Former Tidemill School (Block C)
Frankham Street
Deptford
London SE8 4RN

Verification Report

January 2024

J18257C
Rev 0

Report prepared by

Juliet Fuller BSc MSc DIC FGS
Associate Director

Report checked and approved by

[redacted]

Steve Branch BSc MSc CGeol FGS FRGS
Managing Director

Rev No	Status	Revision Details	Date	Approved for Issue
0	Final		12 January 2024	

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

✓	Hertfordshire	tel 01727 824666
	Nottinghamshire	tel 01509 674888
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Contents

1.0 Introduction

The site has been redeveloped by the construction of two-storey and three-storey houses and apartments, with associated infrastructure and gardens. A Desk Study and Ground Investigation has previously been carried out by GEA (report J14157-2 dated December 2014). Subsequently, additional investigations were undertaken at the site and these have been reviewed and presented in GEA report ref J18257A. The previous work identified arsenic, copper, zinc, lead and PAH concentrations measured within the made ground as well as asbestos fibres. A remediation method statement report has also been prepared for the site (J18257A Issue No 1, dated 19th September 2019).

It is understood that the construction of Block C and the surrounding areas of soft landscaping have been completed, and GEA has been instructed to provide validation of the remedial works carried out in this area of the site.

The previous reports contain data pertinent to the site and should therefore be read in conjunction with this report.

The remedial proposals for this development included the installation of a clean capping layer in the landscaped areas and the installation of new buried services within oversized trenches backfilled with a 'clean' material.

This report has been prepared to provide the information to discharge the planning condition relating to verification of the remediation implemented for Block C only. This report confirms that the objectives of the Remediation Method Statement have been achieved satisfactorily and only applies to the Block C area.

2.0 The Site

The site is located in Deptford, approximately 200 m southeast of Deptford railway station and 230 m north of Deptford Bridge DLR Station.

The site is bounded to the north and south by Frankham Street and Reginald Road respectively. The eastern boundary is formed by Frankham House, a five-storey apartment block, and a car park bounds the site to the west. The site is accessed via a gate located on Frankham Street and an additional gate on Reginald Road.

The site may be located by Ordnance Survey Grid Reference 537340, 177170. A full description of the site is included in the previous reports.

3.0 Ground Model

The desk study indicated that the site has a potentially contaminative history, in that it was in use as an aerosol manufacturing factory since the 1960s. On the basis of the fieldwork, the ground conditions at this site can be characterised as follows:

- below a moderate to relatively significant thickness of made ground, Kempton Park Gravel is present over Thanet Sand;
- the made ground comprises dark brown silty gravelly sand with brick, ash, clinker and coal fragments and generally extends to depths of between 0.40 m and of 2.70 m. The greater thicknesses of made ground may be the result of backfilled basements;
- the Kempton Park Gravel comprises medium dense becoming dense sandy gravel and extends to depths of between 12.20 m and 14.70 m;
- the Thanet Sand comprises dense becoming very dense silty sand and extends to a depth in excess of 20.00 m;
- groundwater is present within the Kempton Park Gravel at a depth of about 7 m;
- elevated concentrations of arsenic, copper and zinc were measured in a single sample and is thought likely to be the result of a fragment of clinker within that sample. Elevated concentrations of lead and PAH were measured in the made ground, which is likely to be attributable to ash, clinker, tarmac and partly burnt coal which was identified in the made ground. Asbestos fibres were identified in eight samples of the made ground recovered from the former garden and area of open space in the southeast of the site; and
- gas monitoring did not reveal any elevated methane or carbon dioxide concentrations.

4.0 Risk Assessment

The table below sets out the risk pathways that were identified as a result of the redevelopment of the site, which will have a residential with plant uptake end use. This conceptual model is based upon the findings of the ground model developed in the light of the investigation findings and highlights areas where remedial was considered necessary.

