

Arthurstown Landfill, Kill,  
Co. Kildare  
W0004-04

**Q-1 2022**

**Quarterly  
Groundwater  
Monitoring  
Report**

**April 2022**

**CDM  
Smith**

# Document Control Sheet

<b>Client</b>		South Dublin County Council		
<b>Project</b>		Environmental Assessment of the Quality of Groundwater at the Arthurstown Landfill Site at Kill, Co. Kildare in accordance with Waste Licence Register No. W0004-04		
<b>Project No:</b>		250405		
<b>Report</b>		Q-1 2022 Quarterly Groundwater Monitoring Report		
<b>Document Reference:</b>		250405/40/DG_34		
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1	E. Waters & L. Foley	L. Foley	L. Foley	22/04/2022

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## Executive Summary

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In accordance with Waste Licence W0004-04, South Dublin County Council monitors groundwater quality at Arthurstown Landfill, Arthurstown, Kill, Co. Kildare. This report contains the results of the quarterly groundwater monitoring carried out during quarter 1 (Q-1) 2022.

Groundwater quality was monitored at eight monitoring locations; seven groundwater monitoring wells (MW) and one private well (PW), monitoring was carried out on 28 March 2022.

Groundwater monitoring well MW-20 is up-gradient of the facility and had specific electrical conductivity (1,286  $\mu\text{S}/\text{cm}$ ) above the Guideline Threshold Value (GTV) 800  $\mu\text{S}/\text{cm}$ . The concentration of ammonia (6.99 mg/L) exceeded the GTV threshold (0.175 mg/L) at up-gradient well (MW-8). The cross-gradient groundwater monitoring well MW-3 had concentrations of electrical conductivity (1,300  $\mu\text{S}/\text{cm}$ ) and chloride (40.5 mg/L, relative to the GTV threshold 24 mg/L) above their respective GTV thresholds. The up-gradient monitoring well data indicates that there are offsite inputs. It is considered likely that the exceedances in the cross-and down-gradient monitoring groundwater wells are due to offsite inputs, as detected in the up-gradient monitoring wells, and not contributed by the facility.

All parameters were monitored in the private well (PW-1) were below their respective assessment criteria.

Based on the information gathered in this report and supported by the contour map, the exceedances are most likely related to offsite sources, however the site will be routinely monitored to ensure the landfill is not impacting the groundwater beneath the facility.

# Section 1 Introduction

## 1.1 Background

Arthurstown Landfill is located approximately 1.6 km south east of Kill, Co. Kildare. The landfill was operated by, and remains in the ownership of, South Dublin County Council (SDCC). Prior to SDCC purchase of the land in the early 1990s, the site was used as a sand and gravel quarry. The Environmental Protection Agency (EPA) issued the site with Waste Licence. W0004-04 in 2009 and the landfill operations ceased in 2010.

In August 2019, SDCC appointed CDM Smith Ireland Ltd to carry out the annual groundwater monitoring programme as required by their Waste Licence. This report details the monitoring that was carried out as part of the quarter 1 (Q-1) 2022 annual groundwater monitoring event, including the sampling and analytical methods used.

## 1.2 Monitoring and Reporting Requirements

Monitoring was carried out in line with Condition 5 of schedule D of the licence. All reporting was carried out in line with Schedule E of the licence. The parameters and monitoring frequency as specified in the Licence are shown in Table 1.

**Table 1 Monitoring Parameters and Frequency**

Parameter	Monitoring Frequency
Ammonia (as N)	Quarterly
Chloride	Quarterly
Dissolved Oxygen	Quarterly
Electrical Conductivity	Quarterly
pH	Quarterly
Temperature	Quarterly
Total Organic Carbon	Quarterly
Total Oxidised Nitrogen	Annually
Total Ortho Phosphate	Annually
Total Alkalinity	Annually
Sulphate	Annually
Mercury	Annually
Fluoride	Annually
Total Cyanide	Annually
Faecal Coliforms	Annually
Total Coliforms	Annually
Boron	Annually
Cadmium	Annually
Calcium	Annually
Total Chromium	Annually
Copper	Annually
Iron	Annually

