ANNUAL ENVIRONMENTAL REPORT

January - December 2017

For

Dundalk Landfill Site

Co. Louth

Waste Licence Reference W0034-02

By

Louth County Council

To

Environmental Protection Agency

Document Control Sheet

Client	Louth County Council					
Project Title	Louth Landfill Sites Reporting 2017					
Document Title	Annual Environmental Report					
Document No.	IBR1074					
This Document Comprises	DCS	TOC	Text	No. of Tables	No. of Figures	No. of Appendices
	1	1	40	19	1	8

Rev.	Status	Author(s)	Reviewed & Approved By	Issue Date
1.0	Draft	Ciara Devine Ciara Devine, Graduate Scientist	Angela McGinley Angela McGinley, Senior Scientist	06/04/18
1.0	Final	Ciara Devine Ciara Devine, Graduate Scientist	Angela McGinley Angela McGinley, Senior Scientist	23/04/18

Contents

Appendices

1 Introduction

This Annual Environmental Report (AER) has been prepared to meet the requirements of Waste Licence W0034-02 for Dundalk Landfill.

The site is owned by Dundalk Town Council and is located at Newry Road, Dundalk. It is situated on the northern bank of the Castletown River in an area of intertidal mudflats. The northern boundary of the site adjoins low lying and poorly drained agricultural lands. Residential and industrial properties adjoin the western boundary of the site.

Dundalk Landfill Site has been in operation since 1980. In 2000 Dundalk Town Council submitted an application to the Environmental Protection Agency (EPA) for the continued operation of the landfill site, as required by the Waste Management (Licensing) Regulations 1997. The landfill site ceased to accept waste in October 2002.

In March 2005, the EPA granted the Council a revised Waste Licence (registration number W0034-02) for the facility, in accordance with the Third and Fourth Schedule of the Waste Management Act, 1996-2003.

A hydrogeological study[1] was undertaken in accordance with Condition 4.14 of the Waste Licence W0034-01 in 2004 to develop a leachate management system at the site. The report recommended that the Best Practicable Environmental Option for the remediation of Dundalk landfill is the capping of the landfill with a low permeability liner augmented by monitored natural attenuation. Groundwater remediation of the Quaternary gravel aquifer impacted by Dundalk landfill leachate is reliant on both the landfill capping intervention and on monitored in-situ natural attenuation processes. Discharge into the Northern Stream will reduce following capping of the site owing the reduction of the leachate head within the waste.

The landfill site was restored in 2006. Works include installation of capping layer, provision of storm water drainage, leachate collection trench, provision of gas collection system, provision of gas flare, grading of site to provide for future football pitches and the provision of access road.

Gas abstraction system provided on site includes a Gas collection layer under the impermeable layer of capping material which provides a path of least resistance to the 47 No boreholes laid out on a grid system over the main body of the site. The boreholes are connected via 63mm. diameter pipework to a 250mm diameter main gas collection pipe

[1] Proposal for leachate management, July 2004. RPS MCOS.

which transfers the gas collected, under suction, provided by compressor, and to the 600 m^3 enclosed Flare Unit. A SCADA system and Programmable Logic Controller produces data which is available by download weekly or by telephone from council offices. The boreholes in the area of historical fill adjoining the rear of Hardy's Grainstore have also been attached to the active gas collection system.

1.1 Report Period

The reporting period of this report refers to January to December 2017. The landfill site ceased to accept waste in October 2002. A Recycling Centre is currently in operation at the facility.

2 Waste Activities Carried Out at the Facility

Waste is no longer accepted at the landfill facility except for restoration purposes. The maximum tonnage of waste to be accepted at the Recycling Centre is 20,000 tonnes per annum in accordance with Table A1 of the Waste Licence.

The waste intake at the Recycling Centre is limited to 20,000 tonnes per annum of municipal waste and construction and demolition waste. The licence also allows composting of biodegradable waste and green waste to 4,000 tonnes per annum.

The licensed disposal activities, in accordance with the Third Schedule of the Waste Management Act, 1996, are restricted to those listed as follows:

- Class 11 Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule.
- Class 12 Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.
- Class 13 Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.

Licensed waste recovery activities, in accordance with the Fourth Schedule of the Waste Management Act, 1996, are restricted to those listed as follows:

- Class 2 Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
- Class 3 Recycling or reclamation of metals and metal compounds.
- Class 4 Recycling or reclamation of other inorganic materials.
- Class 10 The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.
- Class 11 Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.

- Class 13 Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.

3 Quantity and Composition of Waste Received and Disposed of during the Reporting Period and Each Previous Year

3.1 Landfill

Dundalk Landfill Site was in operation for the acceptance of waste for disposal from 1980 until 2002. The site ceased to accept waste for disposal in October 2002 and waste was only brought on site for restoration purposes after this date. Waste data figures are derived from estimates and weighbridge readings. These figures are shown in Table 3.1.

Table 3.1 Waste Quantities Accepted (Tonnes) at Landfill[2]

Waste Types	1997	1998	1999	2000	2001	2002	2003	2004
Total	37,060	37,560	38,000	36,000	32,000	32,420	27,417	3,018

3.2 Recycling Centre

The Recycling Centre is open;

- Monday - Friday 9.30am - 6.00pm
- Saturday 9.00am - 3.00pm

In accordance with Condition 5 of the waste licence only those waste types and quantities listed in Schedule A shall be disposed of at the facility unless prior agreement from the Agency has been obtained. The maximum annual tonnage of individual waste categories for acceptance to the site is listed in Schedule A of the Waste Licence.

The following are accepted at the Recycling Centre;

- cardboard
- glass

[2] 1997-2001 figures based on estimates.

- magazines/newspaper
- domestic plastics
- clothing/textiles
- green/garden waste
- wood
- aluminium cans/steel cans
- domestic appliances
- batteries
- electrical appliances
- scrap metal

The quantity of waste received during the reporting period at the recycling facility is 5,090.65 tonnes. The figures are taken from National Waste Report 2017 Survey.

106 tonnes of mixed residual waste arising from members of the public was accepted for disposal at the recycling facility. The remaining waste was recovered on or off site as listed in Table 3.2. 2,704 tonnes of garden and park waste from municipal sources (landscapers, householders etc.) was composted onsite. Compost analysis has been undertaken and is detailed in Section 5.14.

WEEE is collected by ERP from the recycling facility from the compliance schemes.

Table 3.2 Waste Quantities Accepted for Disposal and Recovery (Tonnes) at CWF

Waste Material Type	EWC Codes	Tonnage	Name of Destination Facility(ies), or Collector(s) If Directly Exported
Mixed residual waste	20 03 01	106.00	Indaver Ireland W0167-03
Garden (green) waste	20 02 01	2,704.00	Dundalk Council W0034-02
Cardboard & paper (segregated packaging waste only) e.g. cardboard boxes	15 01 01	470.00	Peute Europe NI6000076
Cardboard & paper (non-packaging waste only) e.g. news & pams	20 01 01	200.00	Peute Europe NI6000076
Glass (segregated packaging waste only) e.g. glass bottles	15 01 07	206.00	Glassdon N.I LN06/08
Aluminium and steel cans (mixed) (segregated packaging waste)	15 01 04	40.00	Tinnelly N.I LN09/10
Other municipal metals (non-packaging)	20 01 40	292.00	Tinnelly N.I LN09/10
Plastic (segregated packaging waste only) e.g. PET bottles	15 01 02	572.00	Shbara Plastics MN 080022-01
Clothes/textiles for recovery or disposal	20 01 10 & 20 01 011	36.00	Seconhand Clothing Ltd
Wood (segregated packaging waste) e.g. pallets, wooden crates	15 01 03	182.00	Thorntons Disposal W0195-02
Wood (non-packaging waste, municipal)	20 01 38	272.00	Thorntons Disposal W0195-02
Batteries and accumulators	(enter appropriate LoW code)	5.00	Rilta WO192/03
Paint, inks, adhesives and resins containing dangerous substances	20 01 27*	1.45	Enva Portlaoise WO184-01
Waste hydraulic or engine, gear and lubricating oils	13 01* or 13 02*	4.20	Enva Portlaoise WO184-01
Total		**5,090.65**	

4 Summary Report on Emissions

There is no continuous wastewater (sewer), surface water or groundwater emissions monitoring at Dundalk landfill site. Periodic/non-continuous monitoring is carried out for sewer, groundwater, surface water and landfill gas.

4.1 Emissions to Sewer

4.1.1 Discharge Point (From Landfill Site)

A leachate collection trench has been constructed on the southern slope of the landfill. The trench is lined on the estuary side of the trench and also to a level of 3.65mOD on the landfill side of the trench. The trench is connected to the foul sewer running along the western boundary of the site. Zero flow has been measured to date. The flow monitoring device has been removed from this trench as agreed with the EPA.

4.1.2 Discharge Point (from recycling facility)

In accordance with The PRTR Regulations releases of pollutants and off site transfers of waste by facilities operating in relevant industrial sectors are to be reported by the EPA to the European E-PRTR website where the facility exceeds specified thresholds. The PRTR reporting has been completed for Dundalk landfill site and submitted to the EPA.

Periodic/non-continuous monitoring is carried out at S1. S1 is the sewer discharge monitoring location at manhole No 2, adjacent to weighbridge. This monitors run-off from the Recycling Centre and Material Recovery Facility and discharge from the composting facility. The estimated flow to sewer from this area is 3,172 m^3. Reportable emissions for this location as per PRTR requirement are;

- Ammonia (NH_3)
- BOD
- COD
- Suspended solids
- Sulphate

4.2 Emissions to Groundwater and Surface Water

There are no direct emissions to groundwater or surface water. A water balance calculation has been completed for Dundalk landfill site and is presented in Appendix A. The site is unlined and an area of approximately 79,000 m^2 has been capped. There is no active leachate extraction system on the site. Infiltrations in restored areas are in the range of 2-10% of effective rainfall. This equates to 1,044 to 5,520 m^3 of leachate produced.

4.3 Emissions to Air

There is no continuous air emission monitoring at Dundalk landfill site. Periodic/non-continuous monitoring is carried out on the flare. This is further discussed in Section 5.11.

4.3.1 Composting and Biofilter Emissions

Compost analysis and biofilter emission monitoring has been undertaken during the reporting period. These are discussed in section 5.14 and 5.15.

4.3.2 Flare Emissions

The PRTR reporting and landfill gas survey have been completed for Dundalk Landfill Site and submitted to the EPA. The PRTR is including in Appendix B.

A 600m^3 flare was installed at Dundalk Landfill Site. This was downsized in 2013 to a 300m^3 flare.

Based on model predications and information from the landfill gas flare the estimated net emission of methane from the flare combustion process and both surface and lateral emissions from the landfill body is 34,890 kg/year (Table 4.1).

Table 4.1 Net Methane Emission

Quantities of Methane Flared and / or Utilised	T (Total) kg/Year
Total estimated methane generation (as per site model)	196,819
Methane flared	161,929
Methane utilised in engine/s	0.0
Net Methane Emission	34,890

5 Summary of Results and Interpretations of Environmental Monitoring

5.1 Monitoring Locations

Monitoring is carried out at locations and frequencies as specified in Schedules D of the waste licence. Monitoring points are labelled and permanent access to all monitoring points is maintained. The following parameters form the monitoring programme;

- Groundwater Quality
- Groundwater Levels
- Surface Water Quality
- Leachate Quality
- Leachate Levels
- Landfill Gas

All ditches and drains around the perimeter of the facility are kept clear to allow for surface water monitoring points to be maintained.

All monitoring points are detailed in Drawing Monitoring Locations as shown in Appendix C.

5.2 Leachate Quality

Leachate quality can vary during the lifetime of landfill sites depending on the phase of decomposition of the waste. Leachate results for the reporting period are presented in Appendix D and some of the characteristic parameters of the leachate are listed in Table 5.1.

Raw leachate results have been compared to “Typical Leachate Composition of 30 Samples from UK/Irish Landfills accepting mainly Domestic Waste” (Landfill Operational Practices). As can be seen from the Table 5.2 all of the parameters are below the maximum concentration.

Table 5.1 Raw Leachate Concentrations 2017

Parameters	Units	No. of Samples	Minimum	Maximum
Aluminium	**µg/l**	4	<50	458
Ammonia	**mg/l N**	33	13.2	476.48
Barium	**µg/l**	4	296	675
B.O.D.	**mg/l O2**	29	3	260
Boron	**µg/l**	4	<135	1700
Cadmium	**µg/l**	4	<0.5	<0.5
C.O.D.	**mg/l O2**	33	<25	4770
Chloride	**mg/l Cl**	33	1.128	205
Chromium	**µg/l**	4	<3	9.96
Conductivity	**µS/cm @ 25**	33	1211	3923
Copper	**µg/l**	4	<4	9.79
Iron	**µg/l**	4	10.2	45.6
Lead	**µg/l**	4	<0.5	3.42
Magnesium	**mg/l Mg**	4	36.6	88.8
Manganese	**µg/l**	4	469	5260
Mercury	**µg/l**	4	0.0546	0.167
Nickel	**µg/l**	4	4.56	8.71
o-Phosphate	**mg/l P**	33	< 0.07	10.144
pH		33	6.7	7.3
Potassium	**mg/l**	4	10.5	90.6
Sodium	**mg/l**	4	51.8	105
Strontium	**µg/l**	4	613	1000
Sulphate	**mg/l SO4**	4	16.9	45.3
T.O.N	**mg/l N**	33	< 0.08	8.67
Uranium	**µg/l**	4	<0.5	<0.5
Vanadium	**µg/l**	4	<8	<8
Zinc	**µg/l**	4	5.77	45.9

Table 5.2 Raw Leachate Concentrations

	Dundalk Landfill Site		From 30 Samples from UK/Irish Landfills Accepting Domestic Waste Results in mg/l		
Parameter	**Min.Conc**	**Max.Conc**	**Min.Conc**	**Max.Conc**	**Mean**
Ammonia (mg/N)	13.2	476.48	<0.2	1,700	491
BOD (mg/l)	3	260	4.5	>4800	>834
COD (mg/l)	<25	4770	<10	33,700	3,078
Chloride (mg/l)	1.128	205	27	3,410	1,256
Iron (µg/l)*	10.2	45.6	0.4	664	54.4

	Dundalk Landfill Site		From 30 Samples from UK/Irish Landfills Accepting Domestic Waste Results in mg/l		
Parameter	Min.Conc	Max.Conc	Min.Conc	Max.Conc	Mean
Potassium (mg/l)	10.5	90.6	2.7	1,480	491
Sodium (mg/l)	51.8	105	12	3,000	904
TON (mg/l N)	< 0.08	8.67	/	/	/
Conductivity (µS/cm)	1211	3923	503	19,200	7,789
pH (pH units)	6.7	7.3	6.4	8.0	7.2

5.3 Groundwater

As required under the Waste Licence, groundwater monitoring has been undertaken at the borehole locations as set out in Table D1.1 of the waste licence. Schedule D of the waste licence requires the monitoring of certain parameters on either a monthly, quarterly or annual basis; the frequencies of the monitoring of groundwater parameters are shown in Table 5.3 below.

Table 5.3 Groundwater Parameters Monitoring Frequencies

Monthly	Quarterly	Annually		
Groundwater Level	Visual Inspection/Odour	Aluminium	Manganese	Total Alkalinity
Ammoniacal Nitrogen	Dissolved Oxygen	Boron	Nickel	Orthophosphate
Chloride	pH	Cadmium	Potassium	TON
Electrical Conductivity	Temperature	Calcium	Sodium	Residue on Evaporation
	TOC	Chromium	Zinc	List I/II Organic
		Copper	Cyanide	
		Iron	Fluoride	
		Lead	Mercury	
		Magnesium	Sulphate	

A hydrogeological study was undertaken in accordance with Condition 4.14 of the Waste Licence W0034-01 in 2004 to develop a leachate management system at the site. The

report recommended that the Best Practicable Environmental Option for the remediation of Dundalk landfill is the capping of the landfill with a low permeability liner augmented by monitored natural attenuation. Groundwater remediation of the Quaternary gravel aquifer impacted by Dundalk landfill leachate is reliant on both the landfill capping intervention and on monitored in-situ natural attenuation processes. Discharge into the Northern Stream will reduce following capping of the site owing the reduction of the leachate head within the waste.

