

GARDEN VALIDATION – ROYLE ROAD

Project Name: Royle Road

Project Number: 11-778

Client: Countryside Partnerships

Date: 09-11-2023

Project Manager: A. Garrity

E3P Engineer: J. James

Garden Validation Requirements: 600mm cover system (without break layer)

Plots: 101-102, 166-167

OVERVIEW

An E3P engineer attended the above site to validate the thickness of the cover system placed within the rear garden of plots 101-102, 166-167 at Royal Road, Rochdale.

In total four No. Hand-excavated trial pits were advanced, with the resulting strata detailed at the rear of this letter.

All trial pits were completed to highlight the required cover system of 600mm (150mm topsoil and 450mm subsoil).

E3P can confirm that our independent validation demonstrates that all gardens have been installed with 150mm of certified topsoil and at least 450mm subsoil under the NHBC requirements for a site of this nature.



Geo-Environmental



Acoustics



Remediation and
Enabling Earthworks
Design



Arboriculture



Compliance
& Due Diligence



Ecology



Industrial Permitting



Geotechnical

TOPSOIL

E3P attended the site on 15th February 2023, 24th April 2023, 16th May 2023, 22nd May 2023, 20th June 2023 and 11th July 2023 to obtain 18 samples of the stockpiled topsoil deposits which were analysed in accordance the E3P Remediation Strategy. Chemical analysis confirmed that these topsoil deposits were chemically suitable for use within the proposed garden areas.

The topsoil has been imported from Summerhill Farm, Maghull a greenfield site.

Analysis for topsoil undertaken by I2 Analytical Laboratory using UKAS accredited methods where applicable.

The chemical analysis suite comprises heavy metals, sulphates, phenols, speciated Polycyclic Aromatic Hydrocarbons (PAHs), speciated and total Petroleum Hydrocarbons (TPH) and asbestos. Sampling frequency following the agreed Remediation Strategy. Laboratory analysis certificates are attached to this validation certificate.

Chemical analysis results are included within lab report 23-18183, 23-30437, 23-34765, 23-35593, 23-41042 and 23-44707 (attached to this letter).

SUBSOIL

E3P attended the site on 13th December 2022 to obtain three samples of the stockpiled subsoil deposits and again on the 14th February 2023 which were analysed in accordance with the E3P Remediation Strategy. Chemical analysis confirmed that these subsoil deposits were chemically suitable for use within the proposed garden areas.

The subsoil has been imported from Marchington Stone Quarry, Glossop a greenfield site.

Site won naturally occurring sands have also been utilised as subsoil.

Analysis for subsoil undertaken by I2 Analytical Laboratory using UKAS accredited methods where applicable.

The chemical analysis suite comprises heavy metals, sulphates, phenols, speciated Polycyclic Aromatic Hydrocarbons (PAHs), speciated and total Petroleum Hydrocarbons (TPH) and asbestos. Sampling frequency following the agreed Remediation Strategy. Laboratory analysis certificates are attached to this validation certificate.

Chemical analysis results are included within lab report 23-18179 (imported) and 22-13385 (site won) (attached to this letter).

CHEMICAL ANALYSIS

TOPSOIL/SUBSOIL	SOURCE	LAB REFERENCE	SAMPLE REFERENCE	PASS/FAIL
Topsoil	off-site	23-18183	TS101 – TS103	Pass
Subsoil	off-site	23-18179	SS101 – SS103	Pass
Topsoil	off-site	23-30437	TS104–TS106	Pass
Subsoil	on site	22-13385	SS101 – SS103	Pass
Topsoil	off-site	23-34765	TS107–TS109	Pass
Topsoil	off-site	23-35593	TS110– TS112	Pass
Topsoil	off-site	23-41042	TS113– TS115	Pass
Topsoil	off-site	23-44707	TS116 – TS118	Pass

The cover system validation photographs are enclosed within this letter.

