Bonneagar Iompair Éireann
Transport Infrastructure Ireland

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Luas Finglas

Environmental Impact Assessment Report 2024

Appendix A10.3: Surface Water Quality Results

BARRY TRANSPORTATION
egis GROUP
egis

Project Ireland 2040
Building Ireland's Future

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SECTION 1: WATER SAMPLING

1.1 Introduction

In order to determine the baseline water quality across the proposed extents of the Luas Finglas Project, a schedule of surface water and groundwater sampling was conducted. This was to enable assessment of the water and groundwater quality in accordance with the requirements of the Water Framework Directive. For further detail, refer to the Water Framework Directive Compliance Assessment (Volume 4 - Appendix A10.1 of the EIAR) and Chapter 10 Water (Volume 2 of the EIAR).

1.2 Groundwater and Surface Water Bodies

The surface waterbodies that may be affected by the proposed Scheme are provided in Table 1-1. This table includes the ICW (Integrated Constructed Wetland) which was constructed to provide treatment to surface water within the Finglaswood Stream. Both Bachelors Stream and the Finglaswood Stream are piped for the majority of their lengths, and function as surface water collection pipes for the hardstanding areas in the region, with the majority of their flows are comprising of runoff from impermeable surfacing areas along the route.

Table 1-1: Waterbodies along Project Route

Water Body EPA Name (WFD Name)	EPA Segment Code	Type
Tolka (Tolka_050)	09/2128	River
Finglaswood Stream (Tolka_050)	09/2132	Culverted Stream
Bachelors Stream (Tolka_050)	09/1512	Culverted Stream
Royal Canal Main Line (Liffey and Dublin Bay)	N/A	Canal
ICW	N/A	Man Made Wetland

The surface water sampling points were chosen at locations along the River Tolka and the Royal Canal. Along the River Tolka, the sampling locations are upstream and downstream of the outfall from the ICW into the River Tolka. The outfall of the Finglaswood Stream into the river Tolka also falls between these sampling locations.

The details of the River Basin which may be affected by the proposed Scheme is provided in Table 1-2. The details of the relevant sub-catchment and hydrometric area have also been provided.

Table 1-2: WFD Catchment

WFD Catchment Reference (Hydrometric area)	Area (km^2)	WFD Sub-catchment ID	WFD Sub-catchment Name	WFD River Basin	River Basin Area (km^2)
09	1,616	09_4	Tolka_SC_20	Tolka_050	19.92

1.3 Methodology

A programme of water sampling and testing was undertaken by the GI contractor in order to establish the baseline water quality across the proposed Scheme. Samples were sourced from the Royal Canal and the Tolka River and from within groundwater monitoring standpipes which were installed as part of the Ground Investigation.

The monitoring programme included 5 No. surface water locations and 6 No. groundwater monitoring locations (Refer to Appendix A for Sampling Location Maps).

Groundwater level readings within standpipes were recorded monthly, while samples and testing while undertaken quarterly. The monitoring programme began following completion of the GI works in January 2022 and was completed by January 2024. The initial scope allowed for 12 months of sampling and monitoring, however, the baseline monitoring programme was extended until January 2024 following a request from a stakeholder. The determinants that were tested are listed in Table 1-3 below.

Table 1-3: Sampling Determinants

Determinants (Surface Water)	Determinants (Groundwater)
▪ Biological Oxygen Demand ▪ Chemical Oxygen Demand ▪ Total Hardness ▪ Total Suspended Solids ▪ Total Dissolved Solids ▪ Nitrate ▪ Nitrite ▪ Ammoniacal Nitrogen ▪ Orthophosphate ▪ Chlorophyll ▪ Total Coliforms and ▪ Faecal Coliforms (E. coli) ▪ pH ▪ Conductivity ▪ Turbidity ▪ Calcium ▪ Alkalinity ▪ Ammonia ▪ Total Nitrogen ▪ Phosphate ▪ Total Phosphorus	▪ Arsenic ▪ Boron ▪ Cadmium ▪ Chromium (III) ▪ Chromium (VI) ▪ Copper ▪ Lead ▪ Mercury ▪ Nickel ▪ Zinc ▪ pH ▪ Water soluble sulphate (as SO4) ▪ Organic matter ▪ Total petroleum hydrocarbons ▪ Speciated polyaromatic hydrocarbons (ESEPA 16 including coronene) ▪ Phenol ▪ Cyanide (total)

1.4 Summary

The monitoring programme consisted of the following samples:

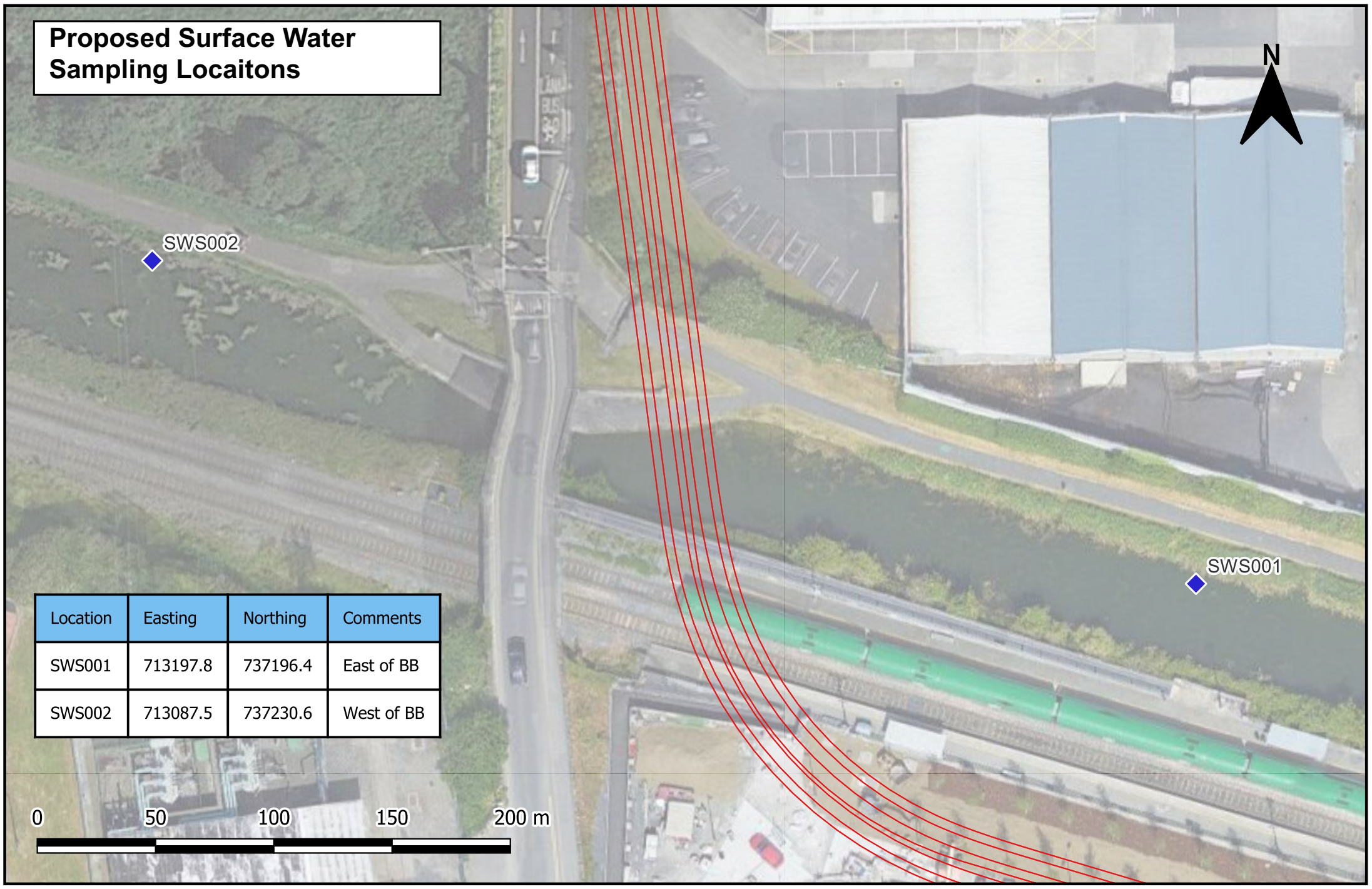
- Seven rounds of surface water sampling across five locations (refer to Appendix A).
- Seven rounds of groundwater sampling across six locations (refer to Appendix A).

Laboratory test results are provided as Appendix B.

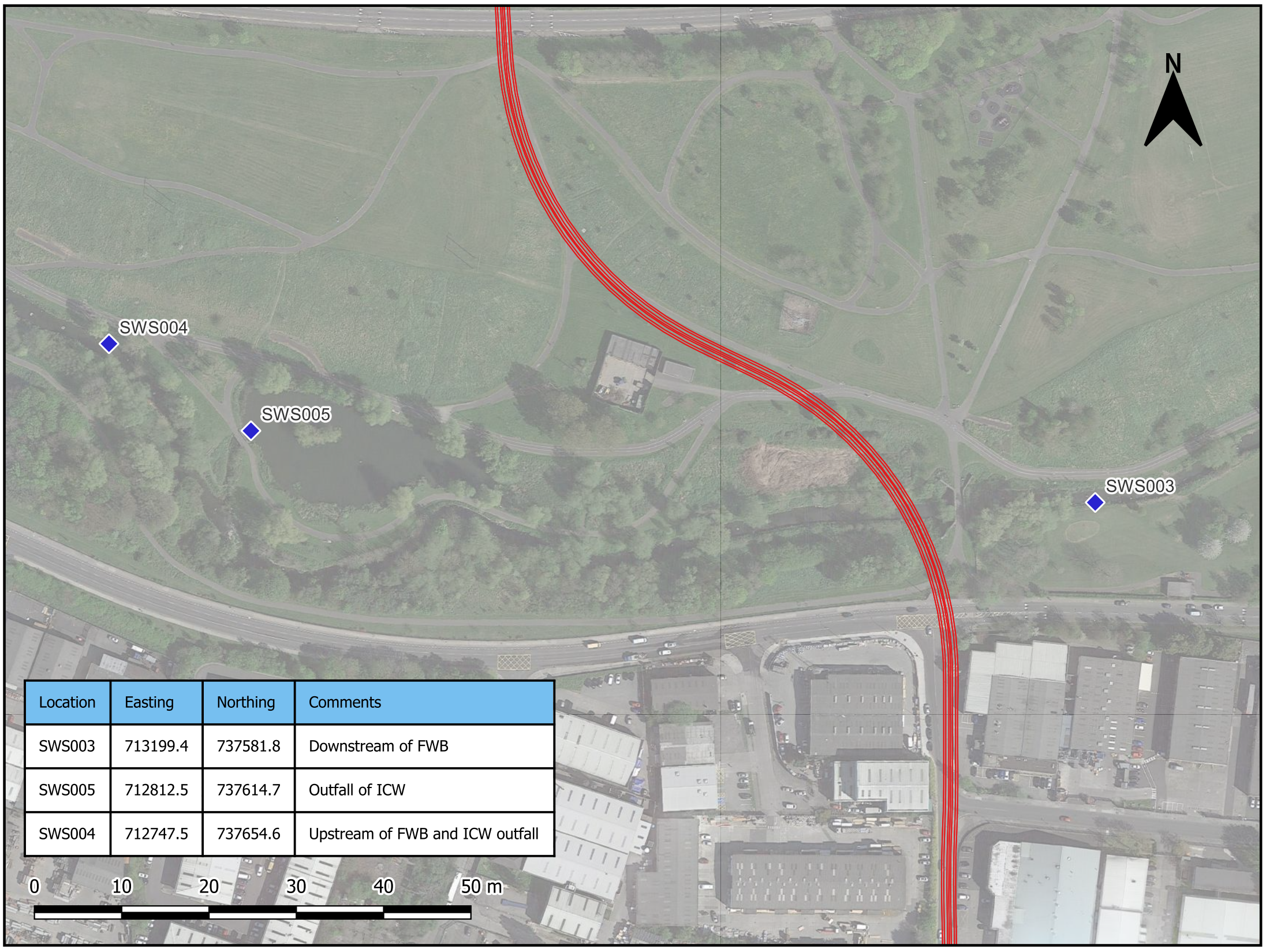
Appendix A: Groundwater and Surface Water Sampling Locations