The landfill site was restored in 2006. Works include installation of capping layer, provision of storm water drainage, leachate collection trench, provision of gas collection system, provision of gas flare, and grading of site.

A leachate collection trench has been constructed on the southern slope of the landfill. The trench is lined on the estuary side of the trench and also to a level of 3.65 mOD on the landfill side of the trench. The trench is connected to the foul sewer running along the western boundary of the site. Zero flow has been measured and subsequently the flow meter has now been removed.

The main groundwater flow path is generally towards the estuary, which is located to the south of the site. Groundwater monitoring has been undertaken at boreholes WM1, WM4, WM5, WM6, WM8, WM9 and WM10. Groundwater monitoring results are provided in full within Appendix E. These results are also presented graphically.

A hydrogeological risk assessment was undertaken in 2014 on foot of a technical amendment to the waste license as per a notification issued by the EPA on 15/01/13. This has been submitted to the EPA under a separate cover. This report found there are no sustained upward trends in contaminant export from the site.

Groundwater monitoring results were assessed against:

- EPA Interim guideline values[3] (IGV);
- SI No 278 of 2007 EC (Drinking water) Regulations (DWR); and
- SI No 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010 as amended Groundwater Threshold Values (GTV).

[3] EPA (2003) Towards setting guideline values for the protection of groundwater in Ireland. Interim Report

5.4 Baseline Data

Monitoring was carried out upgradient of the site in order to obtain an overview of the baseline monitoring water quality of the surrounding groundwater. This allows for a baseline to be established from which the actual impact caused by the site on the downgradient groundwater can be assessed. WM1 is the upgradient monitoring point. Monitoring is undertaken on a monthly, quarterly and annual basis.

5.4.1 Monthly Parameters

Ammonia as N concentrations were below the GTV for ammonium (0.175 mg/l N). Concentrations ranged from <0.1 to <0.11 mg/l N.

Electrical Conductivity readings in WM1 were above the IGV (1,000 µS/cm) for the majority of the sampling dates but were within the GTV range (800 to 1,875 µS/cm). Concentrations ranged from 670 to 1,360 µS/cm.

Chloride concentrations were above the IGV of 30 mg/l but below the GTV of 187.5 mg/l throughout the monitoring period. Concentrations ranged from 42 to 181 mg/l.

5.4.2 Quarterly Parameters

WM1 exhibits TOC values ranging from 15.8 to 27.2 mg/l. The pH levels in WM1 were within the IGV and DWR of ≥ 6.5 and ≤ 9.5.

Dissolved oxygen (DO) levels recorded onsite during sampling ranged from 21 to 32%.

5.4.3 Annually

Annual analysis for List I and II substances, metals and non-metals were undertaken on the 18th December 2017 in upgradient borehole WM1.

Aluminium, Barium, Boron, Cadmium, Chromium, Copper, Cyanide, Fluoride, Lead, Magnesium, Mercury, Sodium, Sulphate, Suspended Solids, Ton, Total Alkalinity and Zinc were below the IGV, DWR and GTV where applicable in upgradient borehole WM1.

Parameters with concentrations detected above the IGV, DWR and GTV in WM1 were:

- Iron 1.48 mg/l;

- Manganese 268 ug/l;
- Nickel 21.9 ug/l;
- Orthophosphate 0.14 mg/l;
- Potassium 19.1 mg/l.

Concentrations above the limit of detection in WM1 were measured for the following parameters:

- Alkalinity 168 mg/l;
- Strontium 197 µg/l;
- Uranium 5.87 µg/l[4];
- Vanadium 13.3 ug/l.

Pesticide and herbicide, volatile organic compound (VOC) and semi volatile organic compound (SVOC) parameters were carried out in WM1 in December. The results were below the lower detection limit for the analytical methodology used.

5.5 Downgradient Data

The impact on the groundwater from leachate generated within the landfill can be identified from Boreholes WM4, WM5, WM6, WM8, WM9 and WM10. WM4 and WM8 are located in the gravel aquifer.

Table 5.5 Groundwater Parameters Down Gradient

Parameters	Units	No. of Samples	Minimum	Maximum
Alkalinity	mg/l	5	718	1,240
Aluminium	µg/l	5	<50	685
Ammonia	mg/l N	45	17.92	134
Barium	µg/l	5	157	542
Boron	µg/l	5	858	1,610

[4] World Health Organisation (2011) Guidelines for Drinking-water Quality, Fourth Edition. Table A3.3 Guideline values for chemicals that are of health significance in drinking-water. Uranium 30 µg/l.

Parameters	Units	No. of Samples	Minimum	Maximum
Cadmium	µg/l	5	<0.5	<0.5
Chloride	mg/l Cl	45	73.9	3,830
Chromium	µg/l	5	<3	8.23
Conductivity	µS/cm @ 25	45	1,494	13,500
Copper	µg/l	5	<4	9.99
Cyanide	mg/l CN	5	<0.05	<0.05
Dissolved Oxygen	%	45	15	31
Fluoride	mg/l	5	0.065	0.411
Iron	mg/l	5	0.513	39.9
Lead	µg/l	5	<0.5	7.75
Magnesium	mg/l Mg	5	58.5	286
Manganese	µg/l	5	152	2,800
Mercury	µg/l	5	<0.02	0.134
Nickel	µg/l	5	5.67	14.9
o-Phosphate	mg/l P	5	<0.07	0.15
pH	pH units	45	6.63	7.4
Potassium	mg/l	5	54.5	123
Sodium	mg/l	5	97.4	1,040
Strontium	µg/l	5	731	2,260
Sulphate	mg/l SO4	5	<5	407
Suspended Solids	mg/l	5	1230	8010
Temp	°C	45	11.7	13.2
T.O.C.	mg/l	45	9.36	38.2
T.O.N	mg/l N	5	0.09	73
Uranium	µg/l	5	<0.5	1.37
Vanadium	µg/l	5	<8	<8
Zinc	µg/l	5	3.62	38.6

5.5.1 Monthly Parameters

Results from downgradient boreholes indicate elevated levels of Ammonia above the IGV (0.15 mg/l), DWR (0.3 mg/l), and GTV range (0.065-0.175 mg/l N) in all downgradient boreholes. Concentrations ranged from 17.92 to 134 mg/l. The highest Ammonia concentration recorded was 134 mg/l N in WM5 in March.

A hydrogeological risk assessment was undertaken in 2014. This report found that concentrations of ammonia in groundwater at the periphery of the landfill are somewhat similar to those currently observed in leachate. This would suggest that there is minimal attenuation of ammonia in the unsaturated zone between the waste cell and the gravel

aquifer, and that upgradient groundwater moving below the source does not have a significant dilution effect on infiltrating leachate.

Electrical Conductivity exceeded the IGV (1,000 µS/cm), DWR (2,500 µS/cm) and GTV range (800-1,875 µS/cm) in all boreholes. Concentrations ranged from 1,494 to 13,500 µS/cm. The highest level was recorded in WM10 in March (13,500 µS/cm).

Chloride levels also exceeded the IGV (30 mg/l), DWR (250 mg/l) and GTV range (24-187.5 mg/l) throughout the monitoring period except in WM8 (73.6 to 123.5 mg/l). Concentrations downgradient ranged from 73.9 to 3,830 mg/l. The highest Chloride concentration recorded was 3,830 mg/l also in WM10 in December. It should be noted that saline water intrusion may contribute to the high levels of Chloride and Electrical Conductivity recorded downgradient of the site as seawater can contain Chloride levels up to 20,000 mg/l.

5.5.2 Quarterly Parameters

TOC values provide a measure of organic contamination of the water, the higher the content the more oxygen is consumed. Organic contamination results in an increase in the growth of micro-organisms. TOC concentrations ranged from 9.36 to 38.2 mg/l. The highest concentration was recorded in WM8 (38.2 mg/l) in September.

pH levels in downgradient boreholes were within the IGV and DWR range of ≥ 6.5 and ≤ 9.5. pH levels ranged from 6.63 to 7.4.

DO levels recorded onsite during sampling ranged from 15 to 31%.

5.5.3 Annually

Annual analysis for List I and II substances, metals and non-metals were undertaken on the 18th December 2017 in all downgradient boreholes.

Cadmium, Chromium, Copper, Cyanide, Fluoride, Lead, Mercury, Nickel, TON and Zinc were below the IGV, DWR and GTV where applicable in downgradient boreholes

Parameters with concentrations detected above the IGV, DWR and GTV in downgradient boreholes were:

- Aluminium in WM5 (685 µg/l) and WM9 (257 µg/l);
- Barium in all downgradient boreholes ranging from 157 to 542 ug/l;

- Boron in all downgradient boreholes ranging from 858 to 1,610 µg/l;
- Iron in all downgradient boreholes ranging from 0.513 to 39.9 mg/l;
- Magnesium in all downgradient boreholes ranging from 58.5 to 286 mg/l;
- Manganese in all downgradient boreholes ranging from 152 to 2,800 ug/l ;
- Orthophosphate in WM8 (0.15 mg/l);
- Potassium in all downgradient boreholes ranging from 54.5 to 123 mg/l;
- Sodium in all downgradient boreholes except WM8 ranging from 97.4 to 1,040 mg/l;
- Sulphate in WM10 (407 mg/l);
- Total Dissolved Solids in all downgradient boreholes ranging from 1,230 to 8,010 mg/l.

Concentrations above the limit of detection in downgradient boreholes were measured for the following parameters:

- Alkalinity ranging from 718 to 1,240 mg/l;
- Total Cadmium in WM8 (0.083 µg/l);
- Strontium ranging from 731 to 2,260 µg/l;
- Uranium ranging from <0.5 to 1.37 µg/l[5].

Pesticide and herbicide, volatile organic compound (VOC) and semi volatile organic compound (SVOC) parameters were carried out in downgradient boreholes in December. The results were below the lower detection limit for the analytical methodology used analysis.

[5] World Health Organisation (2011) Guidelines for Drinking-water Quality, Fourth Edition. Table A3.3 Guideline values for chemicals that are of health significance in drinking-water. Uranium 30 µg/l.

5.5.4 Groundwater Levels

Groundwater levels monitoring is undertaken at six locations on site as show on Table 5.6. WM1 is upgradient of the site and WM4 and WM8 are located in gravel aquifer.

Table 5.6 Groundwater Level mOD

Location	WM1	WM4	WM5	WM6	WM8	WM9	WM10
Cover Level mOD	4.77	5.12	5.57	5.87	5.15	5.78	5.64
03/01/17	1.87		0.76	2.27	1.54	2.84	0.72
09/02/17	1.88		0.72	2.28	1.63	2.88	0.71
16/03/17	1.86		0.64	2.25	1.47	2.72	0.62
11/04/17	1.87		0.62	2.22	1.56	2.7	0.63
12/06/17	1.87		0.79	2.28	1.67	2.82	0.73
14/07/17	1.85		0.67	2.27	1.55	2.67	0.56
23/08/17	1.87		0.65	2.31	1.57	2.68	0.62
28/09/17	1.89		0.61	2.33	1.54	2.66	0.64
18/12/17	1.85		0.67	2.27	1.55	2.67	0.56

5.6 Remediation

The results show that groundwater is being impacted by the landfill site. A hydrogeological study was undertaken and the recommended Best Practicable Environmental Option for the remediation of Dundalk landfill was the capping of the landfill with a low permeability liner augmented by monitored natural attenuation. The hydrogeological study predicated a range of concentrations in groundwater (along boundary with estuary) after 10 years from the completion of the landfill. Capping was completed in 2006.

In the 'Predicted Environmental Risk Assessment' represented by the Dundalk landfill to the Quaternary Gravel Aquifer and the Castletown Estuary after 10 years from the completion of the landfill capping it is predicted that the concentration range for Ammoniacal Nitrogen will be between 67 mg/l and 71 mg/l in groundwater (along boundary with estuary). In WM6, WM9 and WM10 concentrations are below the maximum predicted concentration range.

WM5 and WM8 (gravel aquifer) exceeds the maximum predicted concentration range for Ammoniacal Nitrogen in all sampling rounds.

A hydrogeological risk assessment (HRA) was undertaken in 2014 on foot of a technical amendment to the waste license as per a notification issued by the EPA on 15/01/13. This has been submitted to the EPA under a separate cover. This report found there are no sustained upward trends in contaminant export from the site.

The HRA has set revised down gradient compliance levels for ammonia as a reliable indicator of organic waste as chloride and electrical conductivity are being heavily influenced by tide levels and saline intrusion. Ammonia as N concentrations in down gradient boreholes were within the proposed compliance levels shown in Table 5.7 except WM5 in March (134 mg/l), June (116.1 mg/l) and September (115.4 mg/l) which were above the proposed compliance level of 100.2 mg/l N.

Table 5.7 Proposed Groundwater Compliance Levels for Ammoniacal Nitrogen

Groundwater Borehole	Proposed Ammoniacal Nitrogen Compliance Level (mg/l)
WM1	0.175
WM4	55.5
WM5	100.2
WM6	110.9
WM8	192.0
WM9	165.4
WM10	75.7

5.7 Surface Water

Surface water monitoring results were assessed against:

- SI No 294 of 1989 European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989 Surface Water Quality Standards (SWQS); and
- SI No 272 of 2009 European Communities Environmental Objectives (Surface Water) Regulations 2009 Environmental Quality Standards (EQS); and
- EPA Interim guideline values[6] (IGV).

[6] EPA (2003) Towards setting guideline values for the protection of groundwater in Ireland. Interim Report

The frequencies of the monitoring of surface water parameters are shown in Table 5.8.

Table 5.8 Surface Water Parameters Monitoring Frequencies

Monthly	Quarterly	Annually	
Ammoniacal Nitrogen	BOD	Aluminium	Manganese
Chloride	COD	Boron	Nickel
Electrical Conductivity	Dissolved Oxygen	Cadmium	Potassium
	pH	Calcium	Sodium
	Total Suspended Solids	Chromium	Zinc
	Temperature	Copper	Mercury
	TON	Iron	Sulphate
		Lead	Alkalinity
		Magnesium	Orthophosphate

Samples SW1 to SW4 are taken along the course of the drainage ditch, which adjoins the northern boundaries of the landfill. SW1 is no longer present following the installation of a leachate interceptor drain (S3) adjacent to SW1 in the third quarter of 2017. Samples were not collected at SW1 to SW4 at times during the monitoring period as the drainage ditch was dry.

Monitoring points SW5 to SW9 are located in the estuary. SW5 and SW6 are adjacent (AD) to the landfill, whilst SW7 and SW8 are upstream (US) and SW9 is downstream (DS) of the site.

Table 5.9 provides a summary of results in 2017 for SW1 to SW4 surface water locations.

Table 5.9 Surface Water Parameters SW1 to SW4

Parameter	Units	No. of Samples	Minimum	Maximum
Alkalinity	mg/l	3	412	490
Aluminium	µg/l	3	57.7	582
Ammonia	mg/l N	7	0.42	0.91
Barium	µg/l	3	39	62
B.O.D.	mg/l O2	4	1.5	2.5
Boron	µg/l	3	<135	<135
Cadmium	µg/l	3	<0.5	<0.5
C.O.D.	mg/l O2	7	39	60

Chloride	mg/l Cl	7	82	256
Chromium	µg/l	3	<3	4.09
Conductivity	µS/cm @	7	1,390	2,040
Copper	µg/l	3	<4	6
Dissolved Oxygen	%	7	46	80
Iron	mg/l	3	0.52	0.92
Lead	µg/l	3	<0.5	2.95
Magnesium	mg/l Mg	3	28.7	37.0
Manganese	µg/l	3	344	2,000
Mercury	µg/l	3	<0.02	<0.02
Nickel	µg/l	3	5.51	7.96
o-Phosphate	mg/l P	3	0.11	0.28
pH	pH units	7	7.39	7.57
Potassium	mg/l	3	16.9	22.9
Sodium	mg/l	4	90.9	101
Strontium	µg/l	3	629	768
Sulphate	mg/l SO4	3	162	181
Suspended Solids	mg/l	7	13	38
Temp	°C	7	11	12.1
T.O.N	mg/l N	7	0.77	14.4
Uranium	µg/l	3	2.29	3.21
Vanadium	µg/l	3	<8	<8
Zinc	µg/l	3	3.68	12.2

Table 5.10 below provides a summary of results in 2017 for SW5 to SW9 surface water locations located in the estuary.