SOURCE	RECEPTOR	PATHWAY	COMMENT
Metal and PAH concentrations	End users	Direct soil and dust ingestion, consumption of homegrown produce, consumption of soil adhering to homegrown produce, skin contact with soils and dust and inhalation of dust and vapours	Contaminants identified are considered to be largely insoluble and given the length of time the site has been uncovered and subjected to infiltration any readily soluble contamination is likely to have migrated from site. The proposed development will result in a large proportion of the site being hard covered which will prevent infiltration. Garden areas will either have the made ground removed in its entirety or a minimum depth of 600 mm removed.
	Vegetation	Uptake via soil through roots in landscaped areas and private gardens	
	Adjacent sites	Migration through made ground and Taplow Gravel	
	Ground workers and future site workers	Accidental ingestion of soil and inhalation and ingestion of soil derived dust, direct contact with contaminated soils	Skin contact with soil will be minimized through the use of appropriate PPE and washing facilities will be provided. Soil will be kept damp to prevent fugitive dust emissions. The presence of contamination should be noted on the construction file.
	Groundwater	Percolation and leaching of surface run-off in areas of soft landscaping and permeable paving	The lead contamination identified is unlikely to be in a soluble form so it is unlikely that there will be leaching of contaminants from the made ground into adjacent sites. The site is underlain by the London Clay, which has extremely low vertical permeability, thus the risk posed to the groundwater within the deep aquifer is considered to be minimal.
	Buried services	Direct contact	Contamination will be isolated from buried services through the use of oversized, clean backfilled trenches or through the use of barrier pipe
Asbestos fibres within made ground	End users	Inhalation of fibres	Consideration should be made either for the removal of shallow contaminated made ground or for the inclusion of a clean cover system in areas of soft landscaping.
	Site Workers	Inhalation of fibres	Appropriate protective equipment and working practices will be required during groundworks.

5.0 Remedial Objectives and Recommendations

Based on the above risk assessment the following remedial objectives were established for this development:

- to protect end users and provide a suitable growing medium for plant growth, through the removal or capping of the made ground in which the elevated contaminant concentrations were measured;
- protect ground workers who will be exposed to the soil, through minimising their potential exposure and the potential for dust generation; and
- provide buried water supply pipes with protection to minimise the potential for permeation or degradation by contaminants and to minimise the potential exposure of future maintenance personnel.

In order to address the remedial objectives the remedial measures included:

- removal of the made ground in its entirety from garden / landscaped areas or installation of geotextile separation layer and clean imported soil in all areas of soft landscaping; and
- installation of buried services within oversized trenches backfilled within clean material.

Limited areas of soft landscaping have been formed at ground level, comprising areas of planting with shrubs and trees. Within these areas the made ground has been locally removed and replaced with a capping layer, comprising 'clean' imported topsoil and subsoil, which was be installed over a membrane, with the remaining made ground below. The capping layer prevents direct contact with the potentially contaminated soils below the site and eliminates the potential for the generation of soil derived dust that could potentially contain unacceptable contaminant concentrations.

To verify that the imported soil in-situ was in accordance with the certificate provided it was proposed to obtain a minimum of three samples of imported material for laboratory analysis.

6.0 Verification of Remedial Measures

6.1 Landscaped Areas

The client has provided the proposed soil certificates which GEA have confirmed indicated the imported soil to be free from elevated concentrations of contaminants when compared to the adopted guideline values. A copy is included in the appendix.

Insitu validation of capping layer

GEA attended site on 7th December 2023 to hand excavate trial pits in order to inspect the thickness of capping layer and to collect samples for laboratory testing. .The inspection recorded at least 450 mm thickness of imported material.

Frequency of analysis

Five samples of the imported topsoil were scheduled for confirmatory testing based on the minimum three samples per source requirement.

Laboratory analysis

All samples of the imported topsoil scheduled for laboratory analysis have been shown to be free from any elevated concentrations with respect to end users, in relation to a residential without plant uptake end use.

6.2 Buried Services

Photographs of the installation of the new services, taken by the contractor, are appended.

6.3 Site Workers

Site work was carried out in accordance with guidelines set out by HSE and CIRIA and all appropriate PPE was worn.

The contractor has confirmed that odorous, discoloured, fibrous or suspicious material was not identified during the construction phase.

7.0 Conclusions

The site has been remediated in accordance with the recommendations and end users of the development will be protected from the presence of any residual contamination by the presence of a clean cover layer or hardstanding across the external areas.

The contractor has now completed groundworks at Block C and has provided confirmation that no odorous, discoloured, fibrous or suspicious material was identified during construction work.

