Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-73	Client Reference:	2921-028 COC3-B	Report Number:	426770
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Chartered Land - Heuston South Q
Mass Sample taken (kg)	0.097	**Natural Moisture Content (%)**	8.34
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	92.3
Particle Size <4mm	>95%		

Case	
SDG	170923-73
Lab Sample Number(s)	16240556
Sampled Date	20-Sep-2017
Customer Sample Ref.	2921-BH2-Comp-SS6
Depth (m)	0.30 - 2.00

Solid Waste Analysis	Result	Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Organic Carbon (%)	0.386	3	5	6
Loss on Ignition (%)	2.27	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	66.5	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	11.5	-	>6	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	C_2 Concⁿ in 10:1 eluate (mg/l)		A_2 10:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.00145	<0.0005	0.0145	<0.005	0.5	2	25
Barium	0.0254	<0.0002	0.254	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	0.00654	<0.001	0.0654	<0.01	0.5	10	70
Copper	0.00608	<0.0003	0.0608	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00244	<0.0005	0.0244	<0.005	0.5	10	30
Nickel	0.00162	<0.0004	0.0162	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
nony	0.00157	<0.0001	0.0157	<0.001	0.06	0.7	5
enium	0.00164	<0.0005	0.0164	<0.005	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	57	<2	570	<20	1000	20000	50000
Total Dissolved Solids	364	<5	3640	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	27-Sep-2017
pH (pH Units)	11.46
Conductivity (µS/cm)	623.00
Temperature (°C)	19.80
Volume Leachant (Litres)	0.892

d Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates

04/10/2017 13:00:28

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step		
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition		
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser		
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Determination of PAH by GCMS Microwave extraction	The determination of PAH in soil samples by microwave extraction and GC-MS		
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer		
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Test Completion Dates

Lab Sample No(s)	16240556
Customer Sample Ref.	2921-BH2-Comp-S S6
AGS Ref.	
Depth	0.30 - 2.00
Type	Soil/Solid (S)
Anions by Kone (w)	29-Sep-2017
Asbestos ID in Solid Samples	03-Oct-2017
Boron Water Soluble	28-Sep-2017
CEN 10:1 Leachate (1 Stage)	27-Sep-2017
CEN Readings	28-Sep-2017
Cyanide Comp/Free/Total/Thiocyanate	29-Sep-2017
Dissolved Metals by ICP-MS	29-Sep-2017
Dissolved Organic/Inorganic Carbon	29-Sep-2017
EPH CWG (Aliphatic) GC (S)	28-Sep-2017
EPH CWG (Aromatic) GC (S)	28-Sep-2017
Fluoride	29-Sep-2017
GRO by GC-FID (S)	27-Sep-2017
Hexavalent Chromium (s)	29-Sep-2017
...s on Ignition in soils	04-Oct-2017
...ry Dissolved	29-Sep-2017
...als by iCap-OES Dissolved (W)	29-Sep-2017
Metals in solid samples by OES	29-Sep-2017
Mineral Oil	29-Sep-2017
PAH by GCMS	29-Sep-2017
PCBs by GCMS	28-Sep-2017
pH	27-Sep-2017
Phenols by HPLC (S)	28-Sep-2017
Phenols by HPLC (W)	29-Sep-2017
Sample description	26-Sep-2017
Total Dissolved Solids	28-Sep-2017
Total Organic Carbon	28-Sep-2017
Total Sulphate	29-Sep-2017
Total Sulphur	28-Sep-2017
TPH CWG GC (S)	28-Sep-2017

CERTIFICATE OF ANALYSIS

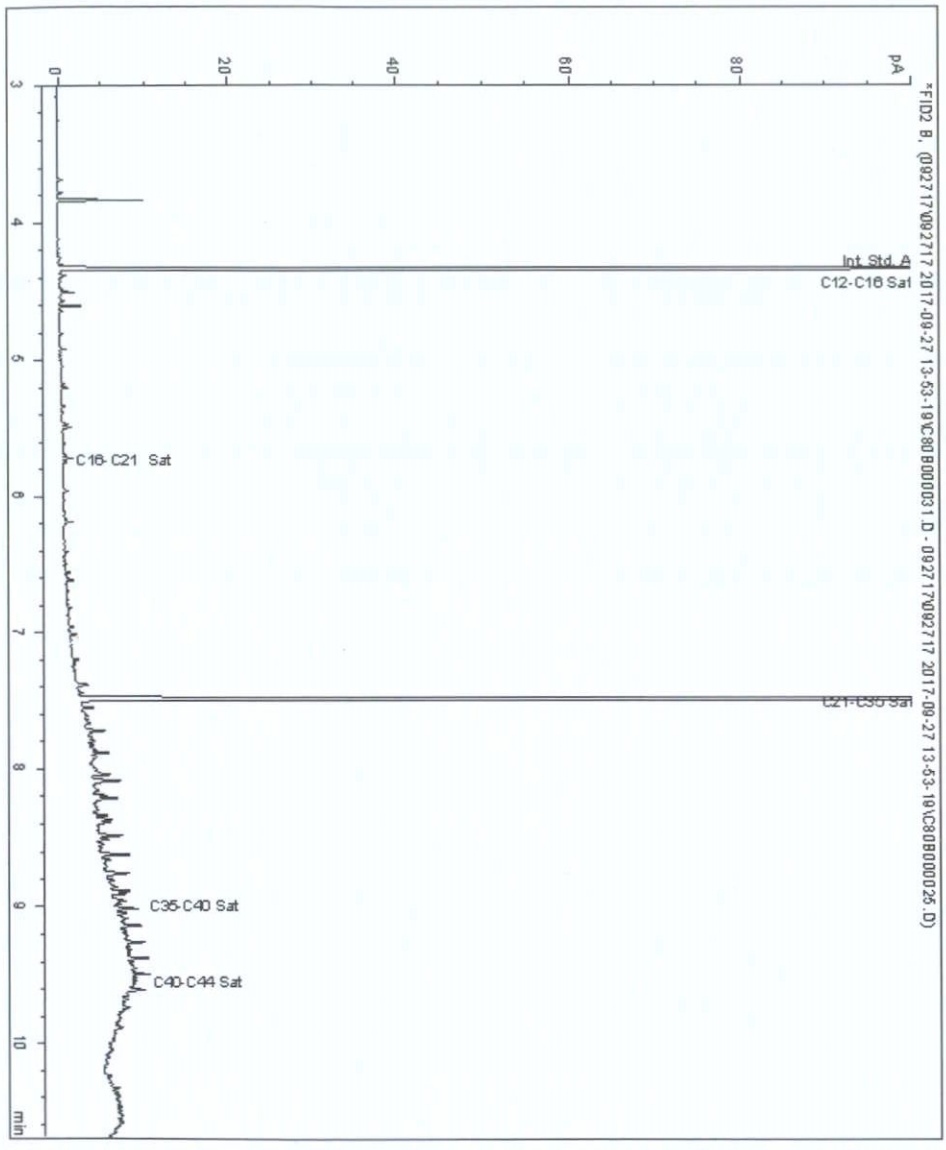
SDG:	170923-73	Client Reference:	2921-028 COC3-B	Report Number:	426770
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S) **Sample No :** 16251489 **Depth :** 0.30 - 2.00
Sample ID : 2921-BH2-Comp-SS6

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 15212360-
Date Acquired : 27/09/17 23:18:12
Units : ppb
Dilution :
CF : 1
Multiplier : 1.010



CERTIFICATE OF ANALYSIS

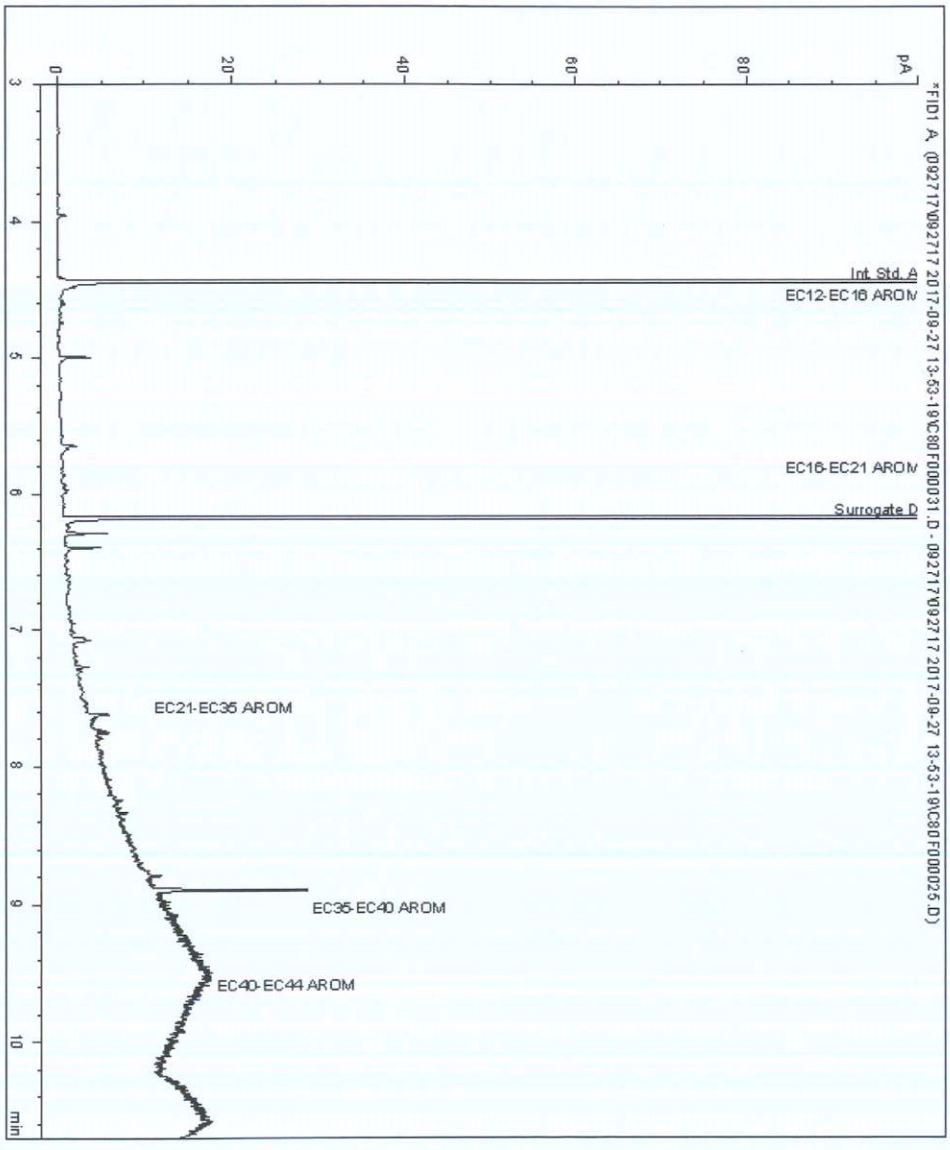
SDG:	170923-73	Client Reference:	2921-028 COC3-B	Report Number:	426770
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S) **Sample No :** 16251489 **Depth :** 0.30 - 2.00
Sample ID : 2921-BH2-Comp-SS6

Speciated TPH - AROMS (C12 - C44)

Sample Identity: 15212361-
Date Acquired : 27/09/17 23:18:12
Units : ppb
Dilution :
CF : 1
Multiplier : 1.010



CERTIFICATE OF ANALYSIS

SDG:	170923-73	Client Reference:	2921-028 COC3-B	Report Number:	426770
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

