

# SOIL BASELINE SAMPLING REPORT

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**Technical Report Prepared For**  
**Indaver Ireland Ltd.**

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## 1.0 INTRODUCTION

### 1.1 BACKGROUND AND SCOPE OF WORKS

AWN Consulting Ltd. (AWN) has been requested by Indaver Ireland Ltd. to carry out a soil site survey and baseline report as part of the EPA compliance requirements.

The scope of the soil baseline survey included the following:

- Drilling of five (5) no. environmental test holes (window sample boreholes) across the site area to examine soil conditions and if any infill or foreign material is present across the land. The auger rigs were drilled until bedrock was encountered.
- Logging of the arisings from each test hole in accordance with BS5930:2015, noting any field evidence of potential impact from hazardous substances.
- Collection of soil samples from each of the test holes for laboratory analysis focusing on potential constituents of concern.

The sampling boreholes were drilled by IGSL on the 9th November 2022 with a Terrier window sampling rig. All soil samples were collected in appropriate sample containers for the required analysis and stored, managed and sealed in accordance with Section 8.2 of BS 10381-2:2002.

All laboratory testing was carried out at Element Laboratory, a UK Accreditation Service (UKAS) accredited laboratory located in Deeside, England. The laboratory is accredited under UKAS 4225 as well as to ISO/IEC 17025:2005.

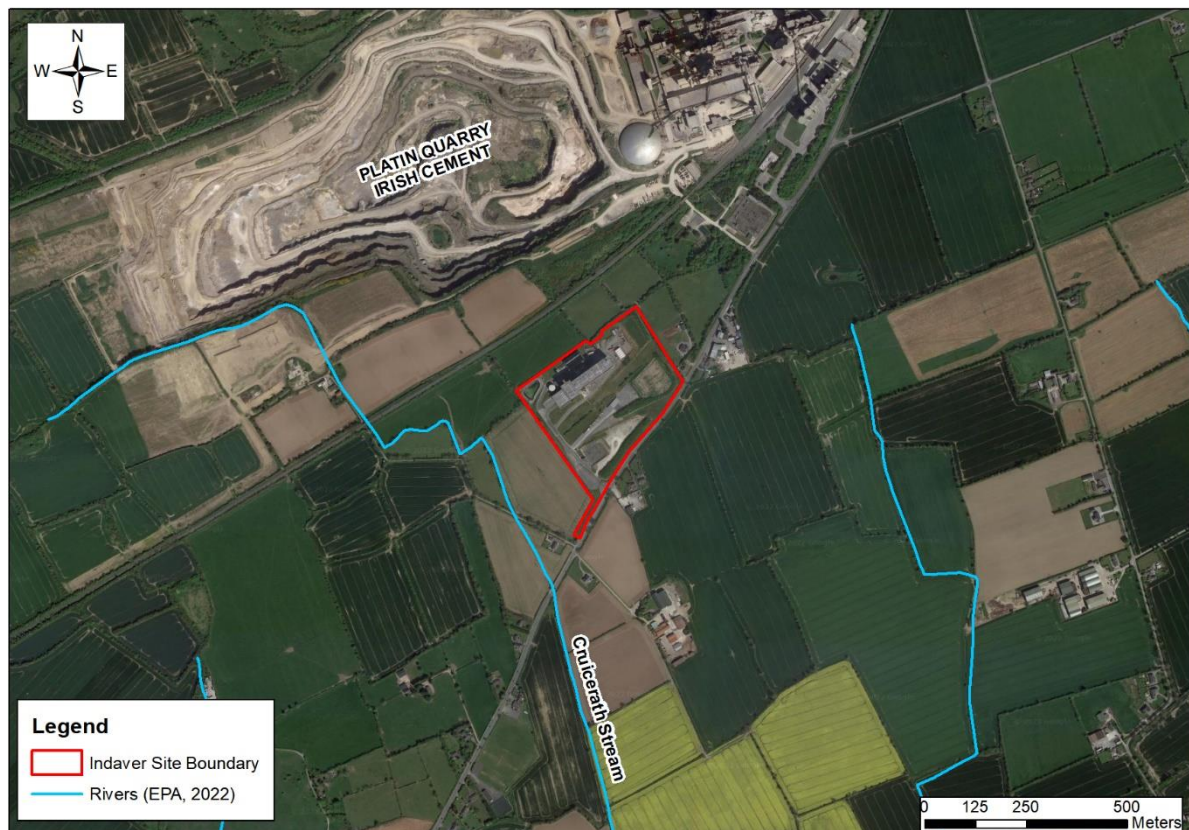
The 5 no. soil samples were analysed for the following suite of parameters:

- Waste Acceptance Criteria suite in accordance with Council Decision 2003/33/EC (Rilta 2016 Revised WAC suite, see Table 1.1 below).
- VOCs plus tentatively identified compounds (TICs).
- Additional metals: Mn, Co, V and Sn.
- Additional PAH's: PFAS/PFOA.

**Table 1.1** RILTA 2016 Suite

Test Method	Code	Rilta Suite	ISO 17025	MDL	CEN references - EN/TS/TR
TM065	Asb	Fibre screen/ asbestos ID (HSG 248)	Y		
073S	pH	pH using Metrohn	Y	0.01pH units	
PM04	MC	Moisture content as % wet weight			
021S	TOC	TOC by combustion - carbonates removed with acid by eltra	Y	0.2%	EN 13137 Method B
030S		metals(As,Ba,Cd,Cr,Cu,Hg,Mo,Ni,Pb,Sb,Se,Zn)	Y	various	
038S	Hex Cr	Hexavalent Chromium plus Trivalent Chromium by calculation	N	0.3mg/kg	
031S	BTEX S	BTEX/MTBE by GC-FID	Y	5ug/kg	
086S	PCB-7 S	PCBs (7 congeners) by GC-MS	Y	5ug/kg	EN 15308 analysis GC-MS
036/005S	CWG	TPH CWG (Aliphatics C5-6,>6-8,>8-10,>10-12,>12-16,>16-21,>21-35, >35-40) (Aromatics >C5-7,>7-8,>8-10,>10-12,>12-16,>16-21,>21-35, >35-40) Extra banding Aliphatics C6-10,C10-25, C25-35, Aromatics C6-10, C10-C25, C25-35	Y	various - see tab	
004S	PAH 17 S	PAH 17 by GC-MS (inc coronene) plus PAH (total 6)	Y	various	EN 15527 PAH GC-MS
		Benzo(j)fluoranthene	N	1mg/kg	
<b>CEN 10: leachate preparation (results expressed as mg/kg)</b>					EN 12457-2 :2002
030W	Metals	As(0.025),Ba(0.03),Cd(0.005),Cr(0.015),Cu(0.07),Mo(0.02),Ni(0.02),Pb(0.05),Sb(0.02),Se(0.03),Zn(0.03)	Y	various (mg/kg)	EN 12506 / EN ISO 11885 ICP-OES
061W		Mercury by Cold Vapour Atomic Fluorescence	Y	0.1ug/kg	EN 13370 / EN 1483 CVAAS
073W	pH	Determination of pH (Metrohm)	Y	0.01pH units	
027W/173W		Chloride(3), Fluoride(3), Sulphate (0.5)	N	various (mg/kg)	EN 12506 /EN ISO 10304-1-2 liquid chromatography
026W		Phenol HPLC	Y	0.1mg/kg	
060W		DOC	N	20mg/kg	EN 1484
020W		TDS	N	350mg/kg	EN 15216

Appendix 1 presents the Laboratory report with analysis and results. Figure 1.1 below presents the site location.