Appendix

Site Plan

Laboratory test results

Topsoil certificate

Site Photographs

Geotechnical & Environmental Associates

Herts:

Widbury Barn
Widbury Hill
Ware
Hertfordshire
SG12 7QE
tel 01727 824666
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Notts:

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tel 01509 674888
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M1 5AN
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mail @ gea-ltd.co.uk

GEA

Geotechnical & Environmental Associates

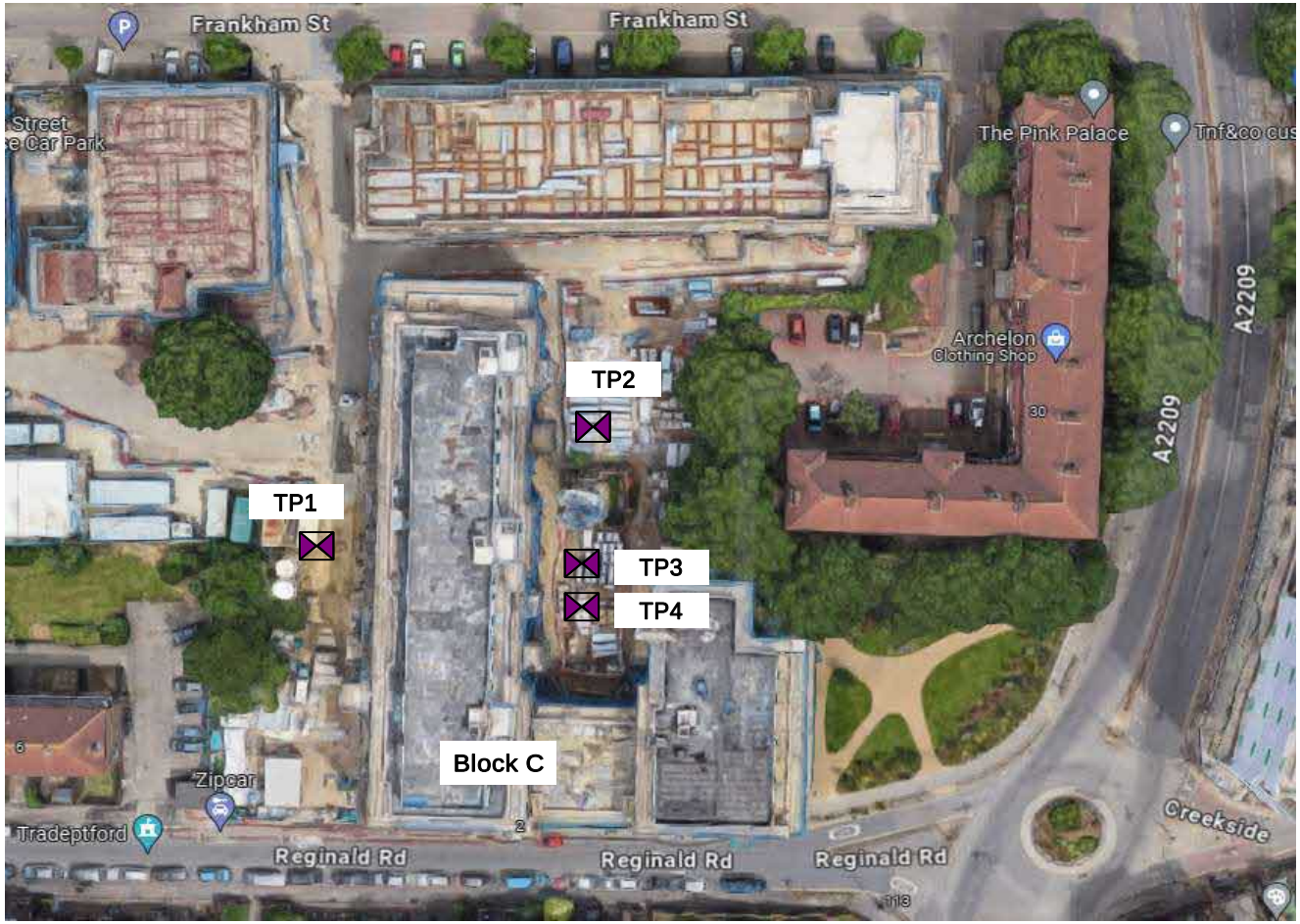
www.gea-ltd.co.uk

Site Plan

Site	Frankham Street
Client	Mulalley
Engineer	

Job Number J18257C

Sheet 1 / 1



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W E

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TP1 -not completed

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Herts,
WD18 8YS

t: 01923 225404
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e: reception@i2analytical.com

