Borehole Log

Borehole No. **GW2**

Sheet 1 of 2

Project Name:	Calary Waste Licence Application	Project No. 501.00180.0189	Co-ords:	Hole Type RO
Location:	Calary Quarry, Kilmacanogue, Co. Wicklow		Level:	Scale 1:250
Client:	Roadstone Limited.		Dates: 01/09/2017	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					1.50			Clay. Subsoil
								Interbedded Sandstone and Siltstone

Remarks
Filled back to 7m

Borehole Log

Borehole No. **GW2**

Sheet 2 of 2

Project Name:	Calary Waste Licence Application	Project No. 501.00180.0189	Co-ords:	Hole Type RO
Location:	Calary Quarry, Kilmacanogue, Co. Wicklow		Level:	Scale 1:250
Client:	Roadstone Limited.		Dates: 01/09/2017	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼							Interbedded Sandstone and Siltstone
					91.50			End of Borehole at 91.500m

Remarks

Filled back to 7m

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Post Certification Report

SLR Consulting Ireland
CSA House
Unit 7
Dundrum Business Park
Windy Harbour
Dublin
Dublin14
Attention: Aldona Binchy

Date:	01/12/2017	**Location:**	Calary Quarry
Customer:	SLR Consulting Ireland	**No. Of Samples Received:**	1
Your Reference:	501.00180.00109	**Samples Scheduled:**	1

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.

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

Post Certification Report

Customer :	SLR Consulting Ireland		
Client Reference :	501.00180.00109	**Location :**	Calary Quarry

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
16599482	GW2		0.00 - 0.00	20/11/2017

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

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

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

Post Certification Report

Customer : SLR Consulting Ireland
Client Reference : 501.00180.00109
Location : Calary Quarry

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			16599482						
Customer Sample Reference			GW2						
AGS Reference									
Depth (m)			0.00 - 0.00						
Container			0.5l glass bottle	1L Plastic	500ml Plastic	H2SO4 (ALE244)	HNO3 Filtered	Vial (ALE297)	
Ammonium Low	All	NDPs: 0 Tests: 1				X			
Anions by Kone (w)	All	NDPs: 0 Tests: 1			X				
Conductivity (at 20 deg.C)	All	NDPs: 0 Tests: 1			X				
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 1					X		
EPH (DRO) (C10-C40) Aqueous (W)	All	NDPs: 0 Tests: 1	X						
Faecal Coliforms	All	NDPs: 0 Tests: 1		X					
GRO by GC-FID (W)	All	NDPs: 0 Tests: 1						X	
Metals by iCap-OES Dissolved (W)	All	NDPs: 0 Tests: 1					X		
Nitrite by Kone (w)	All	NDPs: 0 Tests: 1			X				
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 1	X						
pH Value	All	NDPs: 0 Tests: 1			X				
Suspended Solids	All	NDPs: 0 Tests: 1			X				
Total Coli & Escherichia coli (W)	All	NDPs: 0 Tests: 1		X					
Total Dissolved Solids (Grav)	All	NDPs: 0 Tests: 1			X				
Total EPH (aq)	All	NDPs: 0 Tests: 1	X						

Post Certification Report

Customer : SLR Consulting Ireland
Client Reference : 501.00180.00109 **Location :** Calary Quarry

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.
1-5&♦§@	Sample deviation (see appendix)

Customer Sample Ref.	GW2
Depth (m)	0.00 - 0.00
Sample Type	Ground Water (GW)
Date Sampled	20/11/2017
Date Received	21/11/2017
SDG Ref	171121-76
Lab Sample No.(s)	16599482
AGS Reference	