**Figure 1.1** Site Location and Hydrological Environment (EPA, 2022)

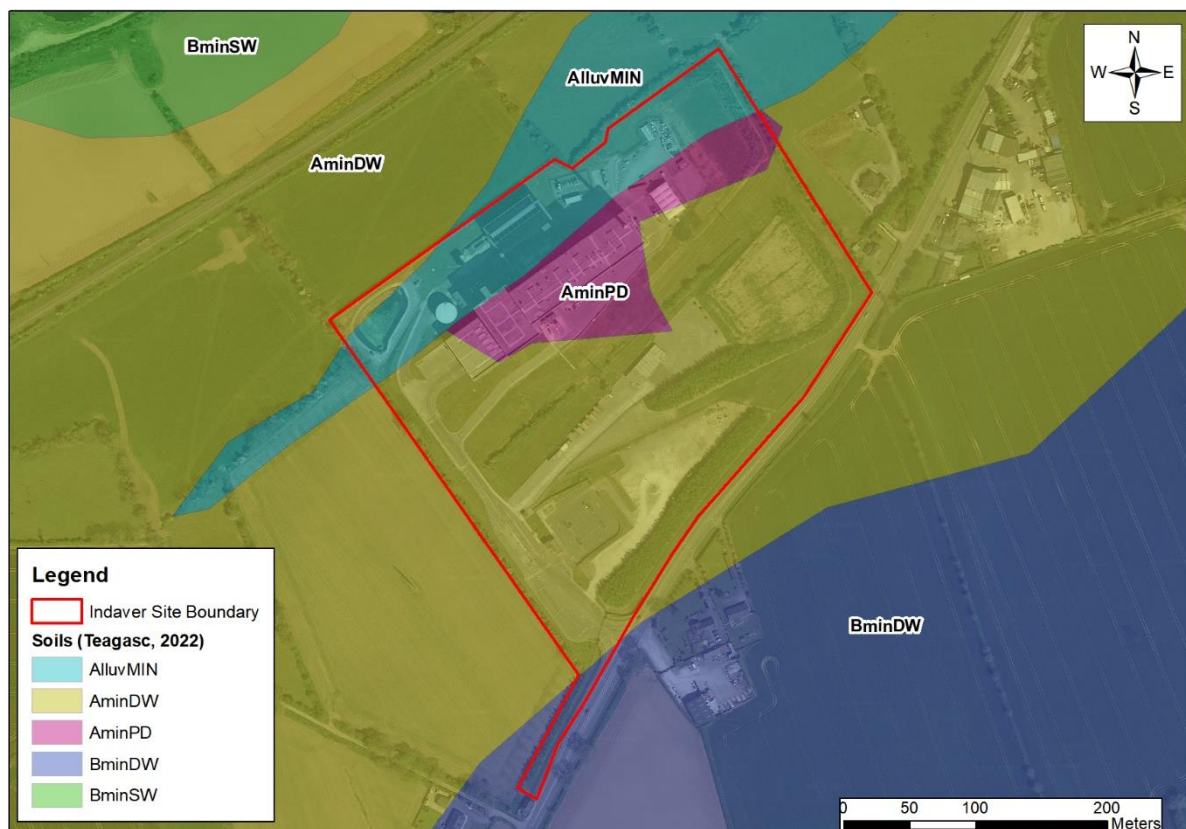
## 2.0 SOIL AND GEOLOGICAL SETTING

The topography around the site is relatively flat with a slight fall from east to west within the boundary. The overall topography for the study area is relatively shallow with a general fall to the southeast towards the River Nanny. There are a number of hills located to the north with a peak of approx. +95mAOD and northwest, +121mAOD of the site. The general elevation of the site is approx. +30mAOD.in the north of the site and 35 mAOD to the south (at road height).

Construction of the facility occurred over 2008/2011, prior to this the lands were used for agricultural purposes only. Soil and groundwater samples collected as part of the baseline for the EIS study provided with planning for the current development (KTC/WYG, 2012) showed no evidence of soil or groundwater contamination at the site that indicate anything other than an agricultural use.

The Irish Cement Platin quarry is located immediately to the north of the site a number of other quarry/ mineral extraction sites are located to the west (Duleek Quarry) and east (Bellewstown Quarry). The immediate surrounding lands are used for agricultural purposes (grazing).

The GSI/Teagasc mapping shows that the soil type beneath the local area is comprises three (3) no. principal soil types. The majority of the site comprises Deep Well Drained Mineral – Mainly Acidic (AminDW) . The northern portion of the site comprises Alluvial Mineral (AlluvMIN) and the north-central portion of the site comprises Poorly Drained Mineral (AminPD) (refer to Figure 2.2 below).



**Figure 2.1** Soils Map (Teagasc, 2022)



The GSI/Teagasc mapping database of the subsoils in the area of the subject site indicates three (3) no. principal soil types, as shown in Figure 2.2 below. The subsoil types present across the site are as follows:

- Alluvium (A) in the northern portion of the site;
- Till derived from Namurian sandstones and shales (TNSSs) in the majority of the site; and
- Till derived from limestones (TLs) in the most south-western portion of the site.



**Figure 2.2** Subsoil Map (Teagasc, 2022)

### 2.1.1 Regional Geology

The site is underlain by Lower Carboniferous Limestone bedrock which forms part of the Platin Formation. The Limestone is typically characterised by pale thick-bedded strata with minor shale, possibly dolomitised, with paleo-karstic features (GSI Sheet 16 and Meath Groundwater Protection Scheme).