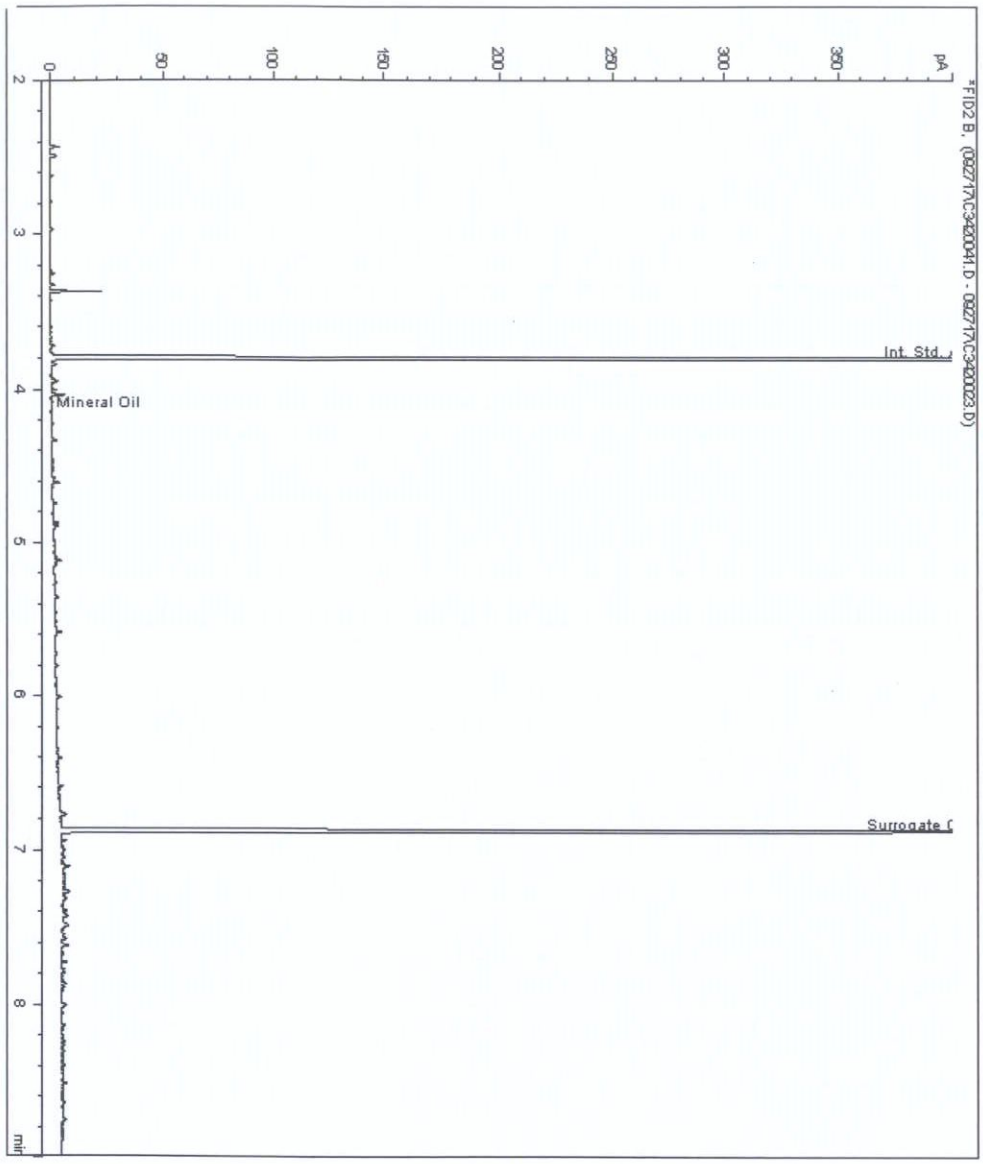
Analysis: Mineral Oil

Sample No : 16256300
Sample ID : 2921-BH2-Comp-SS6

Depth : 0.30 - 2.00

Mineral Oil Range Organics (C10 - C40)

Sample Identity	:	15212363-
Date Acquired	:	28/09/17 16:05:24 PM
Units	:	mg/kg
Sample Multiplier	:	0.000
Dilution	:	



Validated

CERTIFICATE OF ANALYSIS

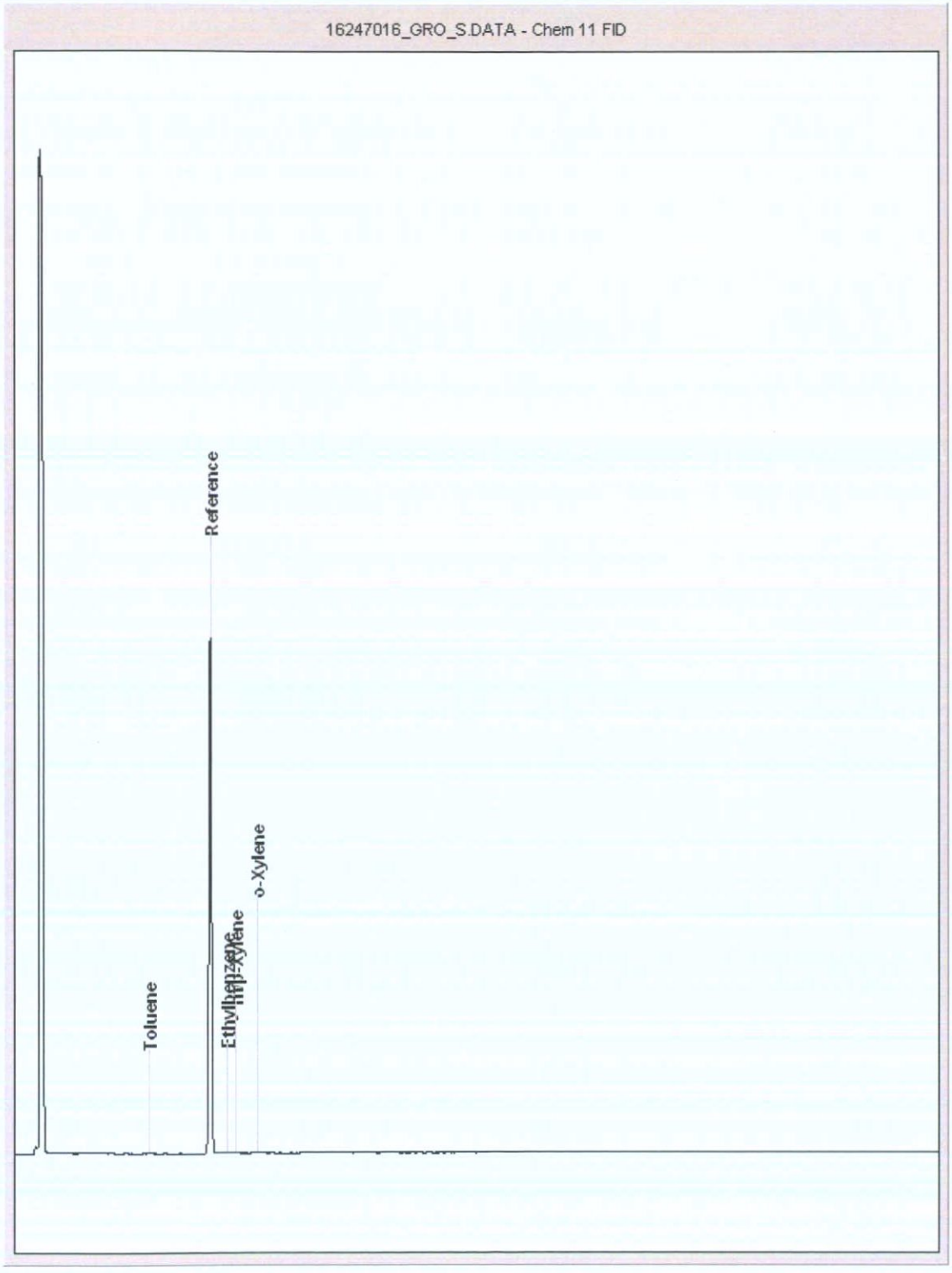
SDG:	170923-73	Client Reference:	2921-028 COC3-B	Report Number:	426770
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 16247016
Sample ID : 2921-BH2-Comp-SS6

Depth : 0.30 - 2.00



Appendix

General

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

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

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

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

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

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

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

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

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

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

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

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

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

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

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

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

Sample Deviations

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

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
5	**Samples exceeded holding time before presevation was performed**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

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

Visual Estimation Of Fibre Content

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

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

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

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Website: www.alsenvironmental.co.uk

Minerex Environmental
Taney hall
Eglinton Terrace
Dundrum
Dublin
Dublin 14

Attention: Sven Klinkenbergh

CERTIFICATE OF ANALYSIS

Date:	04 October 2017
Customer:	D_MINEREX_DUB
Sample Delivery Group (SDG):	170923-71
Your Reference:	2921-028 COC3-C
Location:	Chartered Land - Heuston South Quarter
Report No:	426769

We received 1 sample on Saturday September 23, 2017 and 1 of these samples were scheduled for analysis which was completed on Wednesday October 04, 2017. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Approved By:

Sonia McWhan
Operations Manager

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-71	Client Reference:	2921-028 COC3-C	Report Number:	426769
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
16240471	2921-BH2-SS5		2.00 - 4.00	20/09/2017

Maximum Sample/Coolbox Temperature (°C) : **16.6**

ISO5667-3 Water quality - Sampling - Part3 -
During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

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

CERTIFICATE OF ANALYSIS

SDG:	170923-71	Client Reference:	2921-028 COC3-C	Report Number:	426769
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Results Legend

X Test

N No Determination Possible

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

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Container	Container
			1624047	2921-BH2-SS5		2.00 - 4.00	250g Amber Jar (ALE210)	400g Tub (ALE214)	60g VOC (ALE215)
							Sample Type		
			S	S	S	S	S	S	S
Anions by Kone (w)	All	NDPs: 0 Tests: 1						X	
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 1						X	
Boron Water Soluble	All	NDPs: 0 Tests: 1					X		
CEN Readings	All	NDPs: 0 Tests: 1						X	
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1					X		
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 1						X	
olved Organic/Inorganic rbon	All	NDPs: 0 Tests: 1						X	
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 1					X		
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 1					X		
Fluoride	All	NDPs: 0 Tests: 1						X	
GRO by GC-FID (S)	All	NDPs: 0 Tests: 1							X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 1					X		
Loss on Ignition in soils	All	NDPs: 0 Tests: 1					X		
Mercury Dissolved	All	NDPs: 0 Tests: 1						X	
als by iCap-OES Dissolved (W)	All	NDPs: 0 Tests: 1						X	

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-71	Client Reference:	2921-028 COC3-C	Report Number:	426769
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Results Legend

X Test

N No Determination Possible

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

			Lab Sample No(s)			
			16240471			
			Customer Sample Reference			
			2921-BH2-SS5			
			AGS Reference			
			Depth (m)			
			2.00 - 4.00			
			Container	250g Amber Jar (ALE210)	400g Tub (ALE214)	60g VOC (ALE215)
			Sample Type	S	S	S
Metals in solid samples by OES	All	NDPs: 0 Tests: 1		X		
Mineral Oil	All	NDPs: 0 Tests: 1		X		
PAH by GCMS	All	NDPs: 0 Tests: 1		X		
PCBs by GCMS	All	NDPs: 0 Tests: 1		X		
pH	All	NDPs: 0 Tests: 1		X		
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1		X		
Phenols by HPLC (W)	All	NDPs: 0 Tests: 1			X	
Sample description	All	NDPs: 0 Tests: 1		X		
Total Dissolved Solids	All	NDPs: 0 Tests: 1			X	
Total Organic Carbon	All	NDPs: 0 Tests: 1		X		
Total Sulphate	All	NDPs: 0 Tests: 1		X		
Total Sulphur	All	NDPs: 0 Tests: 1		X		
TPH CWG GC (S)	All	NDPs: 0 Tests: 1		X		

