100)
- W Water sample
- J Jar sample
- V Pilcon Vane (kPa)
- I Mackintosh Probe
- S Standard penetration test
- N SPT blow count

Trial Pit No: 8	Sheet: 1 of 1	SOIL INVESTIGATION EASTERN LIMITED Tel/Fax 01245 237555 Mobile 07810 820620
	Job No: RJ4304.2	
Boring Method: Hand Tools	Date: 16/10/2023	
Client: GNB Developments Ltd.		Site: 259 Noak Hill Road, Billericay

Depth (mm/m)	Description of Strata	Thick-Ness (mm/m)	Legend	Sample	Test Type	Test Result	Depth (mm/m)	Field Records/ Comments	Depth to water (mm/m)
G.L.	MADE GROUND: Mid brown, slightly gravelly, silty, CLAY, with brick fragments.	120		•	Tub & Jar		G.L. to 100	100 Occasional hair & fibrous roots to 200mm.	
120	Mid brown, silty, CLAY, with partings of orange silt & fine sand.	280						No roots observed below 200mm.	
400	Trial pit ends at 400mm								

Remarks: Trial pit dry & open on completion.

Key:

- • Small disturbed sample
- B Bulk disturbed sample
- U Undisturbed sample(U100)
- W Water sample
- J Jar sample
- V Pilcon Vane (kPa)
- I Mackintosh Probe
- S Standard penetration test
- N SPT blow count

APPENDIX 3

ANALYTICAL RESULTS

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	23-50663
Issue:	1
Date of Issue:	31/10/2023
Contact:	Sandra Brown
Customer Details:	Soil Investigation (Eastern) Ltd Unit 8, Hill Farm Church Lane Chelmsford EssexCM3 1LH
Quotation No:	Q22-03526
Order No:	RJ4304-2
Customer Reference:	RJ4304-2
Date Received:	19/10/2023
Date Approved:	31/10/2023
Details:	259 Noak Hill Road, Billericay CM12 9UN
Approved by:	

Ben Rees, Customer Services Assistant

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683

Sample Summary

Report No.: 23-50663, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
342575	TP1 0.10	16/10/2023	19/10/2023	Silty loam	
342576	TP2 G.L. - 0.15	16/10/2023	19/10/2023	Silty loam	
342577	TP3 0.20	16/10/2023	19/10/2023	Silty loam	
342578	TP4 0.20	16/10/2023	19/10/2023	Silty clayey loam	
342579	TP5 0.15	16/10/2023	19/10/2023	Silty clayey loam	
342580	TP6 G.L. - 0.10	16/10/2023	19/10/2023	Silty loam	
342581	TP7 G.L. - 0.10	16/10/2023	19/10/2023	Silty loam	
342582	TP8 G.L. - 0.10	16/10/2023	19/10/2023	Silty loam	
342583	TP7 1.00	16/10/2023	19/10/2023	Silty clayey loam	
342584	TP4 1.00	16/10/2023	19/10/2023	Silty clayey loam	

Results Summary

Report No.: 23-50663, issue number 1

				ELAB Reference	342575	342576	342577	342578	342579	342580	342581	342582	342583	342584
				Customer Reference										
				Sample ID										
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sample Location	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP7	TP4
				Sample Depth (m)	0.10	G.L. - 0.15	0.20	0.20	0.15	G.L. - 0.10	G.L. - 0.10	G.L. - 0.10	1.00	1.00
				Sampling Date	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
Determinand	**Codes**	**Units**	**LOD**											
Soil sample preparation parameters														
Moisture Content	N	%	0.1		17.8	9.2	21.2	17.2	22.7	16.4	16.6	17.6	18.2	19.3
Material removed	N	%	0.1		22.1	26.0	16.4	10.9	25.8	20.6	17.9	26.4	8.8	23.7
Description of Inert material removed	N		0		Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Metals														
Arsenic	M	mg/kg	0.5		14.5	14.2	14.5	11.3	11.4	12.7	11.6	10.7	n/t	n/t
Cadmium	M	mg/kg	0.2		0.3	0.6	1.0	0.2	< 0.2	< 0.2	< 0.2	0.3	n/t	n/t
Chromium	M	mg/kg	1		30.2	33.2	31.1	30.9	38.1	29.9	28.4	29.0	n/t	n/t
Copper	M	mg/kg	4		22.6	40.4	66.1	18.0	20.8	24.6	32.9	25.2	n/t	n/t
Lead	M	mg/kg	1		59.1	162	399	29.7	34.1	55.5	41.4	91.3	n/t	n/t
Mercury	M	mg/kg	0.1		0.1	0.1	0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	n/t	n/t
Nickel	M	mg/kg	1		19.2	24.7	23.0	18.9	22.4	16.8	22.3	18.7	n/t	n/t
Selenium	M	mg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	n/t	n/t
Zinc	M	mg/kg	4.5		139	269	448	81.2	90.5	143	128	252	n/t	n/t
Inorganics														
Elemental Sulphur	M	mg/kg	20		< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	n/t	n/t
Hexavalent Chromium	N	mg/kg	0.8		< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	n/t	n/t
Thiocyanate	N	mg/kg	4		< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	n/t	n/t
Total Cyanide	M	mg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	n/t	n/t
Acid Soluble Sulphate (SO4)	U	%	0.02		0.06	0.06	0.06	0.06	0.05	0.06	0.05	0.04	n/t	n/t
Water Soluble Boron	N	mg/kg	0.5		1.3	1.4	1.5	1.4	1.1	1.7	3.4	2.5	n/t	n/t
Miscellaneous														
Acid Neutralisation Capacity	N	mol/kg	0.1		n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.1	< 0.1
Loss on Ignition	M	%	0.01		n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	5.69	7.23
pH	M	pH units	0.1		7.2	7.7	7.2	6.0	5.9	6.7	6.8	7.2	6.9	6.7
Soil Organic Matter	U	%	0.1		15	3.1	5.6	2.2	2.7	5.8	7.0	3.9	n/t	n/t
Total Organic Carbon	N	%	0.01		n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	0.84	1.2