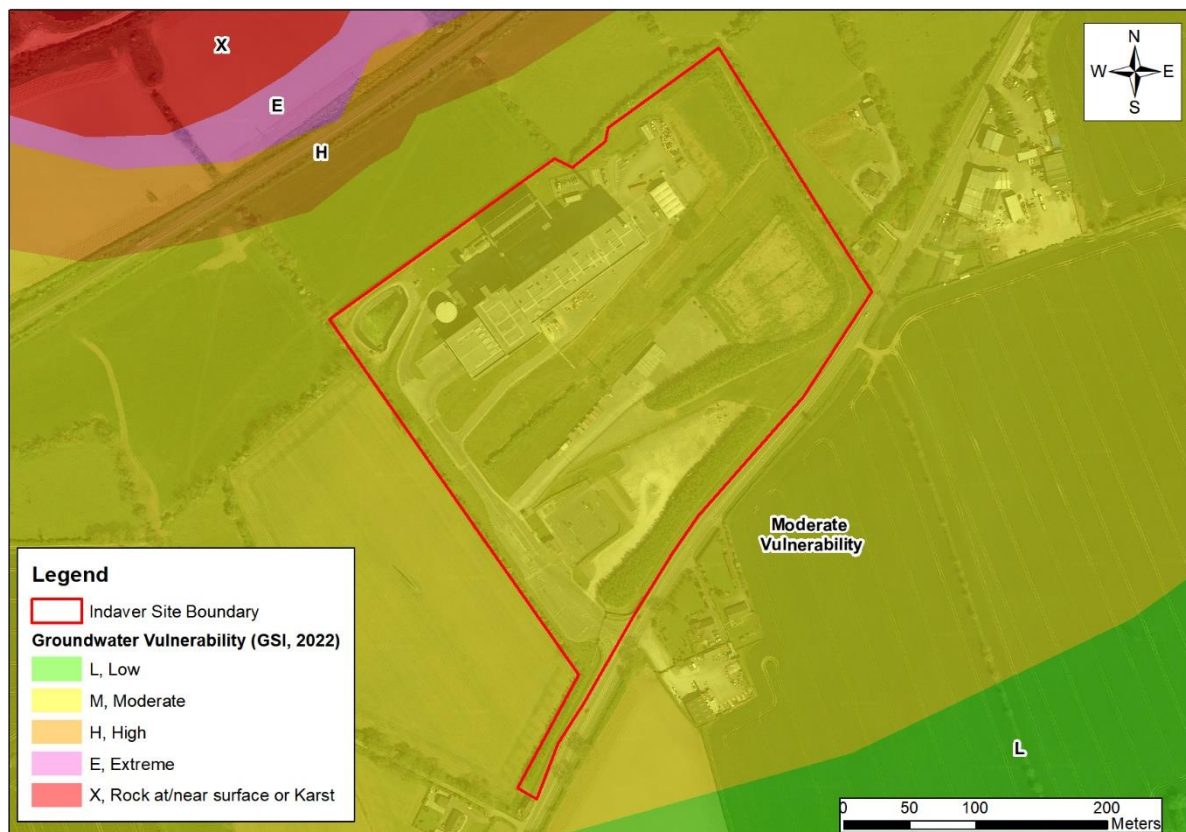
Regional soils comprise the Dunboyne-Ashbourne soil complex. The parent material of the soil is drift deposits intermixed with local limestone and shale. This type of soil is generally poorly drained.

### 2.1.2 Regional Hydrogeology

The Platin formation has been classified as a regionally important karstified (diffuse) aquifer, displaying both karst and fracture flow. The aquifer is classed as having moderate vulnerability, related to the presence of thick boulder clay in the region. The site is located within the Bettystown Groundwater which has a WFD risk projection of “At risk” meaning it is at risk of failing to meet WFD objective. Figure 2.3 shows the



regional aquifer vulnerability map and the aquifer classification of the area surrounding the Indaver site.



**Figure 2.3** Groundwater Vulnerability Map (GSI, 2022)

### 3.0 WINDOWS SAMPLING RECORDS

Site investigations were carried out by IGSL on the 9<sup>th</sup> of November, 2022 using a Terrier window sampling rig. The site investigations comprised drilling of five (5) no. environmental test holes (window sample boreholes) across the site area to examine soil conditions and if any infill or foreign material is present across the land in accordance with BS 5930:1999 Code of Practice for Site Investigations. The auger rigs were drilled until presumed / possible bedrock was encountered, noting any field evidence of potential impact from hazardous substances. Soil samples were collected from each of the test holes for laboratory analysis. Refer to Appendix 2 – WS Logs for further information regarding soil profile and observations of each individual window sample.

Brown gravelly silty CLAY was encountered in all window samples from ground level and the gravel was subangular to subrounded with cobbles (NATURAL GROUND). Refer to Figures 7.1 to 7.5 below for further information on the substrata encountered.

The maximum depth reached was 3.6m bgl in WS03 located along the sites northern boundary. The shallowest depths reached occurred in WSO1 and WS02 located along the sites southern and northern boundary respectively.

Possible bedrock was encountered in all window samples from c. 1.9m to 3.6m bgl as stated above. The depth at which possible bedrock was encountered in each of the window samples is illustrated in Table 3.1 below:

**Table 3.1**      *Strata Noted from Site Investigation*

Window Sample ID	Depth Reached (mbgl)	Comments
WS01	1.9m bgl	Obstruction – Possible Bedrock
WS02	1.95m bgl	Obstruction – Possible Bedrock
WS03	3.6m bgl	Obstruction – Possible Bedrock
WS04	3.2m bgl	Obstruction – Possible Bedrock
WS05	2.9m bgl	Obstruction – Possible Bedrock

All window samples were terminated on contact with possible bedrock. No water strikes / ingresses were encountered in any of the window samples. Refer to Figure 3.1 below for the window sample locations in context of the site.



**Figure 3.1**      *Window Sample Points (Google Earth Pro, 2022)*

## 4.0 SOIL QUALITY ASSESSMENT

There are no legislated threshold values for soils in Ireland. Soil samples were compared to Generic Assessment Criteria (GAC) derived to be protective of human health, water bodies (including groundwater) and also ecology for residential and commercial / industrial end use.

GAC in the UK has been derived using the Contaminated Land Exposure Assessment (CLEA) model to be protective of human health for a number of different land uses. Land Quality Management (LQM) and the CIEH (Chartered Institute of Environmental Health) developed a document in July 2009 detailing their own research and derivation of their own 'LQM GACs'. A total of 82 substances, including many organic substances had LQM GACs derived, for the standard land uses of residential, commercial / industrial and allotments. This was updated in 2015 following further research and the derived results are now called LQM / CIEH Suitable 4 Use Levels (S4UL). The LQM / CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and as transparently derived and cautious "trigger values" above which further assessment of the risks or remedial action may be needed. For each contaminant, S4ULs have been derived for six land use scenarios based on assessing exposure pathways in each planning scenario. In this instance, the commercial scenario has been considered. Soil type and soil organic matter (SOM) has an influence on the behaviour of contaminants. S4ULs have been derived for three SOM contents (1%, 2.5% and 6%) to cover the likely range in soils. A prudent approach has been taken by considering the lower 1% SOM content.