Parameter	Monitoring Frequency
Lead	Annually
Magnesium	Annually
Manganese	Annually
Nickel	Annually
Potassium	Annually
Sodium	Annually
Zinc	Annually
List 1/11 organic substances	Annually

### 1.3 Sampling Point Locations

Seven monitoring wells (MW-2, MW-3, MW-6, MW-8, MW-9, MW-16 and MW-20) and one private wells (PW-1) were monitored to comply with the routine quarterly monitoring as set out in Schedule D.1 of the Licence. Note, two locations are listed as both groundwater monitoring wells and private wells in the Licence; MW-2 and PW2 are the same monitoring point, as are MW- 15 and PW-1. These monitoring locations are included in this report as MW-2 and PW-1, respectively, except in Appendix 2 where PW-2 is indicated (rather than MW-2), for illustrative purposes.

Samples were not required from the remaining groundwater wells. Table 2 indicates the location of other groundwater monitoring wells relative to the facility. The locations of all groundwater and private water monitoring points are included in Appendix 1.

**Table 2 Groundwater Monitoring Locations**

Sample Point	Location
MW-1	Approx. 140 metres N.E of landfill cells
MW-2	Approx. 260 metres N.E of landfill cells
MW-3	Approx. 260 metres N.E of landfill cells
MW-4	Approx. 400 meters East of landfill cells
MW-5	Approx. 400 metres East of landfill cells
MW-6	Approx. 100 metres E.S.E of landfill cells
MW-7	Approx. 80 metres S.E of landfill cells
MW-8	Approx. 240 metres E of landfill cells
MW-9	Approx. 50 metres W of landfill cells
MW-10	Approx. 50 metres W of landfill cells
MW-11	Approx. 50 metres W of landfill cells
MW-12	Approx. 50 metres N.W of landfill cells
MW-13	Approx. 100 metres No of landfill cells
MW-14	Approx. 200 metres N.N.E of landfill cells (across public road)
MW-15	Approx. 200 metres N.N.E of landfill cells (across public road)
MW-16	Approx. 90 metres N.N.W of landfill cells

Sample Point	Location
MW-17	Approx. 100 metres W.S.W of landfill cells
MW-18	Approx. 170 metres N of landfill cells
MW-19	Approx. 20 metres W.S.W of landfill cells
MW-20	Approx. 150 metres S of landfill cells
MW-21	Approx. 140 metres S.S.E of landfill cells
MW-22	Approx. 400 metres East of landfill cells

## Section 2 Methodology

### 2.1 Sampling Procedures

All sampling was carried out in accordance with Standard Operating Procedures (SOP) and best practice, as shown in Table 3. The groundwater monitoring wells (MW) and private well (PW) were sampled on 28 March 2022.

**Table 3 Sampling Procedures Standards**

ISO Standard	Description
ISO 5667-2-2020	Guidance on the design of sampling programmes and sampling techniques
ISO 5667-3-2018	Guidance on sample preservation and handling
ISO 5667-14-2014	Guidance on quality assurance of environmental sampling and handling
ISO 5667-11-2009	Water quality-sampling-part 11: Guidance on sampling of groundwaters

### 2.2 Sampling of Groundwater Monitoring Wells (MWs)

Before sampling, the initial static water level was measured for all wells except MW-2, which was a tap sample. The total measured depth of the well was available from previous monitoring events and the initial static water level was taken away from the total depth. Waterra foot valve and tubing were used at all wells except for well (MW-8) where a bailer and twine were used. For both techniques the well was purged three times the volume of the well before collecting the water samples at monitoring wells MW- 3, MW-6, MW-8, MW-9, MW-16 and MW-20.

The samples were collected in laboratory-supplied sampling containers and stored in a cooler box at constant temperature (5 +/-3 °C).The samples were stored overnight in coolers and collected by DHL courier who delivered the samples to Element Materials Technology Laboratories. Element Materials Technology Laboratories are UKAS ISO 17025 accredited. Chain of custody (COC) documentation was included with all samples delivered to the laboratory. The methodologies were all ISO/CEN approved or equivalent.

