

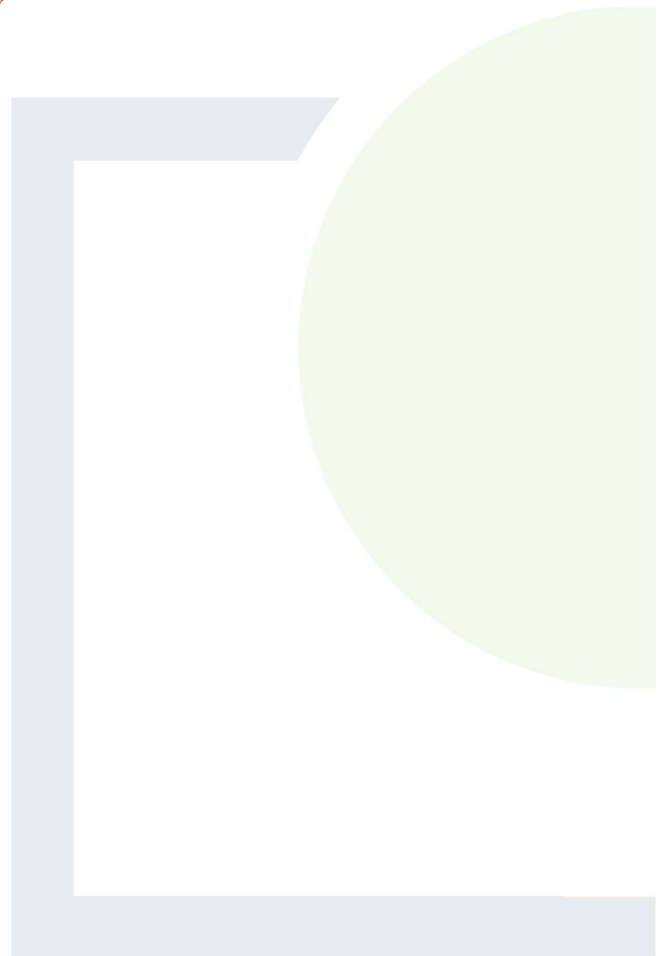


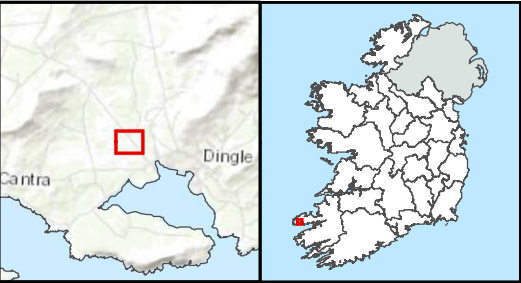
CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 3

Parameters and Results of Groundwater, Surface Water and Landfill Gas Monitoring

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- Borehole Locations
- Site Boundary

TITLE:		Site Investigation Location Plan	
PROJECT:		Dingle Landfill, Co. Kerry	
FIGURE NO:		3.1	
CLIENT:		Kerry County Council	
SCALE:	1:2500	REVISION:	0
DATE:	31/10/2019	PAGE SIZE:	A3

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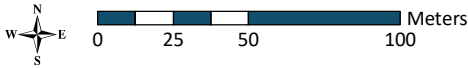


