

Validated

SDG: Location: 170926-63 Client Reference: CHARTERED LAND - HElOrder Number: 2921-028 COC4-F

Report Number: Superseded Report: 427003

Control Service   Control Se								
Marging   Marg				Customer Sample Ref.	2921-BH5-SS4			
Display   Disp	M	mCERTS accredited.						
Subport   Total   Infiltred sample   Sample Type   Solifold (S)   21/09/2017   Subport   Subpo	aq diss.filt	Aqueous / settled sample. Dissolved / filtered sample.		Depth (m)	2.60 - 5.90			
##	tot.unfilt	Total / unfiltered sample.						
Check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery   Lob Sumple No.6)   AGS Reference   Lob Sumple No.6)   AGS Reference   Lob Sumple No.6)   AGS Reference   Component   Lob Junits   Method    -58-6 8  Sample deviation (see appendix)   C1 mg/kg   TM181   C1   #			dard to	Date Sampled	21/09/2017			
Featurist minimulated compounded within   Spig Ref   Lab Sample No.(s)   16251961		check the efficiency of the metho	d. The		26/09/2017		1	
Trigger breach confirmed   Lab Sample No.(s)   AGS Reference   Component   LOD/Units   Method					170926-63			
Component         LOD/Units         Method           Selenium         <1 mg/kg	(F)	Trigger breach confirmed			16251961			
Selenium         <1 mg/kg				AGS Reference				
# Zinc			_					
Zinc     <1.9 mg/kg	Seleniun	1	<1 mg/kg	1M181				
# Sulphate, Total	-							
Sulphate, Total         <48 mg/kg	Zinc		<1.9 mg/k	g TM181				
# Sulphide, Oxidisable			-					
Sulphide, Oxidisable         <0.03 %	Sulphate	, Total	<48 mg/k	g TM221	523			
Boron, water soluble <1 mg/kg TM222 <1					#			
	Sulphide	, Oxidisable	<0.03 %	TM221	0.202			
	Boron, w	rater soluble	<1 mg/kg	TM222	<1			
					#			
	100	)						-
				+				
				_				
			_					
			_					
			_	_				
			-					
			-					
				_				
								-

### **CERTIFICATE OF ANALYSIS**



SDG: 170926-63 Client Reference: 2921-028 COC4-F Report Number: 427003
Location: CHARTERED LAND - HElOrder Number: Superseded Report:

AH D	y GCMS Results Legend		Customer Sample Ref.	2921-BH5-SS4
	ISO17025 accredited.		oustomer sample Kef.	2921-BH5-SS4
tot.unfilt	mCERTS accredited. Aqueous / settled sample. Dissolved / filtered sample. Total / unfiltered sample.		Depth (m) Sample Type	2.60 - 5.90 Soil/Solid (S)
**	Subcontracted test. % recovery of the surrogate stand check the efficiency of the metho results of individual compounds.	d. The	Date Sampled Sampled Time Date Received	21/09/2017
	samples aren't corrected for the r Trigger breach confirmed Sample deviation (see appendix)	recovery	SDG Ref Lab Sample No.(s) AGS Reference	170926-63 16251961
Compo		LOD/Units	Method	
	alene-d8 % recovery**	%	TM218	88.1
recovery		%	TM218	92.6
Phenant	threne-d10 % recovery**	%	TM218	84.9
Chrysen	ne-d12 % recovery**	%	TM218	92.9
Perylene	e-d12 % recovery**	%	TM218	90.1
Naphtha	alene	<9 µg/kg	TM218	58.9
Acenapl	hthylene	<12 µg/kg	TM218	29.5
Acenapl	hthene	<8 µg/kg	TM218	104
Fluoren	е	<10 µg/kg	TM218	445
Phenan	threne	<15 µg/kg	TM218	590
Anthrac	ene	<16 µg/kg	TM218	124
Fluorant	thene	<17 µg/kg	TM218	44.1
Pyrene		<15 µg/kg	TM218	39.1
Benz(a)	anthracene	<14 µg/kg	TM218	<14
Chryser	ne	<10 µg/kg	TM218	<10
Benzo(t	b)fluoranthene	<15 µg/kg	TM218	<15
Benzo(k	k)fluoranthene	<14 µg/kg	TM218	<14
Benzo(a	a)pyrene	<15 µg/kg	TM218	<15
Indeno(	1,2,3-cd)pyrene	<18 µg/kg	TM218	<18
Dibenzo	o(a,h)anthracene	<23 µg/kg	TM218	<23
	g,h,i)perylene	<24 µg/kg		<24
Corone		<200 µg/kg		<200
	otal Detected USEPA 16	<118 µg/kg		1430
	otal Detected USEPA 16	<318 µg/kg		1430
+ Coron		-3 to haka	1W210	1430



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PH CWG (S)  Results Legend		Customer Sample Ref.	2921-BH5-SS4				
# ISO17025 accredited.  M mCERTS accredited.							
aq Aqueous / settled sample.		Donath for	200 - 200				
iss.filt Dissolved / filtered sample.		Depth (m)	2.60 - 5.90				
t.unfilt Total / unfiltered sample.		Sample Type	Soil/Solid (S)				
<ul> <li>Subcontracted test.</li> <li>" recovery of the surrogate stan</li> </ul>	dard to	Date Sampled	21/09/2017				
check the efficiency of the metho	od. The	Sampled Time	2010012047				
results of individual compounds		Date Received	26/09/2017				
samples aren't corrected for the		SDG Ref	170926-63				
<ul><li>(F) Trigger breach confirmed</li></ul>	2.2	Lab Sample No.(s)	16251961				
-5&+§@ Sample deviation (see appendix)		AGS Reference					
Component	LOD/Units	Method					
GRO Surrogate % recovery**	%	TM089	59				
OTA CO							
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089	22900				
Methyl tertiary butyl ether	<5 µg/kg	TM089	<5				
MTBE)				£			
Benzene	<10 µg/kg	TM089	<10				
Toluene	<2 µg/kg	TM089	<2				
Olderie	12 pgrkg	TIVIOUS					
thulbonzon	-0	T14000		‡			
thylbenzene	<3 µg/kg	TM089	<3				
				#			
Xylene	<6 µg/kg	TM089	<6				
o-Xylene	<3 µg/kg	TM089	<3				
	- 25.13						
sum of detected mpo xylene by	d rathe	TM089	<9				
GC agreement and a sylene by	<9 µg/kg	1 10009	-3				
The second secon	.01	T11000	-04				
um of detected BTEX by GC	<24 µg/kg	TM089	<24				
West of the Montal of the Market							-
Aliphatics >C5-C6	<10 µg/kg	TM089	26.7				
Aliphatics >C6-C8	<10 µg/kg	TM089	1160				
•	15.5						
Aliphatics >C8-C10	<10 µg/kg	TM089	5610				
	то руму	111.000	0010		 		
linhatics >C10, C12	Z10 n	TMOOO	7200				
liphatics >C10-C12	<10 µg/kg	TM089	7390				
No. Control Control Control			Description of the second				
Aliphatics >C12-C16	<100 µg/kg	TM173	672000				
				1			
Aliphatics >C16-C21	<100 µg/kg	TM173	593000				
Aliphatics >C21-C35	<100 µg/kg	TM173	178000				
Aliphatics >C35-C44	<100 µg/kg	TM173	<100				
Riphatics >035-044	100 pg/kg	TIVITIO	100				
	C-004000		90000				
I Aliphatics >C12-C44	<100 µg/kg	TM173	1440000				
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10				
	1.5.7						
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10				
	- Figring						
Aromatics >EC8-EC10	<10 µg/kg	TM089	3740				
Indition >ECO-ECIT	> 10 µg/kg	11009	3140				
PATRICIA PATRICIA	- 10	T11000	1000				
romatics >EC10-EC12	<10 µg/kg	TM089	4930				
					-		
romatics >EC12-EC16	<100 µg/kg	TM173	278000				
romatics >EC16-EC21	<100 µg/kg	TM173	325000				
and the second s	13.3					-	
romatics >EC21-EC35	<100 µg/kg	TM173	115000				
	100 pg//g						
romatics SEC2E ECA4	<100 · · - 8 · -	TM173	1370				
romatics >EC35-EC44	<100 µg/kg	1W173	1370				
			y				
romatics >EC40-EC44	<100 µg/kg	TM173	494				
otal Aromatics >EC12-EC44	<100 µg/kg	TM173	719000				
otal Aliphatics & Aromatics	<100 µg/kg	TM173	2180000				
C5-C44	-,50 µg/kg		2.0000				
00-044							
	-						

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# **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-BH5-SS4 2.60 - 5.90 SOLID 21/09/2017 00:00:00 27/09/2017 11:42:44 170926-63 16251961 TM048	04/10/17	Eva Guerra	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected





SDG: 170926-63 Client Reference: Location: CHARTERED LAND - HElOrder Number:

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	CEN 1	10:1 SINGLE	STAGE LEA	CHATE TEST			
CEN ANALYTICAL RESU	JLTS					REF : BS	EN 12457/2
Client Reference			Site Location		CHAF	RTERED LAND	- HEUSTON S
Mass Sample taken (kg)	0.096		Natural Moistu	re Content (%)	6.61		
Mass of dry sample (kg)	0.090		Dry Matter Cor		93.8		
Particle Size <4mm	>95%		,	(///			
Case					Land	fill Waste Acce	otance
SDG	170926-63					Criteria Limits	
Lab Sample Number(s)	16251961			P P			
Sampled Date	21-Sep-2017					Stable	
Customer Sample Ref.	2921-BH5-SS4				Inert Waste	Non-reactive Hazardous Waste	Hazardous
					Landfill	in Non-	Waste Landfill
Depth (m)	2.60 - 5.90					Hazardous Landfill	
Solid Waste Analysis	Result						
Organic Carbon (%)	0.535				3	5	6
Loss on Ignition (%)	2.58					-	10
Sum of BTEX (mg/kg)	< 0.024			9	6		-
Sum of 7 PCBs (mg/kg)	<0.021				1	-	-
Mineral Oil (mg/kg)	909				500		-
PAH Sum of 17 (mg/kg) pH (pH Units)	8.72					>6	
ANC to pH 6 (mol/kg)	0.72					-	
ANC to pH 4 (mol/kg)					Ų.		
Eluate Analysis	C <sub>2</sub> Conc <sup>n</sup> in 1	0:1 eluate (mg/l)	A2 10:1 cor	nc <sup>n</sup> leached (mg/kg)		ues for compliance lea BS EN 12457-3 at L/S	
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.000566	<0.0005	0.00566	<0.005	0.5	2	25
Barium	0.0185	<0.0002	0.185	<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	0.00652	<0.0005	0.0652	<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

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	0.00652	<0.0005	0.0652	<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
nony	0.00141	<0.0001	0.0141	<0.001	0.06	0.7	5
nium	0.000862	<0.0005	0.00862	< 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)	13.5	<2	135	<20	1000	20000	50000
Total Dissolved Solids	71.4	<5	714	<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**

02-Oct-2017
8.89
91.80
17.60
0.894

. 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

05/10/2017 13:49:56



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# Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample 1	Surrogate
PM001		Preparation of Samples for Metals Analysis	Sample	Corrected
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		

<sup>1</sup> 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).