### 2.3 Sampling of Private Well (PWs)

A sample was collected from one private well (PW-1). The sampling tap was run for five to ten minutes to purge water in the pipe work before the field parameters were recorded and samples collected.

The samples were collected in laboratory-supplied sampling container and stored in a cooler box at constant temperature (5 +/-3 °C).The samples were stored overnight in coolers and collected by DHL courier who delivered the samples to Element Materials Technology Laboratories. Element Materials Technology Laboratories are UKAS ISO 17025 accredited. Chain of custody (COC) documentation was included with all samples delivered to the laboratory. The methodologies were all ISO/CEN approved or equivalent.



## Section 3 Results

### 3.1 Field Data/ Parameters

The field data (well depth (m), depth to water (m), purged volume (L), groundwater temperature (°C), and visual and odour observations) are contained in Table 4.

**Table 4 Field Data**

Location ID	Depth (m)	Static Water Level (m)	Purged Volume (L)	Temperature (°C)	Visual	Odour
MW-1	Represented by MW-2				-	-
MW-2	Tap			9.2	clear	none
MW-3	10.16	3.89	21	10.9	very silty	none
MW-4	2.31	Well dry			-	-
MW-5	2.1	Well dry			-	-
MW-6	6.09	1.27	15	8.7	brownish	none
MW-7	6.09	Well dry			-	-
MW-8	30.78	6.68	100	10.8	small sediments	pungent smell
MW-9	28.40	6.47	64	12.4	clear	hydrogen sulphide
MW-10	2.56	Well dry			-	-
MW-11	3.38	Well dry			-	-
MW-12	4.26	Well dry			-	-
MW-13	8.32	Well dry			-	-
MW-14	16.64	-	-	-	-	-
MW-15	2.82	Tap sample		9.3	clear	none
MW-16	22.43	5.93	60	11.7	clear	hydrogen sulphide
MW-17	10.51	-	-	-	-	-
MW-18	27	-	-	-	-	-
MW-19	26.20	-	-	-	-	-
MW-20	8.96	5.53	12	10.3	turbid	none
MW-21	7.01	Well Dry			-	-
MW-22	Well removed				-	-

### 3.2 Laboratory Data

The complete laboratory reports are presented in Appendix 3. The groundwater results were screened against the EPA Guideline Threshold Values (GTVs) or Interim Guideline Values (IGVs). The GTVs take precedence over the IGVs; IGVs are used only in the absence of a GTV for that particular parameter. The sources of the GTV and IGV thresholds are as follows:

- Guideline Threshold Values (GTVs);

- European Union Environmental Objectives (Groundwater) Regulations, 2016 (S.I. No. 366 of 2016) and
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010).
- Interim Guideline Values (IGVs):
  - Environmental Protection Agency (2003), Towards Setting Guideline Values for the Protection of Groundwater in Ireland – Interim Report. Environmental Protection Agency, Wexford.

A comparison of the laboratory results relative to the GTV/IGV thresholds is presented in Table 5 and exceedances are listed below:

1. The concentration of chloride in the cross-gradient well MW-3 (40.5 mg/L) exceeded the GTV threshold (24 mg/L);
2. The electrical conductivity (EC) in up-gradient well MW-20 (1,286  $\mu\text{S}/\text{cm}$ ) and cross-gradient well MW-3 (1,300  $\mu\text{S}/\text{cm}$ ) exceeded the GTV threshold (800  $\mu\text{S}/\text{cm}$ );
3. The concentration of ammonia in the up-gradient well MW-8 (6.99 mg/L) exceeded the GTV threshold (0.175 mg/L); and
4. All other parameters were below their respective IGVs and GTVs.