Table 1: Waste Sampling Results – Solid Waste Analysis

Parameter	Units	Inert Waste Acceptance Criteria	Non-Hazardous Waste Acceptance Criteria	Hazardous Waste Acceptance Criteria	Sampling Results - Sample ID
					TP02 (2.5m)
Arsenic	mg.kg ⁻¹	0.5	2	25	<0.05
Barium	mg.kg ⁻¹	20	100	300	<0.5
Cadmium	mg.kg ⁻¹	0.04	1	5	<0.01
Chromium	mg.kg ⁻¹	0.5	10	70	<0.05
Copper	mg.kg ⁻¹	2	50	100	<0.05
Mercury Dissolved	mg.kg ⁻¹	0.01	0.2	2	<0.005
Molybdenum	mg.kg ⁻¹	0.5	10	30	0.25
Nickel	mg.kg ⁻¹	0.4	10	40	<0.05
Lead	mg.kg ⁻¹	0.5	10	50	<0.01
Antimony	mg.kg ⁻¹	0.06	0.7	5	0.012
Selenium	mg.kg ⁻¹	0.1	0.5	7	0.041
Zinc	mg.kg ⁻¹	4	50	200	<0.5
Chloride	mg.kg ⁻¹	800	15000	25000	17
Fluoride	mg.kg ⁻¹	10	150	500	1.6
Sulphate	mg.kg ⁻¹	1000	20000	50000	2800
Total Dissolved Solids	mg.kg ⁻¹	4000	60000	100000	4500
Dissolved Organic Carbon	mg.kg ⁻¹	500	800	1000	59
Sum of BTEX	mg.kg ⁻¹	6	--	--	<0.01
Total Organic Carbon *	%	3	5	6	5.5
Moisture Content ratio	%	--	--	--	18
Mineral Oil	mg.kg ⁻¹	500	--	--	<10
PCBs (Sum of 7)	mg.kg ⁻¹	1	--	--	<0.1
PAH (Sum of 17)	mg.kg ⁻¹	100	--	--	12

Parameter	Units	Inert Waste Acceptance Criteria	Non-Hazardous Waste Acceptance Criteria	Hazardous Waste Acceptance Criteria	Sampling Results - Sample ID
					TP02 (2.5m)
pH	pH units	>6 or <9	>6	--	7.7
Loss on ignition	%	--	--	10	5.5