Sample Descriptions

Grain Sizes

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

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
16240471	2921-BH2-SS5	2.00 - 4.00	Dark Brown	Stone/Soil	Stones	None

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

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

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-71	**Client Reference:**	2921-028 COC3-C	**Report Number:**	426769
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	2921-BH2-SS5
			Depth (m)	2.00 - 4.00
			Sample Type	Soil/Solid (S)
			Date Sampled	20/09/2017
			Sampled Time	-
			Date Received	23/09/2017
			SDG Ref	170923-71
			Lab Sample No.(s)	16240471
			AGS Reference	
Moisture Content Ratio (% of as received sample)	%	PM024		6.1
Loss on ignition	<0.7 %	TM018		0.856 #
Mineral oil >C10-C40	<1 mg/kg	TM061		11.2
Mineral Oil Surrogate % recovery**	%	TM061		86.7
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 #
Organic Carbon, Total	<0.2 %	TM132		0.622 #
Sulphur, Total	<0.02 %	TM132		0.0361
Sulphate, Total potential	<0.06 %	TM132		0.108
pH	1 pH Units	TM133		9.38 #
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #
Cyanide, Total	<1 mg/kg	TM153		<1 #
Cyanide, Free	<1 mg/kg	TM153		<1 #
PCB congener 28	<3 µg/kg	TM168		<3 #
PCB congener 52	<3 µg/kg	TM168		<3 #
PCB congener 101	<3 µg/kg	TM168		<3 #
PCB congener 118	<3 µg/kg	TM168		<3 #
PCB congener 138	<3 µg/kg	TM168		<3 #
PCB congener 153	<3 µg/kg	TM168		<3 #
PCB congener 180	<3 µg/kg	TM168		<3 #
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168		<21
Antimony	<0.6 mg/kg	TM181		<0.6 #
Arsenic	<0.6 mg/kg	TM181		2.28 #
Barium	<0.6 mg/kg	TM181		10.1 #
Cadmium	<0.02 mg/kg	TM181		0.547 #
Chromium	<0.9 mg/kg	TM181		6.46 #
Copper	<1.4 mg/kg	TM181		4.06 #
Iron	<1000 mg/kg	TM181		3950 #
Lead	<0.7 mg/kg	TM181		3.47 #
Manganese	<0.13 mg/kg	TM181		256 #
Mercury	<0.14 mg/kg	TM181		0.318 #
Molybdenum	<0.1 mg/kg	TM181		0.777 #
Nickel	<0.2 mg/kg	TM181		8.71 #

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-71	**Client Reference:**	2921-028 COC3-C	**Report Number:**	426769
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample Ref.	2921-BH2-SS5		
Depth (m)	2.00 - 4.00		
Sample Type	Soil/Solid (S)		
Date Sampled	20/09/2017		
Sampled Time	-		
Date Received	23/09/2017		
SDG Ref	170923-71		
Lab Sample No.(s)	16240471		
AGS Reference			

Component	LOD/Units	Method					
Selenium	<1 mg/kg	TM181	<1 #				
Zinc	<1.9 mg/kg	TM181	18.1 #				
Sulphate, Total	<48 mg/kg	TM221	123 #				
Sulphide, Oxidisable	<0.03 %	TM221	0.108				
Boron, water soluble	<1 mg/kg	TM222	<1 #				

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-71	**Client Reference:**	2921-028 COC3-C	**Report Number:**	426769
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	2921-BH2-SS5
			Depth (m)	2.00 - 4.00
			Sample Type	Soil/Solid (S)
			Date Sampled	20/09/2017
			Sampled Time	
			Date Received	23/09/2017
			SDG Ref	170923-71
			Lab Sample No.(s)	16240471
			AGS Reference	
Naphthalene-d8 % recovery**	%	TM218		93.3
Acenaphthene-d10 % recovery**	%	TM218		89.8
Phenanthrene-d10 % recovery**	%	TM218		89.4
Chrysene-d12 % recovery**	%	TM218		89.8
Perylene-d12 % recovery**	%	TM218		87.9
Naphthalene	<9 µg/kg	TM218		<9 #
Acenaphthylene	<12 µg/kg	TM218		<12 #
Acenaphthene	<8 µg/kg	TM218		<8 #
Fluorene	<10 µg/kg	TM218		<10 #
Phenanthrene	<15 µg/kg	TM218		<15 #
Anthracene	<16 µg/kg	TM218		<16 #
Fluoranthene	<17 µg/kg	TM218		<17 #
Pyrene	<15 µg/kg	TM218		<15 #
Benz(a)anthracene	<14 µg/kg	TM218		<14 #
Chrysene	<10 µg/kg	TM218		<10 #
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 #
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 #
Benzo(a)pyrene	<15 µg/kg	TM218		<15 #
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 #
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 #
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 #
Coronene	<200 µg/kg	TM218		<200
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		<118
PAH, Total Detected USEPA 16 + Coronene	<318 µg/kg	TM218		<318

CERTIFICATE OF ANALYSIS

SDG: 170923-71 Client Reference: 2921-028 COC3-C Report Number: 426769
Location: Chartered Land - Heuston Order Number: Superseded Report:

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	2921-BH2-SS5
			Depth (m)	2.00 - 4.00
			Sample Type	Soil/Solid (S)
			Date Sampled	20/09/2017
			Sampled Time	
			Date Received	23/09/2017
			SDG Ref	170923-71
			Lab Sample No.(s)	16240471
			AGS Reference	
GRO Surrogate % recovery**	%	TM089		78
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089		<44 #
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #
Benzene	<10 µg/kg	TM089		<10 #
Toluene	<2 µg/kg	TM089		2.13 #
Ethylbenzene	<3 µg/kg	TM089		<3 #
Xylene	<6 µg/kg	TM089		<6 #
o-Xylene	<3 µg/kg	TM089		<3 #
sum of detected mpo xylene by GC	<9 µg/kg	TM089		<9
sum of detected BTEX by GC	<24 µg/kg	TM089		<24
Aliphatics >C5-C6	<10 µg/kg	TM089		<10
Aliphatics >C6-C8	<10 µg/kg	TM089		<10
Aliphatics >C8-C10	<10 µg/kg	TM089		<10
Aliphatics >C10-C12	<10 µg/kg	TM089		<10
Aliphatics >C12-C16	<100 µg/kg	TM173		<100
Aliphatics >C16-C21	<100 µg/kg	TM173		<100
Aliphatics >C21-C35	<100 µg/kg	TM173		551
Aliphatics >C35-C44	<100 µg/kg	TM173		<100
I Aliphatics >C12-C44	<100 µg/kg	TM173		551
Aromatics >EC5-EC7	<10 µg/kg	TM089		<10
Aromatics >EC7-EC8	<10 µg/kg	TM089		<10
Aromatics >EC8-EC10	<10 µg/kg	TM089		<10
Aromatics >EC10-EC12	<10 µg/kg	TM089		<10
Aromatics >EC12-EC16	<100 µg/kg	TM173		237
Aromatics >EC16-EC21	<100 µg/kg	TM173		133
Aromatics >EC21-EC35	<100 µg/kg	TM173		<100
Aromatics >EC35-EC44	<100 µg/kg	TM173		<100
Aromatics >EC40-EC44	<100 µg/kg	TM173		<100
Total Aromatics >EC12-EC44	<100 µg/kg	TM173		371
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173		927

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-71	**Client Reference:**	2921-028 COC3-C	**Report Number:**	426769
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Asbestos Identification - Soil

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	2921-BH2-SS5 2.00 - 4.00 SOLID 20/09/2017 00:00:00 27/09/2017 10:05:31 170923-71 16240471 TM048	03/10/17	Eva Guerra	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-71	Client Reference:	2921-028 COC3-C	Report Number:	426769
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Chartered Land - Heuston South Q
Mass Sample taken (kg)	0.101	**Natural Moisture Content (%)**	12
Mass of dry sample (kg)	0.090	**Dry Matter Content (%)**	89.3
Particle Size <4mm	>95%		

Case	
SDG	170923-71
Lab Sample Number(s)	16240471
Sampled Date	20-Sep-2017
Customer Sample Ref.	2921-BH2-SS5
Depth (m)	2.00 - 4.00

Solid Waste Analysis	Result	Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Organic Carbon (%)	0.622	3	5	6
Loss on Ignition (%)	0.856	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	11.2	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	9.38	-	>6	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	C_2 Concⁿ in 10:1 eluate (mg/l)		A_2 10:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.00155	<0.0005	0.0155	<0.005	0.5	2	25
Barium	0.00379	<0.0002	0.0379	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	<0.0003	<0.0003	<0.003	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00656	<0.0005	0.0656	<0.005	0.5	10	30
Nickel	<0.0004	<0.0004	<0.004	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
[illegible]mony	0.000383	<0.0001	0.00383	<0.001	0.06	0.7	5
[illegible]enium	0.00103	<0.0005	0.0103	<0.005	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	5.6	<2	56	<20	1000	20000	50000
Total Dissolved Solids	42	<5	420	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	28-Sep-2017
pH (pH Units)	10.11
Conductivity (µS/cm)	55.60
Temperature (°C)	18.30
Volume Leachant (Litres)	0.889

[illegible]olid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates

04/10/2017 12:59:31

CERTIFICATE OF ANALYSIS

SDG:	170923-71	**Client Reference:**	2921-028 COC3-C	**Report Number:**	426769
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step		
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition		
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser		
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Determination of PAH by GCMS Microwave extraction	The determination of PAH in soil samples by microwave extraction and GC-MS		
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer		
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Test Completion Dates

Lab Sample No(s)	16240471
Customer Sample Ref.	2921-BH2-SS5
AGS Ref.	
Depth	2.00 - 4.00
Type	Soil/Solid (S)
Anions by Kone (w)	29-Sep-2017
Asbestos ID in Solid Samples	03-Oct-2017
Boron Water Soluble	29-Sep-2017
CEN 10:1 Leachate (1 Stage)	28-Sep-2017
CEN Readings	29-Sep-2017
Cyanide Comp/Free/Total/Thiocyanate	29-Sep-2017
Dissolved Metals by ICP-MS	29-Sep-2017
Dissolved Organic/Inorganic Carbon	29-Sep-2017
EPH CWG (Aliphatic) GC (S)	29-Sep-2017
EPH CWG (Aromatic) GC (S)	29-Sep-2017
Fluoride	29-Sep-2017
GRO by GC-FID (S)	29-Sep-2017
Hexavalent Chromium (s)	29-Sep-2017
[illegible] on Ignition in soils	04-Oct-2017
[illegible]ury Dissolved	29-Sep-2017
[illegible]als by iCap-OES Dissolved (W)	29-Sep-2017
Metals in solid samples by OES	29-Sep-2017
Mineral Oil	29-Sep-2017
PAH by GCMS	29-Sep-2017
PCBs by GCMS	29-Sep-2017
pH	27-Sep-2017
Phenols by HPLC (S)	29-Sep-2017
Phenols by HPLC (W)	29-Sep-2017
Sample description	27-Sep-2017
Total Dissolved Solids	29-Sep-2017
Total Organic Carbon	29-Sep-2017
Total Sulphate	29-Sep-2017
Total Sulphur	28-Sep-2017
TPH CWG GC (S)	29-Sep-2017