Garden Cover System Validation

Complete

Score	25 / 25 (100%)
Site Name	Royle Barn Rd
Location	33 Broadbent Street Rochdale England OL11 3ET United Kingdom (53.59992851569505, - 2.172145245973329)
Project Number	11778
Developer	Countryside
Project Manager	Stu Ellis
Conducted By	Jordan James
Date of visit	9 Nov 2023 9:49 AM GMT

Plot Validation	25 / 25 (100%)
Plot Validation	25 / 25 (100%)
Plot Validation 1	5 / 5 (100%)
Plot Number	166
Is Plot Ready	Yes
Installation Standard	Pass
Depth of Cover System Materials (record the depth and support with Photo down the hole)	600
  Photo 1 Photo 2	
Depth of Topsoil (mm)	150
Depth of Subsoil (mm)	450
Depth of Cover System at Ground Level (Photo)	☒
 Photo 3	
Depth of Cover System in Relation to Plot (Ensure the whole plot can be seen in the photo)	☒
 Photo 4	
Soil suitable	Yes
Geotextile membrane present	N/A

Plot Validation 2		5 / 5 (100%)
Plot Number		167
Is Plot Ready	Yes	
Installation Standard	Pass	
Depth of Cover System Materials (record the depth and support with Photo down the hole)		600
  Photo 5 Photo 6		
Depth of Topsoil (mm)		150
Depth of Subsoil (mm)		450
Depth of Cover System at Ground Level (Photo)		☒
 Photo 7		
Depth of Cover System in Relation to Plot (Ensure the whole plot can be seen in the photo)		☒
 Photo 8		
Soil suitable	Yes	
Geotextile membrane present	N/A	
Plot Validation 3		5 / 5 (100%)
Plot Number		107
Is Plot Ready	Yes	

Installation Standard	Pass
Depth of Cover System Materials (record the depth and support with Photo down the hole)	620
 	
Photo 9	Photo 10
Depth of Topsoil (mm)	150
Depth of Subsoil (mm)	450
Depth of Cover System at Ground Level (Photo)	☒
 	
Photo 11	Photo 12
Depth of Cover System in Relation to Plot (Ensure the whole plot can be seen in the photo)	☒
Soil suitable	Yes
Geotextile membrane present	N/A
Plot Validation 4	5 / 5 (100%)
Plot Number	102
Is Plot Ready	Yes
Installation Standard	Pass
Depth of Cover System Materials (record the depth and support with Photo down the hole)	600
 	
Photo 13	Photo 14
Depth of Topsoil (mm)	150

Depth of Subsoil (mm)	450
Depth of Cover System at Ground Level (Photo)	☒
 Photo 15	
Depth of Cover System in Relation to Plot (Ensure the whole plot can be seen in the photo)	☒
 Photo 16  Photo 17	
Soil suitable	Yes
Geotextile membrane present	N/A
Plot Validation 5	5 / 5 (100%)
Plot Number	101
Is Plot Ready	Yes
Installation Standard	Pass
Depth of Cover System Materials (record the depth and support with Photo down the hole)	600
 Photo 18  Photo 19	
Depth of Topsoil (mm)	150
Depth of Subsoil (mm)	450
Depth of Cover System at Ground Level (Photo)	☒



Photo 20

Depth of Cover System in Relation to Plot (Ensure the whole plot can be seen in the photo) ☒



Photo 21

Soil suitable	Yes
Geotextile membrane present	N/A

Site Manager or Representative

Name M walsh

Signature

9 Nov 2023 10:34 AM GMT

Media summary



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21

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Analytical Report Number : 23-35593

Project / Site name:	Royle Barn Road	Samples received on:	23/05/2023
Your job number:	11 778	Samples instructed on/ Analysis started on:	24/05/2023
Your order number:	004927	Analysis completed by:	02/06/2023
Report Issue Number:	1	Report issued on:	02/06/2023
Samples Analysed:	3 soil samples		



Signed:

Elżbieta Suchy
Junior 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: 23-35593
 Project / Site name: Royle Barn Road
 Your Order No: 004927

Lab Sample Number				2690314	2690315	2690316
Sample Reference				TS110	TS111	TS112
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				22/05/2023	22/05/2023	22/05/2023
Time Taken				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
Moisture Content	%	0.01	NONE	14	13	13
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	JBH	JBH	JBH

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.6	7.5	7.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	430	510	520
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.1	0.12	0.14
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	200	240	280
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	102	118	139
Sulphide	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
Total Sulphur	mg/kg	50	MCERTS	460	320	650
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.1	2	2