* Hazardous Waste Landfill Criteria: >6% TOC

* Items in **bold** are in exceedance of the Inert WAC limit value

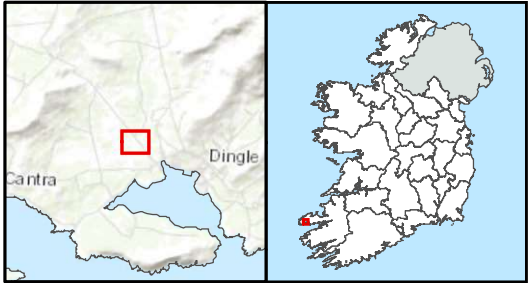
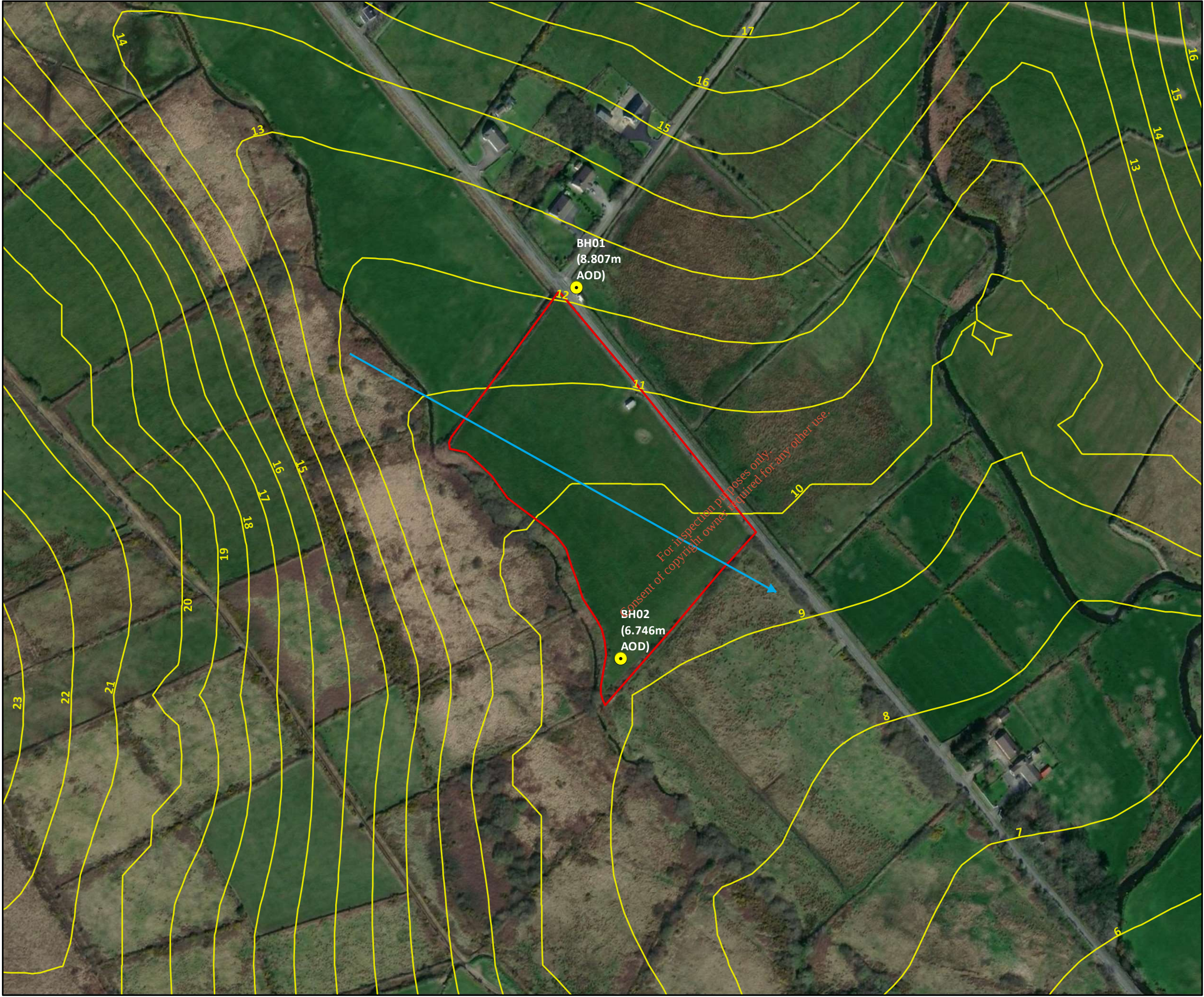
* Items shaded in **green** are in exceedance of the Non-Hazardous WAC limit value

* Items shaded in **orange** are in exceedance of the Hazardous WAC limit value

Table 2: Groundwater Depth Analysis

ID	ITM (E)	ITM (N)	Ground Level (m)	July 2019		September 2019		Average Depth to Water (m)	GW Levels (m AOD)
				Depth to Water (m)	Total Depth (m)	Depth to Water (m)	Total Depth (m)		
BH01	442541.698	602079.184	10.127	1.42	6.9	1.22	6.85	1.32	8.807
BH02	442571.063	601831.889	10.711	4.3	10.2	3.63	10.44	3.965	6.746

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- Borehole Locations
- Groundwater Flow Direction
- Site Boundary
- 1m Contours

TITLE:		Groundwater Flow Direction	
PROJECT:		Dingle Landfill, Co. Kerry	
FIGURE NO:		4.1	
CLIENT:		Kerry County Council	
SCALE:	1:2500	REVISION:	0
DATE:	31/10/2019	PAGE SIZE:	A3

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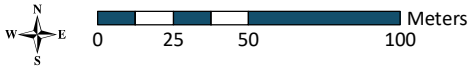