The UK values do not have any legal standing within the Republic of Ireland and no statutory guidance for assessing the significance of soil contamination currently exists. However, the values do provide a means of placing the data within context when considering magnitude of risk, and have been used in that capacity in this assessment.

In addition, in line with the requirement of Council Decision 2003/33/EC, during the site investigations, 5 no. samples were recovered from the on-site window sample locations and sent for analysis. In order to assess materials, which may be excavated and removed from site, in terms of waste classification, a selection of samples collected were analysed for a suite of parameters which allowed for the assessment of the soils in terms of total pollutant content for classification of materials as hazardous or non-hazardous referred to as the 'RILTA Suite'.

The parameter list for the RILTA suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, lead, nickel, mercury, zinc, chloride, fluoride speciated aliphatic and aromatic petroleum hydrocarbons, pH, soluble sulphate, sulphide, phenols, total dissolved solids, moisture content, soil organic matter and an asbestos screen. The total pollutant content analysis also provides analytical data which can be used to assess the quality of the subsoils underlying the site and allow an assessment of their suitability for a range of proposed uses against generic assessment criteria.

The RILTA Suite also includes those parameters specified in the EU Council Decision Establishing Criteria for the Acceptance of Waste at Landfills (Council Decision 2003/33/EC), referred to as Waste Acceptance Criteria (WAC), which for the solid samples are pH; total organic carbon (TOC); speciated aliphatic and aromatic

petroleum hydrocarbons; benzene, toluene, ethylbenzene and xylene (BTEX); phenol; polychlorinated biphenyls (PCB); and polycyclic aromatic hydrocarbons (PAH).

All parameter concentrations recorded values below the most conservative threshold value for the LQM / CIEH for HHRA (Human Health Risk Assessment) Residential Threshold at 1% SOM (refer to below).

In addition to the above mentioned suite of laboratory tests carried out, the following tests were undertaken:

- VOCs plus tentatively identified compounds (TICs);
- Additional metals: Mn, Co, V and Sn; and
- Additional PAH's: PFAS/PFOA.

The laboratory analysis did not identify any asbestos containing materials (ACMs) in any of the samples tested.

With regard to the WAC analysis, all samples recorded concentrations below the 'Inert' landfill waste acceptance criteria limit.

Refer to Table 4.1 below for further information on soil quality results.

**Table 4.1 Soil Quality Results**

Sample ID Laboratory Report Sample Type Sample Depth Sample Date					WS01	WS02	WS03	WS04	WS05
					Element	Element	Element	Element	Element
					22/18605	22/18605	22/18605	22/18605	22/18605
					Soil	Soil	Soil	Soil	Soil
					1.5	1.5	3.0	3.0	2.5
				09/11/2022	09/11/2022	09/11/2022	09/11/2022	09/11/2022	
Parameters	Units	LOD	LQM/CIEH S4ul for HHRA Residential Threshold (mg/kg)	LQM/CIEH S4ul for HHRA Commercial Threshold (mg/kg)					
<b>Metals</b>									
Antimony	mg/kg	<1	nv	nv	2	2	2	1	2
Arsenic	mg/kg	<0.5	40	640	19	12.1	11	9.1	12.7
Barium	mg/kg	<1	nv	nv	130	105	89	54	98
Cadmium	mg/kg	<0.1	85	190	1	1.1	0.7	0.8	0.7
Chromium	mg/kg	<0.5	910	8,600	67.9	84.9	69.1	45.5	82.6
Cobalt	mg/kg	<0.5	nv	nv	14.1	11.4	10.4	5.6	14.4
Copper	mg/kg	<1	7,100	68,000	34	35	32	21	32
Lead	mg/kg	<5	nv	nv	18	15	20	8	14
Manganese	mg/kg	<1	nv	nv	1,144	1,034	806	652	854
Mercury	mg/kg	<0.1	1.2	58vap (25.8)	-	-	-	-	-
Molybdenum	mg/kg	<0.1	nv	nv	4.7	5.5	4.1	4.5	3.6
Nickel	mg/kg	<0.7	180	980	47.6	43.3	36.2	22.6	52.4
Selenium	mg/kg	<1	430	12,000	2	-	2	2	-
Vanadium	mg/kg	<1	1,200	9,000	48	41	36	22	50
Zinc	mg/kg	<5	40,000	730,000	88	67	63	38	78
<b>PAH MS</b>									
Naphthalene	mg/kg	<0.04	2.3	190(76.4)sol	-	-	-	-	-
Acenaphthylene	mg/kg	<0.03	170	83000(86.1)sol	-	-	-	-	-
Acenaphthene	mg/kg	<0.05	210	84000(57.0)	-	-	-	-	-
Fluorene	mg/kg	<0.04	170	63000(30.9)sol	-	-	-	-	-
Phenanthrene	mg/kg	<0.03	95	22,000	-	-	-	-	-
Anthracene	mg/kg	<0.04	2,400	520,000	-	-	-	-	-
Fluoranthene	mg/kg	<0.03	280	23,000	-	-	-	-	-
Pyrene	mg/kg	<0.03	620	54,000	-	-	-	-	-
Benzo(a)anthracene	mg/kg	<0.06	7.2	170	-	-	-	-	-
Chrysene	mg/kg	<0.02	15	350	-	-	-	-	-
Benzo(bk)fluoranthene	mg/kg	<0.07	nv	nv	-	-	-	-	-
Benzo(a)pyrene	mg/kg	<0.04	2.2	35	-	-	-	-	-
Indeno(123cd)pyrene	mg/kg	<0.04	nv	500	-	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	<0.04	0.24	4	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	<0.04	320	3,900	-	-	-	-	-
Coronene	mg/kg	<0.04	nv	nv	-	-	-	-	-
PAH 6 Total	mg/kg	<0.22	nv	nv	-	-	-	-	-
PAH 17 Total	mg/kg	<0.64	nv	nv	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	<0.05	2.6	44	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	<0.02	77	1,200	-	-	-	-	-
Benzo(j)fluoranthene	mg/kg	<1	nv	nv	-	-	-	-	-
PAH Surrogate % Recovery	mg/kg	<0	nv	nv	95	94	91	88	90
Mineral Oil (C10-C40)	mg/kg	<30	nv	nv	-	-	-	-	-
Methyl Tertiary Butyl Ether	ug/kg	<5	nv	nv	-	-	-	-	-
Benzene	mg/kg	<0.005	0.38	27	-	-	-	-	-
Toluene	mg/kg	<0.005	880(869)vap	56,000(869)vap	-	-	-	-	-
Ethylbenzene	mg/kg	<0.005	83	5,700(518)vap	-	-	-	-	-
m/p-Xylene	mg/kg	<0.005	m: 820 p: 790	m: 6,200(625)vap p: 5,900(576)sol	-	-	-	-	-
o-Xylene	mg/kg	<0.005	88	6,600(478)sol	-	-	-	-	-
PCB 28	ug/kg	<5	nv	nv	-	-	-	-	-
PCB 52	ug/kg	<5	nv	nv	-	-	-	-	-
PCB 101	ug/kg	<5	nv	nv	-	-	-	-	-
PCB 118	ug/kg	<5	nv	nv	-	-	-	-	-
PCB 138	ug/kg	<5	nv	nv	-	-	-	-	-
PCB 153	ug/kg	<5	nv	nv	-	-	-	-	-
PCB 180	ug/kg	<5	nv	nv	-	-	-	-	-
Total 7 PCBs	ug/kg	<35	nv	nv	-	-	-	-	-
Natural Moisture Content	%	<0.1	nv	nv	14.6	16.5	15.0	10.6	15.2
Moisture Content (% Wet Weight)	%	<0.1	nv	nv	12.7	14.2	13.0	9.6	13.2
Hexavalent Chromium	mg/kg	<0.3	6	33	-	-	-	-	-
Chromium III	mg/kg	<0.5	910	8,600	67.9	84.9	69.1	45.5	82.6
Total Organic Carbon	%	<0.02	nv	nv	0.65	0.5	0.63	0.22	0.25
Elemental Sulphur	mg/kg	<1	nv	nv	-	1	2	2	-
pH	pH units	<0.01	nv	nv	8.11	8.35	8.22	9.47	8.37
<b>Legend</b>									
0.45 Results exceed LQM/CIEH S4ul for HHRA Residential Threshold without homegrown produce at 1% SOM (mg/kg)									
0.45 Results exceed LQM/CIEH S4ul for HHRA Commercial Threshold at 1% SOM (mg/kg)									
- Results below LOD									
nv Guideline threshold value not available									
nd Parameter not analysed									
<b>Notes</b>									
HHRA 2015 - LQM/CIEH Suitable 4 Use Levels based on 'Commercial' and/or 'residential' land use using 1% SOM. Metals are compared against a 6% SOM									
Sol : sol S4UL presented exceed the solubility saturation limit, which is presented in brackets									
Vap: vap S4UL presented exceed the vapour saturation limit which is presented in brackets									