Table 5 Q-1 2022 Groundwater Analytical Results

Parameter	Units	Assessment Criteria	Source of Criteria	MW-6	MW-20	MW-8	MW-3	MW-9	MW-2	MW-16
				Up-Gradient	Up-Gradient	Up-Gradient	Cross-Gradient	Cross-Gradient	Down-Gradient	Down-Gradient
pH	pH Units	6.5-9.5	IGV 2003	7.48	7.13	7.66	7.23	7.76	7.76	7.76
Electrical Conductivity	µS/cm	800	GTV 2016	672	1286	442	1300	597	578	623
TOC	mg/L	-	-	<2	<2	<2	<2	<2	<2	<2
Ammoniacal Nitrogen	mg/L	0.175	GTV 2016	<0.03	0.03	6.99	<0.03	0.08	<0.03	<0.03
Chloride	mg/L	24	GTV 2016	14.8	13	9.6	40.5	11.8	11	13.1

Note: determinants which exceed the assessment criteria are highlighted in blue above

### 3.3 Private Well

The laboratory data of analysis for PW-1 is shown in Table 6. For comparative purposes, the European Union Drinking Water Regulations 2014 (S.I. No. 122 of 2014) thresholds, where available, are included as assessment criteria in the tables. The full laboratory reports are included in Appendix 3.