CERTIFICATE OF ANALYSIS

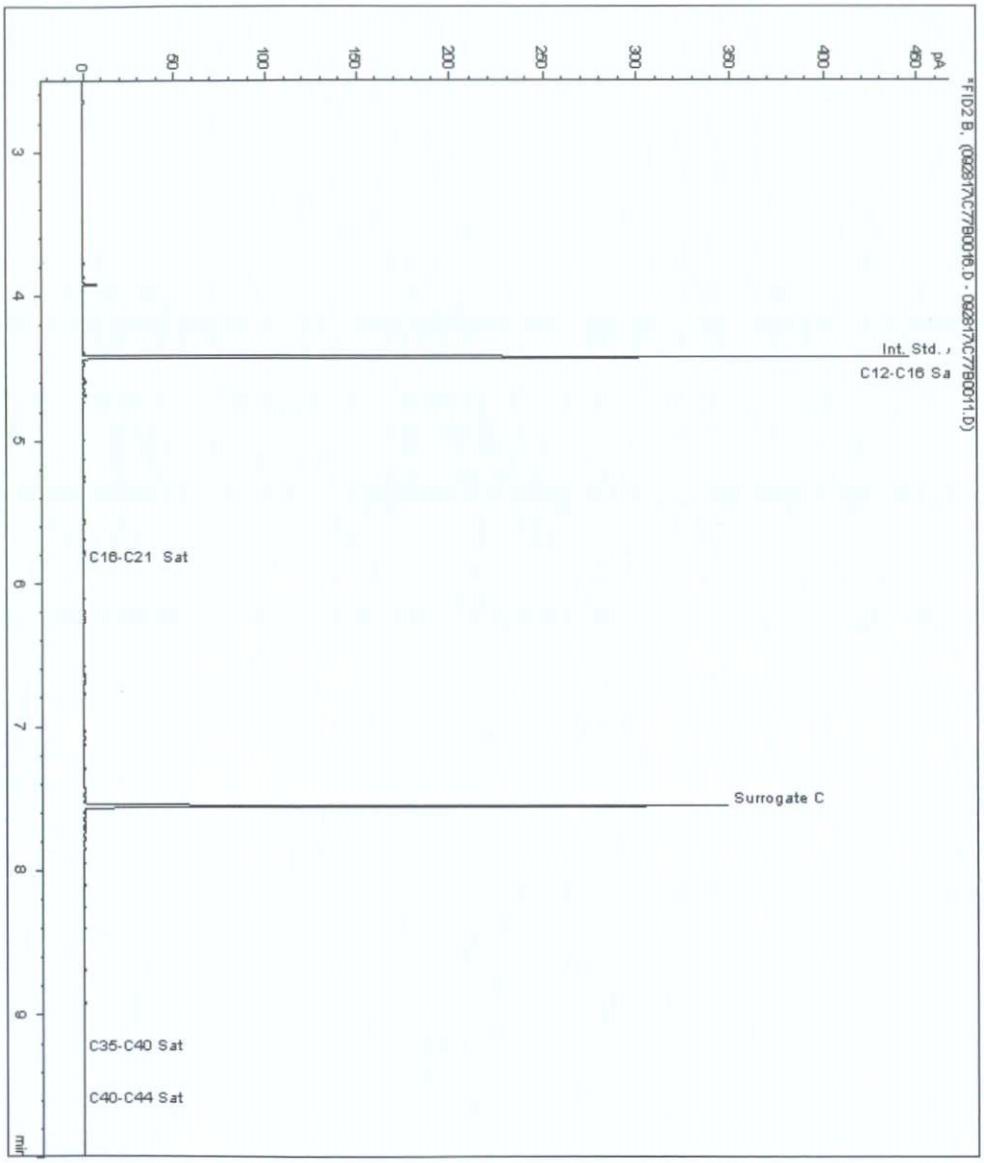
SDG:	170923-71	Client Reference:	2921-028 COC3-C	Report Number:	426769
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S) **Sample No :** 16256105 **Sample ID :** 2921-BH2-SS5 **Depth :** 2.00 - 4.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 15212314-
Date Acquired : 9/28/2017 6:37:26 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.970



Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-71	Client Reference:	2921-028 COC3-C	Report Number:	426769
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

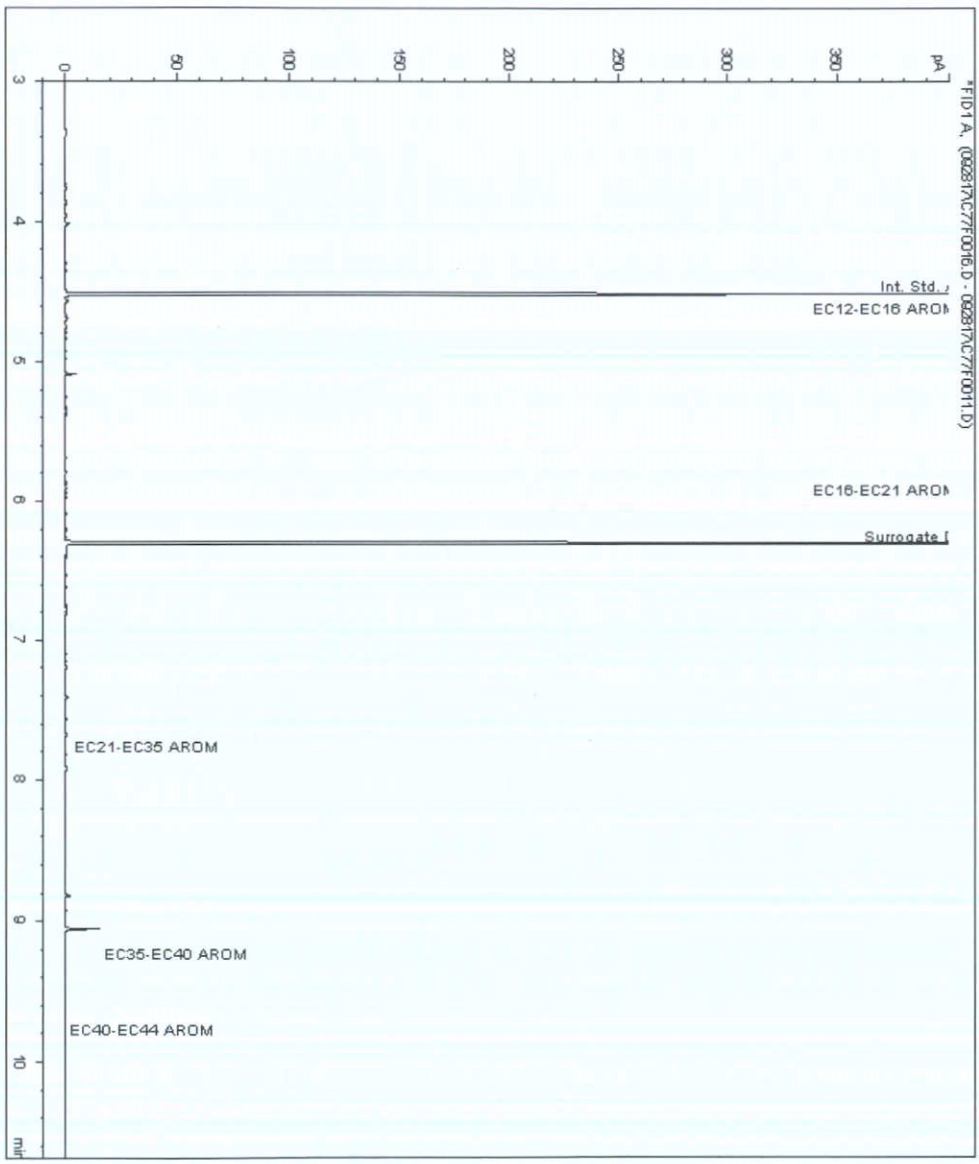
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 16256105
Sample ID : 2921-BH2-SS5

Depth : 2.00 - 4.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 15212315-
Date Acquired : 9/28/2017 6:37:26 PM
Units : ppb
Dilution:



CERTIFICATE OF ANALYSIS

SDG:	170923-71	Client Reference:	2921-028 COC3-C	Report Number:	426769
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

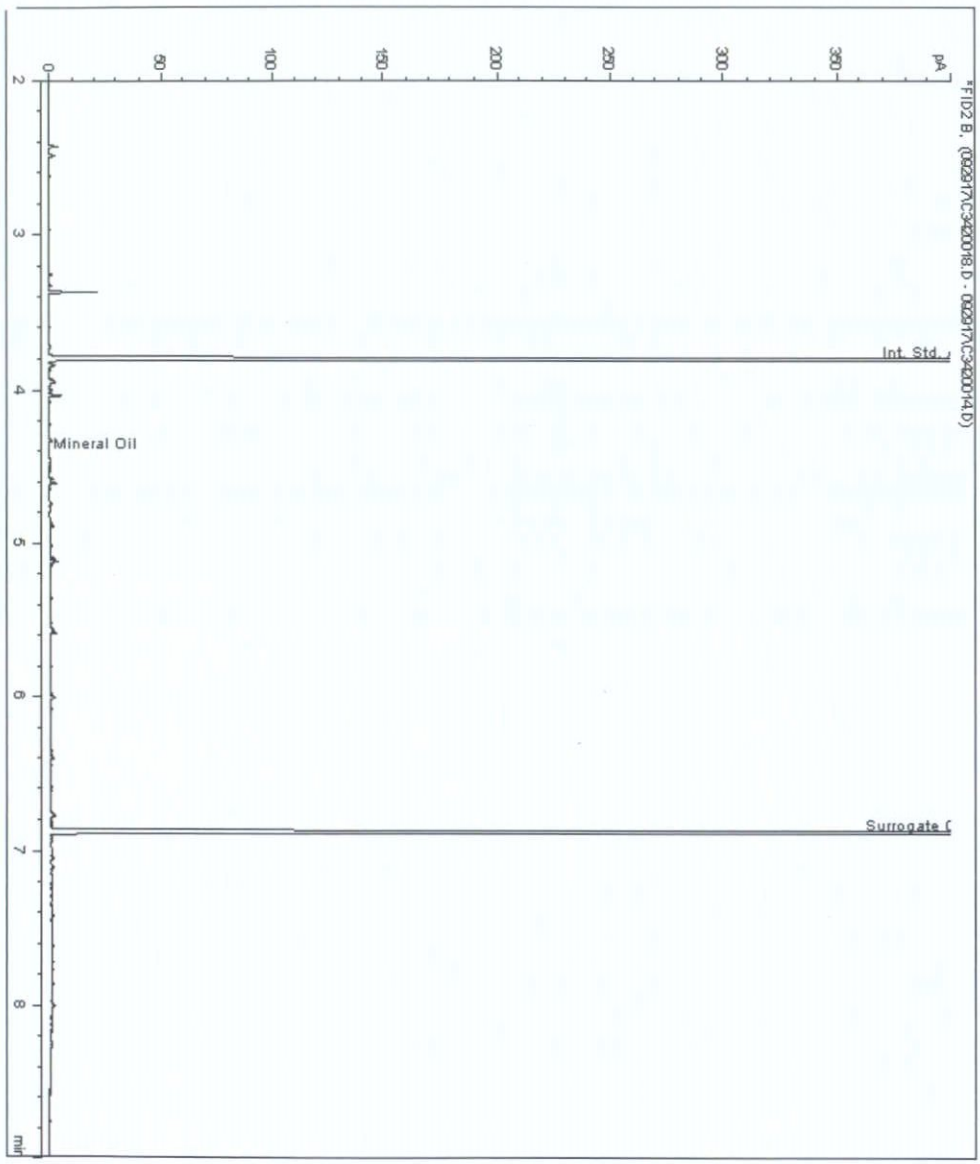
Analysis: Mineral Oil

Sample No : 16265347
Sample ID : 2921-BH2-SS5

Depth : 2.00 - 4.00

Mineral Oil Range Organics (C10 - C40)

Sample Identity : 15212317-
Date Acquired : 29/09/17 12:08:57 PM
Units : mg/kg
Sample Multiplier : 0.000
Dilution :



Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-71	**Client Reference:**	2921-028 COC3-C	**Report Number:**	426769
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 16248042
Sample ID : 2921-BH2-SS5

Depth : 2.00 - 4.00

Appendix

General

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

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

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

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

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

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

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

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

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

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

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

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

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

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

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

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

Sample Deviations

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

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
5	Samples exceeded holding time before presevation was performed
§	Sampled on date not provided
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to sampled on date
&	Sample Holding Time exceeded - Late arrival of instructions.