Results Summary

Report No.: 23-50663, issue number 1

			ELAB Reference	342575	342576	342577	342578	342579	342580	342581	342582	342583	342584
			Customer Reference										
			Sample ID										
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP7	TP4
			Sample Depth (m)	0.10	G.L. - 0.15	0.20	0.20	0.15	G.L. - 0.10	G.L. - 0.10	G.L. - 0.10	1.00	1.00
			Sampling Date	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
Determinand	**Codes**	**Units**	**LOD**										
Phenols													
Phenol	M	mg/kg	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	n/t	n/t
M,P-Cresol	N	mg/kg	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	n/t	n/t
O-Cresol	N	mg/kg	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	n/t	n/t
3,4-Dimethylphenol	N	mg/kg	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	n/t	n/t
2,3-Dimethylphenol	M	mg/kg	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	n/t	n/t
1-Naphthol	N	mg/kg	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	n/t	n/t
2,3,5-trimethylphenol	M	mg/kg	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	n/t	n/t
Total Phenols	N	mg/kg	6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	n/t	n/t
Polyaromatic hydrocarbons													
Naphthalene	MS	mg/kg	0.02	< 0.02	0.08	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Acenaphthylene	MS	mg/kg	0.02	< 0.02	0.05	0.03	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Acenaphthene	MS	mg/kg	0.02	< 0.02	0.02	0.03	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fluorene	US	mg/kg	0.02	< 0.02	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Phenanthrene	MS	mg/kg	0.02	0.04	0.27	0.58	< 0.02	< 0.02	0.10	0.04	0.06	< 0.02	< 0.02
Anthracene	US	mg/kg	0.02	< 0.02	0.11	0.13	< 0.02	< 0.02	< 0.02	< 0.02	0.02	< 0.02	< 0.02
Fluoranthene	MS	mg/kg	0.02	0.13	1.14	1.14	< 0.02	0.06	0.23	0.09	0.15	< 0.02	< 0.02
Pyrene	MS	mg/kg	0.02	0.12	1.09	0.91	< 0.02	0.05	0.20	0.08	0.14	< 0.02	< 0.02
Benzo(a)anthracene	US	mg/kg	0.02	0.07	0.69	0.45	< 0.02	0.03	0.09	0.04	0.07	< 0.02	< 0.02
Chrysene	MS	mg/kg	0.02	0.09	0.80	0.59	< 0.03	0.04	0.14	0.05	0.10	< 0.03	< 0.03
Benzo(b)fluoranthene	MS	mg/kg	0.02	0.09	0.95	0.54	< 0.02	0.04	0.13	0.05	0.09	< 0.02	< 0.02
Benzo(k)fluoranthene	MS	mg/kg	0.03	< 0.03	0.36	0.22	< 0.03	< 0.03	0.06	< 0.03	0.04	< 0.03	< 0.03
Benzo(a)pyrene	US	mg/kg	0.02	0.07	0.81	0.45	< 0.02	0.03	0.09	0.03	0.07	< 0.02	< 0.02
Indeno(1,2,3-cd)pyrene	MS	mg/kg	0.02	0.06	0.55	0.31	< 0.02	< 0.02	0.07	0.03	0.06	< 0.02	< 0.02
Dibenzo(a,h)anthracene	MS	mg/kg	0.02	< 0.02	0.13	0.08	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Benzo[g,h,i]perylene	MS	mg/kg	0.02	0.07	0.63	0.37	< 0.02	0.03	0.08	0.03	0.06	< 0.02	< 0.02
Coronene	NS	mg/kg	0.02	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.02	< 0.02
Total PAH(16)	NS	mg/kg	0.34	0.76	7.69	5.88	< 0.34	< 0.34	1.19	0.45	0.85	n/t	n/t
Total PAH(16) + Coronene	NS	mg/kg	0.34	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.36	< 0.36