Component	LOD/Units	Method	
Dissolved solids, Total (gravimetric)	<10 mg/l	TM021	155 #
Suspended solids, Total	<2 mg/l	TM022	332 #
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099	0.0262 #
Ammoniacal Nitrogen Low as NH3	<0.01 mg/l	TM099	0.0318 #
Conductivity @ 20 deg.C	<0.005 mS/cm	TM120	0.308 #
Cadmium (diss.filt)	<0.08 µg/l	TM152	<0.08 #
Copper (diss.filt)	<0.3 µg/l	TM152	0.413 #
Lead (diss.filt)	<0.2 µg/l	TM152	<0.2 #
Manganese (diss.filt)	<1 µg/l	TM152	1.02 #
Nickel (diss.filt)	<0.4 µg/l	TM152	<0.4 #
Zinc (diss.filt)	<1 µg/l	TM152	6.9 #
EPH Range >C10 - C40 (aq)	<100 µg/l	TM172	<100
Total EPH (C6-C40) (aq)	<100 µg/l	TM172	<100
Nitrite as NO2	<0.05 mg/l	TM184	<0.05 2 #
Sulphate	<2 mg/l	TM184	11.4 #
Chloride	<2 mg/l	TM184	50.7 #
Phosphate (ortho) as PO4	<0.05 mg/l	TM184	<0.05 #
Nitrate as NO3	<0.3 mg/l	TM184	5.78
Magnesium (diss.filt)	<0.036 mg/l	TM228	12.4
Iron (diss.filt)	<0.019 mg/l	TM228	<0.019
pH	<1 pH Units	TM256	8.21 #
Escherichia coli (Presumtive)	<1 CFU/100ml	TM367	18
Total Coliforms (Presumptive)	<1 CFU/100ml	TM367	930
Faecal Coliforms	<1 CFU/100ml	TM395	10

Post Certification Report

Customer : SLR Consulting Ireland
Client Reference : 501.00180.00109 **Location :** Calary Quarry

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

Customer Sample Ref.	GW2
Depth (m)	0.00 - 0.00
Sample Type	Ground Water (GW)
Date Sampled	20/11/2017
Date Received	21/11/2017
SDG Ref	171121-76
Lab Sample No.(s)	16599482
AGS Reference	

Component	LOD/Units	Method	
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245	<3
Benzene	<7 µg/l	TM245	<7
Toluene	<4 µg/l	TM245	<4
Ethylbenzene	<5 µg/l	TM245	<5
m,p-Xylene	<8 µg/l	TM245	<8
o-Xylene	<3 µg/l	TM245	<3
Sum of detected BTEX	<28 µg/l	TM245	<28
GRO >C5-C10	<10 µg/l	TM245	<10
EPH (C6-C10)	<100 µg/l	TM245	<100

Post Certification Report

Customer : SLR Consulting Ireland
Client Reference : 501.00180.00109 **Location :** Calary Quarry

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

Customer Sample Ref.	GW2
Depth (m)	0.00 - 0.00
Sample Type	Ground Water (GW)
Date Sampled	20/11/2017
Date Received	21/11/2017
SDG Ref	171121-76
Lab Sample No.(s)	16599482
AGS Reference	

Component	LOD/Units	Method	
Naphthalene (aq)	<0.01 µg/l	TM178	<0.0683
Acenaphthene (aq)	<0.005 µg/l	TM178	<0.005
Acenaphthylene (aq)	<0.005 µg/l	TM178	<0.005
Fluoranthene (aq)	<0.005 µg/l	TM178	<0.005
Anthracene (aq)	<0.005 µg/l	TM178	<0.005
Phenanthrene (aq)	<0.005 µg/l	TM178	<0.005
Fluorene (aq)	<0.005 µg/l	TM178	<0.005
Chrysene (aq)	<0.005 µg/l	TM178	<0.005
Pyrene (aq)	<0.005 µg/l	TM178	<0.005
Benzo(a)anthracene (aq)	<0.005 µg/l	TM178	<0.005
Benzo(b)fluoranthene (aq)	<0.005 µg/l	TM178	<0.005
Benzo(k)fluoranthene (aq)	<0.005 µg/l	TM178	<0.005
Benzo(a)pyrene (aq)	<0.002 µg/l	TM178	<0.002
Dibenzo(a,h)anthracene (aq)	<0.005 µg/l	TM178	<0.005
Benzo(g,h,i)perylene (aq)	<0.005 µg/l	TM178	<0.005
Indeno(1,2,3-cd)pyrene (aq)	<0.005 µg/l	TM178	<0.005
PAH, Total Detected USEPA 16 (aq)	<0.082 µg/l	TM178	<0.082