Location ID	Easting	Northing	Final Depth	Ground Level
LF-CPRC-1011	712812.50	738703.60	20.30	54.63
LF-CPRC-1007	712695.80	739764.40	11.80	62.67
LF-CPRC-1001	712867.10	740438.60	12.50	66.92
LF-CPRC-1015	713017.90	737663.20	8.30	26.49
LF-CPRC-3001	713820.00	736918.20	18.80	36.22
LF-WS-1016	712938.10	738062.00	4.00	42.25

Proposed Surface Water Sampling Locaitons



Location	Easting	Northing	Comments
SWS001	713197.8	737196.4	East of BB
SWS002	713087.5	737230.6	West of BB



Location	Easting	Northing	Comments
SWS003	713199.4	737581.8	Downstream of FWB
SWS005	712812.5	737614.7	Outfall of ICW
SWS004	712747.5	737654.6	Upstream of FWB and ICW outfall

Appendix B: Laboratory Test Results

City Analysts Limited,
Pigeon House Road,
Ringsend,
Dublin 4.

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Email:
reports@cityanalysts.ie

www.cityanalysts.ie

Customer

Stephen Kealy

Element Materials Technology
Unit 3 Deeside Point
Zone 3 Deeside Industrial Park
Deeside
CH5 2UA

Certificate Of Analysis

Job Number: 22-14450
Issue Number: 1
Report Date: 19 January 2022

Site: Luas Finglas
PO Number: Not Supplied
Date Samples Received: 10/01/2022

Please find attached the results for the samples received at our laboratory on 10/01/2022.

Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our website at the above address.

Thank you for choosing City Analysts Limited. We look forward to assisting you again.

Authorised By: Louise Morrow **Authorised Date:** 19 January 2022

Louise Morrow

Notes are not INAB accredited

Results relate only to the items tested.
Information on methods of analysis and uncertainty of measurement is available on request.
Any opinions or interpretations indicated are outside the scope of our INAB accreditation.

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Element Materials Technology
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Deeside
CH5 2UA

Report Reference: 22-14450

Report Version: 1

Site: Luas Finglas

Sample Description: SWS 001

Sample Type: Surface

Lab Reference Number: 625166

Date of Sampling: 10/01/2022

Date Sample Received: 10/01/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1003#	13/01/2022	BOD5	< 2	mg/l O2	-
D/D1201#	11/01/2022	Coliforms	111.2	MPN/100ml	-
D/D1201#	11/01/2022	E.coli	28.8	MPN/100ml	-
D/D3221#	11/01/2022	Faecal Coliforms	42	cfu/100ml	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
NAC & ATC - No abnormal change and acceptable to customers.
TVC - Total viable count
Site D = Analysed at City Analysts Dublin. Site S = Analysed at City Analysts Shannon

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Report Reference: 22-14450

Report Version: 1

Site: Luas Finglas

Sample Description: SWS 002

Sample Type: Surface

Lab Reference Number: 625167

Date of Sampling: 10/01/2022

Date Sample Received: 10/01/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1003#	13/01/2022	BOD5	< 2	mg/l O2	-
D/D1201#	11/01/2022	Coliforms	159.4	MPN/100ml	-
D/D1201#	11/01/2022	E.coli	24.3	MPN/100ml	-
D/D3221#	11/01/2022	Faecal Coliforms	30	cfu/100ml	-

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Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
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Report Reference: 22-14450

Report Version: 1

Site: Luas Finglas

Sample Description: SWS 003

Sample Type: Surface

Lab Reference Number: 625168

Date of Sampling: 10/01/2022

Date Sample Received: 10/01/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1003#	13/01/2022	BOD5	< 2	mg/l O2	-
D/D1201#	11/01/2022	Coliforms	> 2419.6	MPN/100ml	-
D/D1201#	11/01/2022	E.coli	2419.6	MPN/100ml	-
D/D3221#	11/01/2022	Faecal Coliforms	> 100	cfu/100ml	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
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CH5 2UA

Report Reference: 22-14450

Report Version: 1

Site: Luas Finglas

Sample Description: SWS 004

Sample Type: Surface

Lab Reference Number: 625169

Date of Sampling: 10/01/2022

Date Sample Received: 10/01/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1003#	13/01/2022	BOD5	< 2	mg/l O2	-
D/D1201#	11/01/2022	Coliforms	> 2419.6	MPN/100ml	-
D/D1201#	11/01/2022	E.coli	1732.9	MPN/100ml	-
D/D3221#	11/01/2022	Faecal Coliforms	> 100	cfu/100ml	-

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Note:
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Report Reference: 22-14450

Report Version: 1

Site: Luas Finglas

Sample Description: SWS 005

Sample Type: Surface

Lab Reference Number: 625170

Date of Sampling: 10/01/2022

Date Sample Received: 10/01/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1003#	13/01/2022	BOD5	< 2	mg/l O2	-
D/D1201#	11/01/2022	Coliforms	1413.6	MPN/100ml	-
D/D1201#	11/01/2022	E.coli	248.1	MPN/100ml	-
D/D3221#	11/01/2022	Faecal Coliforms	> 100	cfu/100ml	-

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Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
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Ground Investigations Ireland
Catherinestown House
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Ireland

Attention :	Stephen Kealy
Date :	21st January, 2022
Your reference :	10892-07-21
Our reference :	Test Report 22/289 Batch 1
Location :	Luas Finglas
Date samples received :	12th January, 2022
Status :	Final Report
Issue :	1

Five samples were received for analysis on 12th January, 2022 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas
Contact: Stephen Kealy
EMT Job No: 22/289

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-5	6-9	10-14	15-19	20-24						LOD/LOR	Units	Method No.
Sample ID	SWS001	SWS002	SWS003	SWS004	SWS005								
Depth													
COC No / misc													
Containers	H HN HCL P	H HN P	H HN HCL P	H HN HCL P	H HN HCL P								
Sample Date	10/01/2022 13:00	10/01/2022 12:30	10/01/2022 12:00	10/01/2022 11:00	10/01/2022 11:30								
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water								
Batch Number	1	1	1	1	1								
Date of Receipt	12/01/2022	12/01/2022	12/01/2022	12/01/2022	12/01/2022								
Dissolved Calcium #	107.1	107.1	126.0	132.1	98.9						<0.2	mg/l	TM30/PM14
Total Phosphorus	11	13	122	67	48						<5	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	300	300	341	358	275						<1	mg/l	TM30/PM14
Nitrate as NO3 #	4.9	4.9	15.1	15.2	15.4						<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	0.02	<0.02	0.07						<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	<0.06	<0.06	<0.06	<0.06	<0.06						<0.06	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.04	0.03	0.05	0.05	0.15						<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH3 #	0.05	0.04	0.07	0.07	0.18						<0.03	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	276	260	302	300	370						<1	mg/l	TM75/PM0
Chlorophyll A*	<1	<1	<1	<1	<1						<1	ug/l	Subcontracted
COD (Settled) #	17	19	12	11	13						<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	625	629	722	732	675						<2	uS/cm	TM76/PM0
pH #	8.23	8.26	8.26	8.26	8.01						<0.01	pH units	TM73/PM0
Total Dissolved Solids #	400	416	482	473	434						<35	mg/l	TM20/PM0
Total Nitrogen	1.1	1.1	3.9	3.4	3.5						<0.5	mg/l	TM38/TM125/PM0
Total Suspended Solids #	<10	<10	42	<10	<10						<10	mg/l	TM37/PM0
Turbidity	1.2	10.5	15.6	2.5	1.0						<0.1	NTU	TM34/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/289						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/289

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/289

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM34	Turbidity by 2100P Turbidity Meter. complies with EPA 180.1 1993	PM0	No preparation is required.				
TM37	Modified methods - TSS: USEPA 160.2 (1985), EN872:2005 and APHA SMEWW 2540D:1999 22nd Edition; VSS: USEPA 1684 (Jan 2001), USEPA 160.4 (1971) and SMEWW 2540E:1999 22nd Edition. Gravimetric determination of Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS). Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed at 105°C for TSS and 550°C for VSS.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes			
TM38/TM125	Total Nitogen/Organic Nitrogen by calculation	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. (Rev. 2.0 1993) Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1 (1978). Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			

EMT Job No: 22/289

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
Subcontracted	See attached subcontractor report for accreditation status and provider.						