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# **Test Completion Dates**

Lab Sample No(s)	16251961
Customer Sample Ref.	2921-BH5-SS4
AGS Ref.	
Depth	2.60 - 5.90
Туре	Soil/Solid (S
Anions by Kone (w)	04-Oct-2017
Asbestos ID in Solid Samples	04-Oct-2017
Boron Water Soluble	03-Oct-2017
CEN 10:1 Leachate (1 Stage)	02-Oct-2017
CEN Readings	03-Oct-2017
Cyanide Comp/Free/Total/Thiocyanate	05-Oct-2017
Dissolved Metals by ICP-MS	04-Oct-2017
Dissolved Organic/Inorganic Carbon	04-Oct-2017
EPH CWG (Aliphatic) GC (S)	02-Oct-2017
EPH CWG (Aromatic) GC (S)	02-Oct-2017
Fluoride	04-Oct-2017
GRO by GC-FID (S)	03-Oct-2017
Hexavalent Chromium (s)	29-Sep-2017
1 nes on Ignition in soils	05-Oct-2017
ıry Dissolved	04-Oct-2017
is by iCap-OES Dissolved (W)	04-Oct-2017
Metals in solid samples by OES	04-Oct-2017
Mineral Oil	04-Oct-2017
PAH by GCMS	28-Sep-2017
PCBs by GCMS	03-Oct-2017
pH	27-Sep-2017
Phenois by HPLC (S)	30-Sep-2017
Phenois by HPLC (W)	05-Oct-2017
Sample description	27-Sep-2017
Total Dissolved Solids	04-Oct-2017
Total Organic Carbon	03-Oct-2017
Total Sulphate	03-Oct-2017
Total Sulphur	02-Oct-2017
TPH CWG GC (S)	03-Oct-2017

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# Chromatogram

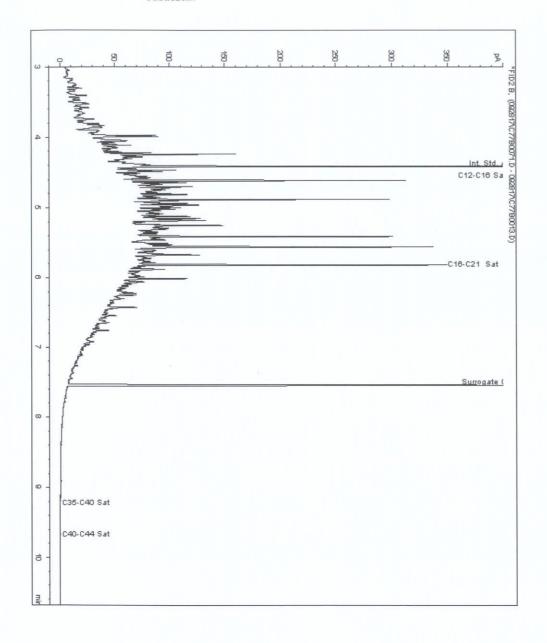
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : Sample ID:

16257061 2921-BH5-SS4 Depth: 2.60 - 5.90

Speciated TPH - SATS ( Cl2 - C40 )

Sample Identity: 15223330-Date Acquired : 29/09/2017 11:21:01 PM Units : ppb Dilution:





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# Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

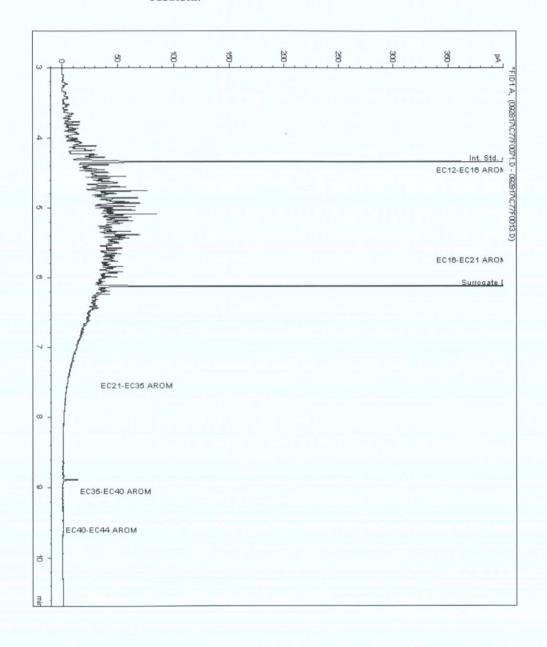
Sample No : Sample ID : 16257061 2921-BH5-SS4

Depth: 2.60 - 5.90

Speciated TPH - SATS ( C12 - C40 )

Sample Identity: 15223331Date Acquired : 29/09/2017 11:21:01 PM
Units : ppb

Dilution:



#### **CERTIFICATE OF ANALYSIS**



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# Chromatogram

Analysis: Mineral Oil

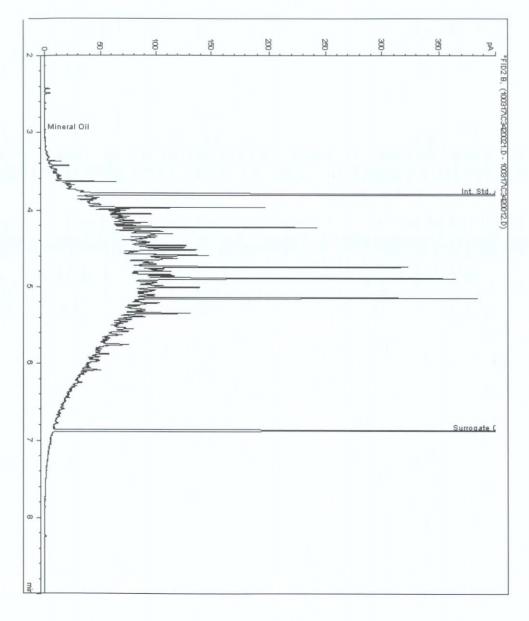
Sample No : Sample ID :

16268722 2921-BH5-SS4 Depth: 2.60 - 5.90

Mineral Oil Range Organics ( C10 - C40 )

15223333-03/10/17 18:40:08 PM mq/kq 0.000

Sample Identity Date Acquired Units Sample Multiplier Dilution





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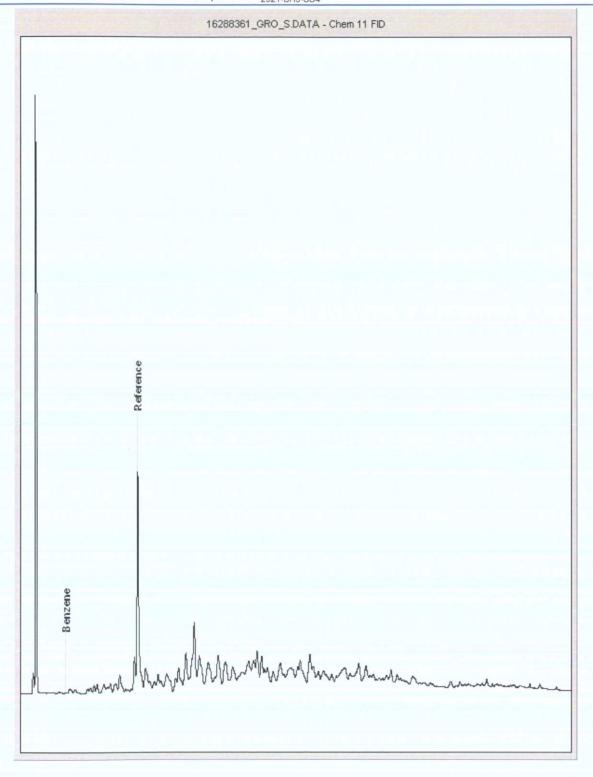
427003

## Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : Sample ID :

16288361 2921-BH5-SS4 Depth: 2.60 - 5.90



SDG Location:

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# Appendix

#### General

- 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
- 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 Dimethylphenol, 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.

- Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except 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
<b>D</b>	Sample holding time exceeded due to sampled on date
ž.	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).

Aste stos Type	Common Name
Chrysotle	White Asbests
Amosite	BrownAsbests
Croid dolite	Blue Asbe stos
Fibrous Actinolite	9
Ribrous Anthophyllite	14
Fibrous Trempi lle	141

#### 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.



Minerex Environmental Taney hall Eglinton Terrace Dundrum Dublin Dublin 14

Attention: Caitriona Keogh

Unit 7-8 Hawarden Business Park Manor Road (off Manor Lane) Hawarden Deeside CH5 3US Tel: (01244) 528700 Fax: (01244) 528701

Website: www.alsenvironmental.co.uk

email: hawardencustomerservices@alsglobal.com

### **CERTIFICATE OF ANALYSIS**

Date:

Customer:

Sample Delivery Group (SDG):

Your Reference:

Location: Report No: 05 October 2017 D\_MINEREX\_DUB

170926-64

2921-028 COC4-G

CHARTERED LAND - HEUSTON SOUTH QUARTER

427004

We received 1 sample on Tuesday September 26, 2017 and 1 of these samples were scheduled for analysis which was completed on Thursday October 05, 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

SDG: Location:

170926-64 CHARTERED LAND

Client Reference:
- HElOrder Number:

2921-028 COC4-G

Report Number: Superseded Report: 427004

# **Received Sample Overview**

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
16252008	2921-BH5-SS5		5.90 - 7.60	22/09/2017

Maximum Sample/Coolbox Temperature (°C):

13.8

ISO5667-3 Water quality - Sampling - Part3 - During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of  $(5\pm3)^{\circ}$ 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.



SDG: 170926-64 Client Reference: 2921-028 COC4-G Report Number: 427004
Location: CHARTERED LAND - HELOrder Number: Superseded Report:

Results Legend	20.00			16
X Test	Lab	Sample No(s)		6252008
No Determination Possible	1			08
				67
		Customer		B-1.7
	Sam	ple Reference		2921-BH5-SS5
Sample Types -				90
S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate	AG	S Reference		
PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage		Depth (m)		5.90 - 7.60
US - Untreated Sewage - Recreational Water			2500	~ 0
- Drinking Water Non-regulato - NL - Unspecified Liquid SL - Sludge G - Gas		Container	250g Amber Jar (ALE210)	(ALE215)
OTH - Other	Sa	ample Type	S	U
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 1		
		lests. 1	Х	
Boron Water Soluble	All	NDPs: 0 Tests: 1	X	
Cyanide	All	NDPs: 0	^	
Comp/Free/Total/Thiocyanate		Tests: 1	Х	
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 1	X	
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 1	X	
GRO by GC-FID (S)	All	NDPs: 0	^	
One by 661 15 (6)	Z NI	Tests: 1		X
avalent Chromium (s)	All	NDPs: 0		
		Tests: 1	х	
Loss on Ignition in soils	All	NDPs: 0		
		Tests: 1	Х	
Metals in solid samples by OE	S All	NDPs: 0		
		Tests: 1	Х	
Mineral Oil	All	NDPs: 0		
		Tests: 1	Х	
PAH by GCMS	All	NDPs: 0		
		Tests: 1	Х	
PCBs by GCMS	All	NDPs: 0		
		Tests: 1	Х	
рН	All	NDPs: 0 Tests: 1		
		10010. 1	Х	
Phenois by HPLC (S)	All	NDPs: 0 Tests: 1	х	
aple description	All	NDPs: 0	^	
		Tests: 1	X	

### **CERTIFICATE OF ANALYSIS**



SDG: Location:

170926-64 Client Reference: CHARTERED LAND - HEl**Order Number**:

2921-028 COC4-G

Report Number: Superseded Report:

427004

Location:		CHARTEREL	LAND - HE	Orde	er Nu
Results Legend  X Test		_ab Sample I	No(s)		16252008
No Determination Possible	_				80
	5	Custome Sample Refer			2921-BH5-SS5
Sample Types - S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate		AGS Refere	nce		
PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage		Depth (m	)		5.90 - 7.60
RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas		Containe	r	250g Amber Jar (ALE210)	60g VOC (ALE215)
OTH - Other		Sample Typ	ое	S	co
Total Organic Carbon	All		NDPs: 0 Tests: 1	Х	
Total Sulphate	All		NDPs: 0 Tests: 1	Х	
Total Sulphur	All		NDPs: 0 Tests: 1	Х	
TPH CWG GC (S)	All		NDPs: 0 Tests: 1	X	



Validated

SDG: Location: 170926-64

Client Reference: CHARTERED LAND - HElOrder Number:

2921-028 COC4-G

Report Number: Superseded Report:

427004

# Sample Descriptions

#### **Grain Sizes**

very fine <0.0	63mm fine 0	0.063mm - 0.1mm	medium 0.	1mm - 2mm	coarse	2mm - :	10mm very	coarse
Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Descrip	tion	Inclusions	Inclusions 2	
16252008	2921-BH5-SS5	5.90 - 7.60	Dark Brown	Stone/S	oil	Stones	Oil/Petroleum	7

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.