Total Phenols

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

Naphthalene	mg/kg	0.05	NONE	0.44	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	NONE	0.46	< 0.05	< 0.05
Fluorene	mg/kg	0.05	NONE	0.29	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	NONE	3.9	0.31	0.32
Anthracene	mg/kg	0.05	NONE	0.55	0.06	0.07
Fluoranthene	mg/kg	0.05	NONE	3.9	0.5	0.75
Pyrene	mg/kg	0.05	NONE	3.7	0.48	0.79
Benzo(a)anthracene	mg/kg	0.05	NONE	1.3	0.22	0.41
Chrysene	mg/kg	0.05	NONE	1.5	0.29	0.46
Benzo(b)fluoranthene	mg/kg	0.05	NONE	1.4	0.35	0.53
Benzo(k)fluoranthene	mg/kg	0.05	NONE	0.48	0.12	0.18
Benzo(a)pyrene	mg/kg	0.05	NONE	1.1	0.26	0.43
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.51	0.16	0.21
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.18	< 0.05	0.07
Benzo(ghi)perylene	mg/kg	0.05	NONE	0.67	0.18	0.28

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	20.3	2.93	4.5
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Analytical Report Number: 23-35593
Project / Site name: Royle Barn Road
Your Order No: 004927

Lab Sample Number				2690314	2690315	2690316
Sample Reference				TS110	TS111	TS112
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				22/05/2023	22/05/2023	22/05/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.7	10	8.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	12	13	12
Copper (aqua regia extractable)	mg/kg	1	MCERTS	28	35	30
Lead (aqua regia extractable)	mg/kg	1	MCERTS	59	66	57
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	15	12
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	45	55	50

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	NONE	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	NONE	< 4.0	< 4.0	< 4.0
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	1	NONE	4.7	< 1.0	< 1.0
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	1	NONE	11	< 1.0	< 1.0
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	NONE	< 10	< 10	< 10
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	NONE	22	< 10	< 10

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

Analytical Report Number : 23-35593

Project / Site name: Royle Barn Road

* 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 *
2690314	TS110	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
2690315	TS111	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
2690316	TS112	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.

Analytical Report Number : 23-35593

Project / Site name: Royle Barn Road

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
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.	In-house method based on USEPA 8270	L064-PL	D	NONE
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	NONE
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 Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
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	NONE
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
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

Analytical Report Number : 23-35593
Project / Site name: Royle Barn Road

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
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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

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Analytical Report Number : 23-41042

Project / Site name:	Royle Barn Road	Samples received on:	20/06/2023
Your job number:	11 778	Samples instructed on/ Analysis started on:	23/06/2023
Your order number:	005305	Analysis completed by:	29/06/2023
Report Issue Number:	1	Report issued on:	29/06/2023
Samples Analysed:	3 soil samples		

Signed:



Dominika Warjan
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

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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: 23-41042
Project / Site name: Royle Barn Road
Your Order No: 005305

Lab Sample Number				2724508	2724509	2724510
Sample Reference				TS113	TS114	TS115
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				20/06/2023	20/06/2023	20/06/2023
Time Taken				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
Moisture Content	%	0.01	NONE	13	15	15
Total mass of sample received	kg	0.001	NONE	0.3	0.3	0.3

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	JBH	JBH	JBH

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.7	7.5	7.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	400	260	470
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.08	0.07	0.071
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	160	140	140
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	79.7	69.6	71.4
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphur	mg/kg	50	MCERTS	340	320	300
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.8	2.1	2.1

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	0.05	0.06	0.06
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.42	0.52	0.46
Anthracene	mg/kg	0.05	MCERTS	0.11	0.11	0.09
Fluoranthene	mg/kg	0.05	MCERTS	1.1	1	0.83
Pyrene	mg/kg	0.05	MCERTS	1.2	1.1	0.83
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.68	0.53	0.4
Chrysene	mg/kg	0.05	MCERTS	0.68	0.5	0.44
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.99	0.69	0.53
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.4	0.23	0.24
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.8	0.52	0.46
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.39	0.25	0.23
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.51	0.31	0.28

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	7.38	5.8	4.85
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Analytical Report Number: 23-41042
Project / Site name: Royle Barn Road
Your Order No: 005305

Lab Sample Number				2724508	2724509	2724510
Sample Reference				TS113	TS114	TS115
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				20/06/2023	20/06/2023	20/06/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.4	8.5	8.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	10	11	11
Copper (aqua regia extractable)	mg/kg	1	MCERTS	30	31	30
Lead (aqua regia extractable)	mg/kg	1	MCERTS	53	59	68
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	11	12	12
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	44	60	48