Post Certification Report

Customer : SLR Consulting Ireland
Client Reference : 501.00180.00109 **Location :** Calary Quarry

Table of Results - Appendix

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description
TM021	Method 2540C, AWWA/APHA, 20th Ed., 1999	Determination of total dissolved solids in waters by gravimetry.
TM022	Method 2540D, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part120 1981;BS EN 872	Determination of total suspended solids in waters
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM172	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	EPH in Waters
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES
TM245	By GC-FID	Determination of GRO by Headspace in waters
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter
TM367		
TM395	Faecal Coliforms	Faecal Coliforms in Waste Water

NA = not applicable.
Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

Post Certification Report

Customer : SLR Consulting Ireland
Client Reference : 501.00180.00109 **Location :** Calary Quarry

Test Completion Dates

Lab Sample No(s)	16599482
Customer Sample Ref.	GW2
AGS Ref.	
Depth	0.00 - 0.00
Type	GROUND_W
Ammonium Low	23-Nov-2017
Anions by Kone (w)	25-Nov-2017
Conductivity (at 20 deg.C)	25-Nov-2017
Dissolved Metals by ICP-MS	27-Nov-2017
EPH (DRO) (C10-C40) Aqueous (W)	27-Nov-2017
Faecal Coliforms	22-Nov-2017
GRO by GC-FID (W)	24-Nov-2017
Metals by iCap-OES Dissolved (W)	27-Nov-2017
Nitrite by Kone (w)	25-Nov-2017
PAH Spec MS - Aqueous (W)	28-Nov-2017
pH Value	24-Nov-2017
Suspended Solids	26-Nov-2017
Total Coli & Escherichia coli (W)	22-Nov-2017
Total Dissolved Solids (Grav)	25-Nov-2017
Total EPH (aq)	27-Nov-2017

Appendix

General

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

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

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

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

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

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

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

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

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

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

11. Results relate only to the items tested.

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

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

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

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

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

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

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

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

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

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

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

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

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

Sample Deviations

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

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

Asbestos

Identification of Asbestos in Bulk Materials & Soils

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

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

Visual Estimation Of Fibre Content

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

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

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

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

SLR Consulting Ireland
CSA House
Unit 7
Dundrum Business Park
Windy Harbour
Dublin
Dublin14

Attention: Aldona Binchy

CERTIFICATE OF ANALYSIS

Date:	10 November 2017
Customer:	D_SLRCON_DUB
Sample Delivery Group (SDG):	171104-108
Your Reference:	501.00180.00109
Location:	Calary Quarry
Report No:	432164

We received 2 samples on Saturday November 04, 2017 and 2 of these samples were scheduled for analysis which was completed on Friday November 10, 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

CERTIFICATE OF ANALYSIS

SDG:	171104-108	**Client Reference:**	501.00180.00109	**Report Number:**	432164
Location:	Calary Quarry	**Order Number:**	3513	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
16496217	SW01		0.00 - 0.00	01/11/2017
16496221	SW02		0.00 - 0.00	01/11/2017

Maximum Sample/Coolbox Temperature (°C) :

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

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

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

Validated

CERTIFICATE OF ANALYSIS

SDG:	171104-108	**Client Reference:**	501.00180.00109	**Report Number:**	432164
Location:	Calary Quarry	**Order Number:**	3513	**Superseded Report:**	