### **CERTIFICATE OF ANALYSIS**



SDG: 170926-64 Client Reference: 2921-028 COC4-G Report Number: 427004
Location: CHARTERED LAND - HElOrder Number: Superseded Report:

Results Legand # ISO17025 accredited. M mCERTS accredited.	C C	Customer Sample Ref.	2921-BH5-SS5				
aq Aqueous / settled sample.		Depth (m)	5.90 - 7.60				
diss.filt Dissolved / filtered sample.		Sample Type	Soil/Solid (S)				
tot.unfilt Total / unfiltered sample.  * Subcontracted test.		Date Sampled	22/09/2017				
** % recovery of the surrogate stands	erd to	Sampled Time	KENDIENTI	1			
check the efficiency of the method.	The	Date Received	26/09/2017				
results of individual compounds w		SDG Ref	170926-64				
samples aren't corrected for the re-	covery	Lab Sample No.(s)	16252008				
(F) Trigger breach confirmed 1-58+5@ Sample deviation (see appendix)		AGS Reference	10202000				
Component	LOD/Units	Method					
Moisture Content Ratio (% of as received sample)	%	PM024	8				
Loss on ignition	<0.7 %	TM018	1.37				
Mineral oil >C10-C40	<1 mg/kg	TM061	99.9				
Mineral Oil Surrogate % recovery**	%	TM061	81.5				
Phenol	<0.01 mg/kg	TM062 (S)	<0.01				
Organic Carbon, Total	<0.2 %	TM132	0.211				
Sulphur, Total	<0.02 %	TM132	0.0394				
Sulphate, Total potential	<0.06 %	TM132	0.118				
pH	1 pH Units	TM133	8.8				
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		<0.6				
Arsenic	<0.6 mg/kg	TM181	3.9	1 11			
Barium	<0.6 mg/kg	TM181	28.4				
Cadmium	<0.02 mg/kg	TM181	0.684				
Copper	<0.9 mg/kg		7.36 #				
Copper	<1.4 mg/kg	TM181	6.92 #				
Lead	mg/kg	TM181	10400 #				
	<0.7 mg/kg	TM181	8.73				
Manganese	mg/kg		522 #				
Melvhdenum	<0.14 mg/kg	TM181	0.353				
Molybdenum	<0.1 mg/kg	TM181	1.93				
INIONGI	<0.2 mg/kg	TM181	15.6				



Validated

SDG: 170926-64 Client Reference: 2921-028 COC4-G Report Number: 427004
Location: CHARTERED LAND - HElOrder Number: Superseded Report:

### ISO17025 accredited.  ### MCRTS accredited.  ### Aqueous / settled sample.  ### Ibisorved / filtered sample.  #### Ibisorved / filtered sample.  #### Ibisorved / filtered sample.  #### Ibisorved / filtered sample.  ##### Ibisorved / filtered sample.  ###################################	15/01/99							
M	Results Legend  # ISO17025 accredited.		Customer Sample Ref.	2921-BH5-SS5				
Dissolved / Hitered sample.   Depth (m)   5.90.7.60	M mCERTS accredited.							
Total   untitiered sample   Sample Type   SullSolid (S)   2009/2017   Subcontracted test.   Subcontracted te	aq Aqueous / settled sample.  diss filt Dissolved / filtered sample.		Depth (m)	5.90 - 7.60				
White control of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery 170926-64 Lab Sample No.(s) AGS Reference Component LOD/Units Method   Selenium	tot.unfilt Total / unfiltered sample.							
Component   LOD/Units   Method		and to		22/09/2017			10 11 12 13	
Trigger breach confirmed   Sample No.(s)   AGS Reference   Service   Service   Sample No.(s)   AGS Reference   Service   Ser		i. The		20/00/2047				
16252008	results of individual compounds w	rithin						
1-58+9@ Sample deviation (see appendix)   AGS Reference	(F) Trigger breach confirmed	covery						
Component         LOD/Units         Method           Selenium         <1 mg/kg	1-5&+§@ Sample deviation (see appendix)							
Selenium     <1 mg/kg	Component	LOD/Un						
# Zinc		_		-1				
Zinc     <1.9 mg/kg	Seletifulti	<1 mg/	kg IMIOI					
# Sulphate, Total					‡			
Sulphate, Total     <48 mg/kg	Zinc	<1.9 mg	/kg TM181	81.5				
Sulphate, Total     <48 mg/kg								
# Sulphide, Oxidisable	Sulphate, Total	<48 mg	/kg TM221	303				
Sulphide, Oxidisable         <0.03 %								
Boron, water soluble <1 mg/kg TM222 <1	Culabida Ovidiaabla	-0.02	0/ TN4004		-			
	Sulphide, Oxidisable	<0.03	% 1WZZ1	0.0877				
	Boron, water soluble	<1 mg/	kg TM222	<1				
				#				
	<u> </u>							
						1		
			_					
						-		
		1						

### **CERTIFICATE OF ANALYSIS**



SDG: Location:

170926-64 Client Reference: CHARTERED LAND - HEl**Order Number**:

2921-028 COC4-G

Report Number: Superseded Report:

427004

AH by GCMS					T		
Results Legend	C	ustomer Sample Ref.	2921-BH5-SS5				
# ISO17025 accredited.  M mCERTS accredited.							
aq Aqueous / settled sample.		Depth (m)	5.90 - 7.60				
diss.filt Dissolved / filtered sample.		Sample Type	Soil/Solid (S)				
ot.unfilt Total / unfiltered sample.  * Subcontracted test.		Date Sampled	22/09/2017				
** % recovery of the surrogate stand	dard to	Sampled Time	22/00/2017				
check the efficiency of the metho	d. The	Date Received	26/09/2017				
results of individual compounds	within	SDG Ref	170926-64				
samples aren't corrected for the r (F) Trigger breach confirmed	ecovery	Lab Sample No.(s)	16252008				
1-5&+§@ Sample deviation (see appendix)		AGS Reference					
Component	1.00011-14-	Method					
	LOD/Units						
Naphthalene-d8 % recovery**	%	TM218	118				
Acenaphthene-d10 % recovery**	%	TM218	118				
Phenanthrene-d10 % recovery**	%	TM218	108				
Chrysene-d12 % recovery**	%	TM218	114				
Perylene-d12 % recovery**	%	TM218	113				
Naphthalene	<9 µg/kg	TM218	9.95				
Acenaphthylene	<12 µg/kg	TM218	<12	#		-	
Acenaphthene	<8 µg/kg	TM218	23.1	#			
Fluorene	<10 µg/kg	TM218	44.5	#			
5255555				#			
Phenanthrene	<15 µg/kg	TM218	53.6	#			
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	131				
PAH, Total Detected USEPA 16 + Coronene	<318 µg/kg	TM218	<318				



Validated

SDG: 170926-64 Client Reference: 2921-028 COC4-G Report Number: 427004
Location: CHARTERED LAND - HElOrder Number: Superseded Report:

7	WG (S)  Results Legend	C	ustomer Sample Ref.	2921-BH5-SS5
	SO17025 accredited. mCERTS accredited.			
	Aqueous / settled sample. Dissolved / filtered sample.		Depth (m)	5.90 - 7.60
tot.unfilt 7	Total / unfiltered sample.		Sample Type	Soil/Solid (S)
	Subcontracted test. % recovery of the surrogate stand	dard to	Date Sampled Sampled Time	22/09/2017
	check the efficiency of the metho results of individual compounds	od. The	Date Received	26/09/2017
	samples aren't corrected for the		SDG Ref	170926-64
(F) 1 1-5&+6@ 5	Trigger breach confirmed Sample deviation (see appendix)		Lab Sample No.(s) AGS Reference	16252008
Compon		LOD/Units	Method	
	rogate % recovery**	%	TM089	84
GRO TO	T (Moisture Corrected)	<44 µg/kg	TM089	4190
Methyl ter	rtiary butyl ether	<5 μg/kg	TM089	<5
(MTBE) Benzene		<10 µg/kg	TM089	<10
				1.
Toluene		<2 µg/kg	TM089	<2
Ethylbenz	tene	<3 µg/kg	TM089	<3
Xyler	ne	<6 µg/kg	TM089	<6
o-Xylene	4.	<3 µg/kg	TM089	<3
sum of de	etected mpo xylene by	<9 µg/kg	TM089	<9
GC	etected BTEX by GC	<24 µg/kg	TM089	<24
	VEC.			
Aliphatics	>C5-C6	<10 µg/kg	TM089	<10
Aliphatics	>C6-C8	<10 µg/kg	TM089	105
Aliphatics	>C8-C10	<10 µg/kg	TM089	827
Aliphatics	>C10-C12	<10 µg/kg	TM089	1620
Alinhatics	>C12-C16	<100 µg/kg	TM173	94500
				1
	>C16-C21	<100 µg/kg	TM173	93000
Aliphatics	>C21-C35	<100 µg/kg	TM173	36900
Aliphatics	>C35-C44	<100 µg/kg	TM173	1160
I Alip	hatics >C12-C44	<100 µg/kg	TM173	226000
Aromatics	s >EC5-EC7	<10 µg/kg	TM089	<10
11.54 2.11.5.2.2	s >EC7-EC8	<10 µg/kg	TM089	<10
Aromatics	s >EC8-EC10	<10 µg/kg	TM089	551
Aromatics	s >EC10-EC12	<10 µg/kg	TM089	1080
Aromatics	s >EC12-EC16	<100 µg/kg	TM173	16600
Aromatics	s >EC16-EC21	<100 µg/kg	TM173	27200
Aromatics	s >EC21-EC35	<100 µg/kg	TM173	13300
			TM173	429
	s >EC35-EC44	<100 µg/kg		
Aromatics	s >EC40-EC44	<100 µg/kg	TM173	<100
Total Aron	matics >EC12-EC44	<100 µg/kg	TM173	57600
	hatics & Aromatics	<100 µg/kg	TM173	287000
>C5-C44				

# **CERTIFICATE OF ANALYSIS**



SDG: Location:

170926-64 Client Reference CHARTERED LAND - HEl**Order Number:** Client Reference: 2921-028 COC4-G

Report Number: Superseded Report:

427004

# **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-BH5-SS5 5.90 - 7.60 SOLID 22/09/2017 00:00:00 27/09/2017 11:32:45 170926-64 16252008 TM048	04/10/17	Eva Guerra		Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected



Validated

SDG: Location:

170926-64 Client Reference CHARTERED LAND - HELOrder Number: Client Reference: 2921-028 COC4-G

Report Number: Superseded Report:

427004

# 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		
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)		
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		
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		
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		

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

SDG: 170926-64 Client Reference: Location: CHARTERED LAND - HElOrder Number:

2921-028 COC4-G

Report Number: Superseded Report: 427004

# **Test Completion Dates**

Lab Sample No(s)	16252008
Customer Sample Ref.	2921-BH5-SS5
AGS Ref.	
Depth	5.90 - 7.60
Туре	Soil/Solid (S)
Asbestos ID in Solid Samples	04-Oct-2017
Boron Water Soluble	03-Oct-2017
Cyanide Comp/Free/Total/Thiocyanate	05-Oct-2017
EPH CWG (Aliphatic) GC (S)	02-Oct-2017
EPH CWG (Aromatic) GC (S)	02-Oct-2017
GRO by GC-FID (S)	03-Oct-2017
Hexavalent Chromium (s)	02-Oct-2017
Loss on Ignition in soils	05-Oct-2017
Metals in solid samples by OES	04-Oct-2017
Mineral Oil	04-Oct-2017
PAH by GCMS	02-Oct-2017
PCBs by GCMS	04-Oct-2017
pH	27-Sep-2017
Phenois by HPLC (S)	30-Sep-2017
Sample description	27-Sep-2017
Total Organic Carbon	03-Oct-2017
Total Sulphate	03-Oct-2017
Total Sulphur	02-Oct-2017
TPH CWG GC (S)	03-Oct-2017