Petroleum Hydrocarbons

TPH (C5 - C6) HS_ID_TOTAL	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) HS_ID_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) HS_ID_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_ID_TOTAL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_ID_TOTAL	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0
TPH (C16 - C21) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	< 1.0	< 1.0	1
TPH (C21 - C35) EH_CU_ID_TOTAL	mg/kg	1	MCERTS	2.6	3.5	3
TPH (C35 - C40) EH_CU_ID_TOTAL	mg/kg	10	NONE	< 10	< 10	< 10
TPH Total C5 - C40 EH_CU+HS_ID_TOTAL	mg/kg	10	NONE	< 10	< 10	< 10

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

Analytical Report Number : 23-41042

Project / Site name: Royle Barn Road

* 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 *
2724508	TS113	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation.
2724509	TS114	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation.
2724510	TS115	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 23-41042
Project / Site name: Royle Barn Road

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
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.	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 Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
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
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

Analytical Report Number : 23-41042
Project / Site name: Royle Barn Road

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 (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

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



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Analytical Report Number : 23-44707

Project / Site name: Royle Barn Road

Samples received on: 12/07/2023

Your job number: 11-778

**Samples instructed on/
Analysis started on:** 13/07/2023

Your order number: 005502

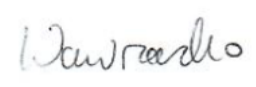
Analysis completed by: 19/07/2023

Report Issue Number: 1

Report issued on: 19/07/2023

Samples Analysed: 3 soil samples

Signed:


Joanna Wawrzeczko
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

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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: 23-44707
Project / Site name: Royle Barn Road
Your Order No: 005502

Lab Sample Number				2746676	2746677	2746678
Sample Reference				TS116	TS117	TS118
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023
Time Taken				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
Moisture Content	%	0.01	NONE	15	14	13
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	IZJ	IZJ	IZJ

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.7	7.1	8
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	320	400	550
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.018	0.019	0.065
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	35	39	130
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	17.7	19.4	64.8
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	1
Total Sulphur	mg/kg	50	MCERTS	300	270	350
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.2	2	2.1

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	0.09	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.9	0.14	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.78	0.1	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	9.2	1.3	0.27
Anthracene	mg/kg	0.05	MCERTS	1.9	0.22	0.06
Fluoranthene	mg/kg	0.05	MCERTS	9	1.8	0.53
Pyrene	mg/kg	0.05	MCERTS	8.5	1.8	0.52
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.5	0.69	0.29
Chrysene	mg/kg	0.05	MCERTS	3.4	0.71	0.29
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3.3	0.72	0.4
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.5	0.29	0.14
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.7	0.55	0.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.3	0.29	0.19
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.33	0.08	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.6	0.37	0.27

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	47.9	9.07	3.26
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Analytical Report Number: 23-44707
Project / Site name: Royle Barn Road
Your Order No: 005502

Lab Sample Number				2746676	2746677	2746678
Sample Reference				TS116	TS117	TS118
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.1	8.4	8.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	16	13	13
Copper (aqua regia extractable)	mg/kg	1	MCERTS	33	34	31
Lead (aqua regia extractable)	mg/kg	1	MCERTS	68	58	66
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	13	13
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	58	49	51

Petroleum Hydrocarbons

TPH (C5 - C6) HS_1D_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1
TPH (C6 - C8) HS_1D_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) HS_1D_TOTAL	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) EH_CU_1D_TOTAL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) EH_CU_1D_TOTAL	mg/kg	4	MCERTS	7.2	9	< 4.0
TPH (C16 - C21) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	22	< 10	< 10
TPH (C21 - C35) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	58	19	< 10
TPH (C35 - C40) EH_CU_1D_TOTAL	mg/kg	10	NONE	< 10	< 10	< 10
TPH Total C5 - C40 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	94	38	< 10

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



Analytical Report Number : 23-44707
Project / Site name: Royle Barn Road

* 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 *
2746676	TS116	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
2746677	TS117	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
2746678	TS118	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.

Analytical Report Number : 23-44707
Project / Site name: Royle Barn Road

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
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.	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 SO ₄ 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 Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
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
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
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

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 aravimetrically using the moisture content which is carried out at a maximum of 30oC.



Analytical Report Number : 23-44707
Project / Site name: Royle Barn Road

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
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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