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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Stephen Kealy
Date :	1st June, 2022
Your reference :	10892-07-21
Our reference :	Test Report 22/7494 Batch 1
Location :	Luas Finglas - TII
Date samples received :	9th May, 2022
Status :	Final Report
Issue :	1

Eleven samples were received for analysis on 9th May, 2022 of which eleven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 22/7494

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-21	22-27	28-33	34-39	40-45	LOD/LOR	Units	Method No.
Sample ID	SWS001	SWS002	SWS003	SWS004	SWS005	LF-CPRC-1001	LF-CPRC-1007	LF-CPRC-1011	LF-CPRC-1015	LF-CPRC-3001			
Depth						1.15	4.36	2.93	1.12	3.25			
COC No / misc													
Containers	H HN P	H HN P	H HN P	H HN P	H HN P	V H HN P G	V H HN P G	V H HN P G	V H HN P G	V H HN P G			
Sample Date	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022			
Dissolved Arsenic #	-	-	-	-	-	<2.5	37.8	<2.5	4.2	<2.5	<2.5	ug/l	TM30/PM14
Dissolved Boron	-	-	-	-	-	101	132	33	39	79	<12	ug/l	TM30/PM14
Dissolved Cadmium #	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Calcium #	98.7	99.8	130.5	130.5	87.3	-	-	-	-	-	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Copper #	-	-	-	-	-	<7	<7	<7	<7	<7	<7	ug/l	TM30/PM14
Dissolved Lead #	-	-	-	-	-	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Mercury #	-	-	-	-	-	<1	<1	<1	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	-	-	-	-	-	5	7	<2	<2	7	<2	ug/l	TM30/PM14
Dissolved Zinc #	-	-	-	-	-	6	5	3	<3	7	<3	ug/l	TM30/PM14
Total Phosphorus	11	13	126	124	51	-	-	-	-	-	<5	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	282	283	364	374	253	-	-	-	-	-	<1	mg/l	TM30/PM14
PAH MS													
Naphthalene #	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM4/PM30
Acenaphthylene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Acenaphthene #	-	-	-	-	-	0.012	0.011	<0.005	0.006	<0.005	<0.005	ug/l	TM4/PM30
Fluorene #	-	-	-	-	-	<0.005	0.008	<0.005	0.007	<0.005	<0.005	ug/l	TM4/PM30
Phenanthrene #	-	-	-	-	-	0.016	0.012	<0.005	0.020	<0.005	<0.005	ug/l	TM4/PM30
Anthracene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Fluoranthene #	-	-	-	-	-	0.008	<0.005	0.005	0.012	<0.005	<0.005	ug/l	TM4/PM30
Pyrene #	-	-	-	-	-	0.007	<0.005	0.006	0.014	<0.005	<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	-	-	-	-	-	<0.005	<0.005	0.008	0.006	<0.005	<0.005	ug/l	TM4/PM30
Chrysene #	-	-	-	-	-	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	-	-	-	-	-	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Coronene	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM4/PM30
PAH 17 Total	-	-	-	-	-	<0.273	<0.273	<0.273	<0.273	<0.273	<0.273	ug/l	TM4/PM30
Benzo(b)fluoranthene	-	-	-	-	-	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	-	-	-	-	-	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	-	-	-	-	-	72	77	77	79	82	<0	%	TM4/PM30
EPH (C8-C40) #	-	-	-	-	-	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total Phenols HPLC	-	-	-	-	-	<0.15	<0.15	<0.15	0.63	<0.15	<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	-	-	-	-	-	3.6	231.4	53.2	45.5	148.0	<0.5	mg/l	TM38/PM0
Nitrate as NO3 #	2.6	2.6	6.2	6.4	5.5	-	-	-	-	-	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	0.12	0.10	0.14	-	-	-	-	-	<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	<0.06	<0.06	0.23	0.24	<0.06	-	-	-	-	-	<0.06	mg/l	TM38/PM0
Ortho Phosphate as P #	<0.03	<0.03	0.08	0.08	<0.03	-	-	-	-	-	<0.03	mg/l	TM38/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 22/7494

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-21	22-27	28-33	34-39	40-45	LOD/LOR	Units	Method No.
Sample ID	SWS001	SWS002	SWS003	SWS004	SWS005	LF-CPRC-1001	LF-CPRC-1007	LF-CPRC-1011	LF-CPRC-1015	LF-CPRC-3001			
Depth						1.15	4.36	2.93	1.12	3.25			
COC No / misc													
Containers	H HN P	H HN P	H HN P	H HN P	H HN P	V H HN P G	V H HN P G	V H HN P G	V H HN P G	V H HN P G			
Sample Date	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022	05/05/2022			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022			
Total Cyanide #	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.05	0.05	0.18	0.09	0.20	-	-	-	-	-	<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH3 #	0.06	0.06	0.22	0.10	0.25	-	-	-	-	-	<0.03	mg/l	TM38/PM0
Hexavalent Chromium	-	-	-	-	-	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	mg/l	TM38/PM0
Total Dissolved Chromium III	-	-	-	-	-	<6	<6	<6	<6	<6	<6	ug/l	TM0/PM0
Total Alkalinity as CaCO3 #	232	238	276	272	210	-	-	-	-	-	<1	mg/l	TM75/PM0
BOD*	2	<2	3	<2	<2	-	-	-	-	-		mg/l	Subcontracted
COD (Settled) #	<7	<7	<7	<7	<7	-	-	-	-	-	<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	608	596	849	855	587	-	-	-	-	-	<2	uS/cm	TM76/PM0
Faecal Coliforms*	92	78	1400	1800	200	-	-	-	-	-		CFU/100ml	Subcontracted
pH #	8.46	8.50	8.57	8.49	8.44	8.43	8.43	7.80	7.99	7.71	<0.01	pH units	TM73/PM0
Total Organic Carbon #	-	-	-	-	-	94	7	3	8	4	<2	mg/l	TM60/PM0
Total Coliforms*						-	-	-	-	-		CFU/100ml	Subcontracted
Total Coliforms*	2419.6	1413.6	>2419.6	>2419.6	>2419.6	-	-	-	-	-		MPN/100ml	Subcontracted
Total Dissolved Solids #	384	379	533	544	358	-	-	-	-	-	<35	mg/l	TM20/PM0
Total Nitrogen	1.5	2.7	2.8	2.0	2.4	-	-	-	-	-	<0.5	mg/l	TM38/TM125/PM0
Total Suspended Solids #	<10	<10	<10	<10	<10	-	-	-	-	-	<10	mg/l	TM37/PM0
Turbidity	1.2	1.4	2.1	1.5	3.0	-	-	-	-	-	<0.1	NTU	TM34/PM0

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 22/7494

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	46-51										LOD/LOR	Units	Method No.
Sample ID	LF-WS-1016												
Depth													
COC No / misc													
Containers	V H HN P G												
Sample Date	05/05/2022												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	09/05/2022												
Dissolved Arsenic #	<2.5										<2.5	ug/l	TM30/PM14
Dissolved Boron	81										<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5										<0.5	ug/l	TM30/PM14
Dissolved Calcium #	-										<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5										<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7										<7	ug/l	TM30/PM14
Dissolved Lead #	<5										<5	ug/l	TM30/PM14
Dissolved Mercury #	<1										<1	ug/l	TM30/PM14
Dissolved Nickel #	<2										<2	ug/l	TM30/PM14
Dissolved Zinc #	13										<3	ug/l	TM30/PM14
Total Phosphorus	-										<5	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	-										<1	mg/l	TM30/PM14
PAH MS													
Naphthalene #	<0.1										<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.005										<0.005	ug/l	TM4/PM30
Acenaphthene #	0.006										<0.005	ug/l	TM4/PM30
Fluorene #	0.007										<0.005	ug/l	TM4/PM30
Phenanthrene #	0.008										<0.005	ug/l	TM4/PM30
Anthracene #	<0.005										<0.005	ug/l	TM4/PM30
Fluoranthene #	0.007										<0.005	ug/l	TM4/PM30
Pyrene #	0.007										<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.005										<0.005	ug/l	TM4/PM30
Chrysene #	<0.005										<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.008										<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.005										<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.005										<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.005										<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.005										<0.005	ug/l	TM4/PM30
Coronene	<0.1										<0.1	ug/l	TM4/PM30
PAH 17 Total	<0.273										<0.273	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.008										<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008										<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	77										<0	%	TM4/PM30
EPH (C8-C40) #	<10										<10	ug/l	TM5/PM30
Total Phenols HPLC	<0.15										<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	102.8										<0.5	mg/l	TM38/PM0
Nitrate as NO3 #	-										<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	-										<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	-										<0.06	mg/l	TM38/PM0
Ortho Phosphate as P #	-										<0.03	mg/l	TM38/PM0

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 22/7494

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

EMT Sample No.	46-51										LOD/LOR	Units	Method No.
Sample ID	LF-WS-1016												
Depth													
COC No / misc													
Containers	V H HN P G												
Sample Date	05/05/2022												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	09/05/2022												
Total Cyanide #	<0.01										<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	-										<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH3 #	-										<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<0.006										<0.006	mg/l	TM38/PM0
Total Dissolved Chromium III	<6										<6	ug/l	TM0/PM0
Total Alkalinity as CaCO3 #	-										<1	mg/l	TM75/PM0
BOD*	-											mg/l	Subcontracted
COD (Settled) #	-										<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	-										<2	uS/cm	TM76/PM0
Faecal Coliforms*	-											CFU/100ml	Subcontracted
pH #	7.66										<0.01	pH units	TM73/PM0
Total Organic Carbon #	10										<2	mg/l	TM60/PM0
Total Coliforms*	-											CFU/100ml	Subcontracted
Total Coliforms*	-											MPN/100ml	Subcontracted
Total Dissolved Solids #	-										<35	mg/l	TM20/PM0
Total Nitrogen	-										<0.5	mg/l	TM38/TM125/PM0
Total Suspended Solids #	-										<10	mg/l	TM37/PM0
Turbidity	-										<0.1	NTU	TM34/PM0

Please see attached notes for all abbreviations and acronyms

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/7494						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/7494

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/7494

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM34	Turbidity by 2100P Turbidity Meter. complies with EPA 180.1 1993	PM0	No preparation is required.				
TM37	Modified methods - TSS: USEPA 160.2 (1985), EN872:2005 and APHA SMEWW 2540D:1999 22nd Edition; VSS: USEPA 1684 (Jan 2001), USEPA 160.4 (1971) and SMEWW 2540E:1999 22nd Edition. Gravimetric determination of Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS). Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed at 105°C for TSS and 550°C for VSS.	PM0	No preparation is required.	Yes			

EMT Job No: 22/7494

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes			
TM38/TM125	Total Nitogen/Organic Nitrogen by calculation	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. (Rev. 2.0 1993) Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1 (1978). Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			
Subcontracted	See attached subcontractor report for accreditation status and provider.						

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Email: astsupport@etuki.eurofins.com

www.eurofins.com

Customer

Stephen Kealy

Element Materials Technology
Unit 3 Deeside Point
Zone 3 Deeside Industrial Park
Deeside
CH5 2UA

Certificate Of Analysis

Job Number: 22-28578
Issue Number: 1
Report Date: 24 August 2022

Site: Not Applicable
PO Number: E208N22001355
Date Samples Received: 18/08/2022

Please find attached the results for the samples received at our laboratory on 18/08/2022.

Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our website at the above address.

Thank you for choosing Eurofins Environment Testing. We look forward to assisting you again

Authorised By: Aoife de Barra **Authorised Date:** 24 August 2022

Notes are not INAB accredited

Results relate only to the items tested.
Information on methods of analysis and uncertainty of measurement is available on request.
Any opinions or interpretations indicated are outside the scope of our INAB accreditation.