Results Summary

Report No.: 23-50663, issue number 1

			ELAB Reference	342575	342576	342577	342578	342579	342580	342581	342582	342583	342584
			Customer Reference										
			Sample ID										
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP7	TP4
			Sample Depth (m)	0.10	G.L. - 0.15	0.20	0.20	0.15	G.L. - 0.10	G.L. - 0.10	G.L. - 0.10	1.00	1.00
			Sampling Date	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
Determinand	**Codes**	**Units**	**LOD**										
BTEX													
Benzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	n/t	n/t
Toluene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	n/t	n/t
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	n/t	n/t
Xylenes	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	n/t	n/t
MTBE	N	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	n/t	n/t
Total BTEX	M	mg/kg	0.01	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.01	< 0.01
Total Petroleum Hydrocarbons													
Mineral Oil w Florisil (EH_CU_1D_Total)	N	mg/kg	5	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 5	< 5
PCB (ICES 7 congeners)													
PCB 28	US	mg/kg	0.03	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.0300	< 0.0300
PCB 52	US	mg/kg	0.03	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.0300	< 0.0300
PCB 101	US	mg/kg	0.03	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.0300	< 0.0300
PCB 118	US	mg/kg	0.03	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.0300	< 0.0300
PCB 153	US	mg/kg	0.03	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.0300	< 0.0300
PCB 138	US	mg/kg	0.03	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.0300	< 0.0300
PCB 180	US	mg/kg	0.03	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 0.0300	< 0.0300
Total PCBs (7 congeners)	US	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	< 1	< 1

Tests marked N are not UKAS accredited.
The Environmental Laboratory Ltd. Reg. No. 3882193

Results Summary

Report No.: 23-50663, issue number 1

WAC Analysis								
Elab Ref:	342584					**Landfill Waste Acceptance Criteria Limits***		
Sample Date:	16/10/2023					**Inert Waste Landfill**	**Stable Non-reactive Hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:	TP4							
Depth (m)	1							
Site:	259 Noak Hill Road, Billericay CM12 9UN							
Determinand		**Code**	**Units**					
Total Organic Carbon		N	%		1.20	3	5	6
Loss on Ignition		M	%		7.2	--	--	10
Total BTEX		M	mg/kg		< 0.01	6	--	--
Total PCBs (7 congeners)		N	mg/kg		< 1	1	--	--
TPH Total WAC (EH_CU_1D_Total)		N	mg/kg		< 5	500	--	--
Total (of 17) PAHs		N	mg/kg		<0.36	100	--	--
pH		M			6.7	--	>6	--
Acid Neutralisation Capacity		N	mol/kg		< 0.1	--	To evaluate	To evaluate
Eluate Analysis			**10:1**		**10:1**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
			mg/l		**mg/kg**			
Arsenic		N	< 0.005		< 0.05	0.5	2	25
Barium		N	< 0.005		< 0.05	20	100	300
Cadmium		N	< 0.001		< 0.01	0.04	1	5
Chromium		N	< 0.005		< 0.05	0.5	10	70
Copper		N	< 0.005		< 0.05	2	50	100
Mercury		N	< 0.005		< 0.01	0.01	0.2	2
Molybdenum		N	< 0.005		< 0.05	0.5	10	30
Nickel		N	< 0.001		< 0.05	0.4	10	40
Lead		N	< 0.001		< 0.05	0.5	10	50
Antimony		N	< 0.005		< 0.05	0.06	0.7	5
Selenium		N	< 0.005		< 0.05	0.1	0.5	7
Zinc		N	< 0.005		< 0.05	4	50	200
Chloride		N	< 5		< 50	800	15000	25000
Fluoride		N	< 5		< 10	10	150	500
Sulphate		N	7		71.90	1000	20000	50000
Total Dissolved Solids		N	25		251.00	4000	60000	100000
Phenol Index		N	< 0.01		< 0.10	1	-	-
Dissolved Organic Carbon		N			140.00	500	800	1000
Leach Test Information								
pH		N	7.1					
Conductivity (uS/cm)		N	< 50					
Dry mass of test portion (g)			100.000					
Dry Matter (%)			78					
Moisture (%)			28					
Eluent Volume (ml)			934					

Results are expressed on a dry weight basis, after correction for moisture content where applicable

* Stated limits are for guidance only, and not for conformity assessment.

Results Summary

Report No.: 23-50663, issue number 1

WAC Analysis								
Elab Ref:	342583					**Landfill Waste Acceptance Criteria Limits***		
Sample Date:	16/10/2023					**Inert Waste Landfill**	**Stable Non-reactive Hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:	TP7							
Depth (m)	1							
Site:	259 Noak Hill Road, Billericay CM12 9UN							
Determinand		**Code**	**Units**					
Total Organic Carbon		N	%		0.84	3	5	6
Loss on Ignition		M	%		5.7	--	--	10
Total BTEX		M	mg/kg		< 0.01	6	--	--
Total PCBs (7 congeners)		N	mg/kg		< 1	1	--	--
TPH Total WAC (EH_CU_1D_Total)		N	mg/kg		< 5	500	--	--
Total (of 17) PAHs		N	mg/kg		<0.36	100	--	--
pH		M			6.9	--	>6	--
Acid Neutralisation Capacity		N	mol/kg		< 0.1	--	To evaluate	To evaluate
Eluate Analysis			**10:1**		**10:1**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
			mg/l		**mg/kg**			
Arsenic		N	< 0.005		< 0.05	0.5	2	25
Barium		N	< 0.005		< 0.05	20	100	300
Cadmium		N	< 0.001		< 0.01	0.04	1	5
Chromium		N	< 0.005		< 0.05	0.5	10	70
Copper		N	< 0.005		< 0.05	2	50	100
Mercury		N	< 0.005		< 0.01	0.01	0.2	2
Molybdenum		N	< 0.005		< 0.05	0.5	10	30
Nickel		N	0.003		< 0.05	0.4	10	40
Lead		N	< 0.001		< 0.05	0.5	10	50
Antimony		N	< 0.005		< 0.05	0.06	0.7	5
Selenium		N	< 0.005		< 0.05	0.1	0.5	7
Zinc		N	< 0.005		< 0.05	4	50	200
Chloride		N	< 5		< 50	800	15000	25000
Fluoride		N	< 5		< 10	10	150	500
Sulphate		N	40		398.00	1000	20000	50000
Total Dissolved Solids		N	94		943.00	4000	60000	100000
Phenol Index		N	< 0.01		< 0.10	1	-	-
Dissolved Organic Carbon		N			200.00	500	800	1000
Leach Test Information								
pH		N	7.0					
Conductivity (uS/cm)		N	141					
Dry mass of test portion (g)			100.000					
Dry Matter (%)			79					
Moisture (%)			27					
Eluent Volume (ml)			933					