Sample ID Laboratory Report Sample Type Sample Depth Sample Date					WS01	WS02	WS03	WS04	WS05
					Element	Element	Element	Element	Element
					22/18605	22/18605	22/18605	22/18605	22/18605
					Soil	Soil	Soil	Soil	Soil
					1.5	1.5	3.0	3.0	2.5
				09/11/2022	09/11/2022	09/11/2022	09/11/2022	09/11/2022	
Parameters	Units	LOD	LQM/CIEH S4ul for HHRA Residential Threshold (mg/kg)	LQM/CIEH S4ul for HHRA Commercial Threshold (mg/kg)					
<b>TPH CWG</b>									
<b>Aliphatics</b>									
>C5-C6	mg/kg	<0.1	42	3,200 (304) sol	-	-	-	-	-
>C6-C8	mg/kg	<0.1	100	7,800 (144) sol	-	-	-	-	-
>C8-C10	mg/kg	<0.1	27	2,000 (78) sol	-	-	0.1	-	-
>C10-C12	mg/kg	<0.2	130	9,700 (48) sol	-	-	-	-	-
>C12-C16	mg/kg	<4	1100	59,000 (24) sol	-	-	-	-	-
>C16-C21	mg/kg	<7	65,000 (combined)	1,600,000 (combined)	-	-	-	-	-
>C21-C35	mg/kg	<7	65,000	1,600,000	-	-	-	-	-
>C35-C40	mg/kg	<7	65,000	1,600,000	-	-	-	-	-
Total aliphatics C5-40	mg/kg	<26	nv	nv	-	-	-	-	-
<b>Aromatics</b>									
>C5-EC7	mg/kg	<0.1	370	26,000(1220) sol	-	-	-	-	-
>EC7-EC8	mg/kg	<0.1	860	56,000(869) vap	-	-	-	-	-
>EC8-EC10	mg/kg	<0.1	47	3,500(613) vap	-	-	-	-	-
>EC10-EC12	mg/kg	<0.2	250	16,000(364) sol	-	-	-	-	-
>EC12-EC16	mg/kg	<4	1800	36,000(169) sol	-	-	-	-	-
>EC16-EC21	mg/kg	<7	1900	28,000	-	-	-	-	-
>EC21-EC35	mg/kg	<7	1900	28,000	-	-	-	-	-
>EC35-EC40	mg/kg	<7	1900	28,000	-	-	-	-	-
Total aromatics C5-40	mg/kg	<26	nv	nv	-	-	-	-	-
Total aliphatics and aromatics C5-40	mg/kg	<52	nv	nv	-	-	-	-	-
<b>PFAAS</b>									
PFBA	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFPeA	ug/kg	<0.5	nv	nv	-	-	-	-	-
HFPO-DA	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFBS	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFHxA	ug/kg	<0.5	nv	nv	-	-	-	-	-
4:2 FTS	ug/kg	<1	nv	nv	-	-	-	-	-
FPePA	ug/kg	<1	nv	nv	-	-	-	-	-
PFPeS	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFHpA	ug/kg	<0.5	nv	nv	-	-	-	-	-
DONA	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFHxS	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFOA	ug/kg	<0.5	nv	nv	-	-	-	-	-
6:2 FTS	ug/kg	<1	nv	nv	-	3	-	13	3
PFHpS	ug/kg	<0.5	nv	nv	-	-	-	-	-
FOUEA	ug/kg	<1	nv	nv	-	-	-	-	-
PFNA	ug/kg	<0.5	nv	nv	-	-	-	-	-
FOSA	ug/kg	<1	nv	nv	-	-	-	-	-
PFOS	ug/kg	<0.5	nv	nv	-	-	-	-	-
N-MeFOSA	ug/kg	<1	nv	nv	-	-	-	-	-
PFDA	ug/kg	<0.5	nv	nv	-	-	-	-	-
N-EtFOSA	ug/kg	<1	nv	nv	-	-	-	-	-
8:2 FTS	ug/kg	<1	nv	nv	-	-	-	-	-
9Cl-PF3ONS	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFNS	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFUnA	ug/kg	<0.5	nv	nv	-	-	-	-	-
N-MeFOSAA	ug/kg	<1	nv	nv	-	-	-	-	-
N-EtFOSAA	ug/kg	<1	nv	nv	-	-	-	-	-
PFDS	ug/kg	<0.5	nv	nv	-	-	1.3	-	-
PFDoA	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFUnDS	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFTeDA	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFTeDS	ug/kg	<0.5	nv	nv	-	-	-	-	-
PFHxDA	ug/kg	<2.5	nv	nv	-	-	-	-	-
PFODA	ug/kg	<2.5	nv	nv	-	-	-	-	-
8:2diPAP	ug/kg	<2.5	nv	nv	-	-	-	-	-
<b>Legend</b>									
0.45 Results exceed LQM/CIEH S4ul for HHRA Residential Threshold without homegrown produce at 1% SOM (mg/kg)									
0.45 Results exceed LQM/CIEH S4ul for HHRA Commercial Threshold at 1% SOM (mg/kg)									
- Results below LOD									
nv Guideline threshold value not available									
nd Parameter not analysed									
<b>Notes</b>									
HHRA 2015 - LQM/CIEH Suitable 4 Use Levels based on 'Commercial' and/or 'residential' land use using 1% SOM. Metals are compared against a 6% SOM									
Sol : sol S4UL presented exceed the solubility saturation limit, which is presented in brackets									
Vap: vap S4UL presented exceed the vapour saturation limit which is presented in brackets									