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Certificate Of Analysis

Customer

Stephen Kealy

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Report Reference: 22-28578

Report Version: 1

Site: Not Applicable

Sample Description: GII SWS001

Sample Type: Surface

Lab Reference Number: 667644

Date of Sampling: 17/08/2022

Date Sample Received: 18/08/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Deviating Flags	Units	PV Value (Drinking Water Only)
D/D1003#	18/08/2022	BOD5	< 2		mg/l O2	-
D/D1201	18/08/2022	Coliforms	920.8	bfg	MPN/100ml	-
D/D3221	18/08/2022	Faecal Coliforms	> 100	fg	cfu/100ml	-
D/D1205	18/08/2022	Enterococci	35	fg	cfu/100ml	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
NAC & ATC - No abnormal change and acceptable to customers.
TVC - Total viable count
Site D = Analysed at EETI Dublin. Site S = Analysed at EETI Shannon

KEY FOR DEVIATING SAMPLES

Sample may be deviating due to one or more of the following:

a - No date of sampling supplied
b - Sampling time not provided. Samples may be deviating
c - Sample not received in appropriate containers
d - Sample not received in correct temperature conditions
e - The container has been provided with headspace
f - Sample age exceeds stability time (sampling to receipt)
g - Sampling time to Analysis start time exceeded stability
h - Sample type not provided

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Certificate Of Analysis

Customer

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Deeside
CH5 2UA

Report Reference: 22-28578

Report Version: 1

Site: Not Applicable

Sample Description: GII SWS002

Sample Type: Surface

Lab Reference Number: 667645

Date of Sampling: 17/08/2022

Date Sample Received: 18/08/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Deviating Flags	Units	PV Value (Drinking Water Only)
D/D1003#	18/08/2022	BOD5	< 2		mg/l O2	-
D/D1201	18/08/2022	Coliforms	> 2419.6	bfg	MPN/100ml	-
D/D3221	18/08/2022	Faecal Coliforms	> 100	fg	cfu/100ml	-
D/D1205	18/08/2022	Enterococci	22	fg	cfu/100ml	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
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e - The container has been provided with headspace
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g - Sampling time to Analysis start time exceeded stability
h - Sample type not provided

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Certificate Of Analysis

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Report Reference: 22-28578

Report Version: 1

Site: Not Applicable

Sample Description: GII SWS003

Sample Type: Surface

Lab Reference Number: 667646

Date of Sampling: 17/08/2022

Date Sample Received: 18/08/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Deviating Flags	Units	PV Value (Drinking Water Only)
D/D1003#	18/08/2022	BOD5	< 2		mg/l O2	-
D/D1201	18/08/2022	Coliforms	> 2419.6	bfg	MPN/100ml	-
D/D3221	18/08/2022	Faecal Coliforms	> 100	fg	cfu/100ml	-
D/D1205	18/08/2022	Enterococci	> 200	fg	cfu/100ml	-

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Note:
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h - Sample type not provided

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Report Reference: 22-28578

Report Version: 1

Site: Not Applicable

Sample Description: GII SWS004

Sample Type: Surface

Lab Reference Number: 667647

Date of Sampling: 17/08/2022

Date Sample Received: 18/08/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Deviating Flags	Units	PV Value (Drinking Water Only)
D/D1003#	18/08/2022	BOD5	< 2		mg/l O2	-
D/D1201	18/08/2022	Coliforms	1986.3	bfg	MPN/100ml	-
D/D3221	18/08/2022	Faecal Coliforms	> 100	fg	cfu/100ml	-
D/D1205	18/08/2022	Enterococci	12	fg	cfu/100ml	-

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Report Reference: 22-28578

Report Version: 1

Site: Not Applicable

Sample Description: GII SWS005

Sample Type: Surface

Lab Reference Number: 667648

Date of Sampling: 17/08/2022

Date Sample Received: 18/08/2022

Site / Method Ref.	Analysis Start Date	Parameter	Result	Deviating Flags	Units	PV Value (Drinking Water Only)
D/D1003#	18/08/2022	BOD5	2		mg/l O2	-
D/D1201	18/08/2022	Coliforms	> 2419.6	bfg	MPN/100ml	-
D/D3221	18/08/2022	Faecal Coliforms	> 100	fg	cfu/100ml	-
D/D1205	18/08/2022	Enterococci	168	fg	cfu/100ml	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
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h - Sample type not provided

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Mr Managers
Element Materials Technology
Environmental UK Limited
Unit 3 Deeside Point
Zone 3 Deeside Industrial Estate
Deeside CH5 2UA

20 August 2022

Test Report: COV/2360825/2022

Dear Mr Managers

Analysis of your sample(s) submitted on 18 August 2022 is now complete and we have pleasure in enclosing the appropriate test report(s).

An invoice for the analysis carried out will be sent under separate cover.

Should you have any queries regarding this report(s) or any part of our service, please contact Customer Services on +44 (0)24 7642 1213 who will be happy to discuss your requirements.

If you would like to arrange any further analysis, please contact Customer Services. To arrange container delivery or sample collection, please call the Couriers Department directly on 024 7685 6562.

Thank you for using ALS Environmental Ltd and we look forward to receiving your next samples.

Yours Sincerely,

Signed: 

Name: B. Paige

Title: Microbiology Team Leader

UKAS TESTING 1314

bsi ISO 14001 Environmental Management CERTIFIED EMS675527 ISO 45001 Occupational Health and Safety Management CERTIFIED OHS 542058

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report Summary

ANALYSED BY

UKAS TESTING 1314

ALS

Mr Project Managers
Element Materials Technology
Environmental UK Limited
Unit 3 Deeside Point
Zone 3 Deeside Industrial Estate
Deeside
CH5 2UA

Date of Issue: **20 August 2022**

Report Number: **COV/2360825/2022** Issue **1**

This issue replaces all previous issues

Job Description: Master Quotation 2021

Number of Samples included in this report **5**

Number of Test Results included in this report **5**

Job Received: **18 August 2022**

Analysis Commenced: **19 August 2022**

Signed: Bpaige

Name: **B. Paige** Date: **20 August 2022**

Title: **Microbiology Team Leader**

ALS Environmental Ltd was not responsible for sampling unless otherwise stated.

Information on the methods of analysis and performance characteristics are available on request.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. The results relate only to the items tested and where relevant sampled.
Tests marked 'Not UKAS Accredited' in this Report/Certificate are not included in the UKAS Accreditation Schedule for our laboratory.
This test report is not a statement of conformity to any specification or standard.

Certificate of Analysis

ANALYSED BY

UKAS TESTING 1314

Report Number:	**COV/2360825/2022**	Issue	**1**
Laboratory Number:	**21945002**	Sample	**1** of **5**

Sample Source:	**Element Materials Technology Environmental UK Limited**
Sample Point Description:	
Sample Description:	**22/13216 - 2**
Sample Matrix:	**Surface Water**
Sample Date/Time:	**12 August 2022**
Sample Received:	**18 August 2022**
Analysis Complete:	**20 August 2022**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Chlorophyll a COLD	<7.00	ug/l	19/08/2022	Y Cov	W45

Analyst Comments for 21945002: This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: *B paige*

Name: **B. Paige** Date: **20 August 2022**

Title: **Microbiology Team Leader**

Certificate of Analysis

ANALYSED BY

UKAS TESTING 1314

Report Number:	**COV/2360825/2022**	Issue	**1**
Laboratory Number:	**21945003**	Sample	**2** of **5**

Sample Source:	**Element Materials Technology Environmental UK Limited**
Sample Point Description:	
Sample Description:	**22/13216 - 5**
Sample Matrix:	**Surface Water**
Sample Date/Time:	**12 August 2022**
Sample Received:	**18 August 2022**
Analysis Complete:	**20 August 2022**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Chlorophyll a COLD	<7.00	ug/l	19/08/2022	Y Cov	W45

Analyst Comments for 21945003: This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: B paige

Name: **B. Paige** Date: **20 August 2022**

Title: **Microbiology Team Leader**

Certificate of Analysis

ANALYSED BY

UKAS TESTING 1314

Report Number:	**COV/2360825/2022**	Issue	**1**
Laboratory Number:	**21945004**	Sample	**3** of **5**

Sample Source:	**Element Materials Technology Environmental UK Limited**
Sample Point Description:	
Sample Description:	**22/13216 - 8**
Sample Matrix:	**Surface Water**
Sample Date/Time:	**12 August 2022**
Sample Received:	**18 August 2022**
Analysis Complete:	**20 August 2022**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Chlorophyll a COLD	<7.00	ug/l	19/08/2022	Y Cov	W45

Analyst Comments for 21945004: This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: B Paige

Name: **B. Paige** Date: **20 August 2022**

Title: **Microbiology Team Leader**

Certificate of Analysis

ANALYSED BY

UKAS TESTING 1314

Report Number:	**COV/2360825/2022**	Issue	**1**
Laboratory Number:	**21945005**	Sample	**4** of **5**

Sample Source:	**Element Materials Technology Environmental UK Limited**
Sample Point Description:	
Sample Description:	**22/13216 - 11**
Sample Matrix:	**Surface Water**
Sample Date/Time:	**12 August 2022**
Sample Received:	**18 August 2022**
Analysis Complete:	**20 August 2022**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Chlorophyll a COLD	<7.00	ug/l	19/08/2022	Y Cov	W45

Analyst Comments for 21945005: This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Bpaige

Name: **B. Paige** Date: **20 August 2022**

Title: **Microbiology Team Leader**

Certificate of Analysis

ANALYSED BY

UKAS TESTING 1314

Report Number:	**COV/2360825/2022**	Issue	**1**
Laboratory Number:	**21945006**	Sample	**5** of **5**

Sample Source:	**Element Materials Technology Environmental UK Limited**
Sample Point Description:	
Sample Description:	**22/13216 - 14**
Sample Matrix:	**Surface Water**
Sample Date/Time:	**12 August 2022**
Sample Received:	**18 August 2022**
Analysis Complete:	**20 August 2022**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Chlorophyll a COLD	19.55	ug/l	19/08/2022	Y Cov	W45

Analyst Comments for 21945006: This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: *B paige*

Name: **B. Paige** Date: **20 August 2022**

Title: **Microbiology Team Leader**

ANALYST COMMENTS FOR REPORT COV/2360825/2022 Issue 1

This issue replaces all previous issues

Date of Issue: **20 August 2022**

Sample No	Analysis Comments
21945002	This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.
21945003	This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.
21945004	This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.
21945005	This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.
21945006	This sample has been analysed for Chlorophyll "a" COLD outside recommended stability times. It is therefore possible that the results provided may be compromised.