Results are expressed on a dry weight basis, after correction for moisture content where applicable

* Stated limits are for guidance only, and not for conformity assessment.

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Results Summary

Report No.: 23-50663, issue number 1

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
342575	0.10	TP1	Brown sandy soil, stones	No asbestos detected	n/t	n/t	n/t	n/t
342576	G.L. - 0.15	TP2	Brown sandy soil, stones, brick, clinker, concrete	No asbestos detected	n/t	n/t	n/t	n/t
342577	0.20	TP3	Brown sandy soil, stones, tile	No asbestos detected	n/t	n/t	n/t	n/t
342578	0.20	TP4	Brown sandy soil, stones	No asbestos detected	n/t	n/t	n/t	n/t
342579	0.15	TP5	Brown sandy soil	No asbestos detected	n/t	n/t	n/t	n/t
342580	G.L. - 0.10	TP6	Brown soil	No asbestos detected	n/t	n/t	n/t	n/t
342581	G.L. - 0.10	TP7	Brown sandy soil	No asbestos detected	n/t	n/t	n/t	n/t
342582	G.L. - 0.10	TP8	Brown sandy soil	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 23-50663, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	20/10/2023	110	Colorimetry
Acid Soluble Sulphate	U	Air dried sample	25/10/2023	115	Ion Chromatography
Phenols in solids	M	As submitted sample	20/10/2023	121	HPLC
Elemental Sulphur	M	Air dried sample	23/10/2023	122	HPLC
Thiocyanate	N	As submitted sample	23/10/2023	146	Colorimetry
Water soluble boron	N	Air dried sample	23/10/2023	202	Colorimetry
Total cyanide	M	As submitted sample	20/10/2023	204	Colorimetry
Asbestos identification	U	Air dried sample	25/10/2023	281	Microscopy
Aqua regia extractable metals	M	Air dried sample	23/10/2023	300	ICPMS
Soil organic matter	U	Air dried sample	24/10/2023	BS1377:P3	Titrimetry
Leachate					
Arsenic	N		24/10/2023	301	ICPMS
Cadmium	N		24/10/2023	301	ICPMS
Chromium	N		24/10/2023	301	ICPMS
Lead	N		24/10/2023	301	ICPMS
Nickel	N		24/10/2023	301	ICPMS
Copper	N		24/10/2023	301	ICPMS
Zinc	N		24/10/2023	301	ICPMS
Mercury	N		24/10/2023	301	ICPMS
Selenium	N		24/10/2023	301	ICPMS
Antimony	N		24/10/2023	301	ICPMS
Barium	N		24/10/2023	301	ICPMS
Molybdenum	N		24/10/2023	301	ICPMS
pH Value	N		24/10/2023	113	Electrometric
Electrical Conductivity	N		24/10/2023	136	Probe
Dissolved Organic Carbon	N		24/10/2023	102	TOC analyser
Chloride	N		24/10/2023	270	Ion Chromatography
Fluoride	N		24/10/2023	270	Ion Chromatography
Sulphate	N		24/10/2023	270	Ion Chromatography
Total Dissolved Solids	N		24/10/2023	144	Gravimetric
Phenol index	N		24/10/2023	121	HPLC
WAC Solids analysis	N				
pH	M	Air dried sample	25/10/2023	113	Electrometric
Total Organic Carbon	N	Air dried sample	23/10/2023	210	IR
Loss on Ignition	M	Air dried sample	24/10/2023	129	Gravimetric
Acid Neutralisation Capacity	N	Air dried sample	25/10/2023	NEN 737	Electrometric
Total BTEX	M	As submitted sample	23/10/2023	181	GCMS
Mineral Oil (EH_CU_1D_Total)	N	As submitted sample	26/10/2023	117	GCFID
Total PCBs (7 congeners)	N	Air dried sample	26/10/2023	120	GCMS
Total (of 17) PAHs	N	As submitted sample	26/10/2023	133	GCFID

Tests marked N are not UKAS accredited

Report Information

Report No.: 23-50663, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.
	Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.
	ELAB are unable to provide an interpretation or opinion on the content of this report.
	The results relate only to the sample received.
	PCB congener results may include any coeluting PCBs
	Uncertainty of measurement for the determinands tested are available upon request
	Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
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