## 5.0 CONCLUSIONS

On the basis of the site investigation undertaken at the site and an assessment of source-pathways-receptors, the following conclusions have been made:

- In the site investigations undertaken, a review of the available soil quality confirms that there is no evidence of any residual contamination beneath the site.
- There is no evidence of historical contamination across the site.
- No exceedances of the most conservative threshold value for the LQM / CIEH for HHRA (Human Health Risk Assessment) Residential Threshold at 1% SOM were detected in any of the sampling points.
- Based on the laboratory results of the material sampled across the site all samples can be classified as non-hazardous.

## 6.0 REFERENCES

EPA, (2022). Environmental Protection Agency. Available on-line at: <https://gis.epa.ie/EPAMaps/> [Accessed: 13-12-2022].

GSI, (2022). Geological Survey of Ireland; Available on-line at: <http://www.gsi.ie> [Accessed: 13-12-2022].

## 7.0 SOIL PROFILE FIGURES



**Figure 7.1** WS01 – Soil Profile



**Figure 7.2** WS02 – Soil Profile





**Figure 7.3** WS03 – Soil Profile



**Figure 7.4**      *WS04 – Soil Profile*





**Figure 7.5**      *WS05 – Soil Profile*



**APPENDIX 1**  
**Invader Ireland Ltd**  
**LABORATORY RESULTS**

AWN Consulting  
Tecpro Building  
Clonshaugh Business & Technology Park  
Dublin  
Dublin 17  
Ireland



**Attention :** Marcello Allende  
**Date :** 25th November, 2022  
**Your reference :** Indaver  
**Our reference :** Test Report 22/18605 Batch 1  
**Location :** -  
**Date samples received :** 11th November, 2022  
**Status :** Final Report  
**Issue :** 1

Five samples were received for analysis on 11th November, 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:**



**Liza Klebe**

Project Co-ordinator

Please include all sections of this report if it is reproduced

















Mass of sample taken (kg) -	Dry Matter Content Ratio (%) =	85.8
Mass of dry sample (kg) = 0.09	Leachant Volume (l)	-
Particle Size <4mm = >95%		

<b>EMT Job No</b>	<b>22/18605</b>		<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Sample No</b>	<b>3</b>		<b>Inert</b>	<b>Stable Non-reactive</b>	<b>Hazardous</b>
<b>Client Sample No</b>	<b>WS01</b>				
<b>Depth/Other</b>					
<b>Sample Date</b>	<b>09/11/2022</b>				
<b>Batch No</b>	<b>1</b>				
<b>Solid Waste Analysis</b>					
Total Organic Carbon (%)	0.65		3	5	6
Sum of BTEX (mg/kg)	<0.017		6	-	-
Sum of 7 PCBs (mg/kg)	<0.035		1	-	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)	<30		500	-	-
PAH Sum of 6 (mg/kg)	<0.22		-	-	-
PAH Sum of 17 (mg/kg)	<0.64		100	-	-
<b>Eluate Analysis</b>	<b>10:1 concn leached</b>		<b>Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg</b>		
	<b>A10</b>		<b>mg/kg</b>		
	<b>mg/kg</b>		<b>mg/kg</b>		
Arsenic	<0.025		0.5	2	25
Barium	0.06		20	100	300
Cadmium	<0.005		0.04	1	5
Chromium	<0.015		0.5	10	70
Copper	<0.07		2	50	100
Mercury	<0.0001		0.01	0.2	2
Molybdenum	<0.02		0.5	10	30
Nickel	<0.02		0.4	10	40
Lead	<0.05		0.5	10	50
Antimony	<0.02		0.06	0.7	5
Selenium	<0.03		0.1	0.5	7
Zinc	<0.03		4	50	200
Chloride	5		800	15000	25000
Fluoride	5		10	150	500
Sulphate as SO4	34		1000	20000	50000
Total Dissolved Solids	860		4000	60000	100000
Phenol	<0.1		1	-	-
Dissolved Organic Carbon	<20		500	800	1000

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Mass of sample taken (kg) -	Dry Matter Content Ratio (%) =	93.3
Mass of dry sample (kg) = 0.09	Leachant Volume (l)	-
Particle Size <4mm = >95%		

<b>EMT Job No</b>	<b>22/18605</b>		<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Sample No</b>	<b>7</b>		<b>Inert</b>	<b>Stable Non-reactive</b>	<b>Hazardous</b>
<b>Client Sample No</b>	<b>WS02</b>				
<b>Depth/Other</b>					
<b>Sample Date</b>	<b>09/11/2022</b>				
<b>Batch No</b>	<b>1</b>				
<b>Solid Waste Analysis</b>					
Total Organic Carbon (%)	0.50		3	5	6
Sum of BTEX (mg/kg)	<0.017		6	-	-
Sum of 7 PCBs (mg/kg)	<0.035		1	-	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)	<30		500	-	-
PAH Sum of 6 (mg/kg)	<0.22		-	-	-
PAH Sum of 17 (mg/kg)	<0.64		100	-	-
<b>Eluate Analysis</b>	<b>10:1 concn leached</b>		<b>Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg</b>		
	<b>A10</b>		<b>mg/kg</b>		
	<b>mg/kg</b>				
Arsenic	<0.025		0.5	2	25
Barium	0.05		20	100	300
Cadmium	<0.005		0.04	1	5
Chromium	<0.015		0.5	10	70
Copper	<0.07		2	50	100
Mercury	<0.0001		0.01	0.2	2
Molybdenum	0.05		0.5	10	30
Nickel	<0.02		0.4	10	40
Lead	<0.05		0.5	10	50
Antimony	<0.02		0.06	0.7	5
Selenium	<0.03		0.1	0.5	7
Zinc	<0.03		4	50	200
Chloride	<3		800	15000	25000
Fluoride	4		10	150	500
Sulphate as SO4	5		1000	20000	50000
Total Dissolved Solids	650		4000	60000	100000
Phenol	<0.1		1	-	-
Dissolved Organic Carbon	<20		500	800	1000