Validated

SDG: Location: 170926-64

Client Reference: CHARTERED LAND - HElOrder Number:

2921-028 COC4-G

Report Number: Superseded Report:

427004

# Chromatogram

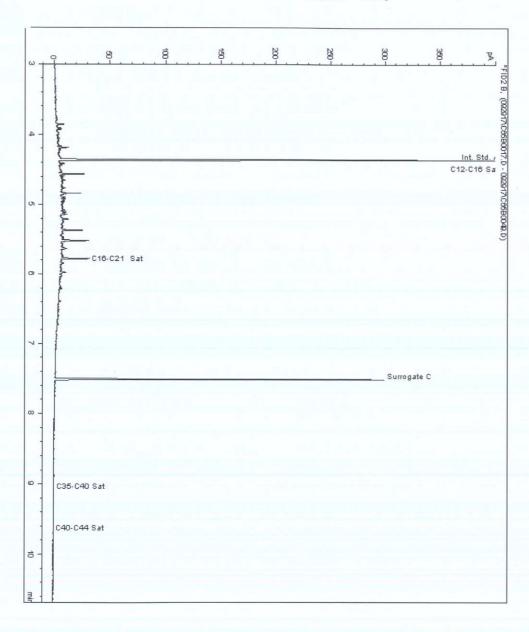
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : Sample ID :

16257225 2921-BH5-SS5 Depth: 5.90 - 7.60

Speciated TPH - SATS ( C12 - C40 )

Sample Identity: 15223239Date Acquired : 29/09/2017 11:40:15 PM
Units : ppb
Dilution: 2921-BH5-SS5[5.90 - 7.60]



### **CERTIFICATE OF ANALYSIS**



SDG: Location: 170926-64

Client Reference: CHARTERED LAND - HElOrder Number:

2921-028 COC4-G

Report Number: Superseded Report:

427004

## Chromatogram

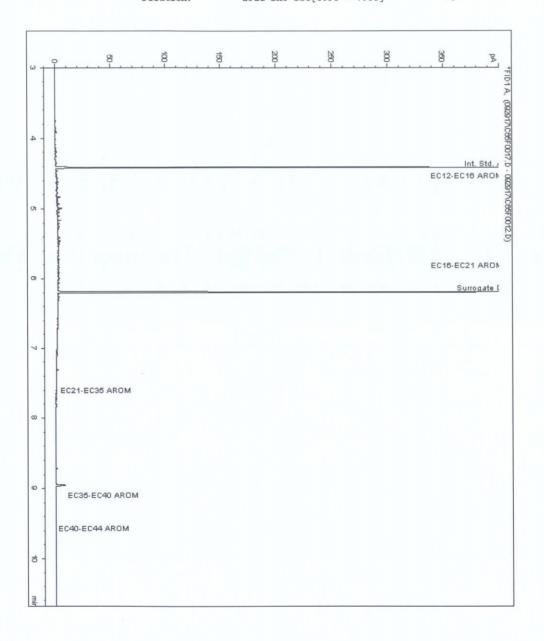
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : Sample ID :

16257225 2921-BH5-SS5 Depth: 5.90 - 7.60

Speciated TPH - AROM ( C12 - C40 )

Sample Identity: 15223240Date Acquired : 29/09/2017 11:40:15 PM
Units : ppb
Dilution: 2921-BH5-SS5[5.90 - 7.60]





Validated

SDG: Location: 170926-64

Client Reference: CHARTERED LAND - HElOrder Number:

2921-028 COC4-G

Report Number: Superseded Report:

427004

# Chromatogram

Analysis: Mineral Oil

Sample No : Sample ID :

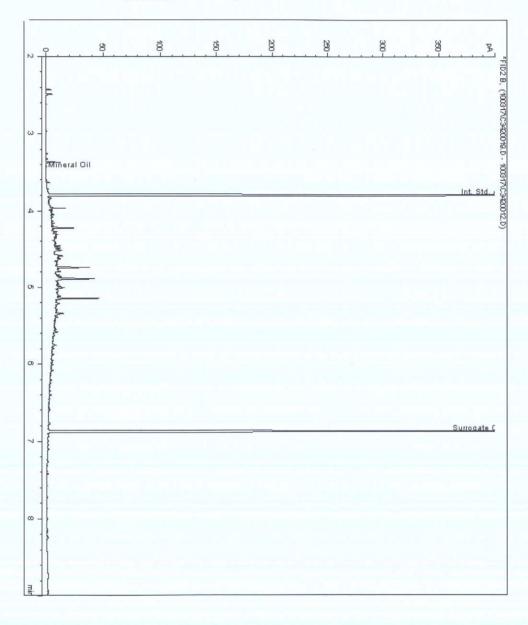
16269274 2921-BH5-SS5 Depth: 5.90 - 7.60

Mineral Oil Range Organics ( ClO - C40 )

15223242-03/10/17 17:56:25 PM mq/kq 0.000

Sample Identity Date Acquired Units Sample Multiplier Dilution







Validated

SDG: Location:

170926-64 Client Referenc CHARTERED LAND - HElOrder Number: Client Reference: 2921-028 COC4-G

Report Number: Superseded Report:

427004

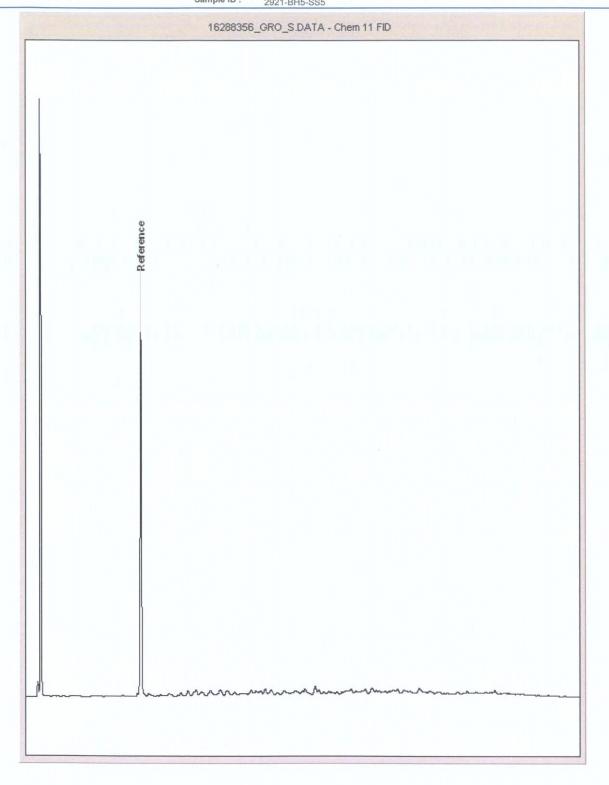
# Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : Sample ID :

16288356 2921-BH5-SS5

Depth: 5.90 - 7.60



SDG

170926-64 Location: ED LAND - HEUSTON SOUTH | Order Number:

Client Reference:

2921-028 COC4-G

Report Number: Superseded Report: 427004

# / endix

#### General

- 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 track record will be utilised
- requested, the individual sub sample scheduled will be analysed in house for the pre. a of aspestos fibres and aspestos 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 maisture content.
- gate 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 Dimethylphenol, 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
- cury results quoted on soils will not include volatile mercury as the analysis is 19 I on a dried and crushed sample.
- 20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

- 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 Asbests
Amosite	Brown Asbestos
Cro d dolite	Blue Asbe stos
Fibrous Actinolite	
Fibrous Anthophyllite	121
Fibrous Tremplite	-

#### 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

# References

No.	Title	Minerex Doc Ref.
1	Technical Guidance Technical Guidance WM3 Guidance on the classification and assessment of waste 1 <sup>st</sup> Ed. (Environment Agency UK, 2015)	F1856
2	British Standard (Investigation of potentially contaminated sites - Code of practice) BS10175:2011+A1:2013	F1726
3	Sampling and Testing of Waste for Landfill – EA UK, 2013	F1900
4	HazToolOnline, August 2016	Pers. Com. (lan Bishop)
5	Commission Decision of 18 December 2014, amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European parliament and of the Council (2014/955/EEC)	F1857
6	Commission Regulation (EU) No 1357/2014 of 18 December 2014, replacing Annex III to Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives	F1858
7	COUNCIL DECISION of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC (2003/33/EC)	F586

# Appendix A

2000 and 2002 Site Investigation Data

Damos & Moore O'Brien Kreitzberg Thoroum Coloubeun

PROJECT INFORMATION

Dames & Moore iveagh Court, 4th Fisci 6-8 Harcourt Road

Dublin 2 Ireland

BOREHOLE LOG

fage 1 of 1

-5.5

BOREHOLE NO. MW101 TOTAL DEPTH:

5.5m

DRILLING INFORMATION

Glovers Site Investigation DRILLING CO. CLIENT: Eircom Danny Corscaden SITE NAME: Kilmainham DRILLER: Shell & Auger SITE LOCATION: North western corner of site DRILLING METHOD/DIAMETER: DATE DRILLED 08/02/02 - 13/02/02 JOB NO .: 47792-002 Nicola O'Hara LOGGED BY: Paul Heaney CHECKED BY: Water level during excavation NOTES: Trenched and backfilled to 1m prior to drilling NVO No visual or olfactory evidence of contamination PID WATER DEPT DEPTH BOREHOLE GEOLOGY DESCRIPTION COMMENTS SAMP. # ppm LEVEL m COMPLETION m 0.0 0 FILL: Clayey FILL, significant gravel and NVO cobbles -0.5 MW101-0.8 -1.0 -1.5 NVO GRAVEL: Coarse subangular to subrounded gravel, coarse sand, small amount of clay -2.0 -2.5 -3.0 --3.5 BOULDERS: Intermittant boulders and gravel -4.0 -4 -4.5 Groundwater @4.8m GRAVEL: Coarse sub-rounded GRAVEL, significant sand, some clay, intermittant -5.0 boulders



Owner, 1.1 tag. -O Brien Kreitzborg Thorburn Colgunoun Dames & Moore

iveagn Coun, 4th Floor 6-8 Harcourt Post

Dublin 2 Ireland

BOREHULE LOG

Page 1 of 1

BOREHOLE NO. MW102

TOTAL DEPTH:

6.7m

PROJECT INFORMATION  CLIENT: Eircom  SITE NAME: Kilmainham  SITE LOCATION: North eastern corner of site  JOB NO.: 47792-002  LOGGED BY: Nicola O'Hara  CHECKED BY: Paul Heaney						DRILLING INFORMATION  DRILLING CO. Glovers Site Investigation DRILLER: Danny Corscaden DRILLING METHOD/DIAMETER: Shell & Auger DATE DRILLED 13/02/02 - 14/02/02				
OTES:	Trenc	ched ar	nd backfil	lled to 1	m prior to drillin	- T	Water level during excavation  NVO No visual or olfactory evidence of contamination			
EHOLE	SAMP.#		WATER LEVEL	DEPTH m	GEOLOGY D	DESCRIPTION		DEPTH m		
	MW101-			0 -	F. O. F.	ILL: Clayey FILL, significant gravel and obbles		0.0		
	0.3	100000000000000000000000000000000000000					NVO	-0.5		
77777				-1 -		RAVEL: Coarse subangular to subroun ravel, coarse sand, small amount of cla	ded NVO	-1.0		
352523247	Variable Co.	COLUMN CO	The second secon			OULDERS: Intermittant boulders and g	ravel	-1.5		
			A Desire of Control of	-2 -	S S	GRAVEL: Coarse sub-rounded GRAVEL ignificant sand, some clay, intermittant oulders		-2.0		
		1,177 5						-2.		
		The second secon		-3				-3.		
	THE RELATIONS OF THE PARTY OF T			-4	00000			-4.		
	10 mg 1 mg	where the control of						-4		
		**************************************	Z	-5			Groundwater @ 5.0m	-5		
			And the second of the second o					-5		
			The second secon	-6				-6		
					62.86			-1		

Dames 5 Modre O'Brien Kreitzberg Thorbum Colquinouri Dames & Moore

iveagh Court, 4tri Floor E. B. Hargourt Done

Dublin 2 Ireland

BOREHOLE LOG

BOREHOLE NO MW103 TOTAL DEPTH:

6.1m

PROJECT INFORMATION						DRILLING INFORMATION			
LIENT: ITE NAME ITE LOCA' OB NO.: OGGED B' CHECKED I	TION: Towa 47792 Y: Nicola	inham rds ce	ntre of si	te to we	est of warehousin	DRILLING CO.  DRILLER:  Danny Corscaden  DRILLING METHOD/DIAMETER:  DATE DRILLED  Glovers Site Investigation  Danny Corscaden  Danny Corscaden			
NOTES: Trenched and backfilled to 1m prior to drilliing						Water level during excavation			
						NVO No visual or olfactory evidence of contaminat			
EHOLE	SAMP.#		WATER LEVEL	DEPTI m	GEOLOGY DI	ESCRIPTION		COMMENTS	DEPTH m
XXX	MW103-	The state of the s		0 -	FIL	L: Clayey FILL, significant gravel and obles		Organic odour, occasional black staining and slight sheen in patches	-0.5
	O.6	A. L. Commontaine de manage des despues		-1 -		RAVEL: Coarse angular to subangula avel, coarse sand, small amount of cl		NVO	-1.0
777.76.950	de la desentación de la contraction de la contra	The second secon				DULDERS: Intermittant boulders and	/		-1.5
	Language of the state of the st		*	-2	G G G Sig	RAVEL: Coarse sub-rounded GRAVE gnificant sand, some clay			-2.0
	MW103- 3.0			-3				NVO	-3.
	Apriliantes had vitte etti soorvaatiin tarkinistiin kanalista kanalista kanalista kanalista kanalista kanalista			-4					-3.
	And the second s		$\searrow$	Andrews and Andrew		OULDERS: Intermittant boulders and	d course	Groundwater @ 4.5m	-4
	And the second s			-5	s	ubrounded gravel	consideration from combining them the ex-	NAO	-5
		1000					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	no o o o o o o o o o o o o o o o o o o	-5
					1922		CAP BY THE PROPERTY OF A SHARE SEA AREA		
				-6	11-9-1				-6



Denga Bildon Génen Kreitzberg Therhum Celqunour.

Dames & Moore iveagn Count, 4th Floor 6-8 Harcourt Road

Dublin 2 Ireland

# BORELOLELOG

Fage, 1 of 1

BOREHOLE NO. MW104 TOTAL DEPTH:

5.45m

The second secon	A STATE OF THE PARTY OF THE PAR	CONTRACTOR OF THE PROPERTY OF
	DRILLING	INFORMATION

CLIENT: SITE NAME: Eircom

Kilmainham

PROJECT INFORMATION

SITE LOCATION: Midway along eastern boundary of site JOB NO.: 47792-002

Nicola O'Har

DRILLING CO. DRILLER:

DRILLING METHOD/DIAMETER: DATE DRILLED

Glovers Site Investigation Danny Corscaden

Shell & Auger 04/02/02 - 06/02/02

OTES:	Trend	hed ar	nd backfil	led to	1 m prior to dri		ng excavation ctory evidence of contamina	ation
REHOLE	SAMP.#		WATER LEVEL	DEPTI m	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH
		The second secon		0 -		FILL: Clayey sandy FILL, some gravel and cobbles		0.0
					P. 00		NVO	
	Altricated president states of			-1 -				-1.0
								-1 '
SESSINE.	MW104- 1.8			-2		CLAY: Medium brown stiff CLAY, significant gravel  GRAVEL: Coarse gravel, some cobbles and	NVO	-2.
		1.000		The second secon		stiff clay (Fill?)  BOULDER  GRAVEL: Broken up gravel and boulder, significant clay in arisings		-2.
	an Area Comment of Paris of the Comment			-3				-3.
	Barramarkia adora Likoo jara premera wa							-3
	ente esta ente antalización de la const			-4		Boulder		-4
	Calabra (Carron Control Contro				0.00	GRAVEL: Broken up gravel and boulder, significant clay in arisings		-4
	According to the control of the cont			-5			Groundwater @ 4.9m	-5
				1	20/20	GRAVEL: Broken up gravel, some clay, occasional blocks and rubble	Very few arisings from hole	

Dames & Moora

iveagn Court, 4th Floor E.B Harcourt Dood

Dublin 2 Ireland

BOREHOLE LOG

Page 1 of 3

-6.5

BOREHOLE NO. MW105 TOTAL DEPTH:

15.5m

CReen Delizbers, Therburn Colquhoun PROJECT INFORMATION DRILLING INFORMATION Glovers Site Investigation Eircom DRILLING CO. CLIENT: SITE NAME: Kilmainham DRILLER: Danny Corscaden DRILLING METHOD/DIAMETER: DATE DRILLED SITE LOCATION: South eastern corner of site Rotary Drilling 47792-002 JOB NO .: 13/02/02 - 14/02/02 Caroline Enright LOGGED BY: Paul Heaney CHECKED BY: Water level during excavation NOTES: Trenched and backfilled to 1m prior to drilliing NVO No visual or olfactory evidence of contamination WATER DEPTH DEPTH BOREHOLE PID SAMP. # GEOLOGY DESCRIPTION COMMENTS ppm LEVEL COMPLETION 0.0 FILL: Clayey FILL, significant gravel and -0.5 BH05A NVO -1.0 -15 BH05B NVO -2 -2.0 SAND: Light-medium brown medium to coarse SAND, some clay and gravel -2.5 -3 -3.0 -35 -4.0 BH05C NVO -4.5 GRAVEL: Coarse sub-rounded GRAVEL, significant sand, some clay, intermittant boulders -5 -5.0 --5.5 -CLAY: Grey-brown boulder CLAY, significant gravel -6.0 --6 BH05D NVO



Dames & Moore 6-8 Har
O'Brien Krenznerg Dublin
Thorburn Colquboun Ireland

Dames & Moore Ivesign Dourg and Poor

6-8 Harcourt Road Dublin 2 Ireland BOREHOLE LOG

Fage = 013

BOREHOLE NO .:

TOTAL DEPTH: 15.5m

COMPLETION	SAMP.#	PID	WATER	DEPTH	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH
COMPLETION		ppm	LEVEL	m				m
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					1			14.0
								4
								-14.5

URS

Dames & Income O'Brien Kreitzberg Thorburn Colquhoun Dames & Morre
Iveagh Court, 4th Floor

Iveagh Court, 4th Floo o-e marcourt Abab Dublin 2 Ireland BOREHOLE LOG

POREHOLE NO.:

TOTAL DEPTH: 15.5m

· Pray 3 st 0

antipometral re	SAMP. #	PID	WATER	DEPTH	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH
				-15 -				-15.0
	Charles Laborate Charles							-15.8

CONTRACT: | Elicom Site

CLIENT: : Horgan Lynch & Partners

Site Address: : Military Road

Boring Commenced: 28/08/2000

Boring Completed: 28/08/2000

HOLE ID 9

Hole Diameter: 200 mm

EN

Drilled by: Peter Friel

Logged by: James Lombard

Ground Level: M.O.D.

				521	mples/Te	252	D	nrc **	1
	th th		50	Jai	Thesite	1	Pro	gressM	ater
DESCRIPTION OF STRATA	Unit Depth	Legend	Elevation (M.O.D.)	Type	Depth (m)	Ref No.	Casing Depth (m)	Date	Wa Dej
ARMAC	0.0 0.0								-
HARDCORE (chiselling 1 hour).	0.1								
irm brown sandy CLAY.	- 0.4			D	0.50	63488			
	E			C(18)	0.65				
	E								
Stiff brown sandy gravelly CLAY.	- 1.10	6		D	1.10	63489			
	F	-0							
	-	-===		D	1.50	63490			
	-	0		C(37)	1.65				
	20	7-5-5							
	-								
	-	-6							
				D C(44)	2.50	63491			
	-	6		0(44)	2.00				
	30								
	F	-=			İ		i		
		0		D	3.50	63492			
	F			C(45)	3.55	03492			
	-	====							
	4.0	-0							
	E								-
		-0		D	4.50	63493			
	-			C(39)	4.65				
	5.0								
	- 3.0	-0							
	F								
	E	6		D C(45)	5.50 5.65	63494			
	E			0(43)	3.03				
	6.0								
resumed BOULDER (chiselling 1 1/2 hours).	6.2	Hole End	-				6.20	29/08/200	d N
	_								
	F								
	-								
	7.0								
	E					1			
	-								
	E						-		
								-	
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	100		1	1			1		

Remarks: Chiselling Installed Spentonite Chiselling 2 1/2 hours.
Installed gas monitoring pipe to 6.2mBGL with pea gravel surround, bentonite seal and stopcock cover at ground level.

Bulk Disturbed Sample

Jar Sample(small disturbed)
Standard Penetration Test(N value)
Standard Penetration Test(refusal)
Water Sample J S(9) S(\*) W

U Undisturbed Sample
C(9) Cone Penetration Test(N value)
C(\*) Cone Penetration Test(refusal)

Waterstrike
Water level (20mins after strike)

CONTRACT: : Elrcom Site

CLIENT: : Horgan Lynch & Partners

Site Address: : Military Road

Boring Commenced: 24/08/2000

Boring Completed: 24/08/2000

HOLE ID 2

Hole Diameter: 200 mm

EN

Drilled by: Peter Friel

Logged by: James Lombard

Ground Level: M.O.D.

	5			Sar	nples/Te	ests	Pro	ogress/W	ater
DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Туре	Depth (m)	Ref No.	Casing Depth (m)		Wa Dep (n
ONCRETE	0.0 0.00	XXXX					-		(
irm brown sandy gravelly CLAY.	0.15			D C(14)	0.50 0.65	63483			
tiff brown sandy gravelly CLAY with cobbles.	1.50	9		D C(41)	1.50 1.65	63484			
	3.0			D C(47)	2.50 2.65	63485	management is a country and another country of the		
	40			D C(49)	3.50 3.65	63486			1
	5 0			D C(49) W	4.50 4.55 4.80	63487 62151		4	
Presumed BOULDER	- <u>8 60</u> - 5.70	Hole End		C(")	5 65		5.60 5.70	24/08/2000 27/09/2000	0 Ni 0 4.8
	-70								
					-				
	90								

Remarks:
Chiselling
Installed
Broke out
At 5.65 55 Chiselling 1 1/2 hours.
Installed 110mm diameter plastic pipe to 5.7mBGL
Broke out concrete with jackhammer.
At 5.65.55 blows to 10mm refusal.

В Bulk Disturbed Sample

Jar Sample(small disturbed)
Standard Penetration Test(N value)
Standard Penetration Test(refusal) S(9) S(\*) W

Water Sample

Key to Symbols

U Undisturbed Sample
C(9) Cone Penetration Test(N vi
C(') Cone Penetration Test(refus.

Waterstrike
Water level (20mins after strike) U C(3)

CONTRACT: : Eircom Site

CLIENT: : Horgan Lynch & Partners

Site Address: : Military Road

Boring Commenced: 21/08/2000

Boring Completed: 29/08/2000

Type of Boring: Shell & Auger

HOLE ID 3

Hole Diameter: 200 mm

Drilled by: Peter Friel/Mick Tully

Logged by: James Lombard

Ground Level: M.O.D.

