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Ref: 11-416- V1
Date: 20th April 2018

Kenny O'Brien
Alan Johnston Partnership
4th Floor
Dale Street
Liverpool
L2 2ET
BY Email (KennyO'brien@ajpstructeng.com)
Dear Sirs,

Garden Validation – Barrel Yard, Manchester Plots 1-4, 10-17 Rear Gardens

An E3P engineer attended the above site to validate the thickness of the cover system that had been placed within the rear garden of plots 1-4, 10-17 Rear Gardens at the site off Barrel Yard, Manchester

In total 12No. hand excavated trial pits were advanced with the resulting strata detailed to 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 in accordance with the NHBC requirements for a site of this nature.

Topsoil

E3P attended site on 22nd March 2018 to obtain three samples of the stockpiled topsoil deposits which were analysed in accordance with the E3P Remediation Strategy. Chemical analysis confirmed that these topsoil deposits were chemically suitable for use within the proposed garden areas.

Chemical analysis results are included within lab report 18-80424 (attached to this letter).

Subsoil

E3P attended site on 22nd March 2018 to obtain three samples of the stockpiled subsoil deposits 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.

Chemical analysis results are included within lab report 18-80424 (attached to this letter).

Cover system validation photographs are enclosed within this letter.

I trust this information is satisfactory to your requirements, and should I be able to be of any further assistance, please do not hesitate to contact me.

Yours sincerely,

For and on behalf of E3P Ltd



Stuart Ellis
Senior Geo- Environmental Consultant

Site: Barrel Yard, Manchester

Date: 22-03-2018	Project Number: 11-416
Project Manager: S. Ellis	E3P Engineer: J. Newall
Plot Numbers Validated: 1-4, 10-17 Rear	

Chemical Laboratory Analysis

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

Chemical analysis suite comprises heavy metals, sulphates, phenols, speciated Polycylic Aromatic Hydrocarbons (PAHs), speciated and total Petroleum Hydrocarbons (TPH) and asbestos.

Sampling frequency in accordance with the agreed Remediation Strategy.

Laboratory analysis certificates attached to this validation certificate.

	Topsoil	**Subsoil**
Chemical analysis confirmed materials suitable?	Pass	Pass
Further Comments	N/A	N/A

Plot No: 1 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials	***Depth of Cover System Materials***
	
Depth of Cover System at Ground Level	***Depth of Cover System in Relation to Plot***
	

Plot No: 2 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials



Depth of Cover System Materials



Depth of Cover System at Ground Level



Depth of Cover System in Relation to Plot



Plot No: 3 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials	***Depth of Cover System Materials***
	
Depth of Cover System at Ground Level	***Depth of Cover System in Relation to Plot***
	

Plot No: 4 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials



Depth of Cover System Materials



Depth of Cover System at Ground Level



Depth of Cover System in Relation to Plot



Plot No: 10 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials	***Depth of Cover System Materials***
	
Depth of Cover System at Ground Level	***Depth of Cover System in Relation to Plot***
	

Plot No: 11 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials



Depth of Cover System Materials



Depth of Cover System at Ground Level



Depth of Cover System in Relation to Plot



Plot No: 12 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials



Depth of Cover System Materials



Depth of Cover System at Ground Level



Depth of Cover System in Relation to Plot



Plot No: 13 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials	***Depth of Cover System Materials***
	
Depth of Cover System at Ground Level	***Depth of Cover System in Relation to Plot***
	

Plot No: 14 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials



Depth of Cover System Materials



Depth of Cover System at Ground Level



Depth of Cover System in Relation to Plot



Plot No: 15 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials



Depth of Cover System Materials



Depth of Cover System at Ground Level



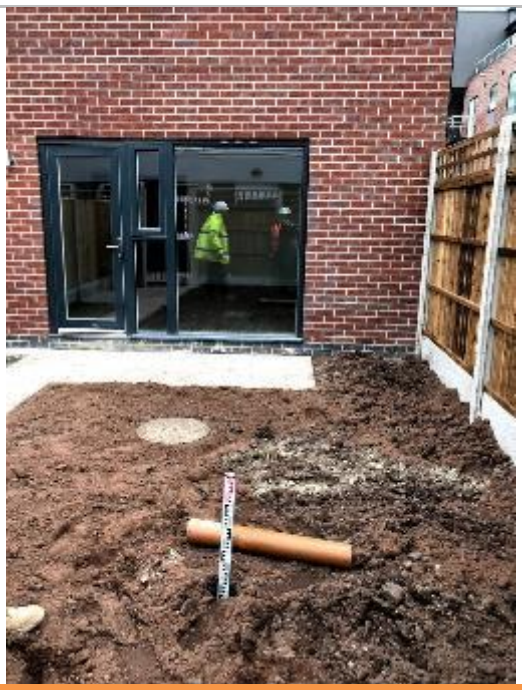
Depth of Cover System in Relation to Plot



Plot No: 16 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials	***Depth of Cover System Materials***
	