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Mass of sample taken (kg)	-	Dry Matter Content Ratio (%) =	89.4
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	-
Particle Size <4mm =	>95%		

<b>EMT Job No</b>	<b>22/18605</b>		<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Sample No</b>	<b>11</b>		<b>Inert</b>	<b>Stable Non-reactive</b>	<b>Hazardous</b>
<b>Client Sample No</b>	<b>WS03</b>				
<b>Depth/Other</b>					
<b>Sample Date</b>	<b>09/11/2022</b>				
<b>Batch No</b>	<b>1</b>				
<b>Solid Waste Analysis</b>					
Total Organic Carbon (%)	0.63		3	5	6
Sum of BTEX (mg/kg)	<0.017		6	-	-
Sum of 7 PCBs (mg/kg)	<0.035		1	-	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)	<30		500	-	-
PAH Sum of 6 (mg/kg)	<0.22		-	-	-
PAH Sum of 17 (mg/kg)	<0.64		100	-	-
<b>Eluate Analysis</b>	<b>10:1 concn leached</b>		<b>Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg</b>		
	<b>A10</b>		<b>mg/kg</b>		
	<b>mg/kg</b>				
Arsenic	<0.025		0.5	2	25
Barium	0.04		20	100	300
Cadmium	<0.005		0.04	1	5
Chromium	<0.015		0.5	10	70
Copper	<0.07		2	50	100
Mercury	<0.0001		0.01	0.2	2
Molybdenum	0.08		0.5	10	30
Nickel	0.03		0.4	10	40
Lead	<0.05		0.5	10	50
Antimony	<0.02		0.06	0.7	5
Selenium	<0.03		0.1	0.5	7
Zinc	<0.03		4	50	200
Chloride	4		800	15000	25000
Fluoride	4		10	150	500
Sulphate as SO4	23		1000	20000	50000
Total Dissolved Solids	710		4000	60000	100000
Phenol	<0.1		1	-	-
Dissolved Organic Carbon	70		500	800	1000

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Mass of sample taken (kg)	-	Dry Matter Content Ratio (%) =	88.6
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	-
Particle Size <4mm =	>95%		

<b>EMT Job No</b>	<b>22/18605</b>		<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Sample No</b>	<b>19</b>		<b>Inert</b>	<b>Stable Non-reactive</b>	<b>Hazardous</b>
<b>Client Sample No</b>	<b>WS05</b>				
<b>Depth/Other</b>					
<b>Sample Date</b>	<b>09/11/2022</b>				
<b>Batch No</b>	<b>1</b>				
<b>Solid Waste Analysis</b>					
Total Organic Carbon (%)	0.25		3	5	6
Sum of BTEX (mg/kg)	<0.017		6	-	-
Sum of 7 PCBs (mg/kg)	<0.035		1	-	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)	<30		500	-	-
PAH Sum of 6 (mg/kg)	<0.22		-	-	-
PAH Sum of 17 (mg/kg)	<0.64		100	-	-
<b>Eluate Analysis</b>	<b>10:1 concn leached</b>		<b>Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg</b>		
	<b>A10</b>		<b>mg/kg</b>		
	<b>mg/kg</b>				
Arsenic	<0.025		0.5	2	25
Barium	<0.03		20	100	300
Cadmium	<0.005		0.04	1	5
Chromium	<0.015		0.5	10	70
Copper	<0.07		2	50	100
Mercury	<0.0001		0.01	0.2	2
Molybdenum	<0.02		0.5	10	30
Nickel	<0.02		0.4	10	40
Lead	<0.05		0.5	10	50
Antimony	<0.02		0.06	0.7	5
Selenium	<0.03		0.1	0.5	7
Zinc	<0.03		4	50	200
Chloride	<3		800	15000	25000
Fluoride	4		10	150	500
Sulphate as SO4	32		1000	20000	50000
Total Dissolved Solids	1050		4000	60000	100000
Phenol	<0.1		1	-	-
Dissolved Organic Carbon	<20		500	800	1000

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**Client Name:** AWN Consulting  
**Reference:** Indaver  
**Location:** -  
**Contact:** Marcello Allende

**Note:**  
 Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
22/18605	1	WS01		4	Matthew Turner	22/11/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/Stone
					Matthew Turner	22/11/2022	<b>Asbestos Fibres</b>	NAD
					Matthew Turner	22/11/2022	<b>Asbestos ACM</b>	NAD
					Matthew Turner	22/11/2022	<b>Asbestos Type</b>	NAD
22/18605	1	WS02		8	Simon Postlewhite	22/11/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/stones
					Simon Postlewhite	22/11/2022	<b>Asbestos Fibres</b>	NAD
					Simon Postlewhite	22/11/2022	<b>Asbestos ACM</b>	NAD
					Simon Postlewhite	22/11/2022	<b>Asbestos Type</b>	NAD
22/18605	1	WS03		12	Matthew Turner	22/11/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/Stone
					Matthew Turner	22/11/2022	<b>Asbestos Fibres</b>	NAD
					Matthew Turner	22/11/2022	<b>Asbestos ACM</b>	NAD
					Matthew Turner	22/11/2022	<b>Asbestos Type</b>	NAD
22/18605	1	WS04		16	Matthew Turner	22/11/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/Stone
					Matthew Turner	22/11/2022	<b>Asbestos Fibres</b>	NAD
					Matthew Turner	22/11/2022	<b>Asbestos ACM</b>	NAD
					Matthew Turner	22/11/2022	<b>Asbestos Type</b>	NAD
22/18605	1	WS05		20	Catherine Coles	23/11/2022	<b>General Description (Bulk Analysis)</b>	soil,stone
					Catherine Coles	23/11/2022	<b>Asbestos Fibres</b>	NAD
					Catherine Coles	23/11/2022	<b>Asbestos ACM</b>	NAD
					Catherine Coles	23/11/2022	<b>Asbestos Type</b>	NAD



## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/18605

### 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 overestimate 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.