Sheet 1 of 2

ype of Boring: Shell & Auger			Sheet	1012					
	-			Sar	nples/Te	ests	Pro	gress/W	ater
DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Туре	Depth (m)	Ref No.	Casing Depth (m)	Date	Wa Dej
CONCRETE	- 00 0.00	XXXX							-
FILL	0.15	$\times\!\!\times\!\!\times\!\!\times$							
Firm brown sandy CLAY.	- 0.50	XXXX		D	0.50	63466			
, , , , , , , , , , , , , , , , , , , ,	F	====		C(9)	0.55				
	-10								
irm brown sandy gravelly CLAY with cobbles and boulders	1.10	100		D	1.10	63467			
chiselling 1 1/4 hours).		0=		D	1.50	63468	-		
	E	ō		C(37)	1.65	05400			
	E								
	20								
	E	125-					-		
		-5		D C(29)	2.50	63469			
	-	0		-()					}
	30	-6-							İ
	E								
	-	0		D	3.50	63470			
	F	===		C(34)	3.65				
	40	0							
	-								
	-			D	4.50	63471			
	E			C(32)	4 65				
	50								
	-	-5							
	E	-52			5.50	62.170			
		0		D C(38)	5.50 5.65	63472			
	F	-O-							
	6.0								
	-	-							
	F		1	D C(43)	6.50 6.65	63473			
	E	-0		C(43)	0.03				1
Presumed BOULDER (chiselling 1 1/4 hours).	70 7.00			C(*)	7.10		7.10	22/08/2000	1 0
Brown sandy gravelly CLAY.	7.10	-6	}	-17					
			]						
	-	-0							
	80	-							
	F	3							
		-0							
	E								
	90								
	- 90								
	E								
	E		}						
			}						
	10 0	10	1				1		

#### Remarks:

Broke out concrete with jackhammer.

At 7.1 60 blows to 5mm refusal.
Chiselling 2 1/2 hours.
Installed 110mm diameter plastic pipe to 7.1mBGL.
open hole drilling from 7.1 to 8.8 and and 11.00 to 14.00mBGL.
Cored from 8.8 to 11.00mBGL and 14.0 to 18.0mBGL.

Bulk Disturbed Sample

Jar Sample(small disturbed)

S(9) Standard Penetration Test(N value)
S(\*) Standard Penetration Test(refusal)
W Water Sample

U Undisturbed Sample
C(9) Cone Penetration Test(N value)
C(\*) Cone Penetration Test(refusai)

Z Waterstrike

Pro Water level (20mins after strike)

CONTRACT: : Eircom Site

CLIENT: : Horgan Lynch & Partners

Site Address: : Military Road

Boring Commenced: 21/08/2000

Boring Completed: 29/08/2000

HOLE ID 3

Hole Diameter: 200 mm

Drilled by: Peter Friel/Mick Tully

Logged by: James Lombard

Ground Level: M.O.D.

13.60 (E)			Туре	Depth (m)	Ref No.	Casing Depth (m)	Dale	Water Waa Dep (r
13.66								
13.60	\$ \\$							
13.60			Activities recent and description of an artific suppression of the contract of		*			
F		ł						
150	6.0							
170	6	adra da						
18.018.	Optiole End							
	15 0	15 0 16 0 18 0 18.0 Miole End	18 0 18 0 Fiole End	18 J 18.0 Mole End	18 0 18.0 Hote End	16 0	18 0 18.0 Fiole End	18 0 18,0 priote End

Remarks:

Broke out concrete with jackhammer.

At 7.1 60 blows to 5mm refusal.

Chiselling 2 1/2 hours.

Installed 110mm diameter plastic pipe to 7.1mBGL open hole drilling from 7.1 to 8.8 and and 11.00 to 14.00mBGL.

Cored from 8 8 to 11.00mBGL and 14.0 to 18.0mBGL.

Bulk Disturbed Sample
Jar Sample(small disturbed)
Standard Penetration Test(N value)
Standard Penetration Test(refusal) S(9) S(\*) W

Water Sample

Undisturbed Sample Cone Penetration Test(N v Cone Penetration Test(refu Waterstrike C(3)

Water level (20mins after strike)

CONTRACT: : Eircom Site

CLIENT: : Horgan Lynch & Partners

Site Address: : Military Road

Boring Commenced: 23/08/2000

Boring Completed: 23/08/2000

HOIEDA

Hole Diameter: 200 mm

EH

Drilled by: Peter Friel

Logged by: James Lombard

Ground Level: M.O.D.

	_			Sa	mples/Te	212	Des	Oros-Kei	
DESCRIPTION OF STRATA	Unit Depth	Legend	Elevation (M.O.D.)	Туре	Depth (m)	Ref No.	Casing Depth (m)	gress/W Date	Wa Dej
TARMAC	- 0.0 0.00	Total Sales							-
HARDCORE	0.15								
Firm brown sandy CLAY.	0.40			D C(18)	0.50 0.65	63474			
Stiff brown sandy gravelly CLAY.	1.10	0		D C(27)	1.50 1.55	63475			
	2.0	0		D C(30)	2.50 2.65	63476			
	130 1			D C(36)	3.50 3.65	63477			
	30			D C(43)	4.50 4.65	63478			
				D C(35)	5.50 5.65	63479			
		9		D C(41)	6 50 6.65	63480			
Stiff/hard grey sandy gravelly CLAY.	7.0	977		D	7.10	63481			
	- 60	9-1-1		D C(53)	7.50 7.65	63482			
Presumed BOULDER (chiselling 1 1/4 hours)	8.30 8.30	Hole End					8.30	23/08/2000	И
	\$0								
	100				1				

Chiselling 1 1/4 hours.

Remarks:
Chiselling Installed Gentonile Installed gas monitoring pipe to 8.3mBGL with pea gravel surround, bentonite seal and stopcock cover at ground level.

Bulk Disturbed Sample

В Jar Sample(small disturbed)

S(9) Standard Penetration Test(N value)

Standard Penetration Test(refusal)
Water Sample

Undisturbed Sample Cone Penetration Test(N value) Cone Penetration Test(refusal) C(2)

Waterstrike

Razon Water level (20mins after strike)

CONTRACT: : Eircom Site

CLIENT: : Horgan Lynch & Pariners

Site Address: : Military Road

Boring Commenced: 17/08/2000

Boring Completed: 31/08/2000

HOLE ID S

Hole Diameter: 200/TNW mm

Drilled by: Peter Friel/Mick Tully

Logged by: James Lombard

Ground Level: M.O.D.

ype of Boring: Shell & Auger and Rotary Drill	1_		Sheet	1	mples/Te	sts	Dra	Orno - AA	
	pth		F .	- Odi	Thies/16	.313	Pro	gress/W	ater
DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Туре	Depth (m)	Ref No.	Casing Depth (m)	Date	Wa Dej
ILL of tarmac and hardcore (chiselling 1 hour).	0.0 0.00	XXXX							
	E	$\bowtie$							
	E	$\bowtie$							
	E	$\bowtie$		C(41)	0.85				
	1.0	$\bowtie$							
irm brown sandy CLAY.									
illi blowii sandy CLAT.	1.40			D C(16)	1.50	53460			
tiff brown sandy gravelly CLAY.	100			-(,					
till blown salloy gravelly CCAT.	2.0 1.90	-0							
	E			_					
	F	-6		D C(39)	2.50	63461			
	E.								
	30	-5							
	E			D	3.50	63462			
	E	-0-		C(48)	3.65	03462			
	40								
	E	<u></u>							
	_			D	4.50	63463			
diff grey sandy gravelly CLAY.	4.70	6		C(§7)	4.95	63464			
3 , 3 , 3	50								
	E								
				D	5.50	63465			
	Ė	_===		C(68)	5.65				
	60	-0							]
*		-==							1
Presumed BOULDER (chiselling 2 hours). Sandy GRAVEL with cobbles.	6.40	0.00	1	C(").	6,50		6.50	18/08/2000	1
and GNAVEE will coopies.	E	000							
	70	000							
	E	000	1						
		0000							
	F	1 / 0 6	1						
	E 0	000	3						
	-	000							
	E	0.0 8	1						
	E	000	1						
	5 0	0.00	1						
	E	0000	1						
	F	000	1						
	F	000	1						1
	100								-

STANDARD

Remarks:
Chiselling
Installed 1
Open hole
At 6.50.50 Chiselling 3 hours.
Installed 110mm diameter plastic pipe to 6.5mBGL.

Open hole drilling from 6.5 to 14.0mBGL At 6.50 50 blows to 10mm refusal.

B Bulk Disturbed Sample
J Jar Sample(small disturbed)
S(9) Standard Penetration Test(N value)
S(\*) Standard Penetration Test(refusal)
W Water Sample

Key to Symbols

U Undisturbed Sample
C(9) Cone Penetration Test(N
e) C(\*) Cone Penetration Test(ref.
I) 
Waterstrike

Waterstrike

Water level (20mins after strike)

CONTRACT: : Eircom Site

CLIENT: : Horgan Lynch & Partners

Site Address: : Military Road

Boring Commenced: 17/08/2000

Boring Completed: 31/08/2000

HOLE ID 5

Hole Diameter: 200/TNW mm

EN

Drilled by: Peter Friel/Mick Tully

Logged by: James Lombard

Ground Level: M.O.D.

ype of Boring: Shell & Auger and Rotary Drill	-			Sa	mples/Te	ests	Dea	ogress/W	l-1
	pt	-	FO (:		T	Ι			ater
DESCRIPTION OF STRATA	Unit Depth	Legend	Elevation (M.O.D.)	Туре	Depth (m)	Ref No.	Casing Depth (m)	Date	Wa De
as previous	10.0								
frown sandy gravelly CLAY with cobbles.	11.91.00	9					7		
	130	GO THOUSE END		4					
	14.0	Hole End					14.00	31/08/2000	
	16 0								
	170			*					
	18 0					+			
	20.0								

Remarks:

Chiselling 3 hours.
Installed 110mm diameter plastic pipe to 6.5mBGL.
Open hole drilling from 6.5 to 14.0mBGL.
At 6.50 50 blows to 10mm refusal.

Bulk Disturbed Sample

В

Jar Sample(small disturbed)
Standard Penetration Test(N value)
Standard Penetration Test(refusal)
Water Sample S(9) S(°) W

U Undisturbed Sample
C(9) Cone Penetration Test(N value)
C(\*) Cone Penetration Test(refusal)

Waterstrike

ই Waterstrike মনতা Water level (20mins after strike)

Site Investigations Ltd

Key to Symbols

Appendix B

**Rotary Corehole Logs** 

### BOREHOLE RECORD oject Name: Westgate Hole ID: RC1 Co-ordinates: J.J. Rhatigan & Co Ltd onsultant: Byrne Looby, Elevation: Location: Project no. 1032-11-05 End date: 30/11/2005 Start date: 25/11/2005 Drilled by: P Sheils Type of drilling: RO + RC Hole diameter: Logged by: F McNamara Legend Level mOD) Samples / tests Strata Description Depth Water Date Result Depth OVERBURDEN no recovery. SPT-C 4.15 N=31 SPT-C 7.15 50/215mm --Continued next sheet KEY Rotary openhole borehole to 15.00mBGL then continued by rotary coring. Reduced to NQ size at 27.10mBGL because of sand. Standpipe inserted to 15.00mBGL with pea gravel surround, bentonite seal and cover. B D U SPT-S SPT-C Bulk disturbed sample. Small disturbed sample Undisturbed sample Undisturbed sample Standard Penetration Test, split spoon. Standard Penetration Test, solid cone. Groundwater strike Water level 20mins after strike.