Analytical Report Number : 23-74713

Project / Site name:	Frankham Street	**Samples received on:**	08/12/2023
Your job number:	J18257C	**Samples instructed on/ Analysis started on:**	13/12/2023
Your order number:		**Analysis completed by:**	21/12/2023
Report Issue Number:	1	**Report issued on:**	22/12/2023
Samples Analysed:	5 soil samples		

Signed: [redacted]

Joanna Szwagrzak
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-74713
Project / Site name: Frankham Street

Lab Sample Number				2909951	2909952	2909953	2909954	2909955
Sample Reference				TP2	TP3	TP3	TP4	TP4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.20	0.40	0.20	0.40
Date Sampled				07/12/2023	07/12/2023	07/12/2023	07/12/2023	07/12/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	20	19	18	26	7.4
Total mass of sample received	kg	0.001	NONE	1	0.7	0.7	0.8	0.7
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	WEM	WEM	WEM	WEM	WEM

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9	8.3	7.5	7.8	8.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	1300	1600	1500	1700	2700
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.225	0.123	0.176	0.202	0.805
Sulphide	mg/kg	1	MCERTS	59	< 1.0	2.9	1.8	3
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	450	210	430	400	220
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	3.2	3.9	3.1	2.4	2.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.13
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.1
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.11
Phenanthrene	mg/kg	0.05	MCERTS	0.22	< 0.05	0.14	< 0.05	1.5
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.45
Fluoranthene	mg/kg	0.05	MCERTS	0.35	< 0.05	0.4	0.21	4.2
Pyrene	mg/kg	0.05	MCERTS	0.32	< 0.05	0.36	0.18	3.7
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.19	0.06	0.21	0.13	1.8
Chrysene	mg/kg	0.05	MCERTS	0.18	< 0.05	0.21	0.1	1.7
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.23	0.07	0.3	0.16	2.2
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.14	< 0.05	0.13	0.06	1.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.23	0.07	0.27	0.15	2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.13	< 0.05	0.15	0.08	1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.31
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.16	< 0.05	0.2	0.12	1.3

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	2.15	< 0.80	2.37	1.19	21.7

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	12	12	13	12	12
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	0.4
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	21	22	21	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	33	21	27	25	46
Lead (aqua regia extractable)	mg/kg	1	MCERTS	41	25	79	31	79
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16	14	15	14	15
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	85	64	100	71	110

Analytical Report Number: 23-74713
Project / Site name: Frankham Street

Lab Sample Number				2909951	2909952	2909953	2909954	2909955
Sample Reference				TP2	TP3	TP3	TP4	TP4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.25	0.20	0.40	0.20	0.40
Date Sampled				07/12/2023	07/12/2023	07/12/2023	07/12/2023	07/12/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	MCERTS	< 10	11	< 10	13	74
TPH (C8 - C10) HS_1D_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C10 - C12) EH_CU_1D_TOTAL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_1D_TOTAL	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	16
TPH (C21 - C35) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	< 10	< 10	< 10	11	45
TPH Total C8 - C35 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	< 10	< 10	< 10	11	61

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-74713
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* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2909951	TP2	None Supplied	0.25	Brown loam and sand with gravel and vegetation.
2909952	TP3	None Supplied	0.2	Brown loam and sand with gravel and vegetation.
2909953	TP3	None Supplied	0.4	Brown loam and sand with gravel and vegetation.
2909954	TP4	None Supplied	0.2	Brown loam and sand with gravel and vegetation.
2909955	TP4	None Supplied	0.4	Brown loam and sand with gravel and vegetation.

Analytical Report Number : 23-74713
Project / Site name: Frankham Street

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. Refer to CoA for analyte specific accreditation.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

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Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Freeland
HORTICULTURE LIMITED

Freeland Horticulture Ltd
Rosedale Nursery
College Road
Hextable
Kent
BR8 7LT

Attention : Philippa Lambourne

Our Ref: 1192-SA

7 August 2023

Dear Philippa

Topsoil Analysis Report : Rainham Topsoil – August 2023

We have completed the analysis of the topsoil sample recently taken from the above site and it has been forwarded to an approved laboratory for analysis and have the pleasure of reporting our findings. The purpose of the analysis was to determine the suitability of the topsoil for general landscaping purposes and its compliance with the current British Standard for topsoil (BS3882).