Depth of Cover System at Ground Level	***Depth of Cover System in Relation to Plot***
	

Plot No: 17 Rear		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials	***Depth of Cover System Materials***
	
Depth of Cover System at Ground Level	***Depth of Cover System in Relation to Plot***
	

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Analytical Report Number : 18-80424

Project / Site name:	Barrell Yard	**Samples received on:**	26/03/2201
Your job number:	11-416	**Samples instructed on:**	26/03/2018
Your order number:	11416-8367-AA	**Analysis completed by:**	03/04/2018
Report Issue Number:	1	**Report issued on:**	03/04/2018
Samples Analysed:	6 soil samples		

Signed:

Jordan Hill
Reporting Manager
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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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 18-80424

Project / Site name: Barrell Yard
Your Order No: 11416-8367-AA

Lab Sample Number				933504	933505	933506	933507	933508
Sample Reference				TS101	SS101	TS102	SS102	TS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				26/03/2018	26/03/2018	26/03/2018	26/03/2018	26/03/2018
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	%	N/A	NONE	18	11	17	11	17
Total mass of sample received	kg	0.001	NONE	0.51	0.57	0.50	0.57	0.50
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.6	8.3	7.8	8.3	7.8
Total Cyanide	mg/kg	1	MCERTS	1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	840	320	810	250	740
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	230	150	300	77	280
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.12	0.077	0.15	0.038	0.14
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	116	77.3	149	38.3	142
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	1.8	< 1.0	2.0
Total Sulphur	mg/kg	50	MCERTS	460	140	450	170	550
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	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.0	0.64	0.91	0.35	1.0
Anthracene	mg/kg	0.05	MCERTS	0.22	< 0.05	0.23	< 0.05	0.25
Fluoranthene	mg/kg	0.05	MCERTS	2.0	0.83	1.6	0.54	1.8
Pyrene	mg/kg	0.05	MCERTS	1.8	0.71	1.4	0.48	1.7
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.97	0.34	1.3	0.38	1.4
Chrysene	mg/kg	0.05	MCERTS	1.1	0.37	0.97	0.29	1.0
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.1	0.33	1.0	0.30	1.1
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.72	0.23	0.59	0.17	0.61
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.1	0.32	1.7	0.53	1.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.53	< 0.05	0.42	< 0.05	0.47
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.67	< 0.05	0.50	< 0.05	0.48
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	11.2	3.77	10.6	3.04	11.8

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 18-80424

Project / Site name: Barrell Yard
Your Order No: 11416-8367-AA

Lab Sample Number				933504	933505	933506	933507	933508
Sample Reference				TS101	SS101	TS102	SS102	TS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				26/03/2018	26/03/2018	26/03/2018	26/03/2018	26/03/2018
Time Taken				None Supplied	None Supplied	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	13	2.2	11	4.2	13
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4	< 0.2	0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	24	19	18	15	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	62	22	42	18	48
Lead (aqua regia extractable)	mg/kg	1	MCERTS	120	28	80	21	89
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.7	< 0.3	0.5	< 0.3	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	16	17	21	23
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	91	41	84	49	89
Petroleum Hydrocarbons								
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	7.6	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	31	< 1.0	24	2.5	15
TPH (C21 - C35)	mg/kg	1	MCERTS	120	< 1.0	38	4.2	39

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Analytical Report Number: 18-80424

Project / Site name: Barrell Yard
Your Order No: 11416-8367-AA

Lab Sample Number				933509				
Sample Reference				SS103				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				26/03/2018				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	11				
Total mass of sample received	kg	0.001	NONE	0.59				
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected				
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.3				
Total Cyanide	mg/kg	1	MCERTS	< 1				
Total Sulphate as SO_4	mg/kg	50	MCERTS	320				
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	130				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.067				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	66.8				
Sulphide	mg/kg	1	MCERTS	< 1.0				
Total Sulphur	mg/kg	50	MCERTS	230				
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0				
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Pyrene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80				

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Analytical Report Number: 18-80424

Project / Site name: Barrell Yard
Your Order No: 11416-8367-AA

Lab Sample Number				933509				
Sample Reference				SS103				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				26/03/2018				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	2.8				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	13				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	8.9				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	10				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	32				

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0				
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1				
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1				
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0				
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0				
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0				
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0				

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Analytical Report Number : 18-80424

Project / Site name: Barrell Yard

* 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 *
933504	TS101	None Supplied	None Supplied	Brown clay and loam.
933505	SS101	None Supplied	None Supplied	Light brown sandy clay.
933506	TS102	None Supplied	None Supplied	Brown loam and clay with vegetation.
933507	SS102	None Supplied	None Supplied	Beige clay and gravel.
933508	TS103	None Supplied	None Supplied	Brown loam and clay with vegetation and gravel
933509	SS103	None Supplied	None Supplied	Beige sandy clay.

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Analytical Report Number : 18-80424

Project / Site name: Barrell Yard

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
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
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	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
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	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
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
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 based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-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 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 sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
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 based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' 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.

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