Table 5.10 Surface Water Parameters SW5 to SW9

Parameter	Units	No. of Samples	Minimum	Maximum
Alkalinity	mg/l CaCO3	5	90.9	131
Aluminium	µg/l	5	189	358
Ammonia	mg/l N	45	<0.11	1.05
Barium	µg/l	5	41.40	47.6
B.O.D.	mg/l O2	40	<2	2.5
Boron	µg/l	5	<135	766
Cadmium	µg/l	5	<0.5	<0.5
C.O.D.	mg/l O2	45	<25	590
Chloride	mg/l Cl	45	19.50	6,402
Chromium	µg/l	5	<3	5.11
Conductivity	µS/cm @ 25	45	291	24,000
Copper	µg/l	5	<4	8.65
Dissolved Oxygen	%	45	55	94
Iron	mg/l	5	0.54	1.09
Lead	µg/l	5	0.68	4.17

Parameter	Units	No. of Samples	Minimum	Maximum
Magnesium	mg/l Mg	5	6.64	271.00
Manganese	µg/l	5	40.3	99.7
Mercury	µg/l	5	<0.02	<0.02
Nickel	µg/l	5	3.86	28.40
o-Phosphate	mg/l P	5	<0.07	0.39
pH	pH units	45	7.40	8.15
Potassium	mg/l	5	3.41	77.4
Sodium	mg/l	7	12.80	2,020
Strontium	µg/l	5	110	1,700
Sulphate	mg/l SO4	5	13.90	523
Suspended Solids	mg/l	45	6	118
Temp	°C	45	11.00	13.20
T.O.N	mg/l N	45	0.33	3.28
Uranium	µg/l	5	<0.5	0.90
Vanadium	µg/l	5	<8	<8
Zinc	µg/l	5	6.03	665.00

5.7.1 Monthly Parameters

Monthly chemical analyses of surface water are summarised in Appendix F.

The EQS for good status total ammonia is 0.14 mg N/l. The results indicate elevated levels of ammonia as N. The highest concentration recorded in the stream was 0.91 mg/l in SW4 in March and in the estuary was 1.05 mg/l in SW5 (AD) in September.

Chloride concentrations were below the A1 SWQS (250 mg/l) in the stream except for SW3 in March (256 mg/l). Chloride exceeded the A1 SWQS at all monitoring locations in the estuary at times throughout the monitoring period. The highest Chloride concentration recorded in the stream was 256 mg/l at SW3 in March and in the estuary was 6,402 mg/l at SW9 (DS) in August.

Elevated Electrical Conductivity levels above the SWQS (1,000 µS/cm) were recorded in the stream and in the estuary throughout the monitoring period. The highest Electrical Conductivity value recorded in the stream was 2,040 µS/cm at SW3 in March and in the estuary was 24,000 µS/cm at SW9 in June.

Elevated levels of Electrical Conductivity and Chloride recorded at SW5 to SW9 were also due to the presence of estuarine water.

5.7.2 Quarterly Parameters

The pH values ranged from 7.39 to 7.57 in the stream and 7.40 to 8.15 in the esturary which are between the A1 SWQS of 5.5 to 9.

BOD concentrations were below the EQS for good status of 2.6 mg/l in the stream. The highest concentration for BOD in the stream was 2.5 mg/l at SW4 in February. BOD values were below the EQS of <4.0 mg/l (95%ile) for a transitional water body at all locations. The highest concentration in the estuary was 2.5 mg/l at SW9 (DS) in February.

COD concentrations in the stream were above the SWQS of 40mg/l at all locations throughout the monitoring period except SW3 in December (39 mg/l). The highest concentration in the stream was 60 mg/l at SW4 in March. COD concentrations in the estuary exceeded the SWQS in SW5 and SW9. The highest concentration in the estuary was 590 mg/l at SW5 in April.

Suspended Solids were below the SWQS (50 mg/l) at all surface water monitoring locations in the stream. Suspended solids concentrations exceeded the SWQS at SW5 and SW9 in the estuary. The highest concentration recorded in the estuary was 118 mg/l in SW5 (AD) in April.

Total Organic Nitrogen (TON) concentrations ranged from 0.77 to 14.4 mg/l in the stream and 0.33 to 3.28 mg/l in the estuary. TON concentrations in the stream were elevated above normal concentrations in March. The highest concentration was 14.4 mg/l recorded in SW3 in March.

DO levels recorded onsite during sampling ranged from 46 to 80% in the stream and 55 to 94% in the estuary.

Previous monitoring results showed levels of contamination increasing between sampling points SW1 and SW4, which are located along the drainage ditch running along the north of the site. Works were undertaken to address this in 2017. SW1 is no longer present following the installation of a leachate interceptor drain (S3) adjacent to SW1 in the third quarter of 2017.

5.7.3 Annual Parameters

Annual analysis for metals and non-metals was undertaken in 18th December 2017.

Barium, Boron, Cadmium, Chromium, Copper, Lead, Magnesium and Mercury were below the IGV, SWQS and EQS where applicable.

Parameters with concentrations exceeding the standards are as follows:

- Aluminium exceeded the IGV in SW3 (582 µg/l) in the stream and SW5, SW7, SW8 and SW9 in the estuary (189 to 358 µg/l);
- Iron exceeded the IGV and A1 SWQS at all stream (0.515 to 0.919 µg/l) and estuarine locations (0.535 to 1.09 µg/l);
- Manganese exceeded the IGV and A1 SWQS at all stream (344 to 2,000 µg/l) and estuarine locations (40.3 to 99.7 µg/l) except SW6 (40.3 µg/l) and SW8 (42.1 µg/l);
- Nickel exceeded the IGV in SW8 (28.4 µg/l);
- Potassium exceeded the IGV at all stream locations (16.9 to 22.9 mg/l) and SW9 (77.4 mg/l) in the estuary;
- Sodium exceeded the IGV in SW9 (2,020 mg/l);
- Sulphate exceeded the IGV and A1 SWQS in SW9 (523 mg/l);
- Zinc exceeded the IGV in SW5 (665 µg/l).

Concentrations above the limit of detection were measured for the following parameters;

- Strontium 110 to 1,700 µg/l;
- Uranium <0.5 to 3.21 µg/l.

Alkalinity concentrations ranged from 412 to 490 mg/l in the stream and from 90.9 to 131 mg/l in the estuary.

Ortho-phosphate concentrations in the stream and estuary exceeded the IGV of 0.03 mg/l at all locations except SW8 (<0.07 mg/l) and SW9 (<0.07 mg/l). Concentrations ranged from 0.11 to 0.28 mg/l in the stream and <0.07 to 0.39 mg/l in the estuary.

5.8 Remediation

The results show that surface water is being impacted by the landfill site. In the hydrogeological study an Ammoniacal Nitrogen contaminant discharge was estimated at 70 mg/l after capping (after 10 years), predicting a long term concentration of 0.26 mg/l (or total ammonia 0.31 mg/l N[7]) in the estuary.

The highest concentration in the estuary was at SW5 (1.05 mg/l) which is adjacent to the site. An upgradient source of contamination is detected in the monitoring results (SW7 and SW8) at times.

5.9 Sewer Discharges

The Waste Licence in Schedule D requires the monitoring of the BOD, COD, Ammonia, Suspended Solids, Sulphates, pH and Temperature on a quarterly basis.

S1 is the sewer discharge monitoring location at manhole No 2, adjacent to weighbridge. This monitors run-off from the Recycling Centre and Material Recovery Facility and discharge from the composting facility.

Samples were not collected at the landfill discharge monitoring location (S2) during the monitoring period as there was no flow.

S3 is an interceptor drain running along the northern boundary of the site adjacent to SW1. S3 was installed in the third quarter of 2017 and monitoring commenced in the fourth quarter of 2017.

Table 5.11 illustrates the minimum and maximum concentrations of parameters that were monitored in S1. All parameter were within the Emission Limit Values (ELV).

Table 5.12 presents the concentrations of parameters analysed in S3 in December.

[7] ammonia to ammoniacal nitrogen then multiply the value by 14/17

Table 5.11 Parameters Monitored in S1

Parameter	Minimum	Maximum	Emission Limit Value (ELV)	
			S1: Civic Waste Facility (mg/l)	S2: Leachate from Landfill (mg/)
BOD (mg/l)	1.8	26	750	2000
COD (mg/l)	<25	249	1000	9000
Suspended Solids (mg/l)	9	55	1000	2000
Sulphate (mg/l)	38.2	51.2	300	400
pH	7.2	7.6	6-9	6-9
Temperature (°C)	NM	NM	40°C	40°C

*NM = not monitored

Table 5.12 Parameters Monitored in S3

Parameter	S3 Concentration
Ammonia (mg/l)	<0.11
BOD (mg/l)	NM
COD (mg/l)	32
Suspended Solids (mg/l)	76
Sulphate (mg/l)	28.2
pH	7.68
Temperature (°C)	NM

5.10 Perimeter Gas Monitoring and Landfill Gas Extraction

Schedule D of the licence requires the licensee to conduct monthly monitoring of gas levels on the perimeter and in the waste of the landfill site. The gas is monitored using a GA2000 infra-red monitoring device. The monitoring locations are shown on Table 5.13 and shown in Drawing in Appendix C (External Gas Monitoring Points).

Table 5.13 Landfill Gas Monitoring Locations

Landfill Gas Wells within Waste and Boundary Locations	GW1 to GW47 inclusive (as shown on Drawing No. 004 of the Restoration Plan for 34-1 (Nov 2002) agreed by the Agency)
Piezometers Boundary Locations	G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G16, G17, GM1, GM2, GM3, GM4, GM5, GM6, GM24[8]

Landfill gas around the periphery of the site is indicated by piezometers as shown in Table 5.13 above.

A landfill gas trench has been installed to the west of the active landfill site to intercept the potential pathway of the gas migrating from the current active landfill site. Piezometers GM5 to GM6, G4 to G10 are to the west of the landfill gas trench.

A permanent gas extraction system has been installed at the facility. This includes a gas collection layer and 47 landfill gas extraction wells laid out on a grid system over the main body of the site. The wells are connected via 63mm diameter pipework to a 250mm diameter main gas collection pipe. A 600m^3 enclosed Flare Unit and SCADA system was installed. This was downsized in 2013 to a 300m^3 flare. The boreholes in the area of historical fill have also been attached to the active gas collection system. Records of field balancing are maintained.

Monthly monitoring of periphery piezometers around Dundalk Landfill site have indicated no exceedances of licence requirements of methane greater than or equal to 1.0% v/v except for G1 in March (1.0 % v/v).

There were no exceedances of licence requirements of carbon dioxide greater than or equal to 1.5% v/v except G1 (1.5% v/v) in August and December.

5.11 Flue Gas Monitoring

Flue gas monitoring was also undertaken on the permanent landfill gas flare. All monitoring was carried out in accordance with Environmental Protection Agency Office of Environmental Enforcement (OEE) Air Emission Monitoring Guidance Note 2 (AG2). This report is available

[8] GM7 and GM8 are no longer monitored

on site for inspection. NOx as NO2 emissions from the flare were within the emission limit values specified in Waste licence W0034-02.

5.12 Estuarine Soil Samples

There was no sediment sampling undertaken in 2017.

5.13 Dust Monitoring

Dust monitoring was carried out twice in the year. Table 5.14 details the results of the three dust monitors installed on site. The waste licence requires dust deposition limits to be no more than 350 mg/m^2/day. From Table 5.14 it can be seen that all dust deposition levels in all periods are below the limit.

Table 5.14 Dust Monitoring Results (mg/m^2/day)

Sampling Period	Dust Monitor 1	Dust Monitor 2	Dust Monitor 3
June	59.76	171.42	201.83
August	189.77	57.67	233.28
November	74.44	25.16	63.96

NM = Not Monitored

5.14 Composting Monitoring

V & W recycling compost hedge grass and hedge cuttings from Civic Amenity users. 2,704 tonnes was received for composting in 2017. Compost testing was undertaken by Bord na Mona Ltd. Compost monitoring was undertaken on the 7th February, 19th May, 20th September and 23rd November in 2017.

The sampling of compost takes place from the static pile before the screening process and hence does not take account of the filtering process. The compost is passed through a rotating drum type sieve prior to bagging. Heavier material is returned to the process.

Compost is also stored on site for 6 months (held over winter) in accordance with Schedule F, Maturity test 4.

The samples of compost were checked for compliance against Schedule F of Waste Licence W0034-02, Oxygen Uptake Rate Bord na Móna Maturity Indicator Values (OS = organic solids) mmolO_2/kg OS/h as shown in Table 5.14 and the human pathogen test BSI PAS 100 Standard Limits (Salmonella s.p.p absent in 25g sample and E coli <1,000 CFU/g).

Table 5.14 Bord na Móna Maturity Indicator Values

Compost Process Stage (mmolO_2/kg OS/h)	
>26	Very Unstable
16-25	Unstable
11-15	Moderately Stable
5-10	Stable
<5	Completely stable

- Compost Monitoring 7th February 2017

Sample complied with Schedule F Maturity tests 3 and 4. The maximum self-heating temperature reached was 19.7°C, less than 20 °C above the ambient temperature.

The oxygen uptake rate of 3 mmolO_2/kgOS/h is completely stable in accordance with Bord Na Mona Maturity Indicator Values.

Trace elements comply with Class 1 Maximum Trace Element Concentration Limits for Compost.

Contaminants were <0.01 % for all sieve sizes from <1 mm to >31.5 mm except for stones in the 2-4mm sieve size (0.94%). Stones in the 2-4mm sieve size (0.94%) is not in compliance with the limit for impurities >2mm of <0.5%.

- Compost Monitoring 19th May 2017

Sample complied with Schedule F Maturity tests 3 and 4. The maximum self-heating temperature reached was 22.3°C, less than 20 °C above the ambient temperature.

The oxygen uptake rate of 2.6 mmolO_2/kgOS/h is completely stable in accordance with Bord Na Mona Maturity Indicator Values.

A cress germination test was undertaken on the compost sample from 19th May with a result of 100% germination rate compared to the control which is compliant with the Waste Licence limit of greater than 90% of the germination rate of the control sample. The sample had a root index of 96% and MLVI of 96% compared to the control.

Trace elements comply with Class 1 Maximum Trace Element Concentration Limits for Compost.

Contaminants were <0.01 % for all sieve sizes from <1 mm to >31.5 mm except for stones in the 2-4mm sieve size (0.93%). Stones in the 2-4mm sieve size (0.93%) is not in compliance with the limit for impurities >2mm of <0.5%.

The compost sample complied with the pathogenic organism content limits in the Waste Licence for Salmonella sp. (absent in 25g sample) and the human pathogen test BSI PAS 100 Standard Limits for E Coli (<1,000 CFU/g).

- Compost Monitoring 20th September 2017

Sample complied with Schedule F Maturity tests 3 and 4. The maximum self-heating temperature reached was 19.7°C, less than 20 °C above the ambient temperature.

The oxygen uptake rate of 6.1 mmolO_2/kgOS/h is stable in accordance with Bord Na Mona Maturity Indicator Values.