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

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

Visual Estimation Of Fibre Content

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

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

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

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Hawarden
Deeside
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email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Minerex Environmental
Taney hall
Eglinton Terrace
Dundrum
Dublin
Dublin 14

Attention: Michael Owens

CERTIFICATE OF ANALYSIS

Date:	04 October 2017
Customer:	D_MINEREX_DUB
Sample Delivery Group (SDG):	170923-93
Your Reference:	2921-028 COC3-D
Location:	Chartered Land - Heuston South Quarter
Report No:	426772

We received 1 sample on Saturday September 23, 2017 and 1 of these samples were scheduled for analysis which was completed on Wednesday October 04, 2017. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Approved By:

Sonia McWhan
Operations Manager

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-93	Client Reference:	2921-028 COC3-D	Report Number:	426772
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
16241161	2921-BH4-Comp-SS8		0.30 - 1.85	21/09/2017

Maximum Sample/Coolbox Temperature (°C) : **16.4**

ISO5667-3 Water quality - Sampling - Part3 -
During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

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

CERTIFICATE OF ANALYSIS

SDG:	170923-93	Client Reference:	2921-028 COC3-D	Report Number:	426772
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Results Legend

X Test

N No Determination Possible

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

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container			Sample Type
			16241161	2921-BH4-Comp-SS 8		0.30 - 1.85	250g Amber Jar (ALE210)	400g Tub (ALE214)	60g VOC (ALE215)	S
Anions by Kone (w)	All	NDPs: 0 Tests: 1						X		
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 1						X		
Boron Water Soluble	All	NDPs: 0 Tests: 1					X			
CEN Readings	All	NDPs: 0 Tests: 1						X		
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1					X			
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 1						X		
olved Organic/Inorganic arbon	All	NDPs: 0 Tests: 1						X		
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 1					X			
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 1					X			
Fluoride	All	NDPs: 0 Tests: 1						X		
GRO by GC-FID (S)	All	NDPs: 0 Tests: 1							X	
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 1					X			
Loss on Ignition in soils	All	NDPs: 0 Tests: 1					X			
Mercury Dissolved	All	NDPs: 0 Tests: 1						X		
als by iCap-OES Dissolved (W)	All	NDPs: 0 Tests: 1						X		

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-93	Client Reference:	2921-028 COC3-D	Report Number:	426772
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Results Legend

X Test

N No Determination Possible

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

Lab Sample No(s)			16241161		
Customer Sample Reference			2921-BH4-Comp-SS 8		
AGS Reference					
Depth (m)			0.30 - 1.85		
Container			250g Amber Jar (ALE210)	400g Tub (ALE214)	60g VOC (ALE215)
Sample Type			S	S	S
Metals in solid samples by OES	All	NDPs: 0 Tests: 1	X		
Mineral Oil	All	NDPs: 0 Tests: 1	X		
PAH by GCMS	All	NDPs: 0 Tests: 1	X		
PCBs by GCMS	All	NDPs: 0 Tests: 1	X		
pH	All	NDPs: 0 Tests: 1	X		
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1	X		
Phenols by HPLC (W)	All	NDPs: 0 Tests: 1		X	
Sample description	All	NDPs: 0 Tests: 1	X		
Total Dissolved Solids	All	NDPs: 0 Tests: 1		X	
Total Organic Carbon	All	NDPs: 0 Tests: 1	X		
Total Sulphate	All	NDPs: 0 Tests: 1	X		
Total Sulphur	All	NDPs: 0 Tests: 1	X		
TPH CWG GC (S)	All	NDPs: 0 Tests: 1	X		

CERTIFICATE OF ANALYSIS

SDG:	170923-93	Client Reference:	2921-028 COC3-D	Report Number:	426772
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Sample Descriptions

Grain Sizes

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

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
16241161	2921-BH4-Comp-SS8	0.30 - 1.85	Grey	Silt Loam	Stones	Vegetation

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

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

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-93	**Client Reference:**	2921-028 COC3-D	**Report Number:**	426772
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample Ref.	2921-BH4-Comp-S S8
Depth (m)	0.30 - 1.85
Sample Type	Soil/Solid (S)
Date Sampled	21/09/2017
Sampled Time	-
Date Received	23/09/2017
SDG Ref	170923-93
Lab Sample No.(s)	16241161
AGS Reference	

Component	LOD/Units	Method	
Moisture Content Ratio (% of as received sample)	%	PM024	13
Loss on ignition	<0.7 %	TM018	4.09 M
Mineral oil >C10-C40	<1 mg/kg	TM061	13.9
Mineral Oil Surrogate % recovery**	%	TM061	88
Phenol	<0.01 mg/kg	TM062 (S)	<0.01 M
Organic Carbon, Total	<0.2 %	TM132	1.41 M
Sulphur, Total	<0.02 %	TM132	0.0558
Sulphate, Total potential	<0.06 %	TM132	0.167
pH	1 pH Units	TM133	10.2 M
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6 #
Cyanide, Total	<1 mg/kg	TM153	<1 M
Cyanide, Free	<1 mg/kg	TM153	<1 M
PCB congener 28	<3 µg/kg	TM168	<3 M
PCB congener 52	<3 µg/kg	TM168	<3 M
PCB congener 101	<3 µg/kg	TM168	<3 M
PCB congener 118	<3 µg/kg	TM168	<3 M
PCB congener 138	<3 µg/kg	TM168	<3 M
PCB congener 153	<3 µg/kg	TM168	<3 M
PCB congener 180	<3 µg/kg	TM168	<3 M
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168	<21
Antimony	<0.6 mg/kg	TM181	1.1 #
Arsenic	<0.6 mg/kg	TM181	7.75 M
Barium	<0.6 mg/kg	TM181	60 #
Cadmium	<0.02 mg/kg	TM181	1.53 M
Chromium	<0.9 mg/kg	TM181	7.9 M
Copper	<1.4 mg/kg	TM181	18.9 M
Iron	<1000 mg/kg	TM181	15300 #
Lead	<0.7 mg/kg	TM181	22.6 M
Manganese	<0.13 mg/kg	TM181	640 M
Mercury	<0.14 mg/kg	TM181	0.55 M
Molybdenum	<0.1 mg/kg	TM181	3.37 #
Nickel	<0.2 mg/kg	TM181	28.4 M

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-93	**Client Reference:**	2921-028 COC3-D	**Report Number:**	426772
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample Ref.	2921-BH4-Comp-S S8		
Depth (m)	0.30 - 1.85		
Sample Type	Soil/Solid (S)		
Date Sampled	21/09/2017		
Sampled Time			
Date Received	23/09/2017		
SDG Ref	170923-93		
Lab Sample No.(s)	16241161		
AGS Reference			

Component	LOD/Units	Method					
Selenium	<1 mg/kg	TM181	<1 #				
Zinc	<1.9 mg/kg	TM181	79.6 M				
Sulphate, Total	<48 mg/kg	TM221	679 M				
Sulphide, Oxidisable	<0.03 %	TM221	0.0991				
Boron, water soluble	<1 mg/kg	TM222	<1 M				

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-93	**Client Reference:**	2921-028 COC3-D	**Report Number:**	426772
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	2921-BH4-Comp-S
				S8
			Depth (m)	0.30 - 1.85
			Sample Type	Soil/Solid (S)
			Date Sampled	21/09/2017
			Sampled Time	
			Date Received	23/09/2017
			SDG Ref	170923-93
			Lab Sample No.(s)	16241161
			AGS Reference	
Naphthalene-d8 % recovery**	%	TM218		101
Acenaphthene-d10 % recovery**	%	TM218		94.2
Phenanthrene-d10 % recovery**	%	TM218		91.7
Chrysene-d12 % recovery**	%	TM218		99.9
Perylene-d12 % recovery**	%	TM218		99.9
Naphthalene	<9 µg/kg	TM218		<9 M
Acenaphthylene	<12 µg/kg	TM218		14.6 M
Acenaphthene	<8 µg/kg	TM218		<8 M
Fluorene	<10 µg/kg	TM218		<10 M
Phenanthrene	<15 µg/kg	TM218		30.1 M
Anthracene	<16 µg/kg	TM218		<16 M
Fluoranthene	<17 µg/kg	TM218		47.2 M
Pyrene	<15 µg/kg	TM218		40.8 M
Benz(a)anthracene	<14 µg/kg	TM218		25.4 M
Chrysene	<10 µg/kg	TM218		24.6 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		44.1 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		26.6 M
Benzo(a)pyrene	<15 µg/kg	TM218		38 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		27.4 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		43.2 M
Coronene	<200 µg/kg	TM218		<200
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		362
PAH, Total Detected USEPA 16 + Coronene	<318 µg/kg	TM218		362

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-93	**Client Reference:**	2921-028 COC3-D	**Report Number:**	426772
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample Ref.			2921-BH4-Comp-S S8					
Depth (m)			0.30 - 1.85					
Sample Type			Soil/Solid (S)					
Date Sampled			21/09/2017					
Sampled Time								
Date Received			23/09/2017					
SDG Ref			170923-93					
Lab Sample No.(s)			16241161					
AGS Reference								
Component	**LOD/Units**	**Method**						
GRO Surrogate % recovery**	%	TM089	52					
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089	78.2 M					
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 #					
Benzene	<10 µg/kg	TM089	<10 M					
Toluene	<2 µg/kg	TM089	3.45 M					
Ethylbenzene	<3 µg/kg	TM089	<3 M					
Xylene	<6 µg/kg	TM089	<6 M					
o-Xylene	<3 µg/kg	TM089	<3 M					
sum of detected mpo xylene by GC	<9 µg/kg	TM089	<9					
sum of detected BTEX by GC	<24 µg/kg	TM089	<24					
Aliphatics >C5-C6	<10 µg/kg	TM089	<10					
Aliphatics >C6-C8	<10 µg/kg	TM089	<10					
Aliphatics >C8-C10	<10 µg/kg	TM089	13.8					
Aliphatics >C10-C12	<10 µg/kg	TM089	23					
Aliphatics >C12-C16	<100 µg/kg	TM173	<100					
Aliphatics >C16-C21	<100 µg/kg	TM173	<100					
Aliphatics >C21-C35	<100 µg/kg	TM173	2930					
Aliphatics >C35-C44	<100 µg/kg	TM173	<100					
l Aliphatics >C12-C44	<100 µg/kg	TM173	2930					
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10					
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10					
Aromatics >EC8-EC10	<10 µg/kg	TM089	10.4					
Aromatics >EC10-EC12	<10 µg/kg	TM089	15					
Aromatics >EC12-EC16	<100 µg/kg	TM173	<100					
Aromatics >EC16-EC21	<100 µg/kg	TM173	<100					
Aromatics >EC21-EC35	<100 µg/kg	TM173	2620					
Aromatics >EC35-EC44	<100 µg/kg	TM173	4280					
Aromatics >EC40-EC44	<100 µg/kg	TM173	2490					
Total Aromatics >EC12-EC44	<100 µg/kg	TM173	6900					
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	9910					