All parameters were below their respective European Union Drinking Water Regulations 2014 (S.I. No. 122 of 2014) thresholds.

**Table 6 Private Well (PW-1) Analytical Results**

Parameter	Units	Drinking Water Regulations	PW-1
pH	pH Units	>6.5 - <9.5	7.72
Odour	-	-	None
Visual	-	-	Clear
Conductivity	(µS/cm)	2500	626
Ammonia as N	(mg/L)	0.30	<0.03
TOC	(mg/L)	-	<2
Chloride	(mg/L)	250	12.9

## Section 4 Discussion & Conclusions

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There were exceedances of the assessment criteria for ammonia and electrical conductivity in the up-gradient wells of MW-8 and MW-20, respectively. Electrical conductivity exceeded the assessment criteria in the cross-gradient well MW-3.

There have been exceedances of ammonia and electrical conductivity in the up-gradient and cross-gradient wells during previous monitoring rounds.

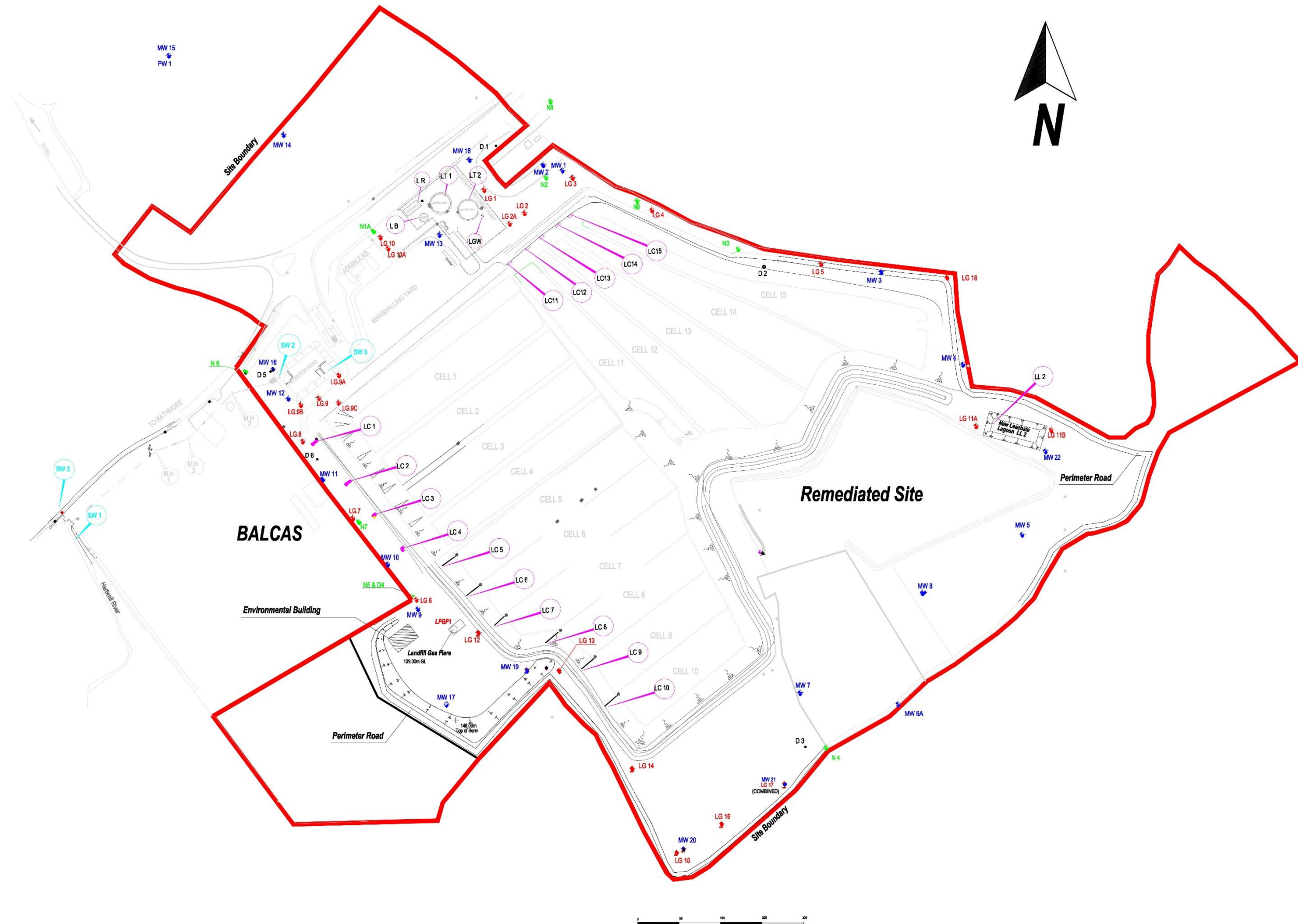
All parameters tested in the private well (PW-1) were below their respective assessment criteria.