Signed: 

Name: **B. Paige** Date: **20 August 2022**

Title: **Microbiology Team Leader**

DETERMINAND COMMENTS FOR REPORT COV/2360825/2022

ISSUE 1

This issue replaces all previous issues

Date of Issue: 20 August 2022

Sample No	Description	Determinand	Comments

Signed: 

Name: **B. Paige** Date: **20 August 2022**

Title: **Microbiology Team Leader**

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Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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F: +44 (0) 1244 833781
W: www.element.com

Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Stephen Kealy
Date :	1st September, 2022
Your reference :	10892-07-21
Our reference :	Test Report 22/13216 Batch 1
Location :	Luas Finglas- TI
Date samples received :	15th August, 2022
Status :	Final Report
Issue :	1

Ten samples were received for analysis on 15th August, 2022 of which ten were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 3rd Floor Davidson Building, 5 Southampton Street, London WC2E 7HA
Company Registration No: 11371415

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas- TI
Contact: Stephen Kealy
EMT Job No: 22/13216

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-20	21-25	26-30	31-35	36-40	LOD/LOR	Units	Method No.
Sample ID	SWS001	SWS002	SWS003	SWS004	SWS005	LF-CPRC-1001	LF-CPRC-1007	LF-CPRC-1011	LF-CPRC-1015	LF-CPRC-3001			
Depth						1.22	4.34	3.17	1.12	3.26			
COC No / misc													
Containers	P BC	P BC	P BC	P BC	P BC	H HN N P G	H HN N P G	H HN N P G	H HN N P G	H HN N P G			
Sample Date	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022			
Dissolved Arsenic #	-	-	-	-	-	3.5	31.4	<2.5	4.1	<2.5	<2.5	ug/l	TM30/PM14
Dissolved Boron	-	-	-	-	-	120	150	48	41	113	<12	ug/l	TM30/PM14
Dissolved Cadmium #	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Calcium #	73.2	73.0	111.8	113.6	84.8	-	-	-	-	-	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Copper #	-	-	-	-	-	<7	<7	<7	<7	<7	<7	ug/l	TM30/PM14
Dissolved Lead #	-	-	-	-	-	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Mercury #	-	-	-	-	-	<1	<1	<1	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	-	-	-	-	-	4	5	<2	<2	7	<2	ug/l	TM30/PM14
Dissolved Zinc #	-	-	-	-	-	4	<3	5	<3	4	<3	ug/l	TM30/PM14
Total Phosphorus	10	11	235	261	82	-	-	-	-	-	<5	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	222	222	323	328	243	-	-	-	-	-	<1	mg/l	TM30/PM14
PAH MS													
Naphthalene #	-	-	-	-	-	<0.1	<0.1 SV	<0.1 SV	<0.1 SV	<0.1 SV	<0.1	ug/l	TM4/PM30
Acenaphthylene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	<0.005 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Acenaphthene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	0.006 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Fluorene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	0.011 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Phenanthrene #	-	-	-	-	-	0.010	<0.005 SV	<0.005 SV	0.023 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Anthracene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	<0.005 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Fluoranthene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	0.022 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Pyrene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	0.023 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	0.011 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Chrysene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	0.012 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	-	-	-	-	-	<0.008	<0.008 SV	<0.008 SV	0.019 SV	<0.008 SV	<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	0.009 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	0.013 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	<0.005 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	-	-	-	-	-	<0.005	<0.005 SV	<0.005 SV	0.007 SV	<0.005 SV	<0.005	ug/l	TM4/PM30
Coronene	-	-	-	-	-	<0.1	<0.1 SV	<0.1 SV	<0.1 SV	<0.1 SV	<0.1	ug/l	TM4/PM30
PAH 17 Total	-	-	-	-	-	<0.273	<0.273	<0.273	<0.273	<0.273	<0.273	ug/l	TM4/PM30
Benzo(b)fluoranthene	-	-	-	-	-	<0.008	<0.008	<0.008	0.014	<0.008	<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	-	-	-	-	-	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	-	-	-	-	-	53 SV	62 SV	65 SV	62 SV	61 SV	<0	%	TM4/PM30
EPH (C8-C40) #	-	-	-	-	-	3610	<10	<10	980	<10	<10	ug/l	TM5/PM30
Total Phenols HPLC	-	-	-	-	-	<0.15	<0.15	<0.15	1.72	<0.15	<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	-	-	-	-	-	2.0	194.2	52.9	47.7	217.1	<0.5	mg/l	TM38/PM0
Nitrate as NO3 #	<0.2	<0.2	5.2	5.4	<0.2	-	-	-	-	-	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	0.19	0.13	<0.02	-	-	-	-	-	<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	<0.06	<0.06	0.68	0.78	0.09	-	-	-	-	-	<0.06	mg/l	TM38/PM0
Ortho Phosphate as P #	<0.03	<0.03	0.22	0.25	<0.03	-	-	-	-	-	<0.03	mg/l	TM38/PM0

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas- TI
Contact: Stephen Kealy
EMT Job No: 22/13216

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-20	21-25	26-30	31-35	36-40	LOD/LOR	Units	Method No.
Sample ID	SWS001	SWS002	SWS003	SWS004	SWS005	LF-CPRC-1001	LF-CPRC-1007	LF-CPRC-1011	LF-CPRC-1015	LF-CPRC-3001			
Depth						1.22	4.34	3.17	1.12	3.26			
COC No / misc													
Containers	P BC	P BC	P BC	P BC	P BC	H HN N P G	H HN N P G	H HN N P G	H HN N P G	H HN N P G			
Sample Date	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022			
Total Cyanide #	-	-	-	-	-	0.02	<0.01	<0.01	0.03	<0.01	<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.05	0.04	0.09	0.09	0.20	-	-	-	-	-	<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH3 #	0.06	0.05	0.11	0.10	0.25	-	-	-	-	-	<0.03	mg/l	TM38/PM0
Hexavalent Chromium	-	-	-	-	-	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	mg/l	TM38/PM0
Total Dissolved Chromium III	-	-	-	-	-	<6	<6	<6	<6	<6	<6	ug/l	TM0/PM0
Total Alkalinity as CaCO3 #	196	192	258	266	238	-	-	-	-	-	<1	mg/l	TM75/PM0
BOD*	<2	<2	<2	<2	2	-	-	-	-	-		mg/l	Subcontracted
Chlorophyll A*	<7 AA	<7 AA	<7 AA	<7 AA	20	-	-	-	-	-	<1	ug/l	Subcontracted
COD (Settled) #	28	8	<7	<7	17	-	-	-	-	-	<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	499	488	789	811	552	-	-	-	-	-	<2	uS/cm	TM76/PM0
Faecal Coliforms*	>100	>100	>100	>100	>100	-	-	-	-	-		CFU/100ml	Subcontracted
pH #	8.19	8.14	8.23	8.23	7.93	7.92	8.01	7.73	7.72	7.50	<0.01	pH units	TM73/PM0
Total Coliforms*	920.8	>2419.6	>2419.6	1986.3	>2419.6	-	-	-	-	-		CFU/100ml	Subcontracted
Total Dissolved Solids #	297	314	503	505	337	-	-	-	-	-	<35	mg/l	TM20/PM0
Total Nitrogen	0.8	0.9	2.3	2.3	1.0	-	-	-	-	-	<0.5	mg/l	TM38/TM125/PM0
Total Suspended Solids #	<10	<10	<10	<10	10	-	-	-	-	-	<10	mg/l	TM37/PM0
Turbidity	0.7	6.0	7.7	5.8	8.8	-	-	-	-	-	<0.1	NTU	TM34/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas- TI
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/13216						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/13216

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x7 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/13216

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM34	Turbidity by 2100P Turbidity Meter. complies with EPA 180.1 1993	PM0	No preparation is required.				
TM37	Modified methods - TSS: USEPA 160.2 (1985), EN872:2005 and APHA SMEWW 2540D:1999 22nd Edition; VSS: USEPA 1684 (Jan 2001), USEPA 160.4 (1971) and SMEWW 2540E:1999 22nd Edition. Gravimetric determination of Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS). Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed at 105°C for TSS and 550°C for VSS.	PM0	No preparation is required.	Yes			

EMT Job No: 22/13216

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes			
TM38/TM125	Total Nitogen/Organic Nitrogen by calculation	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. (Rev. 2.0 1993) Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1 (1978). Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			
Subcontracted	See attached subcontractor report for accreditation status and provider.						

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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Stephen Kealy
Date :	14th November, 2022
Your reference :	10892-07-21
Our reference :	Test Report 22/18211 Batch 1
Location :	Luas Finglas - TII
Date samples received :	4th November, 2022
Status :	Final Report
Issue :	1

Four samples were received for analysis on 4th November, 2022 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Liza Klebe
Project Co-ordinator

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 22/18211

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

EMT Sample No.	1-5	6-10	11-15	16-20							LOD/LOR	Units	Method No.
Sample ID	LF-CPRC-1001	LF-CPRC-1007	LF-CPRC-1011	LF-WS-1016									
Depth													
COC No / misc													
Containers	H HNUF N P G	H HNUF N P G	H HNUF N P G	H HNUF N P G									
Sample Date	03/11/2022	03/11/2022	03/11/2022	03/11/2022									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	04/11/2022	04/11/2022	04/11/2022	04/11/2022									
Dissolved Arsenic #	<2.5	20.1	<2.5	<2.5							<2.5	ug/l	TM30/PM14
Dissolved Boron	133	179	34	88							<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5							<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7							<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5							<5	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1							<1	ug/l	TM30/PM14
Dissolved Nickel #	4	10	2	<2							<2	ug/l	TM30/PM14
Dissolved Zinc #	11	4	4	13							<3	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.005	<0.005	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Acenaphthene #	<0.005	0.015	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Fluorene #	<0.005	0.012	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Phenanthrene #	<0.005	0.024	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Anthracene #	<0.005	<0.005	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Fluoranthene #	<0.005	0.008	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Pyrene #	<0.005	0.009	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.005	<0.005	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Chrysene #	<0.005	<0.005	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.008	<0.008	<0.008	<0.008							<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.005	<0.005	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.005	<0.005	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.005	<0.005	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.005	<0.005	<0.005	<0.005							<0.005	ug/l	TM4/PM30
Coronene	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM4/PM30
PAH 17 Total	<0.273	<0.273	<0.273	<0.273							<0.273	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.008	<0.008	<0.008	<0.008							<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008	<0.008	<0.008	<0.008							<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	90	85	94	88							<0	%	TM4/PM30
EPH (C8-C40) #	1060	<10	<10	<10							<10	ug/l	TM5/PM30
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15							<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	6.6	638.2	38.2	144.4							<0.5	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01							<0.01	mg/l	TM89/PM0
Hexavalent Chromium	<0.006	<0.006	<0.006	<0.006							<0.006	mg/l	TM38/PM0
Total Dissolved Chromium III	<6	<6	<6	<6							<6	ug/l	TM0/PM0
pH #	8.14	7.88	7.59	7.40							<0.01	pH units	TM73/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland

Reference: 10892-07-21

Location: Luas Finglas - TII

Contact: Stephen Kealy

Matrix : Liquid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
22/18211	1	LF-CPRC-1001		1-5	EPH	Sample received in inappropriate container

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/18211

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/18211

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

EMT Job No: 22/18211

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			

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Ireland

Attention :	Stephen Kealy
Date :	19th December, 2022
Your reference :	10892-07-21
Our reference :	Test Report 22/20251 Batch 1
Location :	Luas Finglas - TII
Date samples received :	8th December, 2022
Status :	Final Report
Issue :	1

One sample was received for analysis on 8th December, 2022 and was scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 22/20251