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The Environmental Laboratory Ltd
Unit A2, Windmill Road
Ponswood Industrial Estate
St. Leonards on Sea
East Sussex
TN38 9BY

Attention: Darren Knight

CERTIFICATE OF ANALYSIS

Date of report Generation:	31 October 2023
Customer:	The Environmental Laboratory Ltd
Sample Delivery Group (SDG):	231023-46
Your Reference:	23-50663
Location:	
Report No:	709254
Order Number:	11977

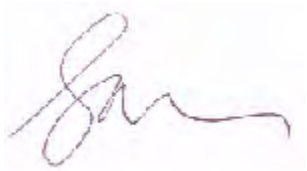
We received 8 samples on Monday October 23, 2023 and 8 of these samples were scheduled for analysis which was completed on Tuesday October 31, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:



Sonia McWhan
Operations Manager

CERTIFICATE OF ANALYSIS

SDG: 231023-46 **Report Number:** 709254 **Superseded Report:**
Client Ref.: 23-50663 **Location:**

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
28828349	342575/TP1		0.10	16/10/2023
28828351	342577/TP3		0.20	16/10/2023
28828353	342578/TP4		0.20	16/10/2023
28828354	342579/TP5		0.15	16/10/2023
28828350	342576/TP2 G.L		0.15	16/10/2023
28828355	342580/TP6 G.L		0.10	16/10/2023
28828356	342581/TP7 G.L		0.10	16/10/2023
28828357	342582/TP8 G.L		0.10	16/10/2023

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG: 231023-46 **Report Number:** 709254 **Superseded Report:**
Client Ref.: 23-50663 **Location:**

Results Legend

X Test

N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water
Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	28828349	28828351	28828353	28828354	28828350	28828355	28828356	28828357
			Customer Sample Reference	342575/TP1	342577/TP3	342578/TP4	342579/TP5	342576/TP2 G.L	342580/TP6 G.L	342581/TP7 G.L	342582/TP8 G.L
			AGS Reference								
			Depth (m)	0.10	0.20	0.20	0.15	0.15	0.10	0.10	0.10
			Container	120g Amber Jar (ALE217)	60g VOC (ALE215)	120g Amber Jar (ALE217)	60g VOC (ALE215)	120g Amber Jar (ALE217)	60g VOC (ALE215)	120g Amber Jar (ALE217)	60g VOC (ALE215)	120g Amber Jar (ALE217)	60g VOC (ALE215)	120g Amber Jar (ALE217)	60g VOC (ALE215)
			Sample Type	S	S	S	S	S	S	S	S	S	S	S	S
EPH CWG GC (S)	All	NDPs: 0 Tests: 8		X		X		X		X	X	X		X		X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 8			X		X		X	X	X		X		X	X
Sample description	All	NDPs: 0 Tests: 8		X		X		X		X	X	X		X		X
TPH CWG GC (S)	All	NDPs: 0 Tests: 8		X		X		X		X	X	X		X		X
VOC MS (S)	All	NDPs: 0 Tests: 8			X		X		X	X	X		X		X	X

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
28828349	342575/TP1	0.10	Dark Brown	Clay Loam	Vegetation	None
28828351	342577/TP3	0.20	Dark Brown	Clay Loam	Stones	Vegetation
28828353	342578/TP4	0.20	Dark Brown	Clay Loam	None	None
28828354	342579/TP5	0.15	Dark Brown	Clay Loam	None	None
28828350	342576/TP2 G.L	0.15	Light Brown	Sandy Clay Loam	Stones	Vegetation
28828355	342580/TP6 G.L	0.10	Dark Brown	Clay Loam	Vegetation	None
28828356	342581/TP7 G.L	0.10	Dark Brown	Clay Loam	Vegetation	None
28828357	342582/TP8 G.L	0.10	Light Brown	Clay Loam	Stones	Vegetation

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG: 231023-46 **Report Number:** 709254 **Superseded Report:**
Client Ref.: 23-50663 **Location:**

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Customer Sample Ref.	342575/TP1	342577/TP3	342578/TP4	342579/TP5	342576/TP2 G.L	342580/TP6 G.L
Depth (m)	0.10	0.20	0.20	0.15	0.15	0.10
Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Date Sampled	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
Sample Time	.	.	.	.	.	.
Date Received	23/10/2023	23/10/2023	23/10/2023	23/10/2023	23/10/2023	23/10/2023
SDG Ref	231023-46	231023-46	231023-46	231023-46	231023-46	231023-46
Lab Sample No.(s)	28828349	28828351	28828353	28828354	28828350	28828355
AGS Reference						

Component	LOD/Units	Method						
Moisture Content Ratio (% of as received sample)	%	PM024	22	21	13	23	15	13

Validated

CERTIFICATE OF ANALYSIS

SDG: 231023-46 **Report Number:** 709254 **Superseded Report:**
Client Ref.: 23-50663 **Location:**

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	342581/TP7 G.L	342582/TP8 G.L
			Depth (m)	0.10	0.10
			Sample Type	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	16/10/2023	16/10/2023
			Sample Time	.	.
			Date Received	23/10/2023	23/10/2023
			SDG Ref	231023-46	231023-46
			Lab Sample No.(s)	28828356	28828357
			AGS Reference		
Moisture Content Ratio (% of as received sample)	%	PM024		11	22