Table 3: Groundwater Sampling Results

Parameter	Units	EPA IGV Standards ¹	S.I. No. 9 of 2010 Standards ²	BH01 (Sept)	BH01 (July)	BH02 (Sept)	BH02 (July)
Carbon							
Organic Carbon, Total	mg/l			<3	<3	<3	<3
Inorganics							
Ammoniacal Nitrogen as N	mg/l	0.15	0.175	<0.2	<0.2	0.402	<0.2
Conductivity @ 20 deg.C	mS/cm	1	1.875	0.356	0.379	0.365	0.369
Dissolved solids, Total (meter)	mg/l	1000		278	299	284	288
Fluoride	mg/l	1		<0.5	<0.5	<0.5	<0.5
Oxygen, dissolved	mg/l		NAC	9.24	9.3	8.71	8.9
pH	pH Units	6.5-9.5		6.71	7.01	6.7	7.04
Phosphate (Ortho as PO4)	mg/l		0.03	<0.05	<0.05	<0.05	<0.05
Chloride	mg/l	30	24-187.5	39.6	38.9	42.6	44.3
Cyanide, Total	mg/l	0.01	0.0375	<0.05	<0.05	<0.05	<0.05
Alkalinity, Total as CaCO3	mg/l		NAC	130	132	135	130
Suspended solids, Total	mg/l			344	3120	43.4	105
Total Oxidised Nitrogen as N	mg/l			2.39	2.48	0.104	0.119
Sulphate (soluble) as S	mg/l	200	187.5	3.37	3.73	2.97	3.07
Filtered (Dissolved) Metals							
Mercury (diss.filt)	µg/l	1	0.75	0.0324	<0.01	<0.01	<0.01
Arsenic (diss.filt)	µg/l	10	7.5	3.06	<0.5	<0.5	<0.5
Barium (diss.filt)	µg/l	100		34.4	11.5	9.82	15.5
Boron (diss.filt)	µg/l	1000	750	14.1	28.7	13.5	15.1
Cadmium (diss.filt)	µg/l	5	3.75	0.112	<0.08	<0.08	0.111
Chromium (diss.filt)	µg/l	30	37.5	3.56	<1	<1	<1
Copper (diss.filt)	µg/l	30	1500	16.7	0.495	2.58	0.5
Lead (diss.filt)	µg/l	10	7.5	32.3	0.344	<0.2	0.888
Manganese (diss.filt)	µg/l	50		506	16.4	3690	3620
Nickel (diss.filt)	µg/l	20	15	2.01	0.529	0.886	1.06

Parameter	Units	EPA IGV Standards ¹	S.I. No. 9 of 2010 Standards ²	BH01 (Sept)	BH01 (July)	BH02 (Sept)	BH02 (July)
Phosphorus (diss.filt)	µg/l			341	20.1	<10	<10
Selenium (diss.filt)	µg/l			<1	<1	<1	<1
Thallium (diss.filt)	µg/l			<2	<2	<2	<2
Zinc (diss.filt)	µg/l	100	75	14.8	5.24	12.6	4.33
Sodium (Dis.Filt)	mg/l	150	150	22.8	27.1	25.2	27.4
Magnesium (Dis.Filt)	mg/l	50		10.9	11.7	7.87	9.26
Potassium (Dis.Filt)	mg/l	5		1.51	2	1.25	1.39
Calcium (Dis.Filt)	mg/l	200		37.1	40.9	34.9	38.4
Iron (Dis.Filt)	mg/l	0.2		4.94	<0.019	0.0857	<0.019
Unfiltered (Total) Metals							
Phosphorus (tot.unfilt)	µg/l			663	1400	79.5	91.3
Mineral Oil / Oils & Greases							
Mineral oil >C10 C40 (aq)	µg/l		10	<100	207	<100	<100
PCB's – (Solids)							
*No measurements exceeded Limit of Detection							
See Appendix 5 for the full set of results.							
Semi-Volatile Organic Compounds (SVOCs)							
*No measurements exceeded Limit of Detection							
See Appendix 5 for the full set of results.							
Volatile Organic Compounds (VOCs)							
Dibromofluoromethane**	%			112	114	108	111
Toluene-d8**	%			99.1	98.4	99.4	98.5
4-Bromofluorobenzene**	%			98.2	94.6	98	94.5
Combined Pesticides / Herbicides							
*No measurements exceeded Limit of Detection							