#### BOREHOLE RECORD Project Name: Westgate Hole ID: RC1 Co-ordinates J.J. Rhatigan & Co Ltd onsultant: Byrne Looby, Elevation: Location: Project no. 1032-11-05 End date: 30/11/2005 Start date: 25/11/2005 Drilled by: P Sheils Type of drilling: RO + RC Hole diameter: Logged by: F McNamara **Legend** Samples / tests Level Strata Description Depth Water Result Date Depth OVERBURDEN no recovery. SPT-C 10.15 50/295mm 13.15 SPT-C 14.65 50/275mm 15.00 OVERBURDEN recovery consists of dark grey sandy gravelly CLAY with cobble fragments. 19.15 OVERBURDEN recovery consists of Clay and gravel and cobble fragments. Continued next sheet Remarks: Bulk disturbed sample. Small disturbed sample Undisturbed sample Standard Penetration Test, split spoon. Standard Penetration Test, solid cone. Groundwater strike Water level 20mins after strike. Rotary openhole borehole to 15.00mBGL then continued by rotary coring. Reduced to NQ size at 27.10mBGL because of sand. Standpipe inserted to 15.00mBGL with pea gravel surround, bentonite seal and cover

	BOREHOL	E RE	CO	RD					
nject Name: Westgate				1: 1	F	lole I	D:RO	21	
.nt: J.J. Rhatigan & Co Ltd			Co-d	ordinate	es:				
Jonsultant: Byrne Looby,			Elev	ation:		_			
Location:	=		Proj	ect no.		1032	2-11-05		
Start date: 25/11/2005	End date: 30/11/2005			ed by:		P Sh			
Type of drilling: RO + RC	Hole diameter:	mm	Log	ged by	:		Namar		
Strata Descrip	otion	Legend	Depth	Level	Type	Depth	S / tests	Water Depth	Date
OVERBURDEN recovery consi	sts of Clay and gravel		21 -	)			«		
OVERBURDEN recovery consicobble fragments.	ists of sand, gravel and		22 - 22 . 15						Andrew of the second se
OVERBURDEN recovery cons gravelly clay.	ists of brown sandy		23.65		The second secon				
OVERBURDEN recovery cons	sists of coarse Sand and		26.65	-					
Very strong to strong black silt to slightly weathered.	ty LIMESTONE, fresh		27.10						
			28	1 (11 11 11 11 11 11 11 11 11 11 11 11 1					
Continued r	next sheet		28						
"Pemarks: any openhole to 15.00mBGL then continued duced to NQ size at 27.10mBGL because of sand. Standpipe inserted to 15.00mBGL with pea gravel surround cover.	d by rotary coring.	KEY  B D U SPT-S SPT-C	Bul Sm Un St Sta G	k disturbed hall disturbe disturbed s andard Per andard Per roundwater ater level 2	d sample ample netration Te etration Te strike	est, solid co	ooon. one.	GROUI	ND ND

BOREHOL	E RE	CO	RD					
Project Name: Westgate		Co-c	ordinate	Hes:	ole I	D:RO	21	
Client: J.J. Rhatigan & Co Ltd  Consultant: Byrne Looby,  Location:  Start date: 25/11/2005 End date: 30/11/2005  Type of drilling: RO + RC Hole diameter:	mm	Elev Proje Drille	ation: ect no. ed by: ged by:		P Sh	-11-05 eils Namar	a	
Strata Description	Legend	Depth	Level mOD )			Result A		Date
Very strong to strong black silty LIMESTONE, fresh to slightly weathered.		31 -				Œ		
End of Borehole at 32.30 m		32.30						,
		34 -					The second secon	
		35 -	1.	And a second for a property of the second of the second second of the second second of the second second of the second second of the second se	A CANADA AND AND AND AND AND AND AND AND AN			
		36						
		38						
		35		The second secon	And the second s	The state of the s		
Remarks: Rotary openhole borehole to 15.00mBGL then continued by rotary coring. Reduced to NQ size at 27.10mBGL because of sand. Standpipe inserted to 15.00mBGL with pea gravel surround, bentonite seal and cover.	KEY B D U SPT-S SPT-C	Bul Sm Un St Sta Gi	k disturbed hall disturbed disturbed sa andard Penandard Penandard Penaroundwater ater level 20	ample etration Te etration Te strike		oon. ne.	GROUN	10 10 10

## BOREHOLE RECORD (Rotary core)

oject Name: Westgate						Hole ID: I	RC.	1			
ient: J.J. Rhatigan & Co Ltd					Co-ordinates:	-					
Consultant: Byrne Looby,					Elevation:						
Location:					Project no.	1032-11-05					
Start date: 25/11/2005	End	date:	30/11/2	2005	Drilled by:	P Sheils					
Type of drilling: RO + RC	Hole	diam	eter:	mr	Logged by:	F McNan	nara			7.7	
Strata Description	Legend	Depth	Level		Discontinuities		FSI	RQD	SCR	TCR CORE RUN	
Continued next sheet			5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6							0.00	
	1000	-	16	K	ΕY			1007	200	IME	
Continued next sheet  Remarks:  Rotary openhole borehole to 15.00mBGL then continued Reduced to NQ size at 27.10mBGL because of sand. Standpipe inserted to 15.00mBGL with pea gravel surrou.	by rotary corin	ng.	10	K) TC SC RQ FS	R Total Core Recover R Solld Core Recover D Rock Quality Desig	/		Car	RO	UND	

### BOREHOLE RECORD (Rotary core) Project Name: Westgate Hole ID: RC1 Co-ordinates J.J. Rhatigan & Co Ltd Consultant: Byrne Looby, Elevation: Location: Project no. 1032-11-05 End date: 30/11/2005 Start date: 25/11/2005 Drilled by: P Sheils Type of drilling: RO + RC Hole diameter: mm Logged by: F McNamara Legend CORE RUN Strata Description Depth Discontinuities Level ROD OVERBURDEN no recovery. 15.00 - 15 **OVERBURDEN** recovery 13 15.00 consists of dark grey sandy gravelly CLAY with cobble fragments. 40 | 18.15 19.15 **OVERBURDEN** recovery 18 19.15 consists of Clay and gravel and cobble fragments. Continued next sheet Remarks: KEY Rotary openhole borehole to 15.00mBGL, then continued by rotary coring. Reduced to NQ size at 27.10mBGL because of sand. Standpipe inserted to 15.00mBGL with pea gravel surround, bentonite seal

#### BOREHOLE RECORD (Rotary core) oject Name: Westgate Hole ID: RC1 Co-ordinates J.J. Rhatigan & Co Ltd lient: Consultant: Byrne Looby, Elevation: Location: Project no. 1032-11-05 End date: 30/11/2005 Start date: 25/11/2005 Drilled by: P Sheils Type of drilling: RO + RC Hole diameter: mm Logged by: F McNamara CORE RUN Legend Strata Description Depth Level Discontinuities ROD SCR FSI **OVERBURDEN** recovery consists of Clay and gravel and cobble fragments. 20.60 22.15 32 22.15 **OVERBURDEN** recovery consists of sand, gravel and cobble fragments. - 23 23.65 **OVERBURDEN** recovery consists of brown sandy gravelly clay. 28 25.15 26,65 **OVERBURDEN** recovery consists of coarse Sand and 27.10 fine Gravel. 44 69 27.10 Mostly non intact. Very strong to strong black silty LIMESTONE, fresh to slightly weathered. 54 92 100 28.40 Fractures extremely closely spaced to medium spaced 15 to 20 degrees, smooth, planar, tight

Remarks:

Rotary openhole borehole to 15.00mBGL then continued by rotary coring. Reduced to NQ size at 27.10mBGL because of sand. Standpipe inserted to 15.00mBGL with pea gravel surround, bentonite seal and cover.

Continued next sheet

KEY

to open.

Total Core Recovery Solid Core Recovery Rock Quality Designation Fracture Spacing Index



## BOREHOLE RECORD (Rotary core)

	Project Name: Westgate				Но	le ID: RC	1_			
Consultant: Byrne Looby, Location:    Elevation:	ient: J.J. Rhatigan & Co Ltd				Co-ordinates:					-
Start date: 25/11/2005 Type of drilling: R0 ± RC Hole diameter: mm Logged by: F McNamara  Strata Description  Strata Descripti					Elevation:	-				
Type of drilling. R0 ± RC Hole diameter: mm Logged by: F McNamara  Strata Description  B	Location:				Project no.	1032-11-05				
Strata Description  See a second plack strong black still LIMESTONE, fresh to slightly weathered.  End of Boverhole Log at 33 30 m  End of Boverhole Log at 33 30 m  Discontinuities  John John John John John John John John	Start date: 25/11/2005	End	date:	30/11/2005	Drilled by:	P Sheils				i
Silty LIMESTONE, fresh to slightly weathered.  The of Brende Log at 32.30 m  End of Brende Log at 32.30 m  The of Brende Log a	Type of drilling: RO + RC		diam	neter:	mm Logged by:	F McNamara	-			***
Silty LIMESTONE, fresh to slightly weathered.  The of Brende Log at 32.30 m  End of Brende Log at 32.30 m  The of Brende Log a	Strata Description	Legend	Depth	Level	Discontinuities	FSI	RQD	SCR	TCR	CORE RUN
32.30 End of Borehole Log at 12.30 m	silty LIMESTONE, fresh to					10	41	41	88	298.90
End of Borehole Log at 32.30 m  32.30  33.30  34.  35.  36.  37.  38.  39.  39.  39.  39.  39.  39.  39			And the state of t	- 31			47	95	100	30.80
- 33 34 35 37 38 39.			32.30							
- 36 - 37 - 38 - 38	End of Borehole Log at 32.30 m									
- 35 - 37 - 37 - 38				-33		10 to 10 to				
				-34			was design to be a second let be a person of		A company of the same of the s	The second secon
37			And the second s	-35				and an account of the contribution of the contribution of the	The second secon	
- 38				- 36			A CONTRACTOR OF THE PERSON NAMED OF THE PERSON	and the same in a case of the	and the state of t	the state of the s
29		and a country (state or beauty). The state of the state o		37				AND AND THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER.	a transference of a majore described	
		1		- 38		And the second second second		A special country of the state		The second section of the section of the sect
40				- 59				was provided to the control of the c		The second secon
Remarks: KEY				140	KEY					

Rotary openhole borehole to 15.00mBGL then continued by rotary coring. Reduced to NQ size at 27.10mBGL because of sand. Standpipe inserted to 15.00mBGL with pea gravel surround, bentonite seal and cover.

Total Core Recovery. Solid Core Recovery Rock Quality Designation Fracture Spacing Index



	BOREHOLE	RE	COI	RD					
Project Name: Westgate			Co-c	ordinate	Hos:	ole II	D: RC	2	
Start date. 30/11/2003	date: 05/12/2005 diameter:	mm	Proje Drille	ation: ect no. ed by: ged by:		P She	Namara		
Strata Description		Legend	Depth	Level ( mOD )	Type	Depth Jepth	Kesnit Vests	Water Depth	Date
OVERBURDEN no recovery.		N X	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		SPT-C	7.15	50/240mn		
Continued next sheet	t	8 N O							
Remarks: Rotary openhole borehole to 10.15mBGL then continued by rotary coring Had to openhole from 10.15 to 17.65mBGL to progress and case hole. Continued coring from 17.65 to 33.65mBGL		KE B D U SPT- SPT-	B	sulk disturbe small disturb Undisturbed Standard Pe Standard Pe Groundwate Water level	ed sample sample enetration T netration Te er strike	est, solid c	poon. one.	GROU	IND NU

### BOREHOLE RECORD Project Name: Westgate Hole ID: RC2 Co-ordinates: J.J. Rhatigan & Co Ltd onsultant: Byrne Looby, Elevation: Location: Project no. 1032-11-05 End date: 05/12/2005 Start date: 30/11/2005 Drilled by: P Sheils Type of drilling: RO + RC Logged by: Hole diameter: F McNamara Samples / tests Legend Strata Description Depth Level Water Date Result Depth OVERBURDEN no recovery. SPT-C 10.15 50/15mm 10.65 OVERBURDEN recovery consists of cored cobbles and boulders. OVERBURDEN recovery consists of dark grey sandy gravelly clay OVERBURDEN recovery consists of brown sandy gravelly clay. Continued next sheet KEY Remarks: Bulk disturbed sample. Small disturbed sample Undisturbed sample Undisturbed sample Standard Penetration Test, split spoon. Standard Penetration Test, solid cone. Groundwater strike Water level 20mins after strike. Rotary openhole borehole to 10,15mBGL then continued by rotary coring to 17.65mBGL Had to openhole from 10.15 to 17.65mBGL to progress and case hole. Continued coring from 17.65 to 33.65mBGL