CERTIFICATE OF ANALYSIS

SDG: 231023-46 **Report Number:** 709254 **Superseded Report:**
Client Ref.: 23-50663 **Location:**

TPH CWG (S)

Results Legend
- # ISO17025 accredited.
- M mCERTS accredited.
- aq Aqueous / settled sample.
- diss.filt Dissolved / filtered sample.
- tot.unfilt Total / unfiltered sample.
- * Subcontracted - refer to subcontractor report for accreditation status.
- ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
- (F) Trigger breach confirmed
- 1-4♦§@ Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	342575/TP1	342577/TP3	342578/TP4	342579/TP5	342576/TP2 G.L	342580/TP6 G.L
			Depth (m)	0.10	0.20	0.20	0.15	0.15	0.10
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
			Sample Time	.	.	.	.	.	.
			Date Received	23/10/2023	23/10/2023	23/10/2023	23/10/2023	23/10/2023	23/10/2023
			SDG Ref	231023-46	231023-46	231023-46	231023-46	231023-46	231023-46
			Lab Sample No.(s)	28828349	28828351	28828353	28828354	28828350	28828355
			AGS Reference						
GRO Surrogate % recovery**	%	TM089		93.4	89.7	93	89.1 2	81.7	79.3
Aliphatics >C5-C6 (HS_1D_AL)	<10 µg/kg	TM089		<10	<10	<10	<10 2	<10	<10
Aliphatics >C6-C8 (HS_1D_AL)	<10 µg/kg	TM089		<10	<10	<10	<10 2	<10	<10
Aliphatics >C8-C10 (HS_1D_AL)	<10 µg/kg	TM089		<10	<10	<10	<10 2	<10	<10
Aliphatics >C10-C12 (EH_2D_AL_#1)	<1000 µg/kg	TM414		<1000 #	<1000 #	<1000 #	<1000 #	<1000 @ #	<1000 #
Aliphatics >C12-C16 (EH_2D_AL_#1)	<1000 µg/kg	TM414		<1000 #	<1000 #	<1000 #	<1000 #	<1000 @ #	<1000 #
Aliphatics >C16-C21 (EH_2D_AL_#1)	<1000 µg/kg	TM414		<1000 #	<1000 #	<1000 #	<1000 #	<1000 @ #	<1000 #
Aliphatics >C21-C35 (EH_2D_AL_#1)	<1000 µg/kg	TM414		2770 #	5890 #	1280 #	6740 #	2280 @ #	3310 #
Aliphatics >C35-C44 (EH_2D_AL_#1)	<1000 µg/kg	TM414		<1000	<1000	<1000	<1000	<1000 @	<1000
Total Aliphatics >C10-C44 (EH_2D_AR_#1)	<5000 µg/kg	TM414		<5000	6680	<5000	7140	<5000 @	<5000
Total Aliphatics & Aromatics >C10-C44 (EH_2D_Total_#1)	<10000 µg/kg	TM414		<10000	48600	<10000	16200	43900	15600
Aromatics >EC5-EC7 (HS_1D_AR)	<10 µg/kg	TM089		<10	<10	<10	<10 2	<10	<10
Aromatics >EC7-EC8 (HS_1D_AR)	<10 µg/kg	TM089		<10	<10	<10	<10 2	<10	<10
Aromatics >EC8-EC10 (HS_1D_AR)	<10 µg/kg	TM089		<10	<10	<10	<10 2	<10	<10
Aromatics > EC10-EC12 (EH_2D_AR_#1)	<1000 µg/kg	TM414		<1000 #	<1000 #	<1000 #	<1000 #	<1000 @ #	<1000 #
Aromatics > EC12-EC16 (EH_2D_AR_#1)	<1000 µg/kg	TM414		<1000 #	<1000 #	<1000 #	<1000 #	<1000 @ #	<1000 #
Aromatics > EC16-EC21 (EH_2D_AR_#1)	<1000 µg/kg	TM414		<1000 #	2760 #	<1000 #	<1000 #	2580 @ #	1090 #
Aromatics > EC21-EC35 (EH_2D_AR_#1)	<1000 µg/kg	TM414		4960 #	29000 #	1670 #	7780 #	19400 @ #	9300 #
Aromatics >EC35-EC44 (EH_2D_AR_#1)	<1000 µg/kg	TM414		<1000	10100	<1000	<1000	19400 @	1560
Aromatics > EC40-EC44 (EH_2D_AR_#1)	<1000 µg/kg	TM414		<1000	2550	<1000	<1000	7430 @	<1000
Total Aromatics > EC10-EC44 (EH_2D_AR_#1)	<5000 µg/kg	TM414		6270	41900	<5000	9110	41400	12000
Total Aliphatics & Aromatics >C5-C44 (EH_2D_Total_#1+HS_1D_Total)	<10000 µg/kg	TM414		<10000	48600	<10000	16200	41400	12000
Total Aliphatics >C5-C10 (HS_1D_AL_TOTAL)	<50 µg/kg	TM089		<50	<50	<50	<50 2	<50	<50
Total Aromatics >EC5-EC10 (HS_1D_AR_TOTAL)	<50 µg/kg	TM089		<50	<50	<50	<50 2	<50	<50
GRO >C5-C10 (HS_1D_TOTAL)	<20 µg/kg	TM089		<20	<20	<20	<20 2	<20	<20