Results Legend

X Test

N No Determination Possible

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

Lab Sample No(s)							16496217				16496221
Customer Sample Reference							SW01				SW02
AGS Reference											
Depth (m)							0.00 - 0.00				0.00 - 0.00
Container							0.5l glass bottle (ALE227)	1L Plastic (Microbiology)	H2SO4 (ALE244)	0.5l glass bottle (ALE227)	1L Plastic (Microbiology)	H2SO4 (ALE244)
Sample Type							SW	SW	SW	SW	SW	SW
Ammonium Low	All	NDPs: 0 Tests: 2							X			X
Anions by Kone (w)	All	NDPs: 0 Tests: 2					X			X		
Conductivity (at 20 deg.C)	All	NDPs: 0 Tests: 2					X			X		
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2					X			X		
EPH (DRO) (C10-C40) Aqueous (W)	All	NDPs: 0 Tests: 2					X			X		
Faecal Coliforms	All	NDPs: 0 Tests: 2						X			X	
GRO by GC-FID (W)	All	NDPs: 0 Tests: 2					X			X		
Metals by iCap-OES Dissolved (W)	All	NDPs: 0 Tests: 2					X			X		
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 2					X			X		
pH Value	All	NDPs: 0 Tests: 2					X			X		
Suspended Solids	All	NDPs: 0 Tests: 2					X			X		
Total Coli & Escherichia coli (W)	All	NDPs: 0 Tests: 2						X			X	
Total EPH (aq)	All	NDPs: 0 Tests: 2					X			X		

Validated

CERTIFICATE OF ANALYSIS

SDG:	171104-108	**Client Reference:**	501.00180.00109	**Report Number:**	432164
Location:	Calary Quarry	**Order Number:**	3513	**Superseded Report:**	

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

Component	LOD/Units	Method	Customer Sample Ref.	SW01	SW02				
			Depth (m)	0.00 - 0.00	0.00 - 0.00				
			Sample Type	Surface Water (SW)	Surface Water (SW)				
			Date Sampled	01/11/2017	01/11/2017				
			Sample Time	.	.				
			Date Received	04/11/2017	04/11/2017				
			SDG Ref	171104-108	171104-108				
			Lab Sample No.(s)	16496217	16496221				
			AGS Reference						
Suspended solids, Total	<2 mg/l	TM022		<2 #	<2 #				
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099		0.0774 #	0.0728 #				
Ammoniacal Nitrogen Low as NH3	<0.01 mg/l	TM099		0.094 #	0.0884 #				
Conductivity @ 20 deg.C	<0.005 mS/cm	TM120		0.196 #	0.197 #				
Cadmium (diss.filt)	<0.08 µg/l	TM152		<0.08	<0.08				
Copper (diss.filt)	<0.3 µg/l	TM152		2.47	1.43				
Lead (diss.filt)	<0.2 µg/l	TM152		<0.2	<0.2				
Manganese (diss.filt)	<1 µg/l	TM152		<1	<1				
Nickel (diss.filt)	<0.4 µg/l	TM152		<0.4	<0.4				
Zinc (diss.filt)	<1 µg/l	TM152		<1	<1				
EPH Range >C10 - C40 (aq)	<100 µg/l	TM172		<100	<100				
Total EPH (C6-C40) (aq)	<100 µg/l	TM172		<100	<100				
Sulphate	<2 mg/l	TM184		6.8 #	6.9 #				
Chloride	<2 mg/l	TM184		11 #	11 #				
Phosphate (ortho) as PO4	<0.05 mg/l	TM184		<0.05 #	<0.05 #				
Nitrate as NO3	<0.3 mg/l	TM184		0.597	0.55				
Magnesium (diss.filt)	<0.036 mg/l	TM228		8.97 #	8.51 #				
Iron (diss.filt)	<0.019 mg/l	TM228		<0.019 #	<0.019 #				
pH	<1 pH Units	TM256		8.01 #	8.04 #				
Escherichia coli (Presumtive)	<1 CFU/100ml	TM367		<1 #	<1 #				
Total Coliforms (Presumptive)	<1 CFU/100ml	TM367		9 #	7 #				
Faecal Coliforms	<1 CFU/100ml	TM395		<1	<1				

Validated

CERTIFICATE OF ANALYSIS

SDG:	171104-108	**Client Reference:**	501.00180.00109	**Report Number:**	432164
Location:	Calary Quarry	**Order Number:**	3513	**Superseded Report:**	

GRO by GC-FID (W)