	BOREHOLI	E RE	CO	RD					
Project Name: Westgate			Co-c	ordinate	es:	ole I	D: RC	12	
Location: Start date: 30/11/2005	End date: 05/12/2005 Hole diameter:		Proje	ect no.		P Sh			
Type of drilling: RO + RC		mm		ged by:	S	amples	Namar s / tests	a 3	0
Strata Descripti	011	Legend	Depth	Level (mOD	Type	Jepth	S / tests	Water	Date
OVERBURDEN recovery consists gravelly clay.  OVERBURDEN recovery consist cobbles and boulders.  Weak black calcareous MUDS highly weathered.	ts of sand and cored		. 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0	27					
Continued n	ext sheet			30					
Remarks: Rotary openhole borehole to 10.15mBGL then continued Had to openhole from 10.15 to 17.65mBGL to progress a Continued coring from 17.65 to 33.65mBGL	by rotary coring to 17.65mBGL. nd case hole.	REDUUSPTSPT	-S -C	Bulk disturb Small distur Undisturbed Standard P Standard Po Groundwat Water leve	bed sample I sample Penetration enetration er strike	e Test, split Test, solid	spoon. cone.	GROU	ND NO

	BOREHOLI	E RE	COI	RD					
Project Name: Westgate					Н	ole II	D: RC	2	
Client: J.J. Rhatigan & Co Ltd Consultant: Byrne Looby, Location: Start date: 30/11/2005 Type of drilling: RO + RC	End date: 05/12/2005 Hole diameter:	mm	Elev Proje Drille	eation: ect no. ed by: ged by:		P She	-11-05 eils Namara	a	
Strata Descrip	tion	Legend	Depth	Level mOD)		amples Debth	Result / tests	Water Depth	Date
Weak black calcareous MUDST highly weathered.	ONE, moderately to		31 -		F	Õ	Ř.		
Very strong to strong dark grey fresh to slightly weathered.  End of Borehole		KE		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				GRO	
Remarks: Rotary openhole borehole to 10.15mBGL then continu Had to openhole from 10.15 to 17.65mBGL to progres Continued coring from 17 65 to 33.65mBGL	ed by rotary coring to 17.65mBGL. s and case hole.	B D U SPT SPT V	-S	Bulk disturbe Small disturbed Undisturbed Standard Po Standard Po Groundwald Water leve	I sample lenetration enetration er strike	Test, split s Test, solid o	poon.		NB

# BOREHOLE RECORD (Rotary core) oject Name: Westgate Hole ID: RC2 Co-ordinates: J.J. Rhatigan & Co Ltd Consultant: Byrne Looby, Elevation: Location: Project no. 1032-11-05 End date: 05/12/2005 Start date: 30/11/2005 Drilled by: P Sheils Type of drilling: RO + RC Hole diameter: mm Logged by: F McNamara Legend Level Depth Strata Description Discontinuities ROD SCR FSI OVERBURDEN no recovery. KEY Remarks: Total Core Recovery. Solid Core Recovery Rock Quality Designation Fracture Spacing Index Rotary openhole borehole to 10.15mBGL, then continued by rotary coring to 17.65mBGL. Had to openhole from 10.15 to 17.65mBGL to progress and case hole. Continued coring from 17.65 to 33.65mBGL.

#### BOREHOLE RECORD (Rotary core) Hole ID: RC2 Project Name: Westgate Co-ordinates J.J. Rhatigan & Co Ltd Consultant: Byrne Looby, Elevation: Location: Project no. 1032-11-05 End date: 05/12/2005 Drilled by: P Sheils Start date: 30/11/2005 F McNamara Type of drilling: RO + RC Hole diameter: mm Logged by: CORE RUN Legend Level Discontinuities Depth Strata Description Rad SCR TCR FSI OVERBURDEN no recovery. 13 10.15 10.65 **OVERBURDEN** recovery consists of cored cobbles and boulders. 7 11.65 13 13.15 57 16.15 **OVERBURDEN** recovery consists of dark grey sandy gravelly clay 60 17.65 19.15 **OVERBURDEN** recovery consists of brown sandy gravelly clay. Continued next sheet KEY Remarks: Total Core Recovery. Solid Core Recovery Rock Quality Designation Fracture Spacing Index Rotary openhole borehole to 10.15mBGL then continued by rotary coring to 17.85mBGL. Had to openhole from 10.15 to 17.85mBGL to progress and case hole. Continued coring from 17.65 to 33.85mBGL.

#### BOREHOLE RECORD (Rotary core) oject Name: Westgate Hole ID: RC2 Co-ordinates J.J. Rhatigan & Co Ltd \_ .ient: Consultant: Byrne Looby, Elevation: Project no. Location: 1032-11-05 End date: 05/12/2005 Start date: 30/11/2005 Drilled by: P Sheils Hole diameter: Type of drilling: RO + RC mm Logged by: F McNamara RUN Legend Level Depth Strata Description Discontinuities CORE RQD SCR TCR FSI **OVERBURDEN** recovery consists of brown sandy gravelly clay. 41 20.65 22 23.65 **OVERBURDEN** recovery consists of sand and cored cobbles and boulders. 11 25.15 33 26.65 0 30 28.15 0 Fractures extremely closely to Weak black calcareous medium spaced 30 to 35 degrees, MUDSTONE, moderately to smooth, planar, moderately open highly weathered. to open. 0 33 29.65 Continued next sheet KEY Remarks: Total Core Recovery. Solid Core Recovery Rock Quality Designation Fracture Spacing Index Rotary openhole borehole to 10.15mBGL then continued by rotary coring to 17.65mBGL Had to openhole from 10.15 to 17.65mBGL to progress and case hole. Continued coring from 17.65 to 33.65mBGL

### BOREHOLE RECORD (Rotary core) Project Name: Westgate Hole ID: RC2 Co-ordinates: Cuent: J.J. Rhatigan & Co Ltd Consultant: Byrne Looby, Elevation: Location: Project no. 1032-11-05 End date: 05/12/2005 Start date: 30/11/2005 Drilled by: P Sheils Type of drilling: RO + RC Hole diameter: mm Logged by: F McNamara Legend RUN Strata Description Level Depth Discontinuities RQD SCR Weak black calcareous MUDSTONE, moderately to highly weathered. 31.15 Very strong to strong dark 53 86 86 31.15 grey silty LIMESTONE, fresh to slightly weathered. 43 | 63 | 63 | 32.65 - 33 5 33.65 End of Borehole Log at 33.65 m Remarks: KEY

Rotary openhole borehole to 10.15mBGL then continued by rotary coring to 17.65mBGL Had to openhole from 10.15 to 17.65mBGL to progress and case hole. Continued coring from 17.65 to 33.65mBGL

TCR SCR RQD FSI Total Core Recovery Solid Core Recovery Rock Quality Designation Fracture Spacing Index



	BOREHOL	E RE	СО	RD					
Project Name: Westgate			-		Н	ole II	D: RC	3	
ent: J.J. Rhatigan & Co Ltd			Co-d	ordinate	es:				
consultant: Byrne Looby,			Elev	ation:		-			
Location:	End date: 06/12/2005		-	ect no.			11-05		
Start date: 05/12/2005				ed by:		P She			
Type of drilling: RO + RC	Hole diameter:	mm		ged by	: Sa	mples	Vamara / tests		
Strata Descriptio	n	Legend	Depth	Level ( mOD	Туре	Depth-	/ tests	Water Depth	Date
OVERBURDEN no recovery					SPT-C	4.15	50/235mn		
Continued nex Remarks:		E B		9 – 9 – 9 – 9 – 9 – 9 – 9 – 9 – 9 – 9 –	SPT-C	7.15	50/65mr	GROU	D D D D D D D D D D D D D D D D D D D
Rotary openhole borehole to 14.65mBGL then continued by r	otary corling.	D U SPT- SPT- Z	9	Small disturt Undisturbed Standard P Standard Pe Groundwat	bed sample I sample enetration T enetration T	est, solid o	poon. one.	IRELA	ND

	BOREHOL	ERE	CO	RD					
Project Name: Westgate					H	lole I	D:RC	3	
Client: J.J. Rhatigan & Co Ltd  Consultant: Byrne Looby,  Location:  Start date: 05/12/2005 End date: 06/12/2005  Type of drilling: RO + RC Hole diameter:		mm	Elev Proje Drille	ation: ect no. ed by: ged by:	es: 	1032 P Sh	2-11-05 leils Namara		
Client: J.J. Rhatigan & Co Ltd Consultant: Byrne Looby, Cocation: Start date: 05/12/2005  End date: 06/12/2006	1	Legend	Depth	Level mOD )	Type	amples	S / tests	Water Depth	Date
OVERBURDEN no recovery			11	<b>"</b>	SPT-C	10.15	50/155mm		
	of gravel		14.65						
			16. 15						
Remarks: Rotary openhole borehole to 14.65mBGL then continued by rotar		KEY  B D U SPT-S SPT-C	Star Star	disturbed s all disturbed sa isturbed sa ndard Pene ndard Pene bundwater s iter level 20	etration Tes tration Tes strike		icn.	GROUN KELAN	D

	BOREHOL	E RE	CO	RD				A11.	
Project Name: Westgate					H	tole l	D:R	23	
ient: J.J. Rhatigan & Co Ltd			Co-c	ordinat	es:	-		-13-1	
onsultant: Byrne Looby,			Elev	ation:					
Location:				ect no.		1032	-11-05		-
Start date: 05/12/2005	End date: 06/12/2005		Drille	ed by:		P Sh	eils		
Type of drilling: RO + RC	Hole diameter:	mm	Logg	ged by			Namar		
Strata Descrip	tion	end	£	O O			s / tests	te (	a)
		Legend	Depth	Level ( mOD	Туре	Depth	Result	Water Depth	Date
OVERBURDEN recovery consist gravelly clay.	sts of grey sandy		21			Ω	<u> </u>		
OVERBURDEN recovery consist gravelly clay.	sts of brown sandy	7 37 (2) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	21.65						
OVERBURDEN recovery consist fragments	sts of clay and cobble		24,65	And the state of t					
OVERBURDEN recovery consi	sts of cored cobbles	0,00	26.15						
and gravel.  Strong dark grey and black silty	/ LIMESTONE slightly								
weathered.	, ongress		28						
Continued ne	ext sheet	TIT		-					
Remarks: totary openhole borehole to 14,65mBGL then continued by	by rotary conling.	KEY  B D U SPT-S SPT-C  □ □	Smal Undi Star Stan Gro	disturbed s I disturbed sturbed sandard Pene dard Pener undwater s er level 20	sample mple etration Te tration Tes etrike	st, split spo st, solid con strike.	on. e.	GROUN IKELAN	D B D C

	BOREHOLI	E RE	COI	RD					
roject Name: Westgate			Co	rdinate	Н	ole I	D:RC	3	
lient: J.J. Rhatigan & Co Ltd					35.	-			
onsultant: Byrne Looby, ocation:				ation: ect no.		1032	-11-05		-
tart date: 05/12/2005	End date: 06/12/2005	1		ed by:		P Sh			
ype of drilling: RO + RC	Hole diameter:	mm		ged by:		F Mc	Namara	а	
Strata Descripti	on	Legend	Depth	Level mOD)	Type	epth	S / tests	Water Depth	Date
Strong dark grey and black silty L weathered.			31 –				IL.		
End of Borehole a	it 31.65 m		33 -						The second control of the second control of
Remarks: Rotary openhole borehole to 14.65mBGL then continued to	by rotary corling.	BDU SPT- SPT- SPT-	S S S	ulk disturbe mail disturb indisturbed Standard Pe standard Pe Groundwate Water level	sample enetration netration T er strike	Test, split s Test, solid o	spoon.	GROL	מאנ מאנ

# BOREHOLE RECORD (Rotary core)

oject Name: Westgate						Hole ID: F	RC:	3									
Client: J.J. Rhatigan & Co Ltd					Co-ordinates:												
Consultant: Byrne Looby,					Elevation:	-					1						
Location:					Project no.	1032-11-0	)5										
Start date: 05/12/2005	End	date:	06/12/	2005	Drilled by:	P Sheils											
Type of drilling: RO + RC	Hole	Hole diameter: mm Logged by: F McN							F McNamara								
Strata Description	Legend Depth Level mAOD				iscontinuitie	FSI	RQD	SCR	TCR	CORE RUN							
Continued next sheet			3 5 6		AN NO: 4610/2 04-08-202												
Continued next sheet		-	10-	KE	ΞΥ				-	2000							