The up-gradient monitoring well data indicates that there are offsite inputs. It is considered likely that the exceedances in the cross-and down-gradient monitoring groundwater wells are due to offsite inputs, as detected in the up-gradient monitoring wells, and not contributed by the facility.

Based on the information gathered in this report and supported by the contour map, the exceedances are most likely related to offsite sources, however the site will be routinely monitored to ensure the landfill is not impacting the groundwater beneath the facility.

## Appendix 1 Sampling Point Locations

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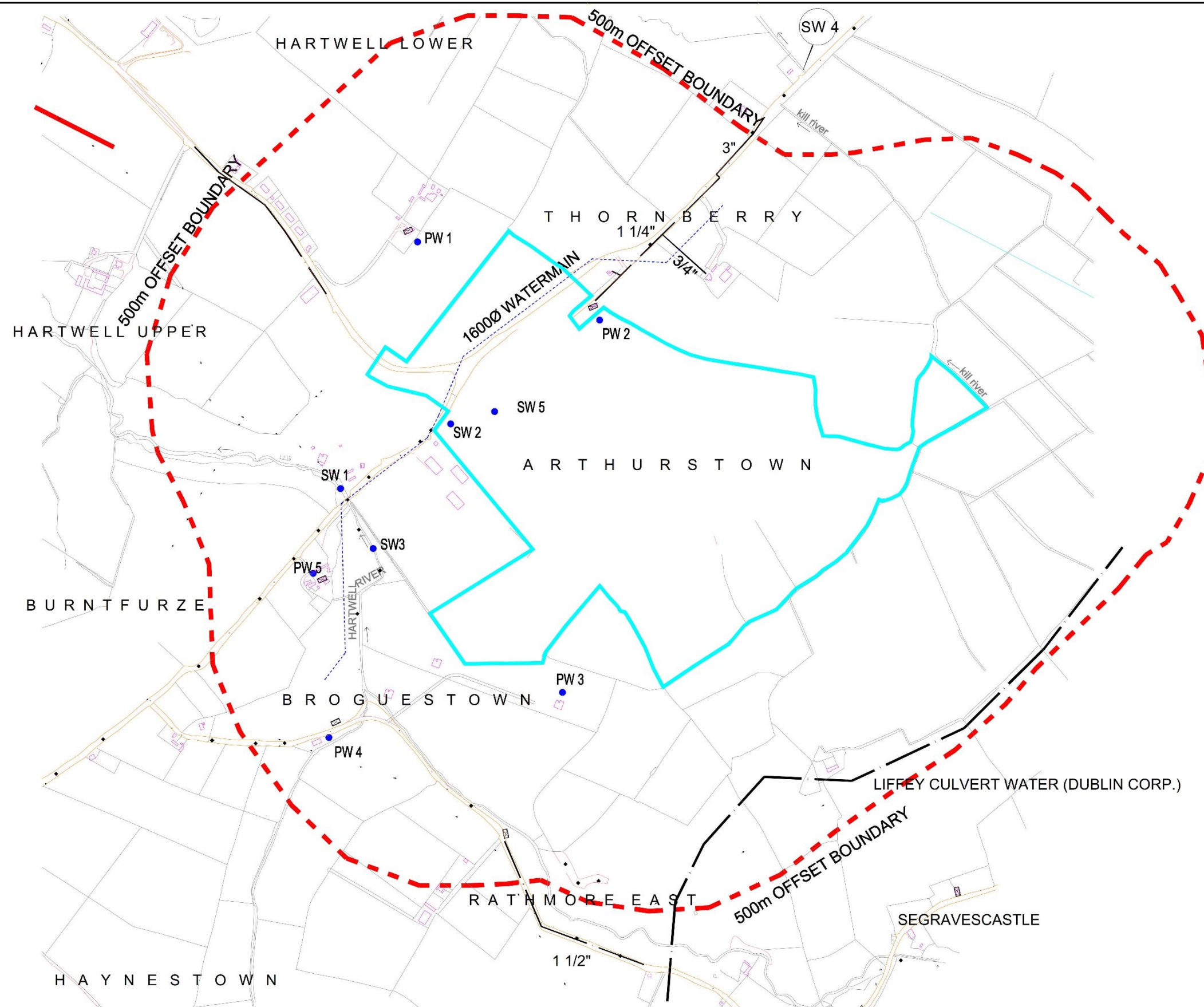
REF.NO.	EASTING	NORTHING
LG 1	*E 265463.89	N 221191.42
LG 2	E 265514.84	N 221292.45
LG 3	E 265572.13	N 221335.37
LG 4	E 265558.13	N 221380.04
LG 5	E 265699.54	N 221216.69
LG 6	E 265618.37	N 220804.94
LG 7	E 265519.38	N 220609.80
LG 8	E 265548.77	N 220716.24
LG 9	E 265587.44	N 221009.11
LG 10	E 265641.83	N 221263.29
LG 2A	E 265662.43	N 221043.04
LG 12	E 265469.22	N 220944.84
LG 13	E 265555.87	N 221338.57
LG 14	E 265503.58	N 220603.27
LG 15	E 265596.88	N 220516.67
LG 16	E 265670.70	N 220553.36
LG 17	E 265625.96	N 220991.19
*FGF1	E 265430.48	N 220788.52
LG 9A	E 265392.18	N 221096.38
LG 8B	E 265246.55	N 221060.33
LG 9C	E 265391.96	N 221263.29
LG 10A	E 265513.90	N 221479.87
LG 11A	E 265681.80	N 221248.74
LG 19	E 266020.57	N 221214.50
MW 1	E 265559.79	N 221344.42
MW 2	E 265720.16	N 221370.59
MW 3	E 265895.28	N 221234.57
MW 4	E 266038.27	N 221101.92
MW 5	E 266110.31	N 220933.46
MW 6	E 265876.02	N 220768.81
MW 7A	E 265961.97	N 220988.19