Results Legend

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

Component	LOD/Units	Method	Customer Sample Ref.	SW01	SW02
			Depth (m)	0.00 - 0.00	0.00 - 0.00
			Sample Type	Surface Water (SW)	Surface Water (SW)
			Date Sampled	01/11/2017	01/11/2017
			Sample Time	.	.
			Date Received	04/11/2017	04/11/2017
			SDG Ref	171104-108	171104-108
			Lab Sample No.(s)	16496217	16496221
			AGS Reference		
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 1 #	<3 1 #
Benzene	<7 µg/l	TM245		<7 1 #	<7 1 #
Toluene	<4 µg/l	TM245		<4 1 #	<4 1 #
Ethylbenzene	<5 µg/l	TM245		<5 1 #	<5 1 #
m,p-Xylene	<8 µg/l	TM245		<8 1 #	<8 1 #
o-Xylene	<3 µg/l	TM245		<3 1 #	<3 1 #
Sum of detected BTEX	<28 µg/l	TM245		<28 1	<28 1
GRO >C5-C10	<10 µg/l	TM245		<10 1	<10 1
EPH (C6-C10)	<100 µg/l	TM245		<100 1	<100 1

Validated

CERTIFICATE OF ANALYSIS

SDG:	171104-108	**Client Reference:**	501.00180.00109	**Report Number:**	432164
Location:	Calary Quarry	**Order Number:**	3513	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

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

Component	LOD/Units	Method	Customer Sample Ref.	SW01	SW02				
			Depth (m)	0.00 - 0.00	0.00 - 0.00				
			Sample Type	Surface Water (SW)	Surface Water (SW)				
			Date Sampled	01/11/2017	01/11/2017				
			Sample Time	.	.				
			Date Received	04/11/2017	04/11/2017				
			SDG Ref	171104-108	171104-108				
			Lab Sample No.(s)	16496217	16496221				
			AGS Reference						
Naphthalene (aq)	<0.01 µg/l	TM178		0.0252	<0.01				
Acenaphthene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Acenaphthylene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Fluoranthene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Anthracene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Phenanthrene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Fluorene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Chrysene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Pyrene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Benzo(a)anthracene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Benzo(b)fluoranthene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Benzo(k)fluoranthene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Benzo(a)pyrene (aq)	<0.002 µg/l	TM178		<0.002	<0.002				
Dibenzo(a,h)anthracene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Benzo(g,h,i)perylene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
Indeno(1,2,3-cd)pyrene (aq)	<0.005 µg/l	TM178		<0.005	<0.005				
PAH, Total Detected USEPA 16 (aq)	<0.082 µg/l	TM178		<0.082	<0.082				

CERTIFICATE OF ANALYSIS

SDG:	171104-108	**Client Reference:**	501.00180.00109	**Report Number:**	432164
Location:	Calary Quarry	**Order Number:**	3513	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM022	Method 2540D, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part120 1981;BS EN 872	Determination of total suspended solids in waters		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser		
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM172	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	EPH in Waters		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM245	By GC-FID	Determination of GRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM367				
TM395	Faecal Coliforms	Faecal Coliforms in Waste Water		

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

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

CERTIFICATE OF ANALYSIS

SDG:	171104-108	**Client Reference:**	501.00180.00109	**Report Number:**	432164
Location:	Calary Quarry	**Order Number:**	3513	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	16496217	16496221
Customer Sample Ref.	SW01	SW02
AGS Ref.		
Depth	0.00 - 0.00	0.00 - 0.00
Type	Surface Water	Surface Water
Ammonium Low	08-Nov-2017	08-Nov-2017
Anions by Kone (w)	09-Nov-2017	09-Nov-2017
Conductivity (at 20 deg.C)	08-Nov-2017	08-Nov-2017
Dispersion index		07-Nov-2017
Dissolved Metals by ICP-MS	10-Nov-2017	10-Nov-2017
EPH (DRO) (C10-C40) Aqueous (W)	08-Nov-2017	08-Nov-2017
Faecal Coliforms	07-Nov-2017	07-Nov-2017
GRO by GC-FID (W)	09-Nov-2017	09-Nov-2017
Metals by iCap-OES Dissolved (W)	09-Nov-2017	09-Nov-2017
Nitrite by Kone (w)	08-Nov-2017	08-Nov-2017
PAH Spec MS - Aqueous (W)	08-Nov-2017	08-Nov-2017
pH Value	07-Nov-2017	07-Nov-2017
Suspended Solids	07-Nov-2017	07-Nov-2017
Total Coli & Escherichia coli (W)	07-Nov-2017	07-Nov-2017
Total EPH (aq)	09-Nov-2017	09-Nov-2017