SOIL SAMPLING & EXAMINATION

At the time of our sampling visit the topsoil was stored in a stockpile. A series of 10 hand augered trial holes were constructed across the stockpile for the purpose of soil examination and sample collection. As the soil examination confirmed a consistent topsoil composition, the ten samples were combined together to form one composite sample for analysis purposes. The soil was described as dark brown, slightly moist and friable with a well-developed, fine to medium granular structure. The soil contained a low fraction of small stones and no deleterious materials (eg. building waste materials, glass, roots or rhizomes of pernicious weeds) or unusual odours (eg. hydrocarbons) were recorded.

LABORATORY ANALYSIS

The topsoil sample was submitted to a UKAS and MCERTS accredited laboratory for routine physical and chemical parameters to confirm the composition and fertility of the soil. The following parameters were determined:

- pH & electrical conductivity values;
- major plant nutrients (N, P, K, Mg) & organic matter content;
- particle size distribution and stone content;
- heavy metals & potentially toxic elements (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn, B);
- sulphate, sulphur, sulphide;
- total cyanide and total (mono) phenols;
- speciated PAHs (US EPA16)
- banded aromatic and aliphatic petroleum hydrocarbons (C_5-C_{35}).
- Asbestos

The results are presented on the attached Certificate of Analysis and an interpretation of the results is given below.

COMMENTS

pH & Electrical Conductivity (salinity) Values

The sample was alkaline in nature (pH 8.2) with a pH value that would be considered suitable for general landscaping purposes.

The electrical conductivity (salinity) value using the soil:water extract was (12552µS/cm) indicating that soluble salts are not present at levels that would be harmful to plants.

The electrical conductivity values by $CaSO_4$ extract (BS3882 requirement) fell below the maximum specified value (3300µS/cm) given in BS3882:2015.

Organic Matter & Nutrient Status

The sample was rich in organic matter and all major plant nutrients. No further additions of compost or fertiliser are required, or indeed recommended, for at least the first growing season.

The C:N ratio of the sample was acceptable for general landscape purposes

Particle Size Distribution & Stone Content

The sample contained 80% sand and fell into the Sandy loam texture class. This particle size distribution is considered suitable for a broad range of landscape applications, including tree and shrub planting, turfing and seeding.

The sample was Virtually free from stones of 50 mm and upwards in diameter and only contained a slight fraction of smaller stones (1.9%). As such, stones will not restrict the use of the soil for landscaping purposes.

Potential Contaminants

We are not aware of any specified contaminant levels set for the proposed end-use of this topsoil. This includes human health, environmental protection and metals considered toxic to plants. In the absence of any site-specific assessment criteria, the concentrations that affect human health have been compare with the 'residential with homegrown produce' land use in the Suitable For Use Levels presented in. 'The LQM/CIEH S4Uls' for Human Health Risk Assessmet (2015) and DEFRA SP1010: 'Development of Category 4 Screening Levels' for Assessment of Land Affected by Contamination – Policy Companion Document (2014).

Of the potential contaminants determined, none was found at levels that would exceed their respective guideline values.

CONCLUSION

The purpose of the analysis was to determine the suitability of the topsoil for general landscaping purposes. From the soil examination and laboratory analysis, the soil is described as an alkaline, non-saline, sandy loam. The organic matter and nutrient levels are acceptable, and no significant contamination was found with respect to the parameters determined. This soil would adhere to the current BS3882 specification for 'multipurpose grade'.

To conclude, based on our findings, the topsoil would be considered well-suited to general landscaping purposes provided the physical condition of the soil is maintained.

We hope this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if you have any queries or comments.

George Longmuir MSc Soil Sci. M.I Soil Sci.

Freeland
HORTICULTURE LIMITED

Client	Freeland Horticulture Ltd
Job Name	Topsoil Analysis
Site	Rainham, Essex
Month/Year	August 23
Our Ref	1192-SA
Date	07 August 2023