MW 8	E 265644.53	N 220711.84
MW 9	E 265991.70	N 220332.78
MW 10	E 265336.73	N 220813.32
MW 11	E 265350.35	N 220867.70
MW 12	E 265373.39	N 220870.63
MW 13	E 265229.74	N 221054.09
MW 14	E 265410.833	N 221267.164
MW 15	E 265326.74	N 221524.20
MW 16	E 265356.72	N 221303.43
MW 17	E 265273.03	N 221348.45
MW 18	E 265419.55	N 220770.38
MW 19	E 265373.39	N 221049.06
MW 20	E 265517.39	N 221308.74
MW 21	E 265705.04	N 220523.05
MW 21	E 265625.96	N 220613.93
LC 1	E 265385.28	N 220115.80
LC 2	E 265305.42	N 220867.24
LC 3	E 265325.25	N 220927.54
LC 4	E 265364.68	N 220894.64
LL 2	E 265688.83	N 221047.88
LT 1	E 265418.7	N 221295.3
LT 2	E 265437.6	N 221298.3
L 1	E 265388.21	N 221387.58
L 2	E 265392.12	N 221305.35
LGW	E 265484.47	N 221289.18
LCW	E 265495.14	N 221298.18
LC12	E 265516.89	N 221248.34
LC13	E 265532.33	N 221262.99
LC14	E 265553.80	N 221278.91
LC15	E 265571.44	N 221392.14
LC 6	E 265414.48	N 220894.34
LC 8	E 265445.43	N 220608.09
LC 7	E 265477.38	N 220791.65
LC 8	E 265493.25	N 220771.67
LC 9	E 265681.50	N 220738.82
LC 10	E 265812.85	N 220894.97
D 1	E 265480.3	N 221374.1
D 2	E 265820.1	N 221226.5
D 3	E 265851.64	N 220645.36
D 4	E 265382.02	N 220626.35
D 5	E 265210.85	N 221100.53
D 6	E 265386.45	N 220994.24
N1A	E 265323.78	N 221333.84
N2	E 265420.25	N 221335.84
N3	E 265707.7	N 221248.01
N4	E 265873.73	N 220804.70
N5	E 265811.969	N 220850.50
N6	E 265616.73	N 221106.38
N7	E 265814.62	N 220918.37
N8	E 265455.70	N 221437.91
N9	E 265894.83	N 221387.01
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SW 2	E 264521.88	N 221058.47
SW 3	E 264533.96	N 220841.96
SW 4	E 265013.71	N 221304.46
SW 5	E 265277.71	N 221130.10