Trace elements comply with Class 1 Maximum Trace Element Concentration Limits for Compost.

Contaminants were <0.01 % for all sieve sizes from <1 mm to >31.5 mm except for stones in the 2-4mm (0.32%), 4-8mm (0.30%) and 8-16mm (0.26%) sieve sizes which is not in compliance with the limit of <0.5% for impurities >2mm and <5% for gravel and stones >5mm.

The compost sample complied with the pathogenic organism content limits in the Waste Licence for Salmonella sp. (absent in 25g sample) and the human pathogen test BSI PAS 100 Standard Limits for E Coli (<1,000 CFU/g).

- Compost Monitoring 23rd November 2017

Sample complied with Schedule F, Maturity tests 1, 3 and 4. The maximum self-heating temperature reached was 15.7°C, less than 20 °C above the ambient temperature.

An AT_4 maturity test was undertaken on the compost sample which complied with the Waste Licence limit for respiration activity after four days AT_4 of ≤10mg/O_2/g dry matter.

Trace elements comply with Class 1 Maximum Trace Element Concentration Limits for Compost. The moisture content was 51.23%.

Contaminants were <0.01 % for all sieve sizes from <1 mm to >31.5 mm except for stones in the 2-4mm (0.60%) and 4-8mm (0.71%) sieve sizes. Stones in the 2-4mm (0.60%) and 4-8mm (0.71%) sieve sizes were not in compliance with the limit of <0.5% for impurities >2mm and <5% for gravel and stones >5mm.

The compost sample complied with the pathogenic organism content limits in the Waste Licence for Salmonella sp. (absent in 25g sample) and Faecal Coliforms (≤1000 Most Probable Number (MPN) in 1g).

5.15 Bed Media

Moisture content, pH, Ammonia and Total viable counts were analysed for the bed media gases from Biofilter using Drager tubes. These results are available on site. There are no limits in the waste licence for these parameters.

5.16 Meteorological Monitoring

Temperature and rainfall readings are taken from Dublin Airport.

Table 5.16 Summary of Meteorological Monitoring for the Reporting Period

Total Rainfall in Millimetres for Dublin Airport												
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
21.9	41.6	67.2	10	43.5	86.4	42.2	73.2	82.3	47.8	81.5	63.1	660.7
Mean Temperature in Degrees C. for Dublin Airport												
5.7	6.2	7.7	8.0	11.6	14.4	15.0	14.6	12.4	11.2	6.5	5.3	9.9

6 Resource and Energy Consumption Summary

Consumption of resources for the reporting period is shown in Table 6.1 below. An energy efficiency audit has not been carried out at this facility as the landfill site is closed it is not a requirement of the licence.

Table 6.1 Consumption of Resources

Parameters	Unit	CWF 2014	CWF 2015	CWF 2016	CWF 2017	% difference +/-
Electricity	kWh	3,900	3,800	4,020	4,771	+18.7
Water	m^3	2,700	2,500	2,060	2,030	-1.5

7 Development / Infrastructural Works in Place and Planned, to Process Waste Quantities Projected

There is no additional development /infrastructural works planned for 2017 in the recycling facility and landfill site.

Plants and Methods

The current plant on site comprises of;

- Compactor – The current compactor is used to bale recyclable materials
- Hopper – The hopper is used to accept recyclables.
- Conveyer Belt – The conveyer belt is used to sort materials
- Wood Shredder – The wood shredder is used to shred wood received at the Civic Waste Facility.

All machines have a 50% back-up capacity and V & W Recycling also have access to spares as required.

7.1 Proprietary Vacuum Aerated Static Pile System

The licence also allows composting of biodegradable waste and green waste to 4,000 tonnes per annum. A Proprietary Vacuum Aerated Static Pile System has been installed. No food waste is utilised through the composting system. Celtic Composting systems biofilters (2) were specified to have capacity of 8,000 tonnes of compost, thus providing 100% spare capacity in the event of breakdown.

8 Schedule of Environmental Objectives and Targets for the Forthcoming Year

There are no proposed developments works (Environmental Objectives and Targets) to be carried out in 2018.

9 Tank, Drum, Pipeline and Bund Testing and Inspection Report

A bund integrity test was undertaken in February 2016. The bunds are located together and each one is constructed with reinforced concrete base (300mm) and walls (225mm). Each bund houses a plastic integrally of specialist oil tanks was approved by EPA and installed as part of the extension to the Civic Amenity Site in 2004/2005, provided these tanks were protected from vehicular impact. This was done by the provision of railings and the tanks are then set in additional recesses. bunded oil storage tank. Each bund is certified to have passed the integrity test as per Environmental Agency of England and Wales Technical Report P16 (equivalent to CIRIA 163).

10 Full Title and a Written Summary of any Procedures Developed by the Licensee in the Year, which Relates to the Facility Operation

The Environmental Management System and Environmental Management Plan were reviewed and updated in 2006 to include the procedures for the Recycling Centre and the closure of the Landfill site. A new flare procedure was developed in 2012 and is available for viewing on site

A Fire Prevention Plan for the facility was reviewed and updated on 15th November 2017. An Emergency Response Procedure/Fire Response Plan for the facility was also reviewed and update.

11 Report on Incidents and Complaints Summaries

No complaints or incidents were reported to the EPA during the monitoring period.

A site visit was undertaken by the EPA on the 19/01/2017 (SV11139). A non-compliance was recorded for non-reporting. The following comment / corrective actions were noted:

- The licensee shall put in place a Fire Prevention Plan for the facility, without delay.
- The licensee shall ensure that the ERP document is dated and a document review number/version number provided. The licensee shall review the ERP to address an underground fire scenario occurring at the facility, without delay.
- The licensee shall implement the technical assessment recommendations contained within the TIER 3 Hydrogeological Risk Assessment Report dated 14/12/14, without delay.
- The licensee shall progress with all actions contained with the open Compliance Investigation Ref. No. CI000724, without delay.
- A record shall be kept for each load of waste departing the Civic Waste Facility and all waste records shall be filled out appropriately and in accordance with Condition 10.5.
- The licensee shall submit to the Agency an ecological monitoring of Castletown Estuary 2016, within 2 weeks of issue of this report.
- The licensee shall retrospectively submit all compost quality monitoring report for 2016, without delay, and ensure that reports are submitted in full at all times in accordance with the requirements of Schedule G.
- The licensee shall maintain and clearly label and name all sampling and monitoring locations, so that they may be used for representative sampling and monitoring.
- The licensee shall ensure that surface water drainage trench's at the facility are actively maintained in accordance with the sites preventative maintenance schedule, and that any maintenance or remedial work arising shall be recorded by the licensee.

A monitoring site visit was undertaken by the EPA on the 20/04/2017 (SV11824). Samples were taken from WM5, WM1, WM9, SW5 and SW7. The groundwater results were similar to

quarterly monitoring results at these locations. The site visit surface water results detected lower levels of chloride and electrical conductivity than the quarterly monitoring results.

12 Review of Nuisance Controls

12.1 Dust Control

There were no breaches of the dust deposition limit in 2017. Daily wind directions are taken and during episodes of high winds no movement of compost is undertaken. In addition operational activities to 'wet down' materials are in place.

12.2 Litter

The landfill site was closed in October 2002 and therefore there is no windblown litter arising from the landfill site. V & W Recycling (operators) of recycling facility do regular litter picks on blown paper waste etc and regular site cleanup.

12.3 Odours

The landfill site was closed in October 2002 and therefore the potential for odours has been reduced. The permanent capping and installation of an active extraction system reduces the occurrence of odour from landfill gas.

The doors to the waste processing building are kept closed where possible; the biofilters minimize the odours from the composting process in the recycling facility.

Odour is checked on a daily basis by V & W Recycling.

12.4 Pest Control (Vermin)

Pest control is undertaken by V & W Recycling. Bait traps are checked on a weekly basis.

12.5 Noise

Noise monitoring was not undertaken during this monitoring period.

13 Volume of Leachate Produced and Volume of Leachate Transported Discharged Off Site

A leachate drainage ditch has been constructed along the southern boundary of the landfill, laid to a nominal invert of 3.65 m (this being the level of the highest tide recorded in Dundalk). The base of the trench is lined with bentonite matting over which a 150 mm diameter perforated pipe is placed and the trench is then backfilled with clean stone. Any leachate/runoff entering the trench drains to the perforated pipe and from there drains via a manhole/ monitoring point to the foul sewer.

The trench is connected to the foul sewer running along the western boundary of the site. The in situ flow meter has been removed as agreed with the EPA. No flow has been observed in this trench during inspections.

14 Reports on Financial Provision made under this Licence, Management and Staffing Structure of the Facility, and a Programme for Public

The management and staffing structure for the facility is as follows;

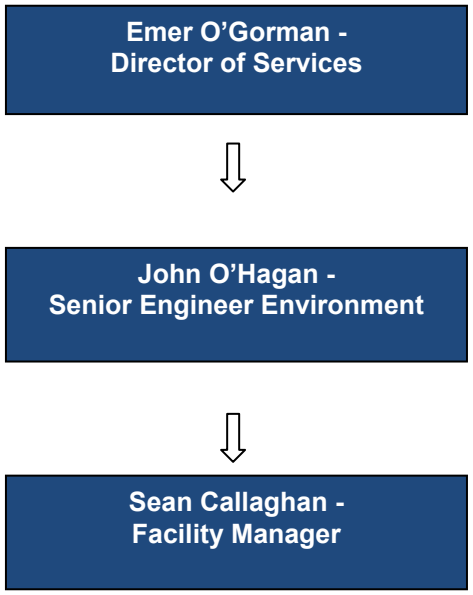


Figure 14.1 Management Structure at Dundalk Landfill Site

14.1 Staffing Structure

The recycling facility is being operated by third party (V & W recycling) on behalf of Dundalk Town Council. There is currently 6 staff members employed at the recycling facility. This consists of:

- managers
- supervisors
- general operatives

The public information programme is provided in the Environmental Management System for the site.

15 Annual Budget and Site Running Costs

The recycling facility is operated by third party (V & W Recycling) on behalf of Dundalk Town Council. A €4.00 entrance charge is applicable to all users of the site except for the disposal of electrical goods.

Funding is provided by Louth County Council for all monitoring requirements.

An Environmental Liability Risk Assessment has not been carried out at this facility as the landfill site is closed it is not a requirement of the licence.

Appendix A

Water balance calculation

WATER BALANCE CALCULATION

Year	Active Phase	Active Area $A(m^2)$	Waste Input t/month	Rainfall mm	Active Area Infilitration $AR(A)(m^3)$	Temp Restored area	Temp Restored area(Temp) $RCA(m^2)$	Restored area(Temp) infiltration IRCA(m3)	Permanently Restored area	Restored area $RCA(m^2)$	Total Water	Cumulative Water	Absorptive Capacity aW(m3)	Cumulative Absorptive Capacity	Cumulative Leachate	Leachate produced Lo(m3)
2017	Closed		0.00	660.7	0				79000	1044	1044	1044	0.00	0.00	1044	1044
Total			**0.00**	**660.7**	**0**			**0**		**1044**			**0**			**1044**

Assumptions

IRCA	Temporarily capped/restored area infiltration of rainfall estimated %	30%	%
	Permanent capped/restored area infiltration of rainfall estimated % (2-10%)	2%	%
Absorptive Capacity	waste density of 0.8 tonnes/m3. Estimated absorptive capacity (water per tonne waste before leachate is produced) t/m3	0.06	t/m3
Restored Area	Area	79,000	m^2
Rainfall	Rainfall taken from Dublin Airport	660.7	mm

WATER BALANCE CALCULATION

Year	Active Phase	Active Area $A(m^2)$	Waste Input t/month	Rainfall mm	Active Area Infilitration $AR(A)(m^3)$	Temp Restored area	Temp Restored area(Temp) $RCA(m^2)$	Restored area(Temp) infiltration IRCA(m3)	Permanently Restored area	Restored area $RCA(m^2)$	Total Water	Cumulative Water	Absorptive Capacity aW(m3)	Cumulative Absorptive Capacity	Cumulative Leachate	Leachate produced Lo(m3)
2017	Closed		0.00	660.7	0				79000	5220	5220	5220	0.00	0.00	5220	5220
Total			**0.00**	**660.7**	**0**			**0**		**5220**			**0**			**5220**

Assumptions

IRCA	Temporarily capped/restored area infiltration of rainfall estimated %	30%	%
	Permanent capped/restored area infiltration of rainfall estimated % (2-10%)	10%	%
Absorptive Capacity	waste density of 0.8 tonnes/m3. Estimated absorptive capacity (water per tonne waste before leachate is produced) t/m3	0.06	t/m3
Restored Area	Area	79,000	m^2
Rainfall	Rainfall taken from Dublin Airport	660.7	mm

Appendix B
PRTR Reporting

Guidance to completing the PRTR workbook

PRTR Returns Workbook

Version 1.1.19

REFERENCE YEAR	2017

1. FACILITY IDENTIFICATION

Parent Company Name	Louth County Council
Facility Name	Dundalk Landfill & Civic Waste Facility - Dundalk Town Council
PRTR Identification Number	W0034
Licence Number	W0034-02

Classes of Activity

No.	class_name
-	Refer to PRTR class activities below

Address 1	Newry Road
Address 2	Dundalk
Address 3	
Address 4	
	Louth
Country	Ireland
Coordinates of Location	-6.39622 54.0147
River Basin District	GBNIIENB
NACE Code	3832
Main Economic Activity	Recovery of sorted materials
AER Returns Contact Name	Sean Callaghan
AER Returns Contact Email Address	sean.callaghan@louthcoco.ie
AER Returns Contact Position	Executive Scientist
AER Returns Contact Telephone Number	042 9392977
AER Returns Contact Mobile Phone Number	086 3837216
AER Returns Contact Fax Number	042 9336761
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	2
User Feedback/Comments	50% variance in Releases to Wastewater or Sewer parameters due to different flow rate and rainfall.
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
50.1	General
5(c)	Installations for the disposal of non-hazardous waste
50.1	General

3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

Is it applicable?	
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4. WASTE IMPORTED/ACCEPTED ONTO SITE

Guidance on waste imported/accepted onto site

Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	

4.1 RELEASES TO AIR Link to previous years emissions data | PRTR# : W0034 | Facility Name : Dundalk Landfill & Civic Waste Facility - Dundalk Town Council | Filename : W0034_2017.xls | Return Year : 2017 | 06/04/2018 13:52

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
01	Methane (CH4)	M	OTH	Gassim	0.0	34890.0	0.0	34890.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Dundalk Landfill & Civic Waste Facility - Dundalk Town Council

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used		Facility Total Capacity m3 per hour	
			Method Code	Designation or Description		
Total estimated methane generation (as per site model)	196819.0	C	Gassim	Gassim Lite	N/A	
Methane flared	161929.0	M	Flare Records	Flare records	0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	34890.0	C	Calculation	Net emission calculation	N/A	

4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used		S1			
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
06	Ammonia (NH3)	C	OTH		3.11	3.11	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used		S1			
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
303	BOD	C	OTH		61.37	61.37	0.0	0.0
306	COD	C	OTH		284.63	284.63	0.0	0.0
343	Sulphate	C	OTH		139.44	139.44	0.0	0.0
240	**Suspended Solids**	C	OTH		101.83	101.83	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