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-5										Please see attached notes for all abbreviations and acronyms		
Sample ID	LF-CPRC-3001												
Depth	2.24												
COC No / misc													
Containers	H HN N P G												
Sample Date	05/12/2022												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	08/12/2022												
											LOD/LOR	Units	Method No.
Dissolved Arsenic #	<2.5										<2.5	ug/l	TM30/PM14
Dissolved Boron	42										<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5										<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	2.0										<1.5	ug/l	TM30/PM14
Dissolved Copper #	13										<7	ug/l	TM30/PM14
Dissolved Lead #	<5										<5	ug/l	TM30/PM14
Dissolved Mercury #	<1										<1	ug/l	TM30/PM14
Dissolved Nickel #	4										<2	ug/l	TM30/PM14
Dissolved Zinc #	<3										<3	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.1										<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.005										<0.005	ug/l	TM4/PM30
Acenaphthene #	0.005										<0.005	ug/l	TM4/PM30
Fluorene #	<0.005										<0.005	ug/l	TM4/PM30
Phenanthrene #	0.008										<0.005	ug/l	TM4/PM30
Anthracene #	<0.005										<0.005	ug/l	TM4/PM30
Fluoranthene #	0.006										<0.005	ug/l	TM4/PM30
Pyrene #	0.006										<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	0.006										<0.005	ug/l	TM4/PM30
Chrysene #	<0.005										<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.008										<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.005										<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.005										<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.005										<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.005										<0.005	ug/l	TM4/PM30
PAH 16 Total #	<0.173										<0.173	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.008										<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008										<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	78										<0	%	TM4/PM30
EPH (C8-C40) #	<10										<10	ug/l	TM5/PM30
Phenol #	<0.01										<0.01	mg/l	TM26/PM0
Sulphate as SO4 #	65.1										<0.5	mg/l	TM38/PM0
Total Cyanide #	<0.01										<0.01	mg/l	TM89/PM0
Hexavalent Chromium	<0.006										<0.006	mg/l	TM38/PM0
Total Dissolved Chromium III	<6										<6	ug/l	TM0/PM0
Total Organic Carbon #	5										<2	mg/l	TM60/PM0

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/20251						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/20251

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/20251

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes			
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.	Yes			

EMT Job No: 22/20251

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			

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Certificate Code: **AR-23-BB-005969-01**
Page Number: **Page 1 of 5**
PO reference: **22001805**

Certificate of Analysis

Sample number	277-2022-00005112	Date received	03/11/2022
		Your sample reference	SWS001
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Time Sampled	17:00
Sample Date	02/11/2022		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	04/11/22	D1003 D		<2	mg/l O2	
Chlorophyll A	04/01/23	*		3.8	µg/l	
Faecal Coliforms	03/11/22 7D	3221 D		25	cfu/100 ml	
Coliforms	03/11/22 7D	1201 D		> 2420	cfu/100 ml	

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6. No date of sampling was supplied, sample stability cannot be assessed, results may be compromised.

7A. This result is compromised as it was tested outside of stability times.

7C. Sample not received in appropriate containers, therefore results may be compromised.

7D. This result is comprised as the sample was received by the laboratory outside of the holding time.

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Certificate Code: **AR-23-BB-005969-01**
Page Number: **Page 2 of 5**
PO reference: **22001805**

Sample number	277-2022-00005113	Date received	03/11/2022
		Your sample reference	SWS002
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Time Sampled	17:00
Sample Date	02/11/2022		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	04/11/22	D1003 D		<2	mg/l O2	
Chlorophyll A	03/11/22	*		<0.1	µg/l	
Faecal Coliforms	03/11/22 7D	3221 D		58	cfu/100 ml	
Coliforms	03/11/22 7D	1201 D		1046.2	cfu/100 ml	

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Sample number	277-2022-00005114	Date received	03/11/2022
		Your sample reference	SWS003
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Time Sampled	17:00
Sample Date	02/11/2022		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	04/11/22	D1003 D		2	mg/l O2	
Faecal Coliforms	03/11/22 7D	3221 D		> 100	cfu/100 ml	
Coliforms	03/11/22 7D	1201 D		> 2420	cfu/100 ml	

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Page Number: **Page 4 of 5**
PO reference: **22001805**

Sample number	277-2022-00005115	Date received	03/11/2022
		Your sample reference	SWS004
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Time Sampled	17:00
Sample Date	02/11/2022		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	04/11/22	D1003 D		<2	mg/l O2	
Faecal Coliforms	03/11/22 7D	3221 D		> 100	cfu/100 ml	
Coliforms	03/11/22 7D	1201 D		> 2420	cfu/100 ml	

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PO reference: **22001805**

Sample number	277-2022-00005116	Date received	03/11/2022
		Your sample reference	SWS005
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Time Sampled	17:00
Sample Date	02/11/2022		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	04/11/22	D1003 D		3	mg/l O2	
Chlorophyll A	04/01/23	*		47.9	µg/l	
Faecal Coliforms	03/11/22 7D	3221 D		61	cfu/100 ml	
Coliforms	03/11/22 7D	1201 D		579.4	cfu/100 ml	

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Certificate Code: **AR-23-BB-008353-01**
Page Number: **Page 1 of 5**
PO reference:

Certificate of Analysis

Sample number	277-2023-00007773	Date received	13/04/2023
		Your sample reference	SWS001
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Site	Ground Investigations Ireland Ltd
Sample Date	13/04/2023		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	14/04/23 [7B]	D1003 D		2	mg/l O2	
Chlorophyll A	13/04/23	*		9.5	µg/l	
Faecal Coliforms	13/04/23 [7B]	3221 D		62	cfu/100 ml	
Coliforms	13/04/23 [7B]	1201 D		613.1	MPN/100 ml	

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Niamh Ward -

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Certificate Code: **AR-23-BB-008353-01**
Page Number: **Page 2 of 5**
PO reference:

Sample number	277-2023-00007774	Date received	13/04/2023
		Your sample reference	SWS002
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Site	Ground Investigations Ireland Ltd
Sample Date	13/04/2023		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	14/04/23 [7B]	D1003 [D]		2	mg/l O2	
Chlorophyll A	13/04/23	[*]		11.0	µg/l	
Faecal Coliforms	13/04/23 [7B]	3221 [D]		54	cfu/100 ml	
Coliforms	13/04/23 [7B]	1201 [D]		547.5	MPN/100 ml	

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Certificate Code: **AR-23-BB-008353-01**

PO reference:

Sample number	277-2023-00007775	Date received	13/04/2023
		Your sample reference	SWS003
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Site	Ground Investigations Ireland Ltd
Sample Date	13/04/2023		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	14/04/23 [7B]	D1003 [D]		<2	mg/l O2	
Chlorophyll A	13/04/23	*		0.4	µg/l	
Faecal Coliforms	13/04/23 [7B]	3221 [D]		> 100	cfu/100 ml	
Coliforms	13/04/23 [7B]	1201 [D]		> 2420	MPN/100 ml	

SIGNATURE 20/04/2023
Niamh Ward -

NOTES
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2. SPEC = Allowable limit or parametric value.
3. LOQ = Limit of Quantification or lowest value that can be reported.
4. ACCRED = Indicates accreditation for the test, a blank field indicates not accredited.
5. * indicates the test was sub-contracted, "D" indicates the analysis was performed in Dublin and "C" indicates the analysis performed in Cork.
6. No date of sampling was supplied, sample stability cannot be assessed, results may be compromised.
7A. This result is compromised as it was tested outside of stability times.
7C. Sample not received in appropriate containers, therefore results may be compromised.
7D. This result is comprised as the sample was received by the laboratory outside of the holding time.

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Client: **Element Materials Technology**
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Certificate Code: **AR-23-BB-008353-01**
Page Number: **Page 4 of 5**
PO reference:

Sample number	277-2023-00007776	Date received	13/04/2023
		Your sample reference	SWS004
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Site	Ground Investigations Ireland Ltd
Sample Date	13/04/2023		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	14/04/23 [7B]	D1003 [D]		<2	mg/l O2	
Chlorophyll A	13/04/23	*		0.4	µg/l	
Faecal Coliforms	13/04/23 [7B]	3221 [D]		> 100	cfu/100 ml	
Coliforms	13/04/23 [7B]	1201 [D]		> 2420	MPN/100 ml	

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6. No date of sampling was supplied, sample stability cannot be assessed, results may be compromised.
7A. This result is compromised as it was tested outside of stability times.
7C. Sample not received in appropriate containers, therefore results may be compromised.
7D. This result is comprised as the sample was received by the laboratory outside of the holding time.

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Certificate Code: **AR-23-BB-008353-01**
Page Number: **Page 5 of 5**
PO reference:

Sample number	277-2023-00007777	Date received	13/04/2023
		Your sample reference	SWS005
Sample Matrix	Surface water		
Sample Condition on Arrival	Satisfactory	Site	Ground Investigations Ireland Ltd
Sample Date	13/04/2023		

Analyte	Analysis Started	Method [5]	SPEC [2]	Result	Units	ACCRED [4]
BOD Non Inhibited Dublin	14/04/23 [7B]	D1003 [D]		5	mg/l O2	
Chlorophyll A	13/04/23	[*]		6.7	µg/l	
Faecal Coliforms	13/04/23 [7B]	3221 [D]		> 100	cfu/100 ml	
Coliforms	13/04/23 [7B]	1201 [D]		2419.6	MPN/100 ml	

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3. LOQ = Limit of Quantification or lowest value that can be reported.
4. ACCRED = Indicates accreditation for the test, a blank field indicates not accredited.
5. * indicates the test was sub-contracted, "D" indicates the analysis was performed in Dublin and "C" indicates the analysis performed in Cork.
6. No date of sampling was supplied, sample stability cannot be assessed, results may be compromised.
7A. This result is compromised as it was tested outside of stability times.
7C. Sample not received in appropriate containers, therefore results may be compromised.
7D. This result is comprised as the sample was received by the laboratory outside of the holding time.