CERTIFICATE OF ANALYSIS

SDG: 231023-46 **Report Number:** 709254 **Superseded Report:**
Client Ref.: 23-50663 **Location:**

TPH CWG (S)

Results Legend
- # ISO17025 accredited.
- M mCERTS accredited.
- aq Aqueous / settled sample.
- diss.filt Dissolved / filtered sample.
- tot.unfilt Total / unfiltered sample.
- * Subcontracted - refer to subcontractor report for accreditation status.
- ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
- (F) Trigger breach confirmed
- 1-4+$@ Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	342581/TP7 G.L	342582/TP8 G.L				
			Depth (m)	0.10	0.10				
			Sample Type	Soil/Solid (S)	Soil/Solid (S)				
			Date Sampled	16/10/2023	16/10/2023				
			Sample Time	.	.				
			Date Received	23/10/2023	23/10/2023				
			SDG Ref	231023-46	231023-46				
			Lab Sample No.(s)	28828356	28828357				
			AGS Reference						
GRO Surrogate % recovery**	%	TM089		88.5	77.3				
Aliphatics >C5-C6 (HS_1D_AL)	<10 µg/kg	TM089		<10	<10				
Aliphatics >C6-C8 (HS_1D_AL)	<10 µg/kg	TM089		<10	<10				
Aliphatics >C8-C10 (HS_1D_AL)	<10 µg/kg	TM089		<10	<10				
Aliphatics >C10-C12 (EH_2D_AL_#1)	<1000 µg/kg	TM414		<1000 #	<1000 @ #				
Aliphatics >C12-C16 (EH_2D_AL_#1)	<1000 µg/kg	TM414		<1000 #	<1000 @ #				
Aliphatics >C16-C21 (EH_2D_AL_#1)	<1000 µg/kg	TM414		<1000 #	<1000 @ #				
Aliphatics >C21-C35 (EH_2D_AL_#1)	<1000 µg/kg	TM414		6360 #	2440 @ #				
Aliphatics >C35-C44 (EH_2D_AL_#1)	<1000 µg/kg	TM414		<1000	<1000 @				
Total Aliphatics >C10-C44 (EH_2D_AR_#1)	<5000 µg/kg	TM414		7440	<5000 @				
Total Aliphatics & Aromatics >C10-C44 (EH_2D_Total_#1)	<10000 µg/kg	TM414		43200	21400				
Aromatics >EC5-EC7 (HS_1D_AR)	<10 µg/kg	TM089		<10	<10				
Aromatics >EC7-EC8 (HS_1D_AR)	<10 µg/kg	TM089		<10	<10				
Aromatics >EC8-EC10 (HS_1D_AR)	<10 µg/kg	TM089		<10	<10				
Aromatics > EC10-EC12 (EH_2D_AR_#1)	<1000 µg/kg	TM414		<1000 #	<1000 @ #				
Aromatics > EC12-EC16 (EH_2D_AR_#1)	<1000 µg/kg	TM414		1440 #	<1000 @ #				
Aromatics > EC16-EC21 (EH_2D_AR_#1)	<1000 µg/kg	TM414		2320 #	<1000 @ #				
Aromatics > EC21-EC35 (EH_2D_AR_#1)	<1000 µg/kg	TM414		28100 #	13600 @ #				
Aromatics >EC35-EC44 (EH_2D_AR_#1)	<1000 µg/kg	TM414		3910	4170 @				
Aromatics > EC40-EC44 (EH_2D_AR_#1)	<1000 µg/kg	TM414		1220	1390 @				
Total Aromatics > EC10-EC44 (EH_2D_AR_#1)	<5000 µg/kg	TM414		35800	18500				
Total Aliphatics & Aromatics >C5-C44 (EH_2D_Total_#1+HS_1D_Total)	<10000 µg/kg	TM414		43200	18500				
Total Aliphatics >C5-C10 (HS_1D_AL_TOTAL)	<50 µg/kg	TM089		<50	<50				
Total Aromatics >EC5-EC10 (HS_1D_AR_TOTAL)	<50 µg/kg	TM089		<50	<50				
GRO >C5-C10 (HS_1D_TOTAL)	<20 µg/kg	TM089		<20	<20				

CERTIFICATE OF ANALYSIS

SDG: 231023-46 **Report Number:** 709254 **Superseded Report:**
Client Ref.: 23-50663 **Location:**

