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Ref: 11-813 – V4
Date: 18th February 2020

Steve Weir
Rowlinson Construction
London House
London Road South
Poynton
Stockport
SK12 1YP

BY Email

Dear Sir

GARDEN VALIDATION – SHARED PARTNERSHIP HOUSES - BOWES STREET

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 45, 46 & 51-54 houses at Bowes Street.

In total 6No. 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 15th August 2019 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 - 19-55101 (attached to this letter).



SUBSOIL

E3P attended site on 15th August 2019 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 - 19-55101 (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



Rob Horseman
Associate Director



Site: Bowes Street

Date: 13-02-2020	Project Number: 11-813
Project Manager: R. Horseman	E3P Engineer: J. Newall
Plot Numbers Validated: 45, 46, 51-54	

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 Polycyclic 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
<i>Chemical analysis confirmed materials suitable?</i>	Pass	Pass
<i>Further Comments</i>	N/A	N/A



Plot No: 45

Depth of Strata (m bgl)	0.15	Validated TOPSOIL
	0.45	Validated SUBSOIL

Depth of Cover System Materials

Depth of Cover System Materials



Depth of Cover System in Relation to Plot



Plot No: 46

Depth of Strata (m bgl)	0.15	Validated TOPSOIL
	0.45	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: 51

Depth of Strata (m bgl)	0.15	Validated TOPSOIL
	0.45	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: 52

Depth of Strata (m bgl)	0.15	Validated TOPSOIL
	0.45	Validated SUBSOIL

Depth of Cover System Materials



Depth of Cover System at Ground Level

Depth of Cover System Materials



Depth of Cover System in Relation to Plot



Plot No:53

Depth of Strata (m bgl)	0.15	Validated TOPSOIL
	0.45	Validated SUBSOIL

Depth of Cover System Materials



Depth of Cover System Materials



Depth of Cover System in Relation to Plot



Plot No: 54

Depth of Strata (m bgl)	0.15	Validated TOPSOIL
	0.45	Validated SUBSOIL

Depth of Cover System Materials

Depth of Cover System Materials



Depth of Cover System in Relation to Plot





Rob Horseman

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i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

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e: reception@i2analytical.com

Analytical Report Number : 19-55101

Project / Site name: Bowes Street

Samples received on: 16/08/2019

Your job number:

Samples instructed on: 16/08/2019

Your order number:

Analysis completed by: 23/08/2019

Report Issue Number: 1

Report issued on: 23/08/2019

Samples Analysed: 6 soil samples

Signed: *Karolina Marek*

Karolina Marek
Technical Reviewer (Reporting Team)
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: 19-55101

Project / Site name: Bowes Street

Lab Sample Number				1293738	1293739	1293740	1293741	1293742
Sample Reference				TS101	TS102	TS103	SS101	SS102
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				15/08/2019	15/08/2019	15/08/2019	15/08/2019	15/08/2019
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	17	18	18	19	17
Total mass of sample received	kg	0.001	NONE	0.48	0.49	0.50	0.40	0.52

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.7	7.7	7.7	7.8	7.7
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	530	460	620	510	500
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	100	120	99	120	110
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.051	0.061	0.050	0.059	0.053
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	50.9	60.9	49.7	58.5	53.2
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphur	mg/kg	50	MCERTS	350	360	380	360	380

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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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	0.63	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.34	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.3	1.0	0.75	2.5	0.83
Anthracene	mg/kg	0.05	MCERTS	0.28	0.17	0.17	0.43	0.18
Fluoranthene	mg/kg	0.05	MCERTS	2.2	2.0	1.4	2.6	1.6
Pyrene	mg/kg	0.05	MCERTS	2.0	1.9	1.4	2.3	1.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.0	1.1	0.73	1.2	0.81
Chrysene	mg/kg	0.05	MCERTS	0.98	0.84	0.73	1.2	0.73
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.3	1.1	0.89	1.3	0.99
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.40	0.44	0.25	0.51	0.22
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.98	0.84	0.68	1.0	0.70
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.44	0.43	0.34	0.48	0.34
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	0.59	0.52	0.40	0.70	0.44

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	11.4	10.4	7.75	15.2	8.24
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Analytical Report Number: 19-55101

Project / Site name: Bowes Street

Lab Sample Number	1293738	1293739	1293740	1293741	1293742
Sample Reference	TS101	TS102	TS103	SS101	SS102
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	15/08/2019	15/08/2019	15/08/2019	15/08/2019	15/08/2019
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	16	16	16	14	17
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.5	0.6	0.4	0.6
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	22	17	16	17	17
Copper (aqua regia extractable)	mg/kg	1	MCERTS	61	54	62	58	63
Lead (aqua regia extractable)	mg/kg	1	MCERTS	85	76	85	73	80
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.3	0.6	< 0.3	0.7	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	17	18	15	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.8	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	88	73	100	86	85

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	< 4.0	< 4.0	< 4.0	5.7	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	12	16	11	19	6.8
TPH (C21 - C35)	mg/kg	1	MCERTS	49	29	36	43	10
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	63	47	49	70	19

Analytical Report Number: 19-55101

Project / Site name: Bowes Street

Lab Sample Number				1293743				
Sample Reference				SS103				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				15/08/2019				
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	18				
Total mass of sample received	kg	0.001	NONE	0.52				

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected				
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.8				
Total Cyanide	mg/kg	1	MCERTS	< 1				
Total Sulphate as SO ₄	mg/kg	50	MCERTS	510				
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	120				
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.060				
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	59.8				
Sulphide	mg/kg	1	MCERTS	< 1.0				
Total Sulphur	mg/kg	50	MCERTS	410				

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0				
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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	0.89				
Anthracene	mg/kg	0.05	MCERTS	0.22				
Fluoranthene	mg/kg	0.05	MCERTS	1.7				
Pyrene	mg/kg	0.05	MCERTS	1.6				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.79				
Chrysene	mg/kg	0.05	MCERTS	0.77				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.87				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.41				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.72				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.35				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.48				

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	8.76				
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Analytical Report Number: 19-55101

Project / Site name: Bowes Street

Lab Sample Number				1293743				
Sample Reference				SS103				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				15/08/2019				
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	16				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	70				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	90				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	93				

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	5.8				
TPH (C21 - C35)	mg/kg	1	MCERTS	25				
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10				
TPH Total C5 - C40	mg/kg	10	MCERTS	33				

Analytical Report Number : 19-55101

Project / Site name: Bowes Street

* 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 *
1293738	TS101	None Supplied	None Supplied	Brown clay and loam with gravel and vegetation.
1293739	TS102	None Supplied	None Supplied	Brown clay and loam with gravel and vegetation.
1293740	TS103	None Supplied	None Supplied	Brown clay and sand with gravel.
1293741	SS101	None Supplied	None Supplied	Brown clay and sand with gravel.
1293742	SS102	None Supplied	None Supplied	Brown clay and sand with gravel.
1293743	SS103	None Supplied	None Supplied	Brown loam and clay with vegetation and gravel

Analytical Report Number : 19-55101

Project / Site name: Bowes Street

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
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine 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 and silica gel split/cleanup.	L076-PL	D	MCERTS

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 300C.