SDG:	171104-108	**Client Reference:**	501.00180.00109	**Report Number:**	432164
Location:	Calary Quarry	**Order Number:**	3513	**Superseded Report:**	

Appendix

General

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

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

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

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

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

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

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

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

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

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

11. Results relate only to the items tested.

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

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

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

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

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

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

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

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

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

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

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

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

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

Sample Deviations

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

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

Asbestos

Identification of Asbestos in Bulk Materials & Soils

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

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

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

Visual Estimation Of Fibre Content

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

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

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

CALARY GROUNDWATER : WATER QUALITY TESTING NOVEMBER 2017

	Units	Detection limits	SI No 9 of 2010 (GW Regs)	SI No 122 of 2014 (EC Drinking Water Regs)	EPA IGVs	WHO DWS	GW2
Sample Date							20/11/2017
Lab ID							16599482
Well depth m							93.2
Groundwater Level mGL							42.58
Groundwater Level mTOC							42.88
Inorganics/Metals							
Dissolved Solids, Total (gravim	mg/l	<10					155
Suspended Solids, Total	mg/l	<2					332
Manganese (diss.filt)	ug/l	<1					1.02
Nitrite as NO2	mg/l	<0.05	0.375				<0.05
Magnesium	mg/l	<0.036					12.4
Cadmium	ug/l	<0.08	3.75	5	5	3	<0.08
Copper	ug/l	<0.3	1500	2000	30	2000	0.413
Lead	ug/l	<0.2	18.75	10	10		<0.2
Nickel	ug/l	<0.4	15	20	20	70	<0.4
Zinc	ug/l	<1			100		6.9
Iron	ug/l	<19		200	200		<19
Sulphate (soluble)	mg/l	<2	187.5	250	200		11.4
Nitrate as NO3	mg/l	<0.3	37.5	50	25		5.78
Chloride	mg/l	<2	24-187.5	25000	30		50
Ammonical Nitrogen as N	mg/l	<0.01	0.065-0.175		0.15		0.0262
Total Ammonia as NH3	mg/l	<0.01	0.07891-0.21245		0.1821		0.0318
Orthophosphate as PO4	mg/l	<0.05			0.03		<0.05
pH Value	pH Units	<1			6.5 - 9.5		8.21
Conductivity	mS/cm	<0.005	0.8 - 1.875*	2.5	1		0.308
Hydrocarbons							
GRO(>C5-C10)	ug/l	<10					<10
MTBE	ug/l	<3			30		<3
Benzene	ug/l	<7	0.75	1	1	10	<7
Toluene	ug/l	<4			10	700	<4
Ethyl benzene	ug/l	<5			10	300	<5
m & p Xylene	ug/l	<8				500	<8
o Xylene	ug/l	<3				500	<3
Sum of BTEX	µg/l	<28					<28
EPH Range >C10-C40(aq)	ug/l	<100					<100
Total EPH (C6-C40) (aq)	ug/l	<100					<100
EPH Band >(C6-C10)	ug/l	<100					<100
PAH							
Acenaphthene Aqueous	ug/l	<0.005					<0.005
Acenaphthylene Aqueous	ug/l	<0.005					<0.005
Anthracene Aqueous	ug/l	<0.005			10000		<0.005
Benz(a)anthracene Aqueous	ug/l	<0.005					<0.005
Benzo(a)pyrene Aqueous	ug/l	<0.002	0.075	0.01	0.01	0.7	<0.002
Benzo(b)fluoranthene Aqueous	ug/l	<0.005			0.5		<0.005
Benzo(ghi)perylene Aqueous	ug/l	<0.005			0.05		<0.005
Benzo(k)fluoranthene Aqueous	ug/l	<0.005			0.05		<0.005
Chrysene Aqueous	ug/l	<0.005					<0.005
Dibenzo(ah)anthracene Aqueo	ug/l	<0.005					<0.005
Fluoranthene Aqueous	ug/l	<0.005			1.0		<0.005
Fluorene Aqueous	ug/l	<0.005					<0.005
Indeno(123cd)pyrene Aqueous	ug/l	<0.005			0.05		<0.005
Naphthalene Aqueous	ug/l	<0.01			1.0		<0.0683
Phenanthrene Aqueous	ug/l	<0.005					<0.005
Pyrene Aqueous	ug/l	<0.005					<0.005
PAH 16 Total	ug/l	<0.082	0.075	0.1	0.1		<0.082
Microbiological							
Escherichia coli (Presumtive)	CFU/100ml	<1		0			18
Faecal Coliforms	CFU/100ml	<1		0			10
Total Coliforms (Presumptive)	CFU/100ml	<1					930