Please enter all quantities on this sheet in Tonnes

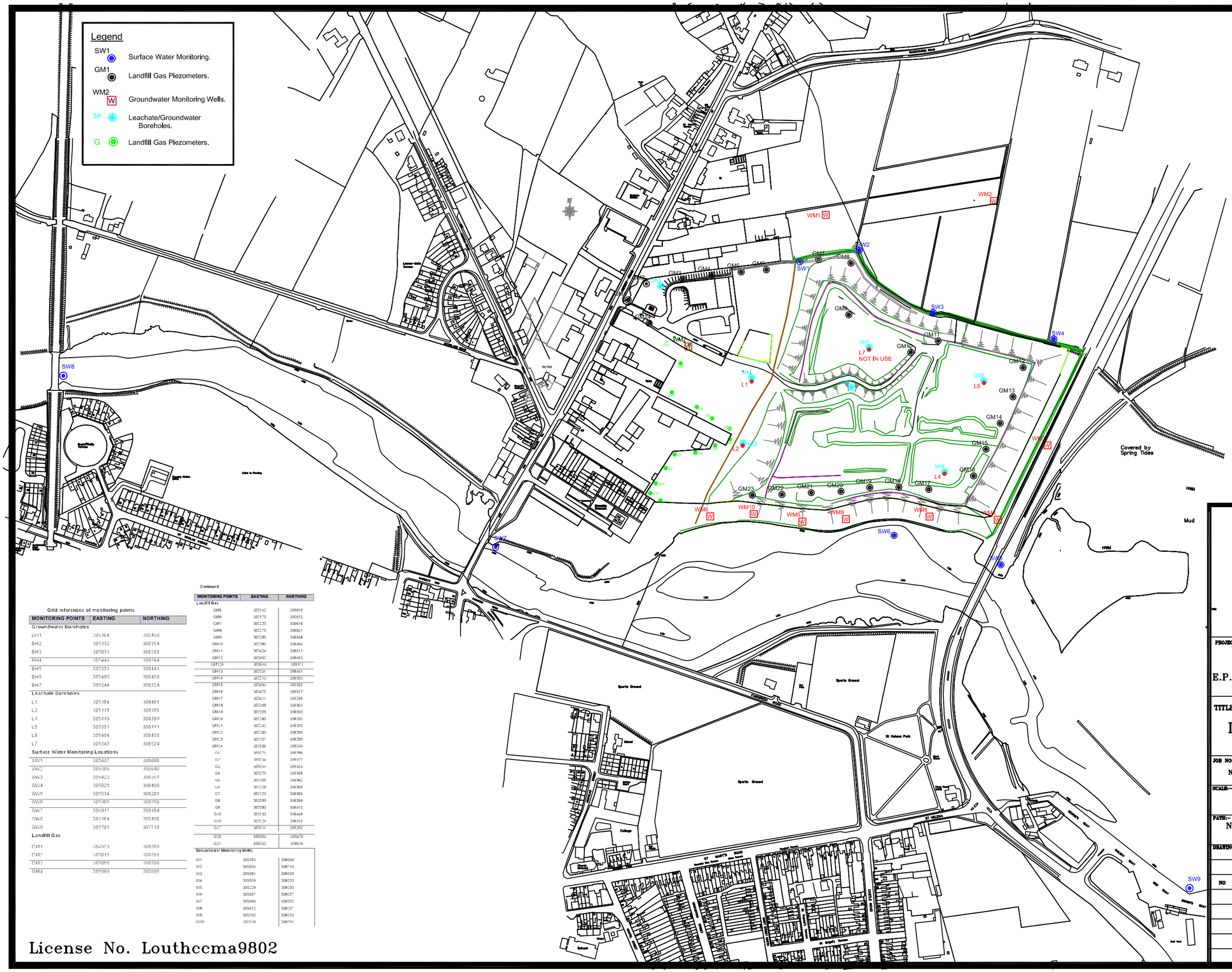
0

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used M/C/E	Method Used	Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
Within the Country	13 02 05	Yes	4.2	mineral-based non-chlorinated engine, gear and lubricating oils	R9	M	Weighed	Offsite in Ireland	Enva ,WO184-01	Clonminam Industrial Estate,Portlaoise,Co. Laois ,.,Ireland	Enva,W0184-01,Clonminam ,Industrial,Estate,Portlaois,Ireland	Enva,Clonminam ,Industrial,Portlaois,Ireland
To Other Countries	15 01 01	No	470.0	newspapers and magazines	R3	M	Weighed	Abroad	Peute Europe,nl 6000076	Baahoekweg 4,LA Dordrecht,.,.,.,Netherlands		
To Other Countries	20 01 01	No	200.0	paper and cardboard	R3	M	Weighed	Abroad	Peute Europe,nl 6000076	Baahoekweg 4,LA Dordrecht,.,.,.,Netherlands		
Within the Country	15 01 03	No	182.0	wooden packaging	R3	M	Weighed	Offsite in Ireland	Thornton Waste Disposal,Waste Licence W0195-02	Kimlainham wood,.,.,.Meath,Ireland		
Within the Country	15 01 02	No	572.0	plastic packaging	R3	M	Weighed	Offsite in Ireland	Shrabra Plastic IRL,Licence No 15/5	Killycard ind est ,Castleblayey,Co Monaghan,.,Ireland		
To Other Countries	15 01 04	No	40.0	metallic packaging	R4	M	Weighed	Abroad	John Tinnelly & Sons,WMEX 20/01	Newtowncloughogue,Newry, Co Down,BT38 8LZ,United Kingdom		
To Other Countries	15 01 07	No	206.0	glass packaging	R5	M	Weighed	Abroad	Glassdon ,NI licenceLN/06/08	52 Creagh Road,Toomebridge,Co Antrim,BT41 3SE,United Kingdom		
Within the Country	16 06 01	Yes	5.0	lead batteries	R4	M	Weighed	Offsite in Ireland	Rilta Environmental Ltd,Licence No W0192-02	Block 402 Grants Drive,Greenogue Business Park,Rathcoole ,Co Dublin,Ireland	Rilta Env,W0192-02,Block 402,Grant Drive,Greenogue,Rathcoole,Ireland	Rilta Env,Block 402,Grant Drive,Greenogue,Ireland
To Other Countries	20 01 11	No	36.0	textiles	R3	M	Weighed	Abroad	Cookstown NI WMEX 01/11,Cookstown NI WMEX 01/11	36 Magheralane Road,Randalstown,County Antrim,.,United Kingdom		
Within the Country	20 01 38	No	272.0	wood other than that mentioned in 20 01 37	R3	M	Weighed	Offsite in Ireland	Thornton Waste Disposal,Waste Licence W0195-02	Kimlainham wood,.,.,.Meath,Ireland		
Within the Country	20 02 01	No	2704.0	Biodegadable waste	R3	M	Weighed	Offsite in Ireland	Dundalk Town Council,W0034-02	Newry Road,.,Dundalk Town Council,.,Ireland		
Within the Country	20 03 01	No	106.0	mixed municipal waste	D1	M	Weighed	Offsite in Ireland	Indaver Ireland,W0167-02	Carranstown,Duleek,.,Co. Meath,Ireland		
To Other Countries	20 01 40	No	292.0	metals	R4	M	Weighed	Abroad	John Tinnelly & Sons,WMEX 20/01	Newtowncloughogue,Newry, Co Down,BT38 8LZ,United Kingdom		
Within the Country	20 01 27	Yes	1.45	paint, inks, adhesives and resins containing dangerous substances	R3	M	Weighed	Offsite in Ireland	Enva ,WO184-01	Clonminam Industrial Estate,Portlaoise,Co. Laois ,.,Ireland	Enva,W0184-01,Clonminam ,Industrial,Estate,Portlaois,Ireland	Enva,Clonminam ,Industrial,Portlaois,Ireland

* Select a row by double-clicking the Description of Waste then click the delete button

Appendix C

Monitoring Points Drawing



Grid references of monitoring points

MONITORING POINTS	EASTING	NORTHING
Groundwater Boreholes		
BH1	305164	308459
BH2	305132	308354
BH3	305031	308308
BH4	305449	308394
BH5	305331	308441
BH6	305495	308458
BH7	305344	308524
Leachate Boreholes		
L1	305164	308461
L2	305138	308355
L4	305449	308394
L5	305331	308441
L6	305494	308458
L7	305343	308524
Surface Water Monitoring Locations		
SW1	305087	308606
SW2	305305	308640
SW3	305423	308551
SW4	305628	308400
SW5	305534	308201
SW6	305365	307950
SW7	304917	308164
SW8	304164	308456
SW9	305781	307718
Landfill Gas		
GM1	304973	308369
GM2	305015	308391
GM3	305068	308399
GM4	305099	308505

Continued

MONITORING POINTS	EASTING	NORTHING
Landfill Gas		
GM5	305142	308510
GM6	305179	308515
GM7	305220	308516
GM8	305273	308521
GM9	305296	308548
GM10	305285	308494
GM11	305424	308511
GM12	305462	308492
GM12A	305516	308471
GM13	305531	308451
GM14	305510	308395
GM15	305493	308355
GM16	305476	308317
GM17	305411	308298
GM18	305369	308301
GM19	305326	308300
GM20	305185	308295
GM21	305142	308293
GM22	305100	308290
GM23	305157	308290
GM24	305009	308336
G1	305071	308766
G2	305134	308377
G3	305091	308343
G4	305076	308348
G5	305109	308362
G6	305129	308369
G7	305123	308385
G8	305098	308399
G9	305083	308413
G10	305030	308449
G16	305024	308310
G17	305011	308292
G20	305053	308479
G21	305062	308616
Groundwater Monitoring Wells.		
W1	305263	308390
W2	305504	308710
W3	305581	308368
W4	305509	308253
W5	305229	308250
W6	305097	308257
W7	305066	308302
W8	305412	308257
W9	305292	308253
W10	305458	308261

License No. Louthccma9802

COMHAIRLE BHAILE DUN DEALGAN

DUNDALK TOWN COUNCIL

Phone (042) 9335579 Fax (042) 9335581

TOWN ENGINEER:- C. DUFF

PROJECT:- Landfill Site Newry Road. E.P.A. LICENCE No.WL 34-2

TITLE:- Location Map

JOB NO:-	DRN.NO:-
NO.2	1
SCALE:-	DATE:-
1 / 2500	14/06/05

PATH:- N:Landfill\Landfill drawings\ Monitoring Locations.dwg

DRAWING BY:- P Mulligan

DRN. No. REVISION

NO	DATE	DETAILS

Appendix D
Leachate Results

Dundalk Landfill Site

LEACHATE QUALITY

Monitoring Point: **LH1**

RESULTS

PARAMETERS	Units	Date																																
		16-Jan-12	23-Apr-12	23-Jul-12	08-Oct-12	30-Jan-13	15-Apr-13	22-Jul-13	07-Oct-13	27-Jan-14	07-Apr-14	14-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	04-Nov-15	31-Mar-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	03-Jan-17	09-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17	
Alkalinity	**mg/l CaCO3**																																	
Aluminium	**µg/l**		6.5				<5				<10.0				<10.0										56									<50
Ammonia	**mg/l N**	93.87	107.62	99.60	101.22	113.65	100.89	11.54	102.62	160	92	110	87	84	87	95	97	96	78.3	97.4	91.2	98.6	10	24	78.1	89.2	78.2	95.9	101.75	102.73	98.6	99.7	91.2	108
Antimony	**µg/l**		<0.5				<0.5				<1.0				<1.0										<4									
Arsenic	**µg/l**		0.76				<0.5				<1.0				<1.0										<2									
Barium	**µg/l**		465.9				500.4				380				460										438									499
Beryllium	**µg/l**		<0.5				<0.5				<1.0				<1.0																			
B.O.D.	**mg/l O2**	11.7	24.1	14.0	9.6	19.6	16.6	17.8	<10	14	17	15	31	10	<8	11	13	12.5	11	19.2	20.1	3.1	<1	5.1		11.3	12.5	10.8	4	29	31	31	32	
Boron	**µg/l**		1594.7				1150.7				1100				990										952									1270
Cadmium	**µg/l**		<0.1				<0.1				<0.020				<0.020										<0.5									<0.5
Calcium	**mg/l Ca**		204.92				161.65				180				170																			
C.O.D.	**mg/l O2**	102	80	82	104	120	95	32	109	133	101	134	92	137	87	118	163	102	112	40	42	78	59	62		82	67	91	115	147	136	138	139	86
Chloride	**mg/l Cl**	195	159	195	182	146	114	50	154	126	123	104	106	103	103	94	129	102	106	114	164	136	123	118.2	126	120	128	124	139.6	137	126	121	162	205
Chromium	**µg/l**		7.4				7.5				7.9				11										8.35									9.96
Cobalt (µg/l)	**µg/l**		2.2				3.2				2				2.1																			
Conductivity	**µS/cm @ 25**	2660	2480	2580	2690	2750	2450	1062	2590	2700	2360	2450	2170	2180	2190	496	2490	2300	2126	2360	2410	2490	1710	1810	1,470.00	2512	1956	2460	2260	2300	1982	2080	2128	2,640.00
Copper	**µg/l**		<0.5				0.7				11				<1.0										7.15									<4
Cyanide	**mg/l CN**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05																	
D.O.	**% Saturation**																		-				-	-										
Fluoride	**mg/l**		<0.150				<0.150				<0.150				2										0.046									
Iron	**µg/l**		30384.3				102.3				620				24000										14.1									11.9
Lead	**µg/l**		<0.5				<0.5				<1.0				<1.0										<0.5									0.764
Magnesium	**mg/l Mg**		66.33				54.11				56				49										48.2									70.7
Manganese	**µg/l**		647.2				520.1				730				530										512									469
Mercury	**µg/l**		<0.05				<0.05				<0.050				<0.020																			0.0673
Molybdenum	**µg/l**		0.5				5.5				<1.0				<1.0										<9									
Nickel	**µg/l**		1.2				8.5				2.2				1.2										8.43									4.56
o-Phosphate	**mg/l P**	0.17	<0.02	<0.02	0.02	0.13	<0.02	<0.02	<0.02	<0.010	<0.010	<0.010	0.017	0.25	<0.010	<0.010	<0.010	<0.07	<0.07	<0.07	<0.07	<0.02	<0.07	<0.07	<0.02	0.46	0.51	0.42	0.046	0.05	0.05	0.05	0.05	< 0.07
pH		6.9	6.9	7.0	6.7	6.8	6.8	7.2	6.8	6.8	6.7	6.7	6.7	6.8	6.7	6.8	6.8	7.14	7.21	6.87	6.89	6.89	7.31	7.2	7.1	6.98	7.01	6.98	6.7	6.9	7	7	7	6.89
Potassium	**mg/l**		70.91				55.18				59				53										53.9									76.7
Residue on Evaporation																																		
Sampling Depth (m)	**m**																																	
Selenium	**µg/l**		<0.5				<0.5				<1.0				<1.0										<1									
Silver	**µg/l**		nm				nm																		<2									
Sodium	**mg/l**		130.76				99.43				110				89										99.2									95.5
Strontium	**µg/l**		1169.14				956.28				890				960										946									1000
Sulphate	**mg/l SO4**		4.1				<2.0				<2.0				<10				-						7.9									27.1
Suspended Solids	**mg/l**																		-															
Temp	**°C**	10.8	10.5	18.2	12.8	9.1	12.1	11.3	13.1	10.1	9.7	14.5	13.7	9.2	11.1	11.1	12.2		15.1															
Thallium	**µg/l**		<0.1				<0.1				<1.0				<1.0																			
Time Sampled		11:10	10:30	10:20	10:45	09:30	10:35	12:25	10:30	11:00	10:30	10:20	10:30	09:50	12:30	10:00	15:15																	
Tin (µg/l)	**µg/l**		<1				nm																											
T.O.C.	**mg/l**																		-				12.1	10.7	0.547									
T.O.N	**mg/l N**	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	7.32	<0.08	<0.20	<0.20	<0.20	<0.20		<0.20	<0.20	<0.20	0.122	<0.20	<0.1	<0.1					1.84	1.98	1.71	0.04	0.1	0.11	0.12	0.11	0.84
Total S Solids	**mg/l**																																	
Uranium	**µg/l**		<0.1				<0.1				<1.0				<1.0										<0.5									<0.5
Vanadium	**µg/l**		1.07				0.7				<1.0				1.1										<8									<8
Zinc	**µg/l**		2.4				57.6				29				5.5																			19.3