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-93	**Client Reference:**	2921-028 COC3-D	**Report Number:**	426772
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Asbestos Identification - Soil

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	2921-BH4-Comp-SS 8 0.30 - 1.85 SOLID 21/09/2017 00:00:00 26/09/2017 13:01:20 170923-93 16241161 TM048	03/10/17	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-93	Client Reference:	2921-028 COC3-D	Report Number:	426772
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Chartered Land - Heuston South Q
Mass Sample taken (kg)	0.103	Natural Moisture Content (%)	14.9
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	87
Particle Size <4mm	>95%		

Case	
SDG	170923-93
Lab Sample Number(s)	16241161
Sampled Date	21-Sep-2017
Customer Sample Ref.	2921-BH4-Comp-SS8
Depth (m)	0.30 - 1.85

Solid Waste Analysis	Result	Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Organic Carbon (%)	1.41	3	5	6
Loss on Ignition (%)	4.09	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	13.9	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	10.2	-	>6	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	C_2 Concⁿ in 10:1 eluate (mg/l)		A_2 10:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0043	<0.0005	0.043	<0.005	0.5	2	25
Barium	0.00259	<0.0002	0.0259	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.00467	<0.0003	0.0467	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.0128	<0.0005	0.128	<0.005	0.5	10	30
Nickel	0.00109	<0.0004	0.0109	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
[illegible]mony	0.00143	<0.0001	0.0143	<0.001	0.06	0.7	5
[illegible]enium	0.00286	<0.0005	0.0286	<0.005	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	0.638	<0.5	6.38	<5	10	150	500
Sulphate (soluble)	19.9	<2	199	<20	1000	20000	50000
Total Dissolved Solids	86.7	<5	867	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	27-Sep-2017
pH (pH Units)	10.62
Conductivity (µS/cm)	137.00
Temperature (°C)	17.70
Volume Leachant (Litres)	0.887

[illegible]d Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates

04/10/2017 13:03:20

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step		
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition		
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser		
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Determination of PAH by GCMS Microwave extraction	The determination of PAH in soil samples by microwave extraction and GC-MS		
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer		
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

CERTIFICATE OF ANALYSIS

SDG:	170923-93	**Client Reference:**	2921-028 COC3-D	**Report Number:**	426772
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	16241161
Customer Sample Ref.	2921-BH4-Comp-S S8
AGS Ref.	
Depth	0.30 - 1.85
Type	Soil/Solid (S)
Anions by Kone (w)	29-Sep-2017
Asbestos ID in Solid Samples	03-Oct-2017
Boron Water Soluble	28-Sep-2017
CEN 10:1 Leachate (1 Stage)	27-Sep-2017
CEN Readings	28-Sep-2017
Cyanide Comp/Free/Total/Thiocyanate	29-Sep-2017
Dissolved Metals by ICP-MS	29-Sep-2017
Dissolved Organic/Inorganic Carbon	29-Sep-2017
EPH CWG (Aliphatic) GC (S)	28-Sep-2017
EPH CWG (Aromatic) GC (S)	28-Sep-2017
Fluoride	29-Sep-2017
GRO by GC-FID (S)	29-Sep-2017
Hexavalent Chromium (s)	28-Sep-2017
[illegible] on Ignition in soils	04-Oct-2017
[illegible] ry Dissolved	29-Sep-2017
[illegible] s by iCap-OES Dissolved (W)	29-Sep-2017
Metals in solid samples by OES	02-Oct-2017
Mineral Oil	29-Sep-2017
PAH by GCMS	28-Sep-2017
PCBs by GCMS	28-Sep-2017
pH	27-Sep-2017
Phenols by HPLC (S)	29-Sep-2017
Phenols by HPLC (W)	29-Sep-2017
Sample description	26-Sep-2017
Total Dissolved Solids	28-Sep-2017
Total Organic Carbon	28-Sep-2017
Total Sulphate	29-Sep-2017
Total Sulphur	28-Sep-2017
TPH CWG GC (S)	29-Sep-2017

CERTIFICATE OF ANALYSIS

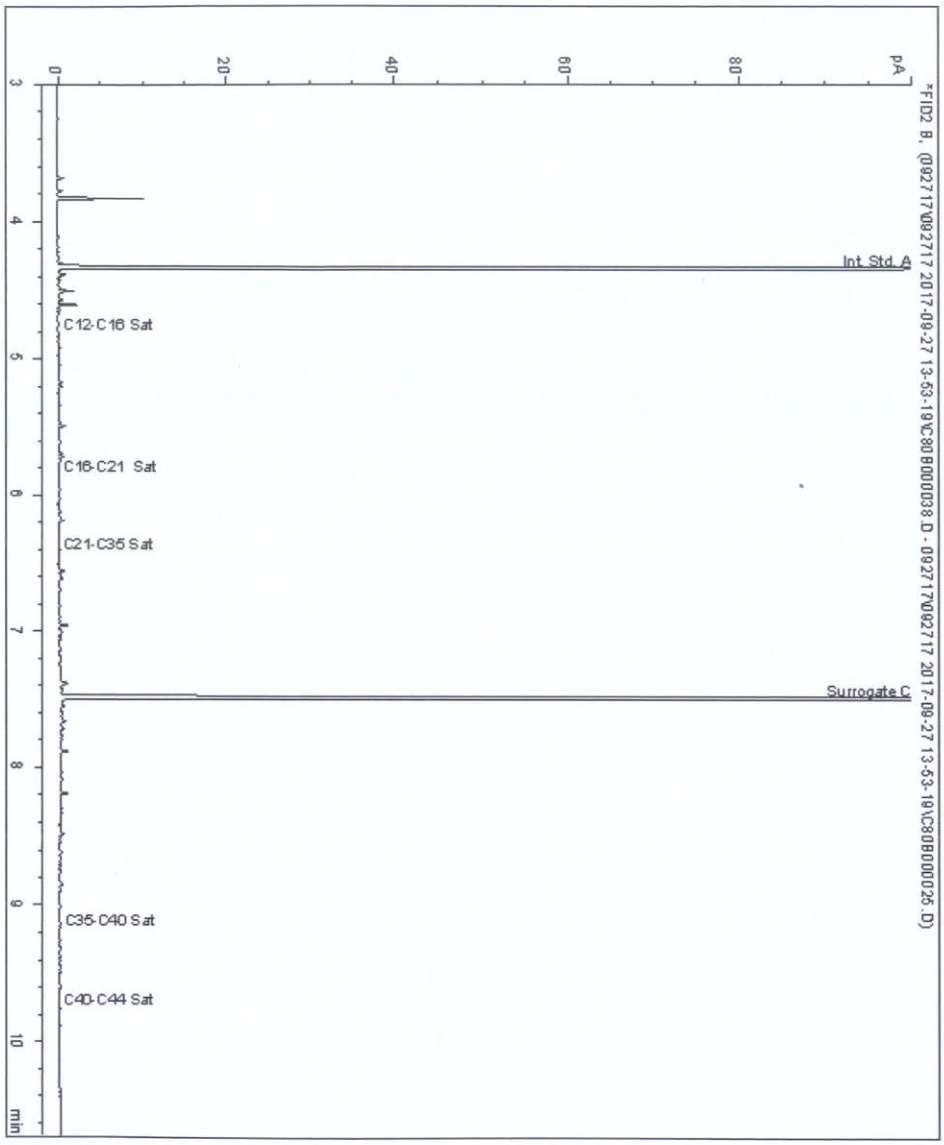
SDG:	170923-93	Client Reference:	2921-028 COC3-D	Report Number:	426772
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S) **Sample No :** 16251274 **Sample ID :** 2921-BH4-Comp-SS8 **Depth :** 0.30 - 1.85

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 15212868-
Date Acquired : 28/09/17 01:07:18
Units : ppb
Dilution :
CF : 1
Multiplier : 1.020



CERTIFICATE OF ANALYSIS

SDG:	170923-93	Client Reference:	2921-028 COC3-D	Report Number:	426772
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

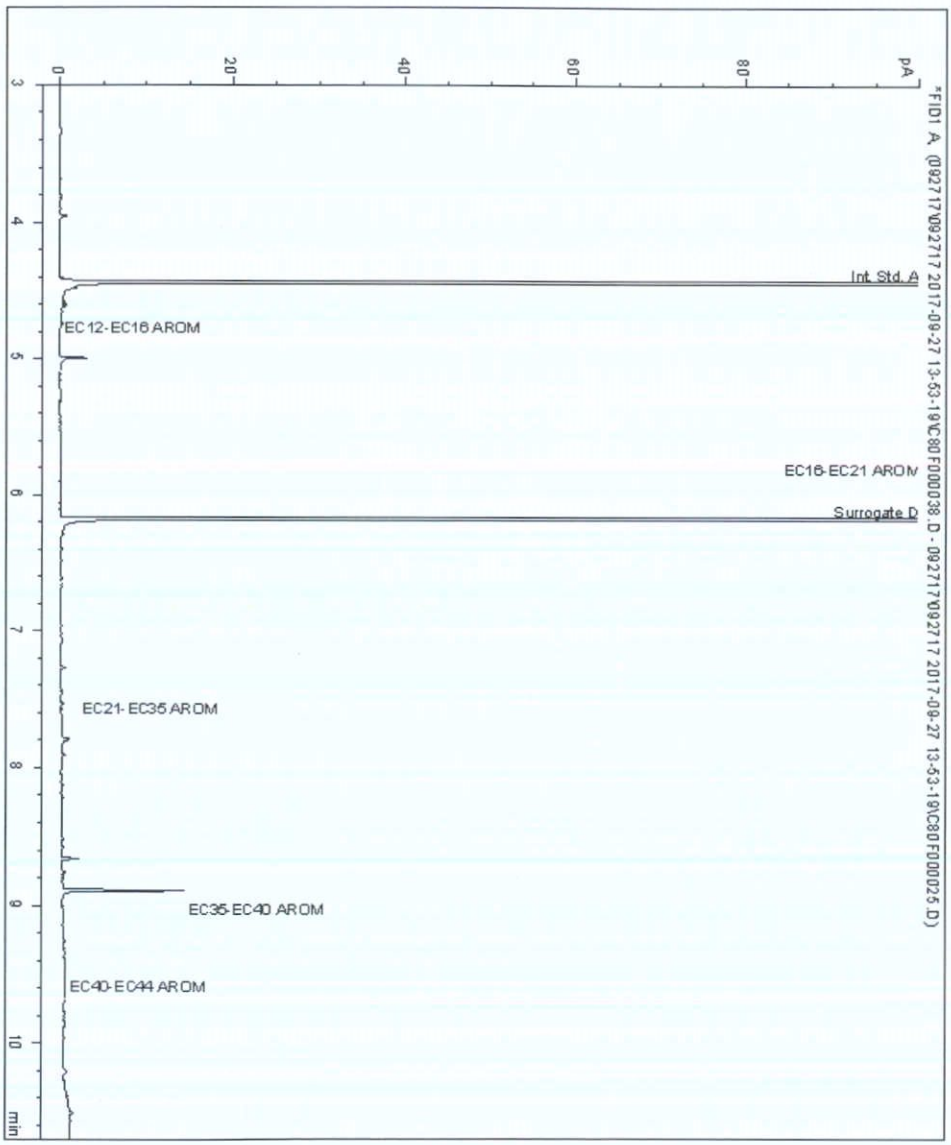
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 16251274
Sample ID : 2921-BH4-Comp-SS8