Notes:

The limit values for the Groundwater Regulations (SI 9 of 2010) are for the Category "Column 4"
Threshold Values for for the general quality of groundwater in a groundwater body in terms of
whether its ability to support human uses has been significantly impaired by pollution.
Where no value is defined, the Overall Threshold values have been used.

CALARY SURFACE WATER POND : WATER QUALITY TESTING NOVEMBER 2017

	Units	Detection limits	SI 327 of 2012 EQS Inland Surface Waters (MACs)	SI 327 of 2012 EQS Other Surface Waters (MACs)	SI 272 of 2009 EQS Inland Surface Waters (MACs)	SI 272 of 2009 EQS Other Surface Waters (MACs)	SW01	SW02
Sample Date							01/11/2017	01/11/2017
Lab ID							16496217	16496221
Well depth m								
Groundwater Level mGL								
Groundwater Level mTOC								
Field Parameters								
Temperature	°C						10.9	10.9
Dissolved Oxygen %	%						4.8	54
Dissolved Oxygen	mg/l						0.53	5.9
Conductivity	$mScm^{-1}$						0.16	0.161
pH	pH Units						8.44	8.33
ORP	mV						-83.6	-77.7
Inorganics/Metals								
Dissolved Solids, Total (gravim	mg/l	<10						
Suspended Solids, Total	mg/l	<2					<2	<2
Manganese (diss.filt)	ug/l	<1					<1	<1
Nitrite as NO2	mg/l	<0.05						
Magnesium	mg/l	<0.036					8.97	8.51
Cadmium	ug/l	<0.08	0.45 - 1.5	0.45 - 1.5	0.45 - 1.5	0.45 - 1.5	<0.08	<0.08
Copper	ug/l	<0.3			5 - 30 (AA)	5 (AA)	2.47	1.43
Lead	ug/l	<0.2	7.2 (AA)	7.2 (AA)	7.2 (AA)	7.2 (AA)	<0.2	<0.2
Nickel	ug/l	<0.4	20 (AA)	20 (AA)	20 (AA)	20 (AA)	<0.4	<0.4
Zinc	ug/l	<1					<1	<1
Iron	ug/l	<19					<19	<19
Sulphate (soluble)	mg/l	<2					6.8	6.9
Nitrate as NO3	mg/l	<0.3					0.597	0.55
Chloride	mg/l	<2			High status ≤0.040 (mean) or ≤0.090(95%ile) Good status ≤0.065		11	11.1
Ammonical Nitrogen as N	mg/l	<0.01					0.0774	0.0728
Total Ammonia as NH3	mg/l	<0.01					0.094	0.0884
Orthophosphate as PO4	mg/l	<0.05			High status ≤0.025 (mean) or ≤0.045 (95%ile) Good status ≤0.035 (mean) or ≤0.075		<0.05	<0.05
pH Value	pH Units	<1					8.01	8.04
Conductivity	mS/cm	<0.005					0.196	0.197
Hydrocarbons								
GRO(>C5-C10)	ug/l	<10					<10	<10
MTBE	ug/l	<3					<3	<3
Benzene	ug/l	<7	50	50			<7	<7
Toluene	ug/l	<4			10 (AA)	10 (AA)	<4	<4
Ethyl benzene	ug/l	<5					<5	<5