Dundalk Landfill Site

LEACHATE QUALITY

Monitoring Point: **LH2**

RESULTS

PARAMETERS	Units	Date 16-Jan-12	23-Apr-12	23-Jul-12	08-Oct-12	30-Jan-13	15-Apr-13	22-Jul-13	07-Oct-13	27-Jan-14	07-Apr-14	14-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	04-Nov-15	31-Mar-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	03-Jan-17	09-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**																																
Aluminium	**µg/l**		5				<5				<10.0				<10.0									143									<50
Ammonia	**mg/l N**	56.09	104.8	8.4	76.78	22.51	93.57	11.54	12.19	2.9	49	140	130	100	110	130	30	33.1	36.2	126	131	135	82	78.9	67.8	69	71	75	134.96	132.65	102.3	130.2	122.4	109
Antimony	**µg/l**		<0.5				0.63				1				<1.0										<4									
Arsenic	**µg/l**		1.23				0.88				<1.0				2.4										2.96									
Barium	**µg/l**		393.3				707.7				330				410										385									675
Beryllium	**µg/l**		<0.5				<0.5				<1.0				<1.0																			
B.O.D.	**mg/l O2**	10.1	15.8	nm	18.5	15.4	16	17.8	<10	4.8	6	<20	26	20	14	17	<10	1.68	<1	7.22	6.55	2.8	<1	12.4		8.2	6.8	6.4	3	36	39	25	41	
Boron	**µg/l**		1858.9				1162.5				830				1500										893									1700
Cadmium	**µg/l**		<0.1				<0.1				0.06				0.03										<0.5									<0.5
Calcium	**mg/l Ca**		260.08				228.26				200				240																			
C.O.D.	**mg/l O2**	77	148	21	144	92	107	32	49	48	68	186	152	134	128	146	47	137	86.6	157	161	107	89	96		<25	<25	67	160	210	186	220	215	86
Chloride	**mg/l Cl**	78	114	11	79	39	85	50	76	26	65	132	167	111	124	148	100	52.8	64.5	126	128	150	110	105.4	98	85	59	73.7	150.1	150.2	111.2	138.2	135.2	103
Chromium	**µg/l**		2.7				6.6				4.8				12										6.41									6.97
Cobalt (µg/l)	**µg/l**		2.6				5				3.4				6.3																			
Conductivity	**µS/cm @ 25**	2110	2700	685	2320	1424	2660	1062	1212	936	1782	3300	3360	2720	3000	2290	1582	1900	2264	3250	3356	3390	2985	3011	2,670.00	1870	1560	2220	2960	3000	2965	2897	2952	2,830.00
Copper	**µg/l**		0.5				3.5				12				<1.0										24.6									<4
Cyanide	**mg/l CN**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05																	
D.O.	**% Saturation**																		-				-	-										
Fluoride	**mg/l**		0.15				<0.150				0.26				1.7										0.076									
Iron	**µg/l**		10759.3				178.8				160				20000										5.63									10.2
Lead	**µg/l**		<0.5				<0.5				<1.0				<1.0										7.7									<0.5
Magnesium	**mg/l Mg**		86.04				67.69				48				85										56.8									88.8
Manganese	**µg/l**		855.8				639.4				690				660										342									564
Mercury	**µg/l**		<0.05				<0.05				<0.050				<0.020																			0.0546
Molybdenum	**µg/l**		1.6				5.5				8.6				9.3										<9									
Nickel	**µg/l**		2.2				11.1				14				15										6.38									5.7
o-Phosphate	**mg/l P**	0.16	0.03	0.04	0.19	0.02	<0.02	<0.02	0.02	0.034	<0.010	0.098	<0.010	0.085	<0.010	0.019	0.08	<0.07	<0.07	0.08	<0.07	<0.02	<0.07	<0.07	<0.02	0.16	0.17	0.17	0.108	0.14	0.14	0.05	0.136	< 0.07
pH		6.9	7.1	7.2	6.8	6.8	6.9	7.2	7.2	7	6.9	6.8	6.9	6.9	6.7	6.9	7.1	7.2	7.1	6.94	6.92	6.96	7.1	7.1	7.15	7.1	7.21	7.04	7	7	7.1	7	7.1	7.03
Potassium	**mg/l**		92.07				63.17				45				83										58.7									90.6
Residue on Evaporation																																		
Sampling Depth (m)	**m**																																	
Selenium	**µg/l**		<0.5				<0.5				<1.0				<1.0										1.75									
Silver	**µg/l**		nm				nm																		<2									
Sodium	**mg/l**		124.94				90.9				64				110										100									105
Strontium	**µg/l**		1043.19				931.56				650				970										640									976
Sulphate	**mg/l SO4**		4.1				77.3				87				<10				-						18.2									45.3
Suspended Solids	**mg/l**																		-															
Temp	**°C**	10	10.7	17.9	13.0	8.1	11.9	11.3	12.6	7	9.3	14.2	13.6	8.6	11.2	12.2	12		14.2															
Thallium	**µg/l**		<0.1				<0.1				<1.0				<1.0																			
Time Sampled		11:25	10:45	10:35	11:00	09:55	11:00	12:25	10:40	11:25	10:50	10:40	10:45	10:35	12:40	10:20	15:30																	
Tin (µg/l)	**µg/l**		<1				nm																											
T.O.C.	**mg/l**																		-				0.68	0.56	2.2									
T.O.N	**mg/l N**	<0.08	0.3	0.13	0.98	0.11	0.3	7.32	4.08	0.73	<0.20	<0.20	<0.20		1.6	<0.20	8.3	1.64	<0.20	0.441	0.356					0.69	0.71	0.75	0.08	0.64	0.58	0.7	0.7	1.09
Total S Solids	**mg/l**																																	
Uranium	**µg/l**		0.1				0.46				<1.0				<1.0										<0.5									<0.5
Vanadium	**µg/l**		0.7				0.83				<1.0				1.3										<8									<8
Zinc	**µg/l**		23				110.6				44				18																			5.77

Dundalk Landfill Site

LEACHATE QUALITY

Monitoring Point: **LH4**

RESULTS

PARAMETERS	Units	Date																																				
		16-Jan-12	23-Apr-12	23-Jul-12	08-Oct-12	30-Jan-13	15-Apr-13	22-Jul-13	07-Oct-13	27-Jan-14	07-Apr-14	17-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	04-Nov-15	31-Mar-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	03-Jan-17	09-Feb-17	########	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17	
Alkalinity	**mg/l CaCO3**																																					
Aluminium	**µg/l**		9.5				8.3				<10.0				<10.0																			221		
Ammonia	**mg/l N**	1.64	1.63	154.03	114.18	121.22	106.56	132.12	117.27	300	200	190	180	190	150	120	140	123				115							476.48	464.48	396.5	398.1	394.2	126		
Antimony	**µg/l**		<0.5				<0.5				<1.0				<1.0																					
Arsenic	**µg/l**		2.6				0.71				1				1.8																					
Barium	**µg/l**		185.2				117.9				180				200																			313		
Beryllium	**µg/l**		<0.5				<0.5				<1.0				<1.0																					
B.O.D.	**mg/l O2**	44.4	71.1	1121	33.8	72.1	30.2	142.8	82	34	61	20	82	15	17	20	18	3.7				4.7							53	135	122	122	128			
Boron	**µg/l**		2319.3				1045.3				1900				1400																			1170		
Cadmium	**µg/l**		<0.1				<0.1				0.09				<0.020																			<0.5		
Calcium	**mg/l Ca**		194.66				135.03				170				180																					
C.O.D.	**mg/l O2**	249	265	2450	176	197	218	217	275	212	179	205	366	183	124	128	225	111				124							4080	2650	2136	2371	2542	119		
Chloride	**mg/l Cl**	181	185	34	132	129	95	130	234	235	207	170	204	195	132	128	138	124				115							66.8	50.36	41.2	49.6	49.5	111		
Chromium	**µg/l**		1.3				3.7				8.4				7.8																			6.64		
Cobalt (µg/l)	**µg/l**		4.6				3.2				4.4				3.7																					
Conductivity	**µS/cm @ 25**	3890	3570	1690	2790	2650	2350	2660	3310	3880	3830	3560	3620	3600	3070	3310	3000	3010				2660							3890	3790	3923	3650	2982	2,480.00		
Copper	**µg/l**		<0.5				4.8				13				<1.0																			9.79		
Cyanide	**mg/l CN**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05																				
D.O.	**% Saturation**																																				
Fluoride	**mg/l**		<0.150				<0.150				<0.150				1.5																					
Iron	**µg/l**		29832.9				2079.2				240				27000																			35.8		
Lead	**µg/l**		<0.5				<0.5				<1.0				<1.0																			3.1		
Magnesium	**mg/l Mg**		100.14				51.61				90				73																			64.8		
Manganese	**µg/l**		1060				1154.5				960				1300																			1030		
Mercury	**µg/l**		<0.05				<0.05				<0.050				<0.020																			0.106		
Molybdenum	**µg/l**		<0.5				<0.5				1.5				<1.0																					
Nickel	**µg/l**		3.8				4.6				8				9.6																			8.71		
o-Phosphate	**mg/l P**	1.24	0.57	<0.02	0.16	0.44	1.02	0.1	<0.02	0.52	0.37	<0.010	0.033	0.53	<0.010	<0.010	0.021	<0.07				<0.02							3.235	1.64	1.58	1.54	1.52	< 0.07		
pH		6.9	7	7.2	6.8	6.8	6.8	6.8	6.9	7	6.9	6.8	6.9	6.9	6.7	6.8	6.9	7.45				6.84							7.3	7.3	7.2	7.2	7.2	6.89		
Potassium	**mg/l**		157.91				75.82				140				100																			82.2		
Residue on Evaporation																																					
Sampling Depth (m)	**m**																																				
Selenium	**µg/l**		0.5				<0.5				<1.0				<1.0																					
Silver	**µg/l**		nm				nm																														
Strontium	**µg/l**		203.55				93.03				180				120																			93.3		
Sodium	**mg/l**		1101				749.32				900				1000																			926		
Sulphate	**mg/l SO4**		2.2				4.2				3.4				<10																			16.9		
Suspended Solids	**mg/l**																																				
Temp	**°C**	12.4	12.1	18.1	13.7	7.5	12.2	11.8	12.7	11.4	12	14.6	13.5	10.7	12.7	12.6	13.2																				
Thallium	**µg/l**		<0.1				<0.1				<1.0				<1.0																					
Time Sampled		12:15	11:10	11:45	11:25	10:30	11:35	10:45	10:55	12:50	11:30	11:35	11:10	11:40	12:50	10:55	15:50																				
Tin (µg/l)	**µg/l**		<1				nm																														
T.O.C.	**mg/l**																																				
T.O.N	**mg/l N**	<0.08	<0.08	<0.08	0.89	<0.08	0.55	0.18	<0.08	1	1.8	<0.20	<0.20		<0.20	<0.20	<0.20	<0.1											0.99	1.43	1.38	1.38	1.61	< 0.08		
Total S Solids	**mg/l**																																				
Uranium	**µg/l**		<0.1				0.1				<1.0				<1.0																			<0.5		
Vanadium	**µg/l**		2.51				1.12				<1.0				2																			<8		
Zinc	**µg/l**		13.8				71.4				37				4.9																			45.9		

Dundalk Landfill Site

LEACHATE QUALITY

Monitoring Point: **LH6**

RESULTS

PARAMETERS	Units	Date 16-Jan-12	23-Apr-12	23-Jul-12	08-Oct-12	30-Jan-13	15-Apr-13	22-Jul-13	07-Oct-13	27-Jan-14	07-Apr-14	14-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	04-Nov-15	31-Mar-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	03-Jan-17	09-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**																																
Aluminium	**µg/l**		17.5				6.7				<10.0				<10.0									<50									458
Ammonia	**mg/l N**	1.4	16.75	10.11	14.17	1.74	5.85	33.79	66.68	5.4	5.7	38	51	12	4.6	82	22	8.89	32.2	34.1	35.6	89.4	37.2	26.5	59.4	15.6	14.2	13.2	149.44	152.33	122.4	137	132.5	33.7
Antimony	**µg/l**		0.91				<0.5				<1.0				<1.0									<4									
Arsenic	**µg/l**		4.53				1.03				1.3				3.3									<2									
Barium	**µg/l**		103.4				50				98				90									371									296
Beryllium	**µg/l**		<0.5				<0.5				<1.0				<1.0																		
B.O.D.	**mg/l O2**	56.1	163.4	141.2	21.7	9	33.6	246.5	75	24	45	120	<100	66	170	120	110	33.6	71.2	>60.3	36	130	136.5	129.4		49.8	39.2	56.8	260	95	92	80	89	
Boron	**µg/l**		98.3				63.2				180				65									706									<135
Cadmium	**µg/l**		<0.1				<0.1				<0.020				<0.020									<0.5									<0.5
Calcium	**mg/l Ca**		257.21				91.45				140				170																		
C.O.D.	**mg/l O2**	557	757	819	255	58	92	1041	802	191	107	1150	640	1010	1200	568	740	536	623	1780	1680	287	3500	2875		311	271	278	4770	4520	3820	256	3892	706
Chloride	**mg/l Cl**	334	40	31	28	12	26	53	69	24	20	55	85	26	26	95	32	21	35.2	47.4	45.7	95.9	42.6	52.1	87.1	31.2	29.8	27.3	72.4	113.5	101.2	1.128	112.5	39
Chromium	**µg/l**		<0.5				<0.5				1.5				1.7									<3									<3
Cobalt (µg/l)	**µg/l**		1.9				1.5				1.6				1.7																		
Conductivity	**µS/cm @ 25**	5080	1657	1096	1681	427	729	1727	2040	913	886	2010	1985	1320	1215	2790	1745	978	1592	1980	2105	2300	1970	2105	1,930.00	1387	1211	1520	2710	2660	2560	2560	2531	1,450.00
Copper	**µg/l**		<0.5				1.1				12				<1.0									28.9									9.66
Cyanide	**mg/l CN**	<0.05	<0.05	nm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05																
D.O.	**% Saturation**																		-				-	-									
Fluoride	**mg/l**		<0.150				<0.150				0.19				<1									0.07									
Iron	**µg/l**		32084.8				2325.8				430				8100									11.6									45.6
Lead	**µg/l**		<0.5				<0.5				<1.0				<1.0									<0.5									3.42
Magnesium	**mg/l Mg**		41.08				11.59				23				24									49.3									36.6
Manganese	**µg/l**		4272.6				2015.8				1900				3300									277									5260
Mercury	**µg/l**		<0.05				<0.05				<0.050				<0.020																		0.167
Molybdenum	**µg/l**		<0.5				<0.5				<1.0				<1.0									<9									
Nickel	**µg/l**		1.8				2.8				3.7				1.8									3.53									7.59
o-Phosphate	**mg/l P**	0.96	<0.02	0.03	<0.02	0.06	0.09	nr	0.37	0.062	0.027	0.94	0.26	0.017	0.074	0.1	0.27	<0.07	<0.07	0.26	<0.07	0.0264	<0.07	<0.07	<0.02	<0.07	<0.07	< 0.07	5.15	10.144	9.82	9.8	5.1	< 0.07
pH		7	7.1	7	6.7	7.1	6.8	6.8	6.8	6.8	6.7	6.5	6.7	6.9	6.6	6.9	6.7	7.13	7.1	6.94	6.94	7.1	7.1	7.2	7.49	7.05	7.08	6.88	6.7	7	7.1	7.1	7.2	6.67
Potassium	**mg/l**		17.36				6.7				16				9.4									50									10.5
Residue on Evaporation																																	
Sampling Depth (m)	**m**																																
Selenium	**µg/l**		0.6				<0.5				<1.0				<1.0									<1									
Silver	**µg/l**		nm				nm																	<2									
Strontium	**µg/l**		101.34				27.96				41				50									97.8									51.8
Sodium	**mg/l**		653.49				245.66				400				450									545									613
Sulphate	**mg/l SO4**		4.5				5.2				11.2				<10				-					16.3									38.1
Suspended Solids	**mg/l**																		-														
Temp	**°C**	16	12.2	18	14.7	6.9	10.1	11.6	14.2	8.2	10.6	15.1	13.5	9.6	11.9	13.4	13.2		16.5														
Thallium	**µg/l**		<0.1				<0.1				<1.0				<1.0																		
Time Sampled		12:45	11:30	12:10	11:50	10:50	11:55	11:30	11:20	12:15	11:55	11:05	11:30	12:15	13:05	11:15	16:10																
Tin (µg/l)	**µg/l**		<1				nm																										
T.O.C.	**mg/l**																		-				<0.1	<0.1	3.16								
T.O.N	**mg/l N**	<0.08	<0.08	<0.08	<0.08	0.08	<0.08	<0.08	<0.08	<0.20	<0.20	<0.20	<0.20		<0.20	<0.20	<0.20	0.325	<0.1	<0.1	<0.1					1.28	1.31	1.47	8.67	3.09	2.62	2.1	2.5	< 0.08
Total S Solids	**mg/l**																																
Uranium	**µg/l**		1.38				0.3				<1.0				<1.0									<0.5									<0.5
Vanadium	**µg/l**		3.56				0.82				<1.0				<1.0									<8									<8
Zinc	**µg/l**		3.1				31.8				43				4.8																		