**SOUTH DUBLIN COUNTY COUNCIL  
ENVIRONMENTAL SERVICES DEPT.  
TOWN CENTRE, TALLAGHT, D.24**

PROJECT


AWL03-14	Oct 2003.	Replaces Dwg AWL02-14C
C	Feb 2000	Addition of New Monitoring Points From Stage 2
B	Aug 99	Exchange of Sampling Points SW1 & SW2
Revision	Date	Description





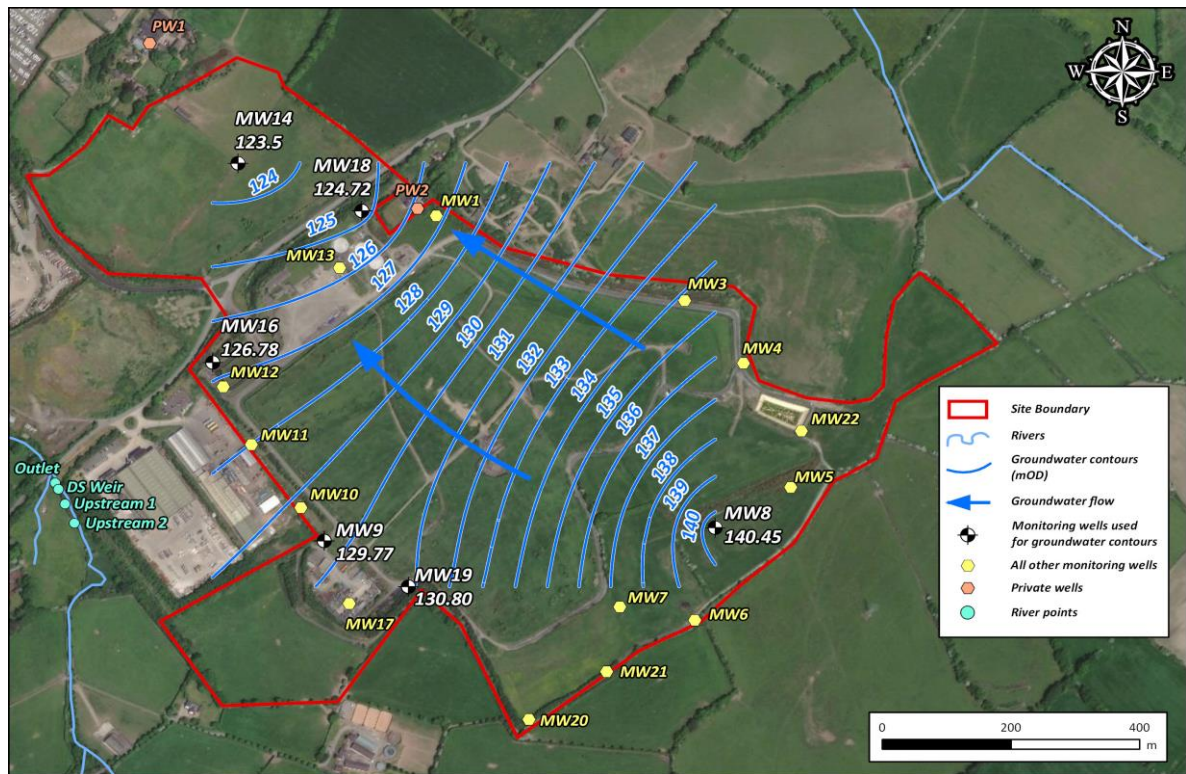
LEGEND

- WATERMAIN (AS SIZED)
- PW PRIVATE WELL
- SW SURFACE WATER MONITORING POINT NO 4  
E 295992.90  
N 221934.35

<b>SOUTH DUBLIN COUNTY COUNCIL</b> <b>ENVIRONMENTAL SERVICES DEPT.</b> <b>TOWN CENTRE, TALLAGHT, D.24</b>			<b>PROJECT</b> <b>ARTHURSTOWN LANDFILL</b>		<b>PREPARED BY</b> M.H	<b>SURVEYED</b> JS
			<b>TITLE</b> <b>Location of Remote Monitoring Points</b>		<b>CHECKED BY</b> J.S	<b>DATE</b> August 2006
			<b>SCALES</b> 1: 5000		<b>DRAWING NO.</b> AWL03 - 15C_2006	
<b>AWL02-15</b>		<b>Oct 2003.</b>	<b>Replaces Dwg AWL02- 15</b>		<b>MH</b>	
<b>Revision</b>	<b>Date</b>	<b>Description</b>		<b>By</b>		
				<b>JOHN SMITH</b> <b>FACILITY MANAGER</b> <b>ARTHURSTOWN LANDFILL</b> <b>ENVIRONMENTAL SERVICES DEPARTMENT</b>		
				<b>MARY PYNE</b> <b>DIRECTOR OF SERVICES</b> <b>ENVIRONMENTAL SERVICES DEPT.</b>		



## Appendix 2 Groundwater Contour Map



## Appendix 3 Laboratory Reports

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CDM Smith  
15 Wentworth  
Eblana Villas  
Dublin 2  
Dublin  
D02 WK10



<b>Attention :</b>	Laura Foley
<b>Date :</b>	14th April, 2022
<b>Your reference :</b>	22538 RGV2
<b>Our reference :</b>	Test Report 22/5208 Batch 1
<b>Location :</b>	Arthurstown
<b>Date samples received :</b>	31st March, 2022
<b>Status :</b>	Final Report
<b>Issue :</b>	1

Fourteen samples were received for analysis on 31st March, 2022 of which fourteen 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

## Element Materials Technology

**Client Name:** CDM Smith  
**Reference:** 22538 RGV2  
**Location:** Arthurstown  
**Contact:** Laura Foley  
**EMT Job No:** 22/5208

Report : Liquid

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HN0<sub>3</sub>

[illegible]

## Element Materials Technology

**Client Name:** CDM Smith  
**Reference:** 22538 RGV2  
**Location:** Arthurstown  
**Contact:** Laura Foley  
**EMT Job No:** 22/5208

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

[illegible]