m & p Xylene	ug/l	<8			10 (AA)	10 (AA)	<8	<8
o Xylene	ug/l	<3					<3	<3
Sum of BTEX	µg/l	<28					<28	<28
EPH Range >C10-C40(aq)	ug/l	<100					<100	<100
Total EPH (C6-C40) (aq)	ug/l	<100					<100	<100
EPH Band >(C6-C10)	ug/l	<100					<100	<100
PAH								
Acenaphthene Aqueous	ug/l	<0.005					<0.005	<0.005
Acenaphthylene Aqueous	ug/l	<0.005					<0.005	<0.005
Anthracene Aqueous	ug/l	<0.005	0.4	0.4	0.4	0.4	<0.005	<0.005
Benz(a)anthracene Aqueous	ug/l	<0.005					<0.005	<0.005
Benzo(a)pyrene Aqueous	ug/l	<0.002	0.1	0.1	0.1	0.1	<0.002	<0.002
Benzo(b)fluoranthene Aqueous	ug/l	<0.005					<0.005	<0.005
Benzo(ghi)perylene Aqueous	ug/l	<0.005					<0.005	<0.005
Benzo(k)fluoranthene Aqueous	ug/l	<0.005					<0.005	<0.005
Chrysene Aqueous	ug/l	<0.005					<0.005	<0.005
Dibenzo(ah)anthracene Aqueo	ug/l	<0.005					<0.005	<0.005
Fluoranthene Aqueous	ug/l	<0.005	1	1			<0.005	<0.005
Fluorene Aqueous	ug/l	<0.005					<0.005	<0.005
Indeno(123cd)pyrene Aqueous	ug/l	<0.005					<0.005	<0.005
Naphthalene Aqueous	ug/l	<0.01	2.4	1.2	N/A	N/A	0.0252	<0.01
Phenanthrene Aqueous	ug/l	<0.005					<0.005	<0.005
Pyrene Aqueous	ug/l	<0.005					<0.005	<0.005
PAH 16 Total	ug/l	<0.082					<0.082	<0.082
Microbiological								
Escherichia coli (Presumtive)	CFU/100ml	<1					<1	<1
Faecal Coliforms	CFU/100ml	<1					<1	<1
Total Coliforms (Presumptive)	CFU/100ml	<1					9	7

NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000716 (C) ORDNANCE SURVEY IRELAND & GOVERNMENT OF IRELAND

2. TOPOGRAPHIC / AERIAL SURVEY SUPPLIED BY SLR CONSULTING IRELAND

LEGEND

ROADSTONE LIMITED LAND INTEREST (c.25.4 Hectares)

PLANNING APPLICATION AREA (c.9.1 Hectares)

GW4 GROUNDWATER MONITORING LOCATION

KILLOUGH STREAM

N

W E

S

GW4

GW3

DIRECTION OF GROUNDWATER FLOW

QUARRY VOID (2014 + 2015)

SUGAR LOAF PEAK UP-SLOPE

SOIL WASTE BODY

GW2

GW5

0 80m 200

Metres 1:2500

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

ROADSTONE LIMITED

WASTE LICENCE APPLICATION

INERT SOIL WASTE RECOVERY FACILITY

CALARY QUARRY,
KILMACANOGE, CO. WICKLOW

PROPOSED GROUNDWATER MONITROING WELLS

FIGURE A

Scale: 1:2,500 @ A3

Date: NOVEMBER 2017

00180.00109.05.Fig_A.Proposed Monitoring Wells.dwg