Appendix E
Groundwater Results

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM1

PARAMETERS	Units	10-Jun-13	22-Jul-13	06-Aug-13	16-Sep-13	07-Oct-13	18-Nov-13	02-Dec-13	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20/01/2015	23/02/2015	09/03/2015	13/04/2015	18/05/2015	15/06/2015	21-Jul-15	10-Aug-15	7-Sep-15	4-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**											428												447																												368
Aluminium	**µg/l**											<10.0												<10.0																				<50									118
Ammonia	**mg/l N**	<0.03	<0.03	0.06	0.09	0.13	0.3	0.15	0.057	0.038	0.081	<0.020	0.045	0.067	0.26	0.026	0.24	5.5	1.8	1.3	0.031	0.081	0.052	0.23	0.92	0.66	2.5	0.13	0.65	0.67	0.12	0.28	<0.2	<0.11	0.16	0.18	<0.11	<0.11	1.34	1.29	1.29	<0.11	0.11	<0.2	<0.11	<0.11	<0.11	<0.1	<0.1	<0.1	<0.1	<0.1	< 0.11
Antimony	**µg/l**											<1.0												<1.0																													
Arsenic	**µg/l**											<1.0												<1.0																													
Barium	**µg/l**											90												92																													13.3
Beryllium	**µg/l**											<1.0												<1.0																													
B.O.D.	**mg/l O2**																																					-	-															
Boron	**µg/l**											400												410																				<135									<135
Cadmium	**µg/l**											<0.020												<0.020																				<0.5									<0.5
Calcium	**mg/l Ca**											110												110																				74.5									
C.O.D.	**mg/l O2**											-												-														-	-				-									
Chloride	**mg/l Cl**	459	475	434	417	433	418	401	432	441	440	440	438	421	391	408	413	411	466	394	402	432	435	432	419	366	377	399	425	369	395	417	375	459	451	451	454	427	197	211	230	462	396	128	125	122	166.00	178.7	178.6	125.6	152.4	181.2	42
Chromium	**µg/l**											<1.0												<1.0																				<3									<3
Cobalt	**µg/l**											<1.0												<1.0																													
Conductivity	**µS/cm @ 25**	2700	2700	2630	2590	2590	2560	2480	2590	2700	2630	2690	2680	2650	2840	2660	2630	2670	2530	3010	2490	2680	2720	2710	2660	2620	2560	2530	2530	2430	2520	2360	2700	2960	2890	2920	2580	2510	1530	1555	1800	2480	2134	1,110.00	1120	1210	1360.00	952	1271	1178	1193	1328	870
Copper	**µg/l**											<1.0												<1.0																				10.2									7.07
Cyanide	**mg/l CN**											<0.05												<0.05																													<0.05
D.O.	**% Saturation**		17			31			43			26			31			25			37	nm		19			16			18					5.78	5.64	6.66	18	31	34	26	7.2	7.2		32	23	21.00	23	32	28	30	25	28
Fluoride	**mg/l**											0.26												<0.20																				0.437									0.329
Iron	**µg/l**											<10.0												<10.0																				1.1									1.48
Lead	**µg/l**											<1.0												<1.0																				<0.5									6.81
Magnesium	**mg/l Mg**											54												54																				16.1									8.18
Manganese	**µg/l**											<5.0												<5.0																													268
Mercury	**µg/l**											<0.050												<0.020																				<0.02									0.023
Molybdenum	**µg/l**											2.3												2																													
Nickel	**µg/l**											<1.0												<1.0																				18									21.9
o-Phosphate	**mg/l P**											0.012												0.058														-	-					0.0313									0.14
pH			7.4			7.4			7.9			7.5			7.5			7.4			7.6	7.5		7.3			7.4			7.5					7.44	7.3	7.47	7.39	7.52	7.51	7.31	7.36	7.2	7.53	7.81	8	7.74	7.6	7.5	7.5	7.5	7.5	7.14
Potassium	**mg/l**											21												21																				24.8									19.1
Residue on Evaporation	**mg/l**											1476												1640																													
Sampling Depth	**m**	3.1	2.9	2.9	3.1	2.9	2.9	nm	2.6	2.7	2.6	2.7	2.5	2.9	nm	2.5	3	2.9	2.3	2.8	2.6			2.8	2.6	3	2.5	2.6	2.2	2.6	2.5	1.9																											
Selenium	**µg/l**											<1.0												<1.0																													
Silver	**µg/l**																																																							
Sodium	**mg/l**											420												410																				141									60.5
Strontium	**µg/l**											520												560																				274									197
Sulphate	**mg/l SO4**											298.8												<0.1														-	-					117									104
Suspended Solids	**mg/l**																							386																				< 3									481
Temp	**°C**		16.8			14.8			9.5			10.7			14.9			13			6.1	nm		9.6			16.1			12.3								21.5	17.6	12.93	13.1	12.7	12.8	12.7	°C	12	12	12.20	12.1	12.5	12.2	12.1	12	12
Thallium	**µg/l**											<1.0												<1.0																													
Time Sampled		09:50	10:10	13:10	10:05	11:00	11:50	10:15	11:10	9:20	10:45	10:50	09:20	12:20	11:30	11:55	12:25	11:05	11:55	10:25	10:15	11:00	10:30	10:15	09:20	10:45	11:15	11:45	12:15	11:35	11:25	10:25																						
Tin	**µg/l**																																																						
T.O.C.	**mg/l**		2.7			3.1			3.4			3.1			5.5			9.7			4.9	2.8		3.8			nm			19.9					<1	<1	3.77	4.26	16.9	15.4	21.8	3.81	2.82	28.7	22.10	21	27.20	18.69	18.67	15.8	16.8	19.2	18.7
T.O.N	**mg/l N**											1.2												0.96														-	-					1.99									1.5
Total S Solids	**mg/l**																																											700									
Uranium	**µg/l**											1.5												1.6																				4.01									5.87
Vanadium	**µg/l**											<1.0												<1.0																				<8									13.3
Zinc	**µg/l**											<1.0												2																				8.22									8.29
Water Level m OD	**4.77**	1.67	1.87	1.87	1.67	1.87	1.87		2.17	2.07	2.17	2.07	2.27	1.87	nm	2.27	1.77	1.87	2.47	1.97	2.17			1.97	2.17	1.77	2.27	2.17	2.57	2.17	2.27	2.87																											

Dissolved oxygen (DO) was measured in mg/l from March to June 2016. DO was measured in % on site from July 2016.

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM4

PARAMETERS	Units	10-Jun-13	22-Jul-13	06-Aug-13	16-Sep-13	07/10/2013	18/11/2013	02/12/2013	27/01/2014	17/02/2014	10/03/2014	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20/01/2015	23/02/2015	09/03/2015	13/04/2015	18/05/2015	15/06/2015	21-Jul-15	10-Aug-15	7-Sep-15	4-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	25-Oct-16	29-Nov-16	20/12/2016	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**											787												925																													
Aluminium	**µg/l**											<10.0												10																													
Ammonia	**mg/l N**	28.27	32.37	44.15	16.68	45.45	40	38	27	40	30	40	28	25	18	39	44	17	32	33	31	43	37	37									13.7																				
Antimony	**µg/l**											<1.0												<1.0																													
Arsenic	**µg/l**											<1.0												1.3																													
Barium	**µg/l**											27												26																													
Beryllium	**µg/l**											<1.0												<1.0																													
B.O.D.	**mg/l O2**																																																				
Boron	**µg/l**											1800												1450																													
Cadmium	**µg/l**											<0.020												<0.020																													
Calcium	**mg/l Ca**											200												190																													
C.O.D.	**mg/l O2**																																																				
Chloride	**mg/l Cl**	3027	3872	3370	5664	3705	4490	5020	4080	3530	3210	3220	3190	3410	4340	3810	3500	6490	2260	3720	3160	3250	3090	2970									3100																				
Chromium	**µg/l**											3.5												3.8																													
Cobalt	**µg/l**											2												2.2																													
Conductivity	**µS/cm @ 25**	10710	12460	11350	18430	12410	14640	11600	12680	11500	11260	11040	10800	11450	15590	11600	11380	19770	16340	12520	11210	11040	10770	10600									10600																				
Copper	**µg/l**											<1.0												<1.0																													
Cyanide	**mg/l CN**											<0.05												<0.05																													
D.O.	**% Saturation**		17			18			17			24			25			21			28	nm		20																													
Fluoride	**mg/l**											0.22												1.1																													
Iron	**µg/l**											53												1400																													
Lead	**µg/l**											<1.0												<1.0																													
Magnesium	**mg/l Mg**											270												230																													
Manganese	**µg/l**											1000												810																													
Mercury	**µg/l**											<0.050												<0.020																													
Molybdenum	**µg/l**											2.3												1.2																													
Nickel	**µg/l**											2.5												2.7																													
o-Phosphate	**mg/l P**											0.51												0.55																													
pH			7			7.1			7.2			7.1			7.1			7.1			7	7.1		7																													
Potassium	**mg/l**											140												120																													
Residue on Evaporation	**mg/l**											6936												6755																													
Sampling Depth	**m**	4.4	3.8	3.9	4	4.4	4	4.1	3.9	4	4	4.6	4.6	4.7	nm	4.1	3.8	4.7	4.2	4.2	4	4.1	nm	4.6																													
Selenium	**µg/l**											<1.0												<1.0																													
Silver	**µg/l**																																																			
Sodium	**mg/l**											2100												1700																													
Strontium	**µg/l**											1600												1700																													
Sulphate	**mg/l SO4**											31.1												<0.1																													
Suspended Solids	**mg/l**																							389																													
Temp	**°C**		16.6			14.5			9.7			10.9			14.9			13			7	nm		11.3																													
Thallium	**µg/l**											<1.0												<1.0																													
Time Sampled		10:55	12:15	14:35	14:00	11:20	12:35	13:10	12:00	10:50	13:20	09:10	12:20	12:30	13:10	14:10	13:15	12:30	12:05	12:50	11:55	12:50	nt	12:15																													
Tin	**µg/l**																																																			
T.O.C	**mg/l**		19.8			21.9			16.4			49.8			14.3			13.1			21.3	26.6		25.9																													
T.O.N	**mg/l N**											3.1												20																													
Total S Solids	**mg/l**																																																			
Uranium	**µg/l**											<1.0												<1.0																													
Vanadium	**µg/l**											<1.0												<1.0																													
Zinc	**µg/l**											1.4												3.6																													
Water Level m OD	**5.12**	0.72	1.32	1.22	1.12	0.72	1.12	1.02	1.22	1.12	1.12	0.52	0.52	0.42		1.02	1.52	0.42	0.92	0.92	1.12			0.52																													

Dissolved oxygen (DO) was measured in mg/l from March to June 2016. DO was measured in % on site from July 2016.

Dundalk Landfill Site

GROUNDWATER QUALITY

WM5

Monitoring Point:

PARAMETERS	Units	10-Jun-13	22-Jul-13	06-Aug-13	16-Sep-13	07/10/2013	18/11/2013	02/12/2013	27/01/2014	17/02/2014	10/03/2014	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20/01/2015	23/02/2015	09/03/2015	13/04/2015	18/05/2015	15/06/2015	21-Jul-15	10-Aug-15	7-Sep-15	6-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	mg/l CaCO3											685												983																														1,240.00
Aluminium	µg/l											<10.0												<10.0																														685
Ammonia	mg/l N	28.23	22.67	26.04	26.67	39.61	50	43	81	29	20	46	110	73	240	44	99	52	76	64	64	53	55	59	58	46	98	78	89	89	75	86	69.9	39.4	59.6	49.40	84.2	70.2	29.1	31.6	61.7	66.8	65.3	19.3	98.2	98.2	134	98.91	116.1	98.5	90.2	115.4	110
Antimony	µg/l											<1.0												<1.0																														
Arsenic	µg/l											<1.0												<1.0																														
Barium	µg/l											150												190																														157
Beryllium	µg/l											<1.0												<1.0																														
B.O.D.	mg/l O2																																				-	-																	
Boron	µg/l											1100												1300																							676								1440
Cadmium	µg/l											<0.020												0.02																							<0.5								<0.5
Calcium	mg/l Ca											150												160																							88.6								
C.O.D.	mg/l O2																																				-	-																	
Chloride	mg/l Cl	365	481	595	778	1190	1190	1320	285	142	141	175	319	322	382	639	1070	1140	456	236	225	205	183	193	110	126	277	272	500	804	895	186	98.6	92.2	102	89.40	153	129	522	456	304	154	161	718	681	711	894	1268.8	1338	1223	1235	1267.1	796
Chromium	µg/l											2.4												3.8																							<3								6.72
Cobalt	µg/l											1.8												2.2																														
Conductivity	uS/cm @ 25	3240	3880	4380	5250	6240	5780	6250	2720	8030	2160	2420	3490	3460	4080	4940	6080	6550	3260	2900	2890	2870	2620	2800	2240	2500	3570	3500	4140	5360	5540	2320	2280	2200	2470	2410.00	2250	2620	3240	3520	3710	2250	2280	3,640.00	3280	3214	5450	5280	6410	5820	6212	6325	5,170.00
Copper	µg/l											<1.0												<1.0																							20.3								5.51
Cyanide	mg/l CN											<0.05												<0.05																							-								<0.05
D.O.	% Saturation		12			16			10			13			24			17			11			18			35			10					2.26	2.77	5.38	7.2	17	18	17	4.9	5.36		24	25	15	22	26	22	20	22	28
Fluoride	mg/l											0.19												1.4																							0.208								0.13
Iron	µg/l											41												249																							3.42								6.9
Lead	µg/l											<1.0												<1.0																							4.19								2.84
Magnesium	mg/l Mg											80												89																							80.2								134
Manganese	µg/l											250												320																														1195
Mercury	µg/l											<0.050												<0.020																							<0.02								0.0277
Molybdenum	µg/l											<1.0												<1.0																														
Nickel	µg/l											1.9												3.3																							19.5								12.5
o-Phosphate	mg/l P											0.037												0.031														-	-								<0.02								< 0.07
pH			7.1			7.1			7			7			7			7			6.9			6.9			6.9			6.9					6.91	6.90	6.99	6.96	7.23	7.11	6.89	7.1	7.1	7.25	6.9	7.12	6.8	7	7	7.1	7	7.1	6.65
Potassium	mg/l											65												74																							52.6								98.6
Residue on Evaporation	mg/l											1543												1775																														
Sampling Depth	m	4.5	3.7	4.1	4.5	5.1	4	4.2	4.8	3.9	4.2	5.2	5	5.3	nm	4.3	3.8	5.3	4.9	4.6	5.1	4.7	4	5.2	4	5.3	4	5	4.3	3.3	3.1	3.2																					
Selenium	µg/l											<1.0												<1.0																														
Silver	µg/l											-												-																														
Sodium	mg/l											180												179																							477								469
Strontium	µg/l											730												910																							642								2260
Sulphate	mg/l SO4											15.2												<0.1														-	-								110								< 5
Suspended Solids	mg/l																							5																							6								2,670.00
Temp	°C		16.2			14.9			10.2			12.5			15.1			13			7.7			11.3			12.8			12.9							21.5	18.4	13.98	12.9	13.16	12.9	13.1		12.4	12.6	12.6	12.7	12.6	12.5	12.1	12.3	12.1
Thallium	µg/l											<1.0												<1.0																														
Time Sampled		12:35	11:25	12:00	12:00	12:10	11:25	13:55	12:15	12:40	12:40	11:10	11:50	11:30	12:20	13:05	12:00	11:45	11:05	10:35	12:50	11:40	11:15	10:55	08:55	13:40	12:30	12:55	10:55	14:20	13:20	11:50																					
Tin	µg/l																																																						
T.O.C.	mg/l		22.1			20.5			17.3			16.1			67.6			20.2			36.5			28.6			nm			22.6					8.26	9.53	17.7	16.2	14.1	10.2	28.6	14.5	15.2	18.8	25.7	25.7	34.2	23.23	20.54	22.6	10.56	21.1	12.5
T.O.N	mg/l N											72												79														-	-								0.678								73
Total S Solids	mg/l																																														1950								
Uranium	µg/l											<1.0												<1.0																							1.65								1.18
Vanadium	µg/l											<1.0												<1.0																							<8								<8
Zinc	µg/l											2.7												5.7																							55.9								28.5
Water Level m OD	m AT	1.07	1.87	1.47	1.07	0.47	1.57	1.37	0.77	1.87	1.37	0.37	0.57	0.27		1.27	1.77	0.27	0.67	0.97	0.47			0.37	1.57	0.27	1.57	0.57	1.27																									

Dissolved oxygen (DO) was measured in mg/l from March to June 2016. DO was measured in % on site from July 2016.