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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Stephen Kealy
Date :	18th April, 2023
Your reference :	10892-07-21
Our reference :	Test Report 23/5402 Batch 1
Location :	Luas Finglas-TII
Date samples received :	5th April, 2023
Status :	Final Report
Issue :	1

Fifteen samples were received for analysis on 5th April, 2023 of which fifteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Liza Klebe
Project Co-ordinator

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas-TII
Contact: Stephen Kealy
EMT Job No: 23/5402

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60	LOD/LOR	Units	Method No.
Sample ID	LF-CPRC-1032	LF-CPRC-1028	LF-CPRC-1018	LF-CPRC-2007	LF-CPRC-1015	LF-WS-1018	LF-CPRC-1014	LF-WS-1014	LF-WS-1016	LF-WS-1015			
Depth	1.92	1.32	3.78	3.44	1.10	3.25	4.42	3.22	2.27	2.02			
COC No / misc													
Containers	V HN N P G	V HN N P G	V HN N P G	V HN N P G	V HN N P G	V HN N P G	V HN N P G	V HN N P G	V HN N P G	V HN N P G			
Sample Date	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/04/2023	05/04/2023	05/04/2023	05/04/2023	05/04/2023	05/04/2023	05/04/2023	05/04/2023	05/04/2023	05/04/2023			
Dissolved Arsenic #	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	4.9	10.2	<2.5	<2.5	<2.5	ug/l	TM30/PM14
Dissolved Boron	57	38	53	96	39	46	87	30	53	22	<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	1.6	<1.5	<1.5	1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	6	3	3	11	2	13	19	5	<2	4	<2	ug/l	TM30/PM14
Dissolved Zinc #	12	8	36	5	6	6	8	10	9	6	<3	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Acenaphthene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Fluorene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Phenanthrene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Anthracene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Fluoranthene #	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Pyrene #	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Chrysene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Coronene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM4/PM30
PAH 17 Total	<0.273	<0.273	<0.273	<0.273	<0.273	<0.273	<0.273	<0.273	<0.273	<0.273	<0.273	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	82	84	86	91	88	87	78	89	83	79	<0	%	TM4/PM30
EPH (C8-C40) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	58.3	56.7	45.7	94.5	31.0	87.7	3.8	107.6	118.4	43.6	<0.5	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM89/PM0
Hexavalent Chromium	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	mg/l	TM38/PM0
Total Dissolved Chromium III	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	ug/l	TM0/PM0
pH #	7.82	7.80	8.01	7.37	7.54	7.22	7.31	7.99	7.82	7.39	<0.01	pH units	TM73/PM0

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas-TII
Contact: Stephen Kealy
EMT Job No: 23/5402

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	61-66	67-72	73-77	78-82	83-85						LOD/LOR	Units	Method No.
Sample ID	LF-CPRC-1011	LF-CPRC-1001	LF-CPRC-1004	LF-CPRC-1009	LF-CPRC-1010								
Depth	2.58	1.07	2.19	5.19	5.65								
COC No / misc													
Containers	V HN N P G	V HN N P G	V HN N P	V HN N P G	HN N P								
Sample Date	29/03/2023	29/03/2023	29/03/2023	29/03/2023	29/03/2023								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	1	1	1	1	1								
Date of Receipt	05/04/2023	05/04/2023	05/04/2023	05/04/2023	05/04/2023								
Dissolved Arsenic #	<2.5	<2.5	<2.5	3.4	<2.5						<2.5	ug/l	TM30/PM14
Dissolved Boron	29	103	42	46	94						<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7						<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5						<5	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1						<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	6	<2	7	<2						<2	ug/l	TM30/PM14
Dissolved Zinc #	6	11	5	8	6						<3	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Acenaphthene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Fluorene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Phenanthrene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Anthracene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Fluoranthene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Pyrene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Chrysene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.008	<0.008	<0.008	<0.008	<0.008						<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Coronene	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM4/PM30
PAH 17 Total	<0.273	<0.273	<0.273	<0.273	<0.273						<0.273	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.008	<0.008	<0.008	<0.008	<0.008						<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008	<0.008	<0.008	<0.008	<0.008						<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	80	86	71	82	80						<0	%	TM4/PM30
EPH (C8-C40) #	<10	730	<10	<10	1920						<10	ug/l	TM5/PM30
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15						<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	17.3	8.7	210.0	161.4	49.6						<0.5	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01	0.02						<0.01	mg/l	TM89/PM0
Hexavalent Chromium	<0.006	<0.006	<0.006	<0.006	<0.006						<0.006	mg/l	TM38/PM0
Total Dissolved Chromium III	<6	<6	<6	<6	<6						<6	ug/l	TM0/PM0
pH #	7.71	7.92	7.53	7.45	7.59						<0.01	pH units	TM73/PM0

Client Name: Ground Investigations Ireland

Reference: 10892-07-21

Location: Luas Finglas-TII

Contact: Stephen Kealy

Matrix : Liquid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
23/5402	1	LF-CPRC-1004	2.19	73-77	EPH	Sample received in inappropriate container
23/5402	1	LF-CPRC-1010	5.65	83-85	EPH	Sample received in inappropriate container

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/5402

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/5402

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

EMT Job No: 23/5402

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			

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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Stephen Kealy
Date :	24th April, 2023
Your reference :	10892-07-21
Our reference :	Test Report 23/5942 Batch 1
Location :	Luas Finglas - TII
Date samples received :	17th April, 2023
Status :	Final Report
Issue :	1

Five samples were received for analysis on 17th April, 2023 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Liza Klebe
Project Co-ordinator

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 3rd Floor Davidson Building, 5 Southampton Street, London WC2E 7HA
Company Registration No: 11371415

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 23/5942

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

EMT Sample No.	1-7	8-14	15-21	22-28	29-35							
Sample ID	SWS001	SWS002	SWS003	SWS004	SWS005							
Depth												
COC No / misc												
Containers	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G							
Sample Date	13/04/2023	13/04/2023	13/04/2023	13/04/2023	13/04/2023							
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water							
Batch Number	1	1	1	1	1							
Date of Receipt	17/04/2023	17/04/2023	17/04/2023	17/04/2023	17/04/2023							

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Calcium #	103.0	103.5	123.1	125.3	109.0						<0.2	mg/l	TM30/PM14
Total Phosphorus	17	14	70	70	61						<5	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	290	292	339	338	311						<1	mg/l	TM30/PM14
Nitrate as NO3 #	4.0	3.9	7.8	6.8	10.1						<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	0.04	0.04	0.15						<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	<0.06	<0.06	0.07	0.15	<0.06						<0.06	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	<0.03	<0.03	0.10	0.05	0.29						<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH3 #	<0.030	<0.030	0.123	0.066	0.349						<0.030	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	242	240	294	286	250						<1	mg/l	TM75/PM0
COD (Settled) #	<7	29	<7	9	<7						<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	670	661	701	723	697						<2	uS/cm	TM76/PM0
pH #	8.20	8.20	8.29	8.28	8.07						<0.01	pH units	TM73/PM0
Total Dissolved Solids #	396	392	431	426	420						<35	mg/l	TM20/PM0
Total Nitrogen	1.4	1.5	2.9	2.2	3.4						<0.5	mg/l	TM38/TM125/PM0
Total Suspended Solids #	<10	10	14	10	13						<10	mg/l	TM37/PM0
Turbidity	5.8	7.2	13.0	13.9	13.7						<0.1	NTU	TM34/PM0

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/5942						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/5942

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/5942

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM34	Turbidity by 2100P Turbidity Meter. complies with EPA 180.1 1993	PM0	No preparation is required.				
TM37	Modified methods - TSS: USEPA 160.2 (1985), EN872:2005 and APHA SMEWW 2540D:1999 22nd Edition; VSS: USEPA 1684 (Jan 2001), USEPA 160.4 (1971) and SMEWW 2540E:1999 22nd Edition. Gravimetric determination of Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS). Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed at 105°C for TSS and 550°C for VSS.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes			
TM38/TM125	Total Nitogen/Organic Nitrogen by calculation	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. (Rev. 2.0 1993) Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1 (1978). Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			

EMT Job No: 23/5942

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

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Attention :	Stephen Kealy
Date :	17th August, 2023
Your reference :	12432-12-22
Our reference :	Test Report 23/12525 Batch 1
Location :	Luas Finglas - TII
Date samples received :	28th July, 2023
Status :	Final Report
Issue :	1

Five samples were received for analysis on 28th July, 2023 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 12432-12-22
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 23/12525

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

EMT Sample No.	1-8	9-16	17-24	25-32	33-40						LOD/LOR	Units	Method No.
Sample ID	LF - CPRC - 1001	LF - CPRC - 1007	LF - CPRC - 1011	LF - CPRC - 1015	LF - WS-1016								
Depth													
COC No / misc													
Containers	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G								
Sample Date	27/07/2023	27/07/2023	27/07/2023	27/07/2023	27/07/2023								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	1	1	1	1	1								
Date of Receipt	28/07/2023	28/07/2023	28/07/2023	28/07/2023	28/07/2023								
Dissolved Arsenic #	<2.5	16.0	<2.5	<2.5	<2.5						<2.5	ug/l	TM30/PM14
Dissolved Boron	136	140	41	51	224						<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7						<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5						<5	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1						<1	ug/l	TM30/PM14
Dissolved Nickel #	3	6	<2	<2	3						<2	ug/l	TM30/PM14
Dissolved Zinc #	15	3	12	12	9						<3	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Acenaphthene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Fluorene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Phenanthrene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Anthracene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Fluoranthene #	<0.005	<0.005	<0.005	0.006	<0.005						<0.005	ug/l	TM4/PM30
Pyrene #	<0.005	<0.005	<0.005	0.006	<0.005						<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Chrysene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.008	<0.008	<0.008	<0.008	<0.008						<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.005+	<0.005+	<0.005+	<0.005+	<0.005+						<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Coronene	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM4/PM30
PAH 17 Total	<0.273	<0.273	<0.273	<0.273	<0.273						<0.273	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.008	<0.008	<0.008	<0.008	<0.008						<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008	<0.008	<0.008	<0.008	<0.008						<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	89	82	85	93	83						<0	%	TM4/PM30
EPH (C8-C40) #	2160	<10	<10	<10	110						<10	ug/l	TM5/PM30
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15						<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	5.0	658.1	33.1	72.9	79.6						<0.5	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	mg/l	TM89/PM0
Hexavalent Chromium	<0.006	<0.006	<0.006	<0.006	<0.006						<0.006	mg/l	TM38/PM0
Total Dissolved Chromium III	<6	<6	<6	<6	<6						<6	ug/l	TM0/PM0
pH #	7.83	7.76	7.56	7.68	7.32						<0.01	pH units	TM73/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland

Reference: 12432-12-22

Location: Luas Finglas - TII

Contact: Stephen Kealy

Matrix : Liquid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
23/12525	1	LF - CPRC - 1001		1-8	Mercury	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/12525

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/12525

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

EMT Job No: 23/12525

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			

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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland
D22 K5P8

Attention :	Stephen Kealy
Date :	5th September, 2023
Your reference :	12432-12-22
Our reference :	Test Report 23/13183 Batch 1
Location :	Luas Finglas-TII
Date samples received :	10th August, 2023
Status :	Final Report
Issue :	1

Five samples were received for analysis on 10th August, 2023 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 12432-12-22
Location: Luas Finglas-TII
Contact: Stephen Kealy
EMT Job No: 23/13183