		Composite sample
pH Value & Salinity		
pH value (1:2.5 soil/water ext)	units	8.2
Electrical Conductivity (1:2.5 soil/water ext)	µS/cm	1252
Electrical Conductivity (1:2.5 soil/CaSO4 ext)	µS/cm	3220
Neutralising Value ($CaCO_3$ equivalent)	%	1.3
Organic Matter & Nutrient Status		
Organic Matter (LOI)	%	5.6
Organic Carbon (Derived)	%	3.3
Total Nitrogen	%	0.309
Carbon:Nitrogen Ratio	:1	10.5
Available Phosphorus	mg/l	78.6
Available Potassium	mg/l	1860
Available Magnesium	mg/l	280
Particle Size Analysis & Stones		
Clay (<0.002mm)	%	10
Silt (0.063-0.002mm)	%	10
Sand (2.0-0.063mm)	%	80
Texture Class	UK Class	Sandy Loam
Stones 2-20mm	% by DW	1.9
Stones 20-50mm	% by DW	0.0
Stones >50mm	% by DW	0.0
Potential Contaminants		
Total Arsenic (As)	mg/kg	16.3
Total Cadmium (Cd)	mg/kg	0.19
Total Chromium (Cr)	mg/kg	46.4
Hexavalent Chromium (CR^{VI})	mg/kg	0.6
Total Copper (Cu)	mg/kg	22.2
Total Lead (Pb)	mg/kg	29.9
Total Mercury (Hg)	mg/kg	<0.2
Total Nickel (Ni)	mg/kg	21.7
Total Selenium (Se)	mg/kg	0.36
Total Zinc (Zn)	mg/kg	104
Total Beryllium (Be)	mg/kg	<1
Total Barium (Ba)	mg/kg	49.8
Total Vanadium (V)	mg/kg	43.3
Hot Water Soluble Boron (B)	mg/kg	3.2
Total Cyanide (CN)	mg/kg	<1
Elemental Sulphur (S)	mg/kg	5.2
Easily Liberated Sulphide (S^{2-})	mg/kg	<1
Water Soluble Sulphate (SO_4^{2-})	mg/l	84.1
Total Phenols Index	mg/kg	<1
Asbestos Screen	-	N.D.

Client	Freeland Horticulture Ltd
Job Name	Topsoil Analysis
Site	Rainham, Essex
Month/Year	August 23
Our Ref	1192-SA
Date	07 August 2023

Polyaromatic Hydrocarbons		
Naphthalene	mg/kg	<0.05
Acenaphthylene	mg/kg	<0.05
Acenaphthene	mg/kg	<0.05
Fluorene	mg/kg	<0.05
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.05
Fluoranthene	mg/kg	0.1
Pyrene	mg/kg	0.1
Benzo[a]anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo[b]fluoranthene	mg/kg	<0.1
Benzo[k]fluoranthene	mg/kg	<0.1
Benzo[a]pyrene	mg/kg	<0.1
Indeno[1,2,3-cd]pyrene	mg/kg	<0.1
Dibenzo[a,h]anthracene	mg/kg	<0.1
Benzo[g,h,i]perylene	mg/kg	<0.1
Total PAHs sum US EPA 16	mg/kg	<0.1

Banded Petroleum Hydrocarbons		
Aliphatic TPH >C_5-C_6	mg/kg	<0.05
Aliphatic TPH >C_6-C_8	mg/kg	<0.05
Aliphatic TPH >C_8-C_{10}	mg/kg	<0.05
Aliphatic TPH >C_{10}-C_{12}	mg/kg	<10
Aliphatic TPH >C_{12}-C_{16}	mg/kg	<10
Aliphatic TPH >C_{16}-C_{21}	mg/kg	<10
Aliphatic TPH >C_{21}-C_{35}	mg/kg	<10
Aliphatic TPH >C_{35}-C_{44}	mg/kg	<12
Aromatic TPH >C_5-C_7	mg/kg	<0.05
Aromatic TPH >C_7-C_8	mg/kg	<0.05
Aromatic TPH >C_8-C_{10}	mg/kg	<0.05
Aromatic TPH >C_{10}-C_{12}	mg/kg	<10
Aromatic TPH >C_{12}-C_{16}	mg/kg	<10
Aromatic TPH >C_{16}-C_{21}	mg/kg	<10
Aromatic TPH >C_{21}-C_{35}	mg/kg	<10
Aromatic TPH >C_{35}-C_{44}	mg/kg	18.0
Total Petroleum Hydrocarbons (C_5-C_{44})	mg/kg	18.0

BTEX		
Benzene	mg/kg	<0.02
Toluene	mg/kg	<0.2
Ethyl Benzene	mg/kg	<0.04
m- & p- Xylene	mg/kg	<0.2
o-Xylene	mg/kg	<0.1

Chain of Custody Requires a Freeland Ticket: 01322 619161

GEA
Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Site Photographs

Site Former Tidemill School (Block D), Frankham Street, Deptford, London SE8 4RN

Client Mulalley

Job Number J18257C

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Photographs showing new pipe installations in oversized excavations