VOC MS (S)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	342575/TP1	342577/TP3	342578/TP4	342579/TP5	342576/TP2 G.L	342580/TP6 G.L
			Depth (m)	0.10	0.20	0.20	0.15	0.15	0.10
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
			Sample Time	.	.	.	.	.	.
			Date Received	23/10/2023	23/10/2023	23/10/2023	23/10/2023	23/10/2023	23/10/2023
			SDG Ref	231023-46	231023-46	231023-46	231023-46	231023-46	231023-46
			Lab Sample No.(s)	28828349	28828351	28828353	28828354	28828350	28828355
			AGS Reference						
Dibromofluoromethane**	%	TM116		95.9	103	97.3	107 2	106	105
Toluene-d8**	%	TM116		95.4	99.7	94.9	92.9 2	99.6	99.4
4-Bromofluorobenzene**	%	TM116		74.3	94.2	76.2	70.8 2	93	91.2
Methyl Tertiary Butyl Ether	<0.5 µg/kg	TM116		<0.5 M	<10 M	<0.5 M	<0.5 2 M	<10 M	<10 M
Benzene	<1 µg/kg	TM116		<1 M	<20 M	<1 M	2.36 2 M	<20 M	<20 M
Toluene	<1 µg/kg	TM116		<1 M	<20 M	<1 M	1.74 2 M	<20 M	<20 M
Ethylbenzene	<1 µg/kg	TM116		<1 M	<20 M	<1 M	<1 2 M	<20 M	<20 M
p/m-Xylene	<2 µg/kg	TM116		<2 #	<40 #	<2 #	<2 2 #	<40 #	<40 #
o-Xylene	<2 µg/kg	TM116		<2 M	<40 M	<2 M	<2 2 M	<40 M	<40 M
Sum of Detected Xylenes	<0.02 mg/kg	TM116		<0.02	<0.4	<0.02	<0.02 2	<0.4	<0.4
Sum of BTEX	<7 µg/kg	TM116		<7	<140	<7	<7 2	<140	<140

CERTIFICATE OF ANALYSIS

SDG: 231023-46 Report Number: 709254 Superseded Report:
Client Ref.: 23-50663 Location:

VOC MS (S)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	342581/TP7 G.L	342582/TP8 G.L
			Depth (m)	0.10	0.10
			Sample Type	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	16/10/2023	16/10/2023
			Sample Time	.	.
			Date Received	23/10/2023	23/10/2023
			SDG Ref	231023-46	231023-46
			Lab Sample No.(s)	28828356	28828357
			AGS Reference		
Dibromofluoromethane**	%	TM116		106	105
Toluene-d8**	%	TM116		99.7	100
4-Bromofluorobenzene**	%	TM116		91.3	95.8
Methyl Tertiary Butyl Ether	<0.5 µg/kg	TM116		<5 M	<10 M
Benzene	<1 µg/kg	TM116		<10 M	<20 M
Toluene	<1 µg/kg	TM116		<10 M	<20 M
Ethylbenzene	<1 µg/kg	TM116		<10 M	<20 M
p/m-Xylene	<2 µg/kg	TM116		<20 #	<40 #
o-Xylene	<2 µg/kg	TM116		<20 M	<40 M
Sum of Detected Xylenes	<0.02 mg/kg	TM116		<0.2	<0.4
Sum of BTEX	<7 µg/kg	TM116		<70	<140

Table of Results - Appendix

Method No	Description
PM024	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM089	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM116	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM414	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).

CERTIFICATE OF ANALYSIS

SDG: 231023-46 **Report Number:** 709254 **Superseded Report:**
Client Ref.: 23-50663 **Location:**

Test Completion Dates

Lab Sample No(s)	28828349	28828351	28828353	28828354	28828350	28828355	28828356	28828357
Customer Sample Ref.	342575/TP1	342577/TP3	342578/TP4	342579/TP5	342576/TP2 G.L	342580/TP6 G.L	342581/TP7 G.L	342582/TP8 G.L
AGS Ref.								
Depth	0.10	0.20	0.20	0.15	0.15	0.10	0.10	0.10
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
EPH CWG GC (S)	27-Oct-2023	27-Oct-2023	26-Oct-2023	27-Oct-2023	31-Oct-2023	27-Oct-2023	27-Oct-2023	31-Oct-2023
GRO by GC-FID (S)	27-Oct-2023	27-Oct-2023	27-Oct-2023	27-Oct-2023	29-Oct-2023	27-Oct-2023	30-Oct-2023	29-Oct-2023
Sample description	25-Oct-2023	25-Oct-2023	25-Oct-2023	25-Oct-2023	28-Oct-2023	25-Oct-2023	25-Oct-2023	28-Oct-2023
TPH CWG GC (S)	27-Oct-2023	27-Oct-2023	27-Oct-2023	27-Oct-2023	31-Oct-2023	27-Oct-2023	30-Oct-2023	31-Oct-2023
VOC MS (S)	27-Oct-2023	27-Oct-2023	27-Oct-2023	27-Oct-2023	30-Oct-2023	27-Oct-2023	30-Oct-2023	30-Oct-2023

Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of 15 days after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

20. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials andd soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX 4

GUIDELINES ON CONTAMINATION LEVELS

Human Health

CLEA Soil Guideline values (SGV)

The UKs 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.

	Soil Guideline Value (mg kg^{-1})		
Land use	**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.

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:

PARAMETER	Residential						Commercial			Allotment			POS resi	POS park	Source
	With Plant uptake			Without Plant uptake											
SOM %	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6			
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.

	LQM CIEH Generic Assessment Criteria (mg/kg dry weight soil)											
	Residential						Allotment Land Use			Commercial Land Use		
	With Plant Uptake			Without Plant Uptake								
SOM %	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	41000	69000	94000	41000	69000	94000	240000	260000	260000	140000	160000	180000
EC > 35 – 44	41000	69000	94000	41000	69000	94000	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

													POS_{resi}	POS_{park}
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)	140	230
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		

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.

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.

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.