Depth : 0.30 - 1.85

Speciated TPH - AROMS (C12 - C44)

Sample Identity	:	15212869-
Date Acquired	:	28/09/17 01:07:18
Units	:	ppb
Dilution	:	
CF	:	1
Multiplier	:	1.020



CERTIFICATE OF ANALYSIS

SDG:	170923-93	Client Reference:	2921-028 COC3-D	Report Number:	426772
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Chromatogram

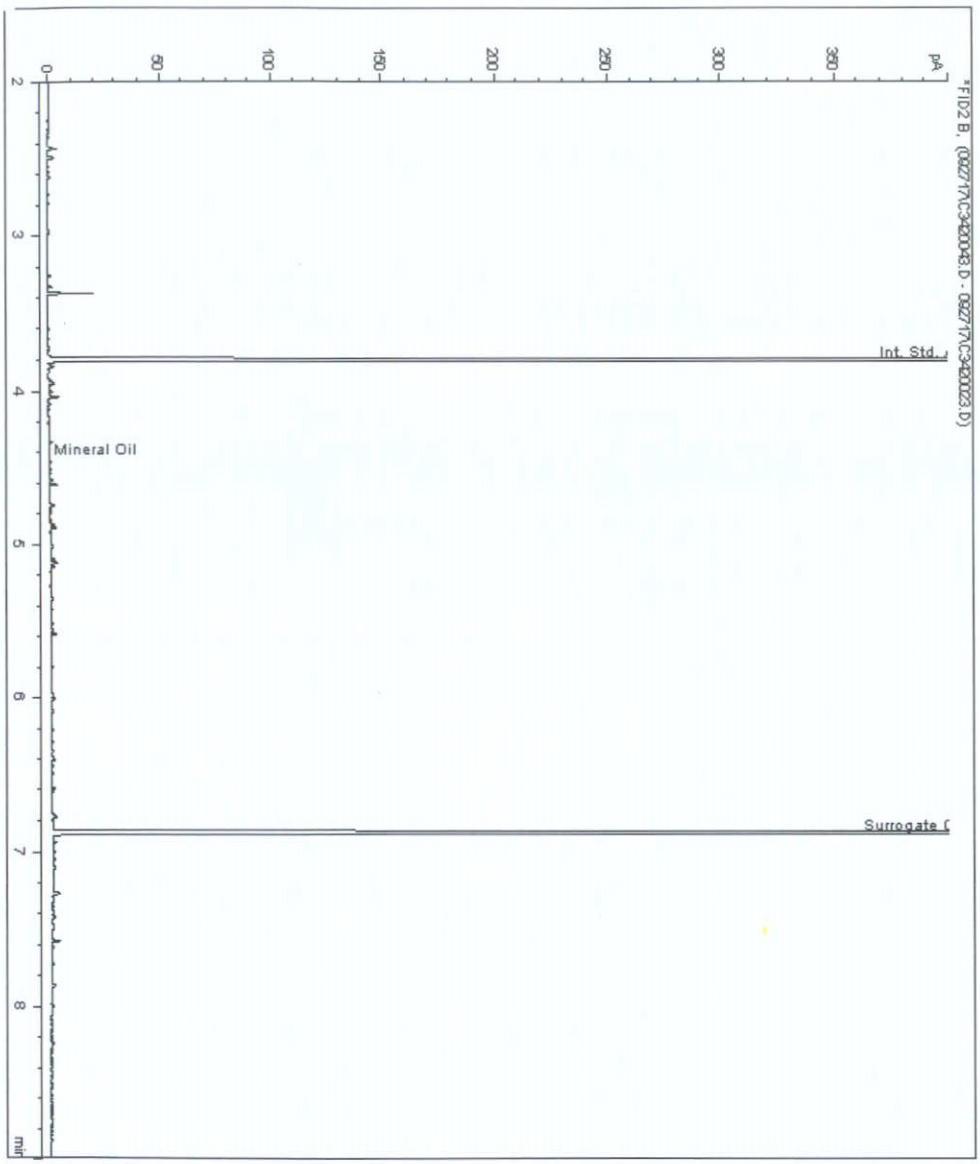
Analysis: Mineral Oil

Sample No : 16256430
Sample ID : 2921-BH4-Comp-SS8

Depth : 0.30 - 1.85

Mineral Oil Range Organics (C10 - C40)

Sample Identity	:	15212871-
Date Acquired	:	28/09/17 17:23:25 PM
Units	:	mg/kg
Sample Multiplier	:	0.000
Dilution	:	



Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-93	**Client Reference:**	2921-028 COC3-D	**Report Number:**	426772
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 16248038
Sample ID : 2921-BH4-Comp-SS8

Depth : 0.30 - 1.85

Appendix

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

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

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

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

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

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

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

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

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

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

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

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

General

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

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

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

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

Sample Deviations

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

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
5	Samples exceeded holding time before presevation was performed
§	Sampled on date not provided
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to sampled on date
&	Sample Holding Time exceeded - Late arrival of instructions.

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

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

Visual Estimation Of Fibre Content

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

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

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

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Deeside
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Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Minerex Environmental
Taney hall
Eglinton Terrace
Dundrum
Dublin
Dublin 14

Attention: Sven Klinkenbergh

CERTIFICATE OF ANALYSIS

Date:	03 October 2017
Customer:	D_MINEREX_DUB
Sample Delivery Group (SDG):	170923-100
Your Reference:	2921-028 COC3-E
Location:	Chartered Land - Heuston South Quarter
Report No:	426613

We received 1 sample on Saturday September 23, 2017 and 1 of these samples were scheduled for analysis which was completed on Tuesday October 03, 2017. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Approved By:

Sonia McWhan
Operations Manager

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-100	**Client Reference:**	2921-028 COC3-E	**Report Number:**	426613
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
16241380	2921-BH4-SS3		0.80 - 0.90	21/09/2017

Maximum Sample/Coolbox Temperature (°C) : **16.4**

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-100	**Client Reference:**	2921-028 COC3-E	**Report Number:**	426613
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

Sample Types -

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

Lab Sample No(s)			16241380
Customer Sample Reference			2921-BH4-SS3
AGS Reference			
Depth (m)			0.80 - 0.90
Container			1kg TUB
Sample Type			S
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 1	X

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-100	**Client Reference:**	2921-028 COC3-E	**Report Number:**	426613
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Asbestos Identification - Solid Samples

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	2921-BH4-SS3 0.80 - 0.90 SOLID 21/09/2017 00:00:00 27/09/2017 08:47:44 170923-100 16241380 TM048	03/10/17	Eva Guerra	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-100	**Client Reference:**	2921-028 COC3-E	**Report Number:**	426613
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-100	**Client Reference:**	2921-028 COC3-E	**Report Number:**	426613
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	16241380	
Customer Sample Ref.	2921-BH4-SS3	
AGS Ref.		
Depth	0.80 - 0.90	
Type	Soil/Solid (S)	
Asbestos ID in Solid Samples	03-Oct-2017	

Appendix

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

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

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

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

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

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

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

Surrogate recoveries - Surrogates are added to your sample to monitor recovery of test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

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

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

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

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

General

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

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

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

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

Sample Deviations

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

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
5	Samples exceeded holding time before presevation was performed
§	Sampled on date not provided
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to sampled on date
&	Sample Holding Time exceeded - Late arrival of instructions.

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

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

Visual Estimation Of Fibre Content

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

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

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

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Website: www.alsenvironmental.co.uk

Minerex Environmental
Taney hall
Eglinton Terrace
Dundrum
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Dublin 14

Attention: Sven Klinkenbergh

CERTIFICATE OF ANALYSIS

Date:	04 October 2017
Customer:	D_MINEREX_DUB
Sample Delivery Group (SDG):	170923-99
Your Reference:	2921-028 COC3-F
Location:	Chartered Land - Heuston South Quarter
Report No:	426761

We received 1 sample on Saturday September 23, 2017 and 1 of these samples were scheduled for analysis which was completed on Wednesday October 04, 2017. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Approved By:

Sonia McWhan
Operations Manager

1291

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-99	**Client Reference:**	2921-028 COC3-F	**Report Number:**	426761
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
16241350	2921-BH4-SS5		1.70 - 1.80	21/09/2017

Maximum Sample/Coolbox Temperature (°C) : **16.4**

ISO5667-3 Water quality - Sampling - Part3 -
During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-99	**Client Reference:**	2921-028 COC3-F	**Report Number:**	426761
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

Sample Types -

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

Lab Sample No(s)			16241350
Customer Sample Reference			2921-BH4-SS5
AGS Reference			
Depth (m)			1.70 - 1.80
Container			1kg TUB
Sample Type			S
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 1	X

12:43:26 04/10/2017

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-99	**Client Reference:**	2921-028 COC3-F	**Report Number:**	426761
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Asbestos Identification - Solid Samples

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	2921-BH4-SS5 1.70 - 1.80 SOLID 21/09/2017 00:00:00 27/09/2017 08:51:32 170923-99 16241350 TM048	04/10/17	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

DCC PLAN NO:4610/22
RECEIVED: 04/08/2022

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-99	**Client Reference:**	2921-028 COC3-F	**Report Number:**	426761
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-99	**Client Reference:**	2921-028 COC3-F	**Report Number:**	426761
Location:	Chartered Land - Heuston S	**Order Number:**		**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	16241350
Customer Sample Ref.	2921-BH4-SS5
AGS Ref.	
Depth	1.70 - 1.80
Type	Soil/Solid (S)
Asbestos ID in Solid Samples	04-Oct-2017

Appendix

General

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

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

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

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

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

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

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

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

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

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

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

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

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

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

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

Sample Deviations

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

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
5	**Samples exceeded holding time before presevation was performed**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

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

Visual Estimation Of Fibre Content

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

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

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

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Minerex Environmental
Taney hall
Eglinton Terrace
Dundrum
Dublin
Dublin 14

Attention: Sven Klinkenbergh

CERTIFICATE OF ANALYSIS

Date:	04 October 2017
Customer:	D_MINEREX_DUB
Sample Delivery Group (SDG):	170923-97
Your Reference:	2921-028 COC3-G
Location:	Chartered Land - Heuston South Quarter
Report No:	426773

We received 1 sample on Saturday September 23, 2017 and 1 of these samples were scheduled for analysis which was completed on Wednesday October 04, 2017. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Approved By:

Sonia McWhan
Operations Manager

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-97	**Client Reference:**	2921-028 COC3-G	**Report Number:**	426773
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
16241281	2921-BH1-SS3		0.60 - 1.30	20/09/2017

Maximum Sample/Coolbox Temperature (°C) : **16.4**

ISO5667-3 Water quality - Sampling - Part3 -
During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-97	Client Reference:	2921-028 COC3-G	Report Number:	426773
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Results Legend

X Test

N No Determination Possible

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

			Lab Sample No(s)			16241281
			Customer Sample Reference			2921-BH1-SS3
			AGS Reference			
			Depth (m)			0.60 - 1.30
			Container	250g Amber Jar (ALE210)	400g Tub (ALE214)	60g VOC (ALE215)
			Sample Type	S	S	S
Anions by Kone (w)	All	NDPs: 0 Tests: 1			X	
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 1			X	
Boron Water Soluble	All	NDPs: 0 Tests: 1		X		
CEN Readings	All	NDPs: 0 Tests: 1			X	
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1		X		
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 1			X	
olved Organic/Inorganic arbon	All	NDPs: 0 Tests: 1			X	
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 1		X		
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 1		X		
Fluoride	All	NDPs: 0 Tests: 1			X	
GRO by GC-FID (S)	All	NDPs: 0 Tests: 1				X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 1		X		
Loss on Ignition in soils	All	NDPs: 0 Tests: 1		X		
Mercury Dissolved	All	NDPs: 0 Tests: 1			X	
als by iCap-OES Dissolved (W)	All	NDPs: 0 Tests: 1			X	