Parameter	Units	EPA IG Standards ¹	S.I. No. 9 of 2010 Standards ²	BH01 (Sept)	BH01 (July)	BH02 (Sept)	BH02 (July)
See Appendix 5 for the full set of results.							
Miscellaneous Organics							
Dinitro-o-cresol	µg/l			0.17	0.175	<0.1	0.581
Clopyralid	µg/l			<0.04	<0.04	<0.04	<0.04
MCPA	µg/l	0.075		<0.05	<0.05	<0.05	<0.05
Mecoprop	µg/l	0.075	10	<0.04	<0.04	<0.04	<0.04
Dicamba	µg/l			<0.04	<0.04	<0.04	<0.04
MCPB	µg/l			<0.05	<0.05	<0.05	<0.05
2,4-DB	µg/l			<0.1	<0.1	<0.1	<0.1
2,3,6-Trichlorobenzoic acid	µg/l			<0.05	<0.05	<0.05	<0.05
Dichlorprop	µg/l		100	<0.1	<0.1	<0.1	<0.1
Triclopyr	µg/l			<0.05	<0.05	<0.05	<0.05
Fenoprop (Silvex)	µg/l			<0.1	<0.1	<0.1	<0.1
2,4-Dichlorophenoxyacetic acid	µg/l	0.075		<0.05	<0.05	<0.05	<0.05
2,4,5-Trichlorophenoxyacetic acid	µg/l			<0.05	<0.05	<0.05	<0.05
Bromoxynil	µg/l		5	<0.04	<0.04	<0.04	<0.04
Benazolin	µg/l			<0.04	<0.04	<0.04	<0.04
Ioxynil	µg/l			<0.05	<0.05	<0.05	<0.05
Pentachlorophenol	µg/l		2	<0.04	<0.04	<0.04	<0.04
Fluoroxypyr	µg/l			<0.1	<0.1	<0.1	<0.1

¹ IG-Interim Guideline Values, from EPA, Towards Setting Guideline Values for the Protection of Groundwater in Ireland, 2003.

² OTV-Overall threshold value, European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010) as amended in 2011, 2012, 2016.

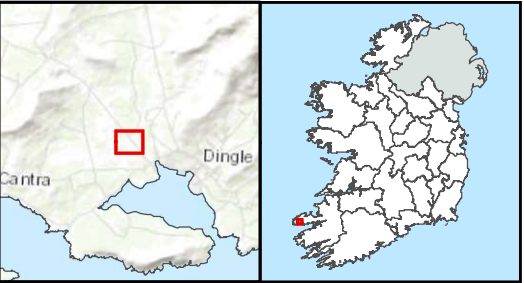
* Items shaded in **bold** are in exceedance of the EPA IG Standards

* Items shaded in **orange** are in exceedance of the Drinking Water Regulations

Table 4: Perimeter Well Monitoring Results October 2019

Sample Station	Date	BH ID	CH ₄	CO ₂	O ₂	Atmospheric Pressure	Staff Member	Weather
			(% v/v)	(% v/v)	(% v/v)	(mbar)		
Dingle	23/10/2019	BH01	0.4	0.6	22.3	1005	Emily Archer	Scattered cloud with light showers, 8-12°C

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- Surface Water Sampling Locations
- Rivers
- Site Boundary

TITLE:		Surface Water Sampling Locations	
PROJECT:		Dingle Landfill, Co. Kerry	
FIGURE NO:		4.2	
CLIENT:		Kerry County Council	
SCALE:	1:2500	REVISION:	0
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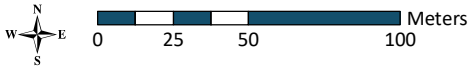