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-7	8-14	15-21	22-28	29-35						LOD/LOR	Units	Method No.
Sample ID	SWS001	SWS002	SWS003	SWS004	SWS005								
Depth	SW	SW	SW	SW	SW								
COC No / misc													
Containers	H HN P G BC	H HN P G BC	H HN P G BC	H HN P G BC	H HN P G BC								
Sample Date	09/08/2023	09/08/2023	09/08/2023	09/08/2023	09/08/2023								
Sample Type	Liquid	Liquid	Liquid	Liquid	Liquid								
Batch Number	1	1	1	1	1								
Date of Receipt	10/08/2023	10/08/2023	10/08/2023	10/08/2023	10/08/2023								
Dissolved Calcium	83.1	81.5	139.8	139.0	76.9						<0.2	mg/l	TM30/PM14
Total Phosphorus	18	12	89	83	147						<5	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	243	238	381	378	221						<1	mg/l	TM30/PM14
Nitrate as NO3	0.7	0.6	6.3	7.1	2.9						<0.2	mg/l	TM38/PM0
Nitrite as NO2	<0.02	<0.02	0.13	<0.02	0.16						<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4	<0.06	<0.06	0.10	0.10	<0.06						<0.06	mg/l	TM38/PM0
Ortho Phosphate as P	<0.03	<0.03	0.03	0.03	<0.03						<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as N	0.04	0.03	0.09	0.05	0.08						<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH3	0.047	0.038	0.113	0.057	0.094						<0.030	mg/l	TM38/PM0
Total Alkalinity as CaCO3	212	210	312	306	210						<1	mg/l	TM75/PM0
BOD (Settled)	<1	<1	<1	<1	3						<1	mg/l	TM58/PM0
Chlorophyll A*	<7	<7	<7	<7	38						<7	ug/l	Subcontracted
COD (Settled)	23	20	24	14	33						<7	mg/l	TM57/PM0
Electrical Conductivity @25C	512	508	752	747	507						<2	uS/cm	TM76/PM0
Escherichia Coli*	2	0	52	17	14							MPN/100ml	Subcontracted
pH	8.14	8.07	8.22	8.22	7.77						<0.01	pH units	TM73/PM0
Total Coliforms*	36	17	1120	1050	366							MPN/100ml	Subcontracted
Total Dissolved Solids	344	336	492	494	323						<35	mg/l	TM20/PM0
Total Nitrogen	0.6	<0.5	2.3	1.6	2.2						<0.5	mg/l	TM38/TM125/PM0
Total Suspended Solids	<10	<10	<10	<10	<10						<10	mg/l	TM37/PM0
Turbidity	0.8	0.9	2.0	1.3	3.9						<0.1	NTU	TM34/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 12432-12-22
Location: Luas Finglas-TII
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/13183						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/13183

SOILS and ASH

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All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x7 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/13183

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM34	Turbidity by 2100P Turbidity Meter. complies with EPA 180.1 1993	PM0	No preparation is required.				
TM37	Modified methods - TSS: USEPA 160.2 (1985), EN872:2005 and APHA SMEWW 2540D:1999 22nd Edition; VSS: USEPA 1684 (Jan 2001), USEPA 160.4 (1971) and SMEWW 2540E:1999 22nd Edition. Gravimetric determination of Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS). Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed at 105°C for TSS and 550°C for VSS.	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.				
TM38/TM125	Total Nitogen/Organic Nitrogen by calculation	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. (Rev. 2.0 1993) Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.				
TM58	APHA SMEWW 5210B:1999 22nd Edition. Comparible with ISO 5815:1989. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as am	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1 (1978). Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				

EMT Job No: 23/13183

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.				
Subcontracted	See attached subcontractor report for accreditation status and provider.						

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Hazelhatch Road
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Ireland
D22 K5P8

Attention :	Stephen Kealy
Date :	2nd January, 2024
Your reference :	10892-07-21
Our reference :	Test Report 23/20430 Batch 1
Location :	Luas Finglas - TII
Date samples received :	5th December, 2023
Status :	Final Report
Issue :	202401021046

Ten samples were received for analysis on 5th December, 2023 of which ten were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 20.344 kg of CO2

Scope 1&2&3 emissions - 48.079 kg of CO2

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 23/20430

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60	LOD/LOR	Units	Method No.
Sample ID	SWS001	SWS002	SWS003	SWS004	SWS005	LF-CPRC 1001	LF-CPRC 1007	LF-CPRC 1011	LF-CPRC 1015	LF-WS-1016			
Depth													
COC No / misc													
Containers	HN N P BOD BC	HN N P BOD BC	HN N P BOD BC	HN Z P BOD BC	HN N P BOD BC	V HN N P G	V HN N P G	V HN N P G	V HN N P G	V HN N P G			
Sample Date	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023			
Dissolved Arsenic #	-	-	-	-	-	4.1	12.5	4.3	4.1	4.0	<2.5	ug/l	TM30/PM14
Dissolved Boron	-	-	-	-	-	132	109	25	20	52	<12	ug/l	TM30/PM14
Dissolved Cadmium #	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Calcium #	120.5	120.8	117.0	116.9	125.0	-	-	-	-	-	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Copper #	-	-	-	-	-	<7	<7	<7	<7	<7	<7	ug/l	TM30/PM14
Dissolved Lead #	-	-	-	-	-	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Mercury #	-	-	-	-	-	<1	<1	<1	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	-	-	-	-	-	<2	3	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Phosphorus #	18	18	59	60	110	-	-	-	-	-	<5	ug/l	TM30/PM14
Dissolved Zinc #	-	-	-	-	-	5	4	<3	3	6	<3	ug/l	TM30/PM14
Total Phosphorus	20	18	71	76	133	-	-	-	-	-	<5	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	334	334	318	318	384	-	-	-	-	-	<1	mg/l	TM30/PM14
PAH MS													
Naphthalene #	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM4/PM30
Acenaphthylene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Acenaphthene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Fluorene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Phenanthrene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Anthracene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Fluoranthene #	-	-	-	-	-	<0.005	<0.005	<0.005	0.014	<0.005	<0.005	ug/l	TM4/PM30
Pyrene #	-	-	-	-	-	<0.005	<0.005	<0.005	0.014	<0.005	<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	-	-	-	-	-	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	ug/l	TM4/PM30
Chrysene #	-	-	-	-	-	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	-	-	-	-	-	<0.008	<0.008	<0.008	0.015	<0.008	<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	-	-	-	-	-	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	-	-	-	-	-	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	-	-	-	-	-	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	ug/l	TM4/PM30
Coronene	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM4/PM30
PAH 16 Total #	-	-	-	-	-	<0.173	<0.173	<0.173	<0.173	<0.173	<0.173	ug/l	TM4/PM30
PAH 17 Total	-	-	-	-	-	<0.273	<0.273	<0.273	<0.273	<0.273	<0.273	ug/l	TM4/PM30
Benzo(b)fluoranthene	-	-	-	-	-	<0.008	<0.008	<0.008	0.011	<0.008	<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	-	-	-	-	-	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	-	-	-	-	-	90	92	92	71	92	<0	%	TM4/PM30
EPH (C8-C40) (EH_1D_Total) #	-	-	-	-	-	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Phenol #	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM26/PM0
Sulphate as SO4 #	-	-	-	-	-	3.7	701.5	13.9	40.8	95.2	<0.5	mg/l	TM38/PM0
Nitrate as NO3 #	3.5	3.6	6.3	6.4	7.1	-	-	-	-	-	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	0.05	0.05	0.23	-	-	-	-	-	<0.02	mg/l	TM38/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy
EMT Job No: 23/20430

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

EMT Sample No.	1-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60	LOD/LOR	Units	Method No.
Sample ID	SWS001	SWS002	SWS003	SWS004	SWS005	LF-CPRC 1001	LF-CPRC 1007	LF-CPRC 1011	LF-CPRC 1015	LF-WS-1016			
Depth													
COC No / misc													
Containers	HN N P BOD BC	HN N P BOD BC	HN N P BOD BC	HN Z P BOD BC	HN N P BOD BC	V HN N P G	V HN N P G	V HN N P G	V HN N P G	V HN N P G			
Sample Date	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023	04/12/2023			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023	05/12/2023			
Ortho Phosphate as PO4 #	<0.06	<0.06	0.07	0.09	<0.06	-	-	-	-	-	<0.06	mg/l	TM38/PM0
Total Cyanide #	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.08	0.09	0.19	0.14	3.82	-	-	-	-	-	<0.03	mg/l	TM38/PM0
Hexavalent Chromium	-	-	-	-	-	<6	<6	<6	<6	<6	<6	ug/l	TM38/PM0
Total Ammonia as NH3 #	0.09	0.11	0.23	0.17	4.64	-	-	-	-	-	<0.03	mg/l	TM38/PM0
Total Dissolved Chromium III	-	-	-	-	-	<6	<6	<6	<6	<6	<6	ug/l	TM0/PM0
Total Alkalinity as CaCO3 #	276	292	282	264	378	-	-	-	-	-	<1	mg/l	TM75/PM0
BOD (Settled) #	<1	2	1	<1	4	-	-	-	-	-	<1	mg/l	TM58/PM0
Chlorophyll A*	7_{AA}	$<7_{AA}$	$<7_{AA}$	$<7_{AA}$	90_{AA}	-	-	-	-	-	<1	ug/l	Subcontracted
COD (Settled) #	8	11	28	9	52	-	-	-	-	-	<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	690	686	840	821	851	-	-	-	-	-	<2	uS/cm	TM76/PM0
Escherichia Coli*	6	2	981	867	6	-	-	-	-	-		MPN/100ml	Subcontracted
pH #	8.35	8.34	8.30	8.33	8.25	7.96	7.79	7.62	7.80	7.39	<0.01	pH units	TM73/PM0
Total Coliforms*	20	65	2600	4100	44	-	-	-	-	-		MPN/100ml	Subcontracted
Total Dissolved Solids #	411	411	493	491	508	-	-	-	-	-	<35	mg/l	TM20/PM0
Total Nitrogen	1.3	0.8	2.2	1.5	7.4	-	-	-	-	-	<0.5	mg/l	TM38/TM125/PM0
Total Suspended Solids #	<10	<10	14	15	11	-	-	-	-	-	<10	mg/l	TM37/PM0
Turbidity	1.9	1.3	12.6	13.2	8.6	-	-	-	-	-	<0.1	NTU	TM34/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 10892-07-21
Location: Luas Finglas - TII
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/20430						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/20430

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x7 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/20430

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM34	Turbidity by 2100P Turbidity Meter. complies with EPA 180.1 1993	PM0	No preparation is required.				
TM37	Modified methods - TSS: USEPA 160.2 (1985), EN872:2005 and APHA SMEWW 2540D:1999 22nd Edition; VSS: USEPA 1684 (Jan 2001), USEPA 160.4 (1971) and SMEWW 2540E:1999 22nd Edition. Gravimetric determination of Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS). Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed at 105°C for TSS and 550°C for VSS.	PM0	No preparation is required.	Yes			

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Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes			
TM38/TM125	Total Nitogen/Organic Nitrogen by calculation	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. (Rev. 2.0 1993) Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	APHA SMEWW 5210B:1999 22nd Edition. Comparible with ISO 5815:1989. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as am	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1 (1978). Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			
Subcontracted	See attached subcontractor report for accreditation status and provider.						

Bonneagar Iompair Éireann
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