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-97	**Client Reference:**	2921-028 COC3-G	**Report Number:**	426773
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

Sample Types -

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

Lab Sample No(s)			16241281		
Customer Sample Reference			2921-BH1-SS3		
AGS Reference					
Depth (m)			0.60 - 1.30		
Container			250g Amber Jar (ALE210)	400g Tub (ALE214)	60g VOC (ALE215)
Sample Type			S	S	S
Metals in solid samples by OES	All	NDPs: 0 Tests: 1	X		
Mineral Oil	All	NDPs: 0 Tests: 1	X		
PAH by GCMS	All	NDPs: 0 Tests: 1	X		
PCBs by GCMS	All	NDPs: 0 Tests: 1	X		
pH	All	NDPs: 0 Tests: 1	X		
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1	X		
Phenols by HPLC (W)	All	NDPs: 0 Tests: 1		X	
Sample description	All	NDPs: 0 Tests: 1	X		
Total Dissolved Solids	All	NDPs: 0 Tests: 1		X	
Total Organic Carbon	All	NDPs: 0 Tests: 1	X		
Total Sulphate	All	NDPs: 0 Tests: 1	X		
Total Sulphur	All	NDPs: 0 Tests: 1	X		
TPH CWG GC (S)	All	NDPs: 0 Tests: 1	X		

CERTIFICATE OF ANALYSIS

SDG:	170923-97	Client Reference:	2921-028 COC3-G	Report Number:	426773
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Sample Descriptions

Grain Sizes

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

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
16241281	2921-BH1-SS3	0.60 - 1.30	Dark Brown	Loamy Sand	Stones	Vegetation

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

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

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-97	Client Reference:	2921-028 COC3-G	Report Number:	426773
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample Ref.			2921-BH1-SS3					
Depth (m)			0.60 - 1.30					
Sample Type			Soil/Solid (S)					
Date Sampled			20/09/2017					
Sampled Time			-					
Date Received			23/09/2017					
SDG Ref			170923-97					
Lab Sample No.(s)			16241281					
AGS Reference								
Component	**LOD/Units**	**Method**						
Moisture Content Ratio (% of as received sample)	%	PM024	16					
Loss on ignition	<0.7 %	TM018	3.54 M					
Mineral oil >C10-C40	<1 mg/kg	TM061	92.8					
Mineral Oil Surrogate % recovery**	%	TM061	85					
Phenol	<0.01 mg/kg	TM062 (S)	<0.01 M					
Organic Carbon, Total	<0.2 %	TM132	0.765 M					
Sulphur, Total	<0.02 %	TM132	0.116					
Sulphate, Total potential	<0.06 %	TM132	0.348					
pH	1 pH Units	TM133	9.06 M					
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6 #					
Cyanide, Total	<1 mg/kg	TM153	<1 M					
Cyanide, Free	<1 mg/kg	TM153	<1 M					
PCB congener 28	<3 µg/kg	TM168	<3 M					
PCB congener 52	<3 µg/kg	TM168	<3 M					
PCB congener 101	<3 µg/kg	TM168	<3 M					
PCB congener 118	<3 µg/kg	TM168	<3 M					
PCB congener 138	<3 µg/kg	TM168	<3 M					
PCB congener 153	<3 µg/kg	TM168	<3 M					
PCB congener 180	<3 µg/kg	TM168	<3 M					
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168	<21					
Antimony	<0.6 mg/kg	TM181	1.03 #					
Arsenic	<0.6 mg/kg	TM181	9.86 M					
Barium	<0.6 mg/kg	TM181	44.8 #					
Cadmium	<0.02 mg/kg	TM181	1.51 M					
Chromium	<0.9 mg/kg	TM181	15.3 M					
Copper	<1.4 mg/kg	TM181	22.4 M					
Iron	<1000 mg/kg	TM181	20400 #					
Lead	<0.7 mg/kg	TM181	21.8 M					
Manganese	<0.13 mg/kg	TM181	1050 M					
Mercury	<0.14 mg/kg	TM181	0.522 M					
Molybdenum	<0.1 mg/kg	TM181	3.53 #					
Nickel	<0.2 mg/kg	TM181	38.3 M					

Validated

CERTIFICATE OF ANALYSIS

SDG:	170923-97	**Client Reference:**	2921-028 COC3-G	**Report Number:**	426773
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+$@	Sample deviation (see appendix)

Customer Sample Ref.	2921-BH1-SS3							
Depth (m)	0.60 - 1.30							
Sample Type	Soil/Solid (S)							
Date Sampled	20/09/2017							
Sampled Time	-							
Date Received	23/09/2017							
SDG Ref	170923-97							
Lab Sample No.(s)	16241281							
AGS Reference								
Component	**LOD/Units**	**Method**						
Selenium	<1 mg/kg	TM181	1.03 #					
Zinc	<1.9 mg/kg	TM181	90.4 M					
Sulphate, Total	<48 mg/kg	TM221	759 M					
Sulphide, Oxidisable	<0.03 %	TM221	0.272					
Boron, water soluble	<1 mg/kg	TM222	<1 M					

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PAH by GCMS

Results Legend	
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tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample Ref.	2921-BH1-SS3							
Depth (m)	0.60 - 1.30							
Sample Type	Soil/Solid (S)							
Date Sampled	20/09/2017							
Sampled Time								
Date Received	23/09/2017							
SDG Ref	170923-97							
Lab Sample No.(s)	16241281							
AGS Reference								
Component	**LOD/Units**	**Method**						
Naphthalene-d8 % recovery**	%	TM218	102					
Acenaphthene-d10 % recovery**	%	TM218	94.1					
Phenanthrene-d10 % recovery**	%	TM218	90.5					
Chrysene-d12 % recovery**	%	TM218	98.5					
Perylene-d12 % recovery**	%	TM218	102					
Naphthalene	<9 µg/kg	TM218	<9 M					
Acenaphthylene	<12 µg/kg	TM218	<12 M					
Acenaphthene	<8 µg/kg	TM218	<8 M					
Fluorene	<10 µg/kg	TM218	<10 M					
Phenanthrene	<15 µg/kg	TM218	34.5 M					
Anthracene	<16 µg/kg	TM218	<16 M					
Fluoranthene	<17 µg/kg	TM218	42.2 M					
Pyrene	<15 µg/kg	TM218	39 M					
Benz(a)anthracene	<14 µg/kg	TM218	18.5 M					
Chrysene	<10 µg/kg	TM218	18.5 M					
Benzo(b)fluoranthene	<15 µg/kg	TM218	31.6 M					
Benzo(k)fluoranthene	<14 µg/kg	TM218	19.3 M					
Benzo(a)pyrene	<15 µg/kg	TM218	28.1 M					
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	<18 M					
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	<23 M					
Benzo(g,h,i)perylene	<24 µg/kg	TM218	<24 M					
Coronene	<200 µg/kg	TM218	<200					
PAH, Total Detected USEPA 16	<118 µg/kg	TM218	232					
PAH, Total Detected USEPA 16 + Coronene	<318 µg/kg	TM218	<318					

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SDG:	170923-97	**Client Reference:**	2921-028 COC3-G	**Report Number:**	426773
Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Depth (m)	Sample Type	Date Sampled	Sampled Time	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
			2921-BH1-SS3	0.60 - 1.30	Soil/Solid (S)	20/09/2017		23/09/2017	170923-97	16241281	
GRO Surrogate % recovery**	%	TM089	54								
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089	<44 M								
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 #								
Benzene	<10 µg/kg	TM089	<10 M								
Toluene	<2 µg/kg	TM089	5.95 M								
Ethylbenzene	<3 µg/kg	TM089	<3 M								
Xylene	<6 µg/kg	TM089	<6 M								
o-Xylene	<3 µg/kg	TM089	<3 M								
sum of detected mpo xylene by GC	<9 µg/kg	TM089	<9								
sum of detected BTEX by GC	<24 µg/kg	TM089	<24								
Aliphatics >C5-C6	<10 µg/kg	TM089	<10								
Aliphatics >C6-C8	<10 µg/kg	TM089	<10								
Aliphatics >C8-C10	<10 µg/kg	TM089	<10								
Aliphatics >C10-C12	<10 µg/kg	TM089	<10								
Aliphatics >C12-C16	<100 µg/kg	TM173	2090								
Aliphatics >C16-C21	<100 µg/kg	TM173	6430								
Aliphatics >C21-C35	<100 µg/kg	TM173	77400								
Aliphatics >C35-C44	<100 µg/kg	TM173	75600								
I Aliphatics >C12-C44	<100 µg/kg	TM173	162000								
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10								
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10								
Aromatics >EC8-EC10	<10 µg/kg	TM089	<10								
Aromatics >EC10-EC12	<10 µg/kg	TM089	<10								
Aromatics >EC12-EC16	<100 µg/kg	TM173	202								
Aromatics >EC16-EC21	<100 µg/kg	TM173	3240								
Aromatics >EC21-EC35	<100 µg/kg	TM173	64200								
Aromatics >EC35-EC44	<100 µg/kg	TM173	105000								
Aromatics >EC40-EC44	<100 µg/kg	TM173	59900								
Total Aromatics >EC12-EC44	<100 µg/kg	TM173	173000								
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	334000								

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Location:	Chartered Land - Heuston	**Order Number:**		**Superseded Report:**	

Asbestos Identification - Soil

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	2921-BH1-SS3 0.60 - 1.30 SOLID 20/09/2017 00:00:00 26/09/2017 12:59:37 170923-97 16241281 TM048	3/10/2017	Barbara Urbanek-Walsh	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

Validated

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SDG:	170923-97	Client Reference:	2921-028 COC3-G	Report Number:	426773
Location:	Chartered Land - Heuston	Order Number:		Superseded Report:	

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Chartered Land - Heuston South Q
Mass Sample taken (kg)	0.107	Natural Moisture Content (%)	19
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	84
Particle Size <4mm	>95%		

Case	
SDG	170923-97
Lab Sample Number(s)	16241281
Sampled Date	20-Sep-2017
Customer Sample Ref.	2921-BH1-SS3
Depth (m)	0.60 - 1.30

Solid Waste Analysis	Result	Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Organic Carbon (%)	0.765	3	5	6
Loss on Ignition (%)	3.54	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	92.8	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	9.06	-	>6	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	C_2 Conc^n in 10:1 eluate (mg/l)		A_2 10:1 conc^n leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.00147	<0.0005	0.0147	<0.005	0.5	2	25
Barium	0.00472	<0.0002	0.0472	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.00243	<0.0003	0.0243	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.0191	<0.0005	0.191	<0.005	0.5	10	30
Nickel	0.00134	<0.0004	0.0134	<0.004	0.4	10	40
Lead	0.000235	<0.0002	0.00235	<0.002	0.5	10	50
...ony	0.00112	<0.0001	0.0112	<0.001	0.06	0.7	5
...enium	0.00317	<0.0005	0.0317	<0.005	0.1	0.5	7
Zinc	0.00105	<0.001	0.0105	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	0.594	<0.5	5.94	<5	10	150	500
Sulphate (soluble)	34.4	<2	344	<20	1000	20000	50000
Total Dissolved Solids	92.4	<5	924	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	27-Sep-2017
pH (pH Units)	9.50
Conductivity (µS/cm)	114.00
Temperature (°C)	18.80
Volume Leachant (Litres)	0.883

...d Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates

04/10/2017 13:04:17