Please include all sections of this report if it is reproduced

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

**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: 22/18605

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	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.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
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.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	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.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes

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Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	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		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.	Yes		AR	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	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	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	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	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	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	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		AR	Yes

EMT Job No: 22/18605

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	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	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	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.			AR	Yes
TM61	Determination of Mercury by Cold Vapour Atomic Fluorescence - WATERS: Modified USEPA Method 245.7, Rev 2, Feb 2005. SOILS: Modified USEPA Method 7471B, Rev.2, Feb 2007	PM0	No preparation is required.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
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.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	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.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes
TM108	Determination of Elemental Sulphur by Reversed Phase High Performance Liquid Chromatography with Ultra Violet spectroscopy.	PM114	End over end extraction of dried and crushed soil samples for organic analysis. The solvent mix varies depending on analysis required			AD	Yes

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Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM135	Analysis of PFAS compounds in Water and Soil by LC-MS/MS	PM120	Methanol/NH4OH Extraction for PFAS Analysis by LC-MS - As received solid samples are extracted in Methanol: Ammonium Hydroxide solution by Sonication and End over End shaker.			AR	Yes
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	
TM15_A	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds, Vinyl Chloride & Styrene by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes



## **APPENDIX 2**

**Invader Ireland Ltd**

**Window Sample (WS) Logs**



AWN Project Ref: 227501.0667	Client: Indaver Ireland Ltd.	Excavation date: 09/11/2022
Ground Level (mAOD): No value		
Grid Reference: 706122E, 770972N	Location: Meath	Geology log: AW

SUBSURFACE PROFILE		Depth mbgl (mAOD)	Lithology	Backfill Details/ Samples taken
<b>Ground surface</b>				
0.1	Brown gravelly silty CLAY. Gravel is subangular to subrounded with cobbles (NATURAL GROUND).			Sample WS01 taken
0.2				
0.3				
0.4				
0.5				
0.6				
0.7				
0.8				
0.9				
1.0				
1.1				
1.2				
1.3				
1.4				
1.5				
1.6				
1.7				
1.8				
1.9	Possible Bedrock - Obstruction	1.9		
2.0	<b>End of Window Sample 1.9 mbgl</b>			
2.1				
2.2				
2.3				
2.4				
2.5				
2.6				
2.7				
2.8				
2.9				
3.0				
3.1				
3.2				
3.3				
3.4				
3.5				


Excavation Method: Mechanical Excavation (Terrier Window Sampling Rig)

Comments: No sign of contamination.

Contractor: IGSL	Water Strikes (mbgl):	-	-	-
	Static Water Level (mbgl):	-		



AWN Project Ref: 227501.0667	Client: Indaver Ireland Ltd.	Excavation date: 09/11/2022
Ground Level (mAOD): No value		
Grid Reference: 706211E, 770965N	Location: Meath	Geology log: AW

SUBSURFACE PROFILE		Depth mbgl (mAOD)	Lithology	Backfill Details/ Samples taken
<b>Ground surface</b>				
0.1	Brown gravelly silty CLAY. Gravel is subangular to subrounded with cobbles (NATURAL GROUND).			Sample WS02 taken
0.2				
0.3				
0.4				
0.5				
0.6				
0.7				
0.8				
0.9				
1.0				
1.1				
1.2				
1.3				
1.4				
1.5				
1.6				
1.7				
1.8				
1.9	Possible Bedrock - Obstruction	1.95		
2.0	<b>End of Window Sample 1.95 mbgl</b>			
2.1				
2.2				
2.3				
2.4				
2.5				
2.6				
2.7				
2.8				
2.9				
3.0				
3.1				
3.2				
3.3				
3.4				
3.5				

Excavation Method: Mechanical Excavation (Terrier Window Sampling Rig)

Comments: No sign of contamination.			
	Water Strikes (mbgl):	-	-
Contractor: IGSL	Static Water Level (mbgl):	-	



AWN Project Ref: 227501.0667	Client: Indaver Ireland Ltd.	Excavation date: 09/11/2022
Ground Level (mAOD): No value		
Grid Reference: 706273E, 771065N	Location: Meath	Geology log: AW

SUBSURFACE PROFILE		Depth mbgl (mAOD)	Lithology	Backfill Details/ Samples taken
<b>Ground surface</b>				
0.1	Brown gravelly silty CLAY. Gravel is subangular to subrounded with cobbles (NATURAL GROUND).			
0.2				
0.3				
0.4				
0.5				
0.6				
0.7				
0.8				
0.9				
1.0				
1.1				
1.2				
1.3				
1.4				
1.5				
1.6				
1.7				
1.8				
1.9				
2.0				
2.1				
2.2				
2.3				
2.4				
2.5				
2.6				
2.7				
2.8				
2.9				
3.0				
3.1				
3.2				
3.3				
3.4				
3.5				
3.6		Possible Bedrock - Obstruction		
3.7	<b>End of Window Sample 3.6 mbgl</b>			

Excavation Method: Mechanical Excavation (Terrier Window Sampling Rig)

Comments: No sign of contamination.				
Contractor: IGSL	Water Strikes (mbgl):	-	-	-
	Static Water Level (mbgl):	-		



AWN Project Ref: 227501.0667	Client: Indaver Ireland Ltd.	Excavation date: 09/11/2022
Ground Level (mAOD): No value		
Grid Reference: 706274E, 771067N	Location: Meath	Geology log: AW

SUBSURFACE PROFILE		Depth mbgl (mAOD)	Lithology	Backfill Details/ Samples taken			
<b>Ground surface</b>							
0.1	Brown gravelly silty CLAY. Gravel is subangular to subrounded with cobbles (NATURAL GROUND).			} Sample WS04 taken			
0.2							
0.3							
0.4							
0.5							
0.6							
0.7							
0.8							
0.9							
1.0							
1.1							
1.2							
1.3							
1.4							
1.5							
1.6							
1.7							
1.8							
1.9							
2.0							
2.1							
2.2							
2.3							
2.4							
2.5							
2.6							
2.7							
2.8							
2.9							
3.0							
3.1		Possible Bedrock - Obstruction			3.2		
3.2		<b>End of Window Sample 3.2 mbgl</b>					
3.3							
3.4							
3.5							

Excavation Method: Mechanical Excavation (Terrier Window Sampling Rig)

Comments: No sign of contamination.

Contractor: IGSL	Water Strikes (mbgl):	-	-	-
	Static Water Level (mbgl):	-		



AWN Project Ref: 227501.0667	Client: Indaver Ireland Ltd.	Excavation date: 09/11/2022
Ground Level (mAOD): No value		
Grid Reference: 706315E, 770799N	Location: Meath	Geology log: AW

SUBSURFACE PROFILE		Depth mbgl (mAOD)	Lithology	Backfill Details/ Samples taken
<b>Ground surface</b>				
0.1	Brown gravelly silty CLAY. Gravel is subangular to subrounded with cobbles (NATURAL GROUND).			} Sample WS05 taken
0.2				
0.3				
0.4				
0.5				
0.6				
0.7				
0.8				
0.9				
1.0				
1.1				
1.2				
1.3				
1.4				
1.5				
1.6				
1.7				
1.8				
1.9				
2.0				
2.1				
2.2				
2.3				
2.4				
2.5				
2.6				
2.7				
2.8				
2.9		Possible Bedrock - Obstruction		
3.0	<b>End of Window Sample 2.9 mbgl</b>			
3.1				
3.2				
3.3				
3.4				
3.5				

Excavation Method: Mechanical Excavation (Terrier Window Sampling Rig)

Comments: No sign of contamination.

Contractor: IGSL	Water Strikes (mbgl):	-	-	-
	Static Water Level (mbgl):	-		