Table 5: Surface Water Sampling Results

Test	Units	MAC ¹	EQS ²	SW01 (Sept)	SW01 (July)	SW02 (Sept)	SW02 (July)
Carbon							
Organic Carbon, Total	mg/l			5.81	<3	5.84	<3
Inorganics							
Ammoniacal Nitrogen as N	mg/l			<0.2	<0.2	<0.2	<0.2
Conductivity @ 20 deg.C	mS/cm			0.304	0.359	0.302	0.362
Fluoride	mg/l		0.5	<0.5	<0.5	<0.5	<0.5
Oxygen, dissolved	mg/l			9.94	8.05	12	9.63
pH	pH Units		6.0 – 9.0	7.36	8.15	7.31	7.11
Phosphate (Ortho as PO4)	mg/l			<0.05	<0.05	<0.05	<0.05
Chloride	mg/l			38.7	48	38.6	47.4
COD, unfiltered	mg/l			11.4	33.2	9.55	14.3
Cyanide, Total	mg/l		0.01	<0.05	<0.05	<0.05	<0.05
BOD, unfiltered	mg/l			<1	-	<1	-
Alkalinity, Total as CaCO3	mg/l			100	125	100	110
Suspended solids, Total	mg/l			11	21	18.7	71.6
Total Oxidised Nitrogen as N	mg/l			0.429	0.642	0.43	0.634
Sulphate (soluble) as S	mg/l			5.53	5.93	5.57	5.93
Filtered (Dissolved) Metals							
Mercury (diss.filt)	µg/l	0.07	0.05	<0.01	<0.01	<0.01	<0.01
Arsenic (diss.filt)	µg/l		25	0.861	<0.5	0.597	<0.5
Barium (diss.filt)	µg/l			6.5	6.67	6.86	7.51
Boron (diss.filt)	µg/l			15.4	21.8	14	20.5
Cadmium (diss.filt)	µg/l	0.9	0.15	<0.08	<0.08	<0.08	<0.08
Chromium (diss.filt)	µg/l	32	4.7	<1	<1	<1	<1
Copper (diss.filt)	µg/l		30	3.14	1.85	3.05	1.66
Lead (diss.filt)	µg/l	14	1.2	<0.2	<0.2	0.224	0.399
Manganese (diss.filt)	µg/l			62.3	59.6	59.4	97.7
Nickel (diss.filt)	µg/l	34	4	1.61	0.929	1.81	0.857
Phosphorus (diss.filt)	µg/l			<10	<10	11.1	<10
Selenium (diss.filt)	µg/l			<1	<1	<1	<1
Thallium (diss.filt)	µg/l			<2	<2	<2	<2
Zinc (diss.filt)	µg/l		100	11	10.3	10.4	14.8
Sodium (Dis.Filt)	mg/l			21.9	30.7	22.1	28.9
Magnesium (Dis.Filt)	mg/l			9.05	12	9.17	12.1
Potassium (Dis.Filt)	mg/l			2.59	4.57	2.63	4.5
Calcium (Dis.Filt)	mg/l			26.1	32.4	26.9	32

Test	Units	MAC ¹	EQS ²	SW01 (Sept)	SW01 (July)	SW02 (Sept)	SW02 (July)
Iron (Dis.Filt)	mg/l			0.076	0.0464	0.0749	0.0457
Unfiltered (Total) Metals							
Phosphorus (tot.unfilt)	µg/l			35.6	33.4	22.7	37.1
Mineral Oil / Oils & Greases							
Mineral oil >C10 C40 (aq)	µg/l			<200	<100	<200	<200

Notes:

¹ Maximum Admissible Concentration (MAC), as classified by European Communities (Quality of Surface Water intended for abstraction of drinking water) Regulations 1989 (S.I No. 294 of 1989)

² Environmental Quality Standard (EQS), European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I No. 272 of 2009)

* Items shaded in **bold** are in exceedance of the European Communities MACs

* * Items shaded in **orange** are in exceedance of the 2009 EQS Regulations

* * * NAC – no abnormal change

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