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM6

PARAMETERS	Units	10-Jun-13	22-Jul-13	05-Aug-13	16-Sep-13	########	18/11/2013	02/12/2013	########	########	########	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20/01/2015	23/02/2015	09/03/2015	13/04/2015	18/05/2015	15/06/2015	21-Jul-15	10-Aug-15	7-Sep-15	4-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-16	9-Feb-16	16-Mar-16	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**											907												1013																													718
Aluminium	**µg/l**											<10.0												<10.0																						<50									<50
Ammonia	**mg/l N**	75.83	97.43	86.81	80.68	28.99	75	92	62	50	46	58	54	47	43	33	32	36	27	26	32	53	64	51	48	40	47	48	67	65	61	60	64.4	61.5	51.8	51.70	44.3	52.5	41.8	42.1	31.4	41.2	42.3	48.6	62.5	68.7	50.4	26.43	38.55	41.2	32.5	26.5	33
Antimony	**µg/l**											<1.0												<1.0																													
Arsenic	**µg/l**											3.9												27																													
Barium	**µg/l**											130												160																													542
Beryllium	**µg/l**											<1.0												<1.0																													
B.O.D.	**mg/l O2**											-												-													-	-															
Boron	**µg/l**											1400												1300																						1040									1610
Cadmium	**µg/l**											<0.020												0.03																						<0.5									<0.5
Calcium	**mg/l Ca**											140												140																						156									
C.O.D.	**mg/l O2**																																				-	-															
Chloride	**mg/l Cl**	357	221	268	252	2271	301	283	301	304	305	252	236	244	240	238	207	281	342	307	79	252	230	220	215	211	204	199	231	247	270	282	221	204	187	189.00	211	198	247	198	243	216	228	275	292	322	325	303.4	304.8	268.2	256.8	289.2	334
Chromium	**µg/l**											4												5.3																						<3									8.23
Cobalt	**µg/l**											2.2												2.4																													
Conductivity	**µS/cm @ 25**	3140	2930	3000	2900	8530	2940	2870	2770	2840	2710	2600	2530	2460	2420	2360	2320	2470	2500	2450	1828	2420	2530	2480	2350	2250	2380	2320	2630	2700	2710	2400	2460	2440	2250	2270.00	3100	2370	2390	2147	2380	2980	2880	2,530.00	2894	1975	2650	1494	2250	1925	1860	2148	2,500.00
Copper	**µg/l**											4.4												2																						<4									<4
Cyanide	**mg/l CN**											<0.05												<0.05																													<0.05
D.O.	**% Saturation**		12			17			10			15			20			13			17			12			19			14					5.01	4.96	7.68	6.82	20	21	28	7.52	6.5		25	20	19	20	25	20	25	22	24
Fluoride	**mg/l**											0.29												1.1																						0.221									0.241
Iron	**µg/l**											260												7200																						4.95									8.98
Lead	**µg/l**											<1.0												<1.0																						<0.5									<0.5
Magnesium	**mg/l Mg**											68												64																						67.9									58.6
Manganese	**µg/l**											120												390																						941									941
Mercury	**µg/l**											<0.050												<0.020																						0.0288									0.0496
Molybdenum	**µg/l**											1.2												1.4																													
Nickel	**µg/l**											4.7												3.9																						5.98									10.8
o-Phosphate	**mg/l P**											0.021												0.083														-	-							<0.02									< 0.07
pH			7			7.2			7.1			7.2			7.3			7.1			6.9			7.2			7.1			7.1					7.32	7.23	7.6	7.52	7.13	7.15	7.3	7.1	7.1	7.27	7.2	7.12	7.17	7.4	7.2	7.1	7.1	7.1	7.26
Potassium	**mg/l**											90												85																						88.7									74
Residue on Evaporation	**mg/l**											1353												1322																													
Sampling Depth	**m**	4.8	4.4	4.5	4.8	4.7	4.2	4.6	4.4	4.2	4.5	4.7	4.8	4.9	nm	4.7	4.3	5	4.2	4.6	4.5	4.2	4.7	4.8	4.1	5.1	4.2	4.9	4.6	3.9	3.5	3.8																					
Selenium	**µg/l**											<1.0												<1.0																													
Silver	**µg/l**																																																						
Sodium	**mg/l**											220												200																						218									220
Strontium	**µg/l**											720												750																						759									1330
Sulphate	**mg/l SO4**											6.1																										-	-							17.9									9.03
Suspended Solids	**mg/l**																							3														-	-							5									1,370.00
Temp	**°C**		15.4			14.7			10.4			11.3			14.7			13.5			7.8			11.5			13.5			12.8							21.4	16.8	16.58	13.9	13.1	12.6	12.5		12.7	12.8	13.2	12.9	13.1	12.9	12.8	12.9	12.9
Thallium	**µg/l**											<1.0												<1.0																													
Time Sampled		13:10	12:50	11:15	12:15	11:40	12:50	11:20	11:55	13:30	12:20	11:30	10:50	11:10	11:50	12:25	10:55	11:20	10:40	11:10	12:25	11:20	10:50	10:05	07:20	12:10	11:55	12:15	11:40	13:30	12:45	11:30																					
Tin	**µg/l**																																																					
T.O.C	**mg/l**		>100			14.4			47.8			38.3			41.4			22.5			22.2			24.7			nm			21.3					11.2	14.5	18.9	19.3	19.2	17.6	25.3	17.5	16.2	26.5	21.5	19.8	26.2	15.54	16.48	15.8	12.5	15.4	20.8
T.O.N	**mg/l N**											12												13														-	-							4.09									28.8
Total S Solids	**mg/l**																																													1380									
Uranium	**µg/l**											<1.0												<1.0																						<0.5									<0.5
Vanadium	**µg/l**											<1.0												1.7																						<8									<8
Zinc	**µg/l**											4.4												4.6																						4.57									3.62
Water Level m OD	**5.87**	1.07	1.47	1.37	1.07	1.17	1.67	1.27	1.47	1.67	1.37	1.17	1.07	0.97		1.17	1.57	0.87	1.67	1.27	1.37			1.07	1.77	0.77	1.67	0.97	1.27	1.97	2.37	2.07																					

Dissolved oxygen (DO) was measured in mg/l from March to June 2016. DO was measured in % on site from July 2016.

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM8

PARAMETERS	Units	19-Jun-13	22-Jul-13	06-Aug-13	16-Sep-13	07/10/2013	18/11/2013	02/12/2013	27/01/2014	17/02/2014	10/03/2014	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20/01/2015	23/02/2015	09/03/2015	13/04/2015	18/05/2015	15/06/2015	21-Jul-15	10-Aug-15	7-Sep-15	4-Nov-15	16-Nov-15	14-Dec-15	26-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	25-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**											1050												1190																														1,210.00
Aluminium	**µg/l**											<10.0												<10.0																														<50
Ammonia	**mg/l N**	86.17	113.02	153.87	108.83	124.71	95	140	80	53	47	74	96	89	400	110	98	100	30	70	74	78	79	61	66	75	98	150	92	82	49	39	51.4	62.6	83	80.40	94.8	76.5	97.9	87.1	107	78.2	75.2	105	85.6	79.8	83.7	98.77	104.54	99.5	101.2	102.6	73.6
Antimony	**µg/l**											<1.0												<1.0																														
Arsenic	**µg/l**											1.1												1.8																														
Barium	**µg/l**											530												200																														158
Beryllium	**µg/l**											<1.0												<1.0																														
B.O.D.	**mg/l O2**											-												-													-	-															
Boron	**µg/l**											1400												1100																						1410								1180
Cadmium	**µg/l**											<0.020												<0.020																						<0.5								<0.5
Calcium	**mg/l Ca**											220												210																						355								
C.O.D.	**mg/l O2**																																				-	-															
Chloride	**mg/l Cl**	90	158	536	5557	3287	98	101	139	304	110	93	91	86	92	198	3280	1350	250	165	103	88	97	87	97	94	107	210	228	146	171	116	102	85.1	85.6	88.80	85.7	91.2	93.9	87.2	109	79.6	80.6	446	82.3	73.9	105	101.9	107	98.5	92.5	123.5	115
Chromium	**µg/l**											3.3												6.2																						<3								5.24
Cobalt	**µg/l**											3.3												3.2																														
Conductivity	**µScm @ 25**	2400	2980	4430	18540	11800	2760	2560	2550	2740	2410	2400	2450	2440	2520	2930	11160	6360	2230	2500	2220	2170	2300	2230	2150	2230	2670	2880	2820	2610	2410	1904	2130	2200	2280	2370.00	2520	2230	2610	2280	2710	2420	2510	3,740.00	3100	2560	2580	1760	2420	2268	1892	1980	2,530.00
Copper	**µg/l**											15												<1.0																						24.2									<4
Cyanide	**mg/l CN**											<0.05												<0.05																														<0.05
D.O.	**% Saturation**		<10			15			14			17			13			<10			16			10			13			15					1.33	1.62	1.52	1.82	18	19	21	5.8	6.2	22	24	20	20	25	20	23	26	26
Fluoride	**mg/l**											<0.150												1.8																						0.057									0.065
Iron	**µg/l**											15000												40000																						46.8									0.513
Lead	**µg/l**											<1.0												<1.0																						22.7									<0.5
Magnesium	**mg/l Mg**											53												48																						97.7									58.5
Manganese	**µg/l**											2300												2400																														152
Mercury	**µg/l**											<0.050												<0.020																						<0.02									<0.02
Molybdenum	**µg/l**											<1.0												<1.0																														
Nickel	**µg/l**											10												7.2																						52.8									5.67
o-Phosphate	**mg/l P**											<0.010												<0.010														-	-						<0.02									0.15
pH			6.7			6.8			7			6.6			6.6			6.7			6.7			6.6			6.7			6.7					6.67	6.63	6.57	6.63	6.61	7.02	6.71	7.2	7.02	6.74	7.01	7.11	6.72	6.7	6.7	7	7	7.1	6.63
Potassium	**mg/l**											54												45																						98									54.5
Residue on Evaporation	**mg/l**											1236												1096																														
Sampling Depth	**m**	3.1	3.6	3.9	4.1	4.1	4.4	3	2.7	2.8	3.8	2.7	2.3	3.2	nm	3.2	4.1	3.7	2.7	2.8	3.1	2.2	2.3	3.3	4.3	3.7	3.8	3.2	3.9	2.8	2.6	2.7																					
Selenium	**µg/l**											<1.0												<1.0																														
Silver	**µg/l**																																																													
Sodium	**mg/l**											92												76																						300									97.4
Strontium	**µg/l**											740												780																						1330									731
Sulphate	**mg/l SO4**											14.3																										-	-								51.8									37.9
Suspended Solids	**mg/l**																							2																						125									1,230.00
Temp	**°C**		16.1			14.9			11.4			12.1			15			14			7.2			12.6			12.8			14.5							21.7	14.5	16.34	14.6	14.6	12.5	12.5		12.2	12.4	12.3	12.3	12.8	12.3	12.3	12	11.7
Thallium	**µg/l**											<1.0												<1.0																														
Time Sampled		11:45	12:50	12:45	12:40	12:35	13:50	12:50	12:30	11:55	13:05	11:45	12:50	12:00	12:55	13:45	12:50	12:15	11:45	11:20	13:25	12:30	11:50	12:05	08:25	12:30	13:20	13:25	10:00	14:55	13:50	12:45																					
Tin	**µg/l**																																																												
T.O.C.	**mg/l**		>100			29.1			83.8			122.6			49.2			31			30			31.2			nm			25					11.9	8.29	25.8	22.3	29	22.9	29.3	19.8	21.9	42.8	28.1	26.2	37.6	28.3	37.54	31.7	25.8	38.2	16.1
T.O.N	**mg/l N**											1.4												0.4														-	-						0.849									2.92
Total S Solids	**mg/l**																																													1950									
Uranium	**µg/l**											<1.0												<1.0																						<0.5									<0.5
Vanadium	**µg/l**											<1.0												2																						<8									<8
Zinc	**µg/l**											180												12																						291									27.2
Water Level m OD	**5.15**	2.05	1.55	1.25	1.05	1.05	0.75	2.15	2.45	2.35	1.35	2.45	2.85	1.95		1.95	1.05	1.45	2.45	2.35	2.05			1.85	0.85	1.45	1.35	1.95	1.25																										

Dissolved oxygen (DO) was measured in mg/l from March to June 2016. DO was measured in % on site from July 2016.

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM9

PARAMETERS	Units	10-Jun-13	22-Jul-13	06-Aug-13	16-Sep-13	07/10/2013	18/11/2013	02/12/2013	27/01/2014	17/02/2014	10/03/2014	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	29/01/2015	23/02/2015	09/03/2015	13/04/2015	18/05/2015	15/06/2015	21-Jul-15	10-Aug-15	7-Sep-15	4-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	mg/l CaCO3											813												831																													
Aluminium	µg/l											<10.0												<10.0																					<50									257
Ammonia	mg/l N	107.26	74.76	49.57	35.88	41.51	58	170	15	27	36	46		56	220	53	53	31	5	33	67	32	29	24	26	29	34	22	14	18	13	8.5	45	35.1	30	30.50	27.2	28.2				25.4	31.5	26.1	93.9	45.8	39.8	35.2	33.41	38.52	32.6	39.5	35.8	37.5
Antimony	µg/l											<1.0												<1.0																													
Arsenic	µg/l											1.1												<1.0																													
Barium	µg/l											520												98																													
Beryllium	µg/l											<1.0												<1.0																													
B.O.D.	mg/l O2											-												-													-	-															
Boron	µg/l											780												940																					1230									1530
Cadmium	µg/l											0.02												0.04																					<0.5									<0.5
Calcium	mg/l Ca											240												140																					390									
C.O.D.	mg/l O2																																				-	-															
Chloride	mg/l Cl	374	552	660	733	720	93	113	50	142	157	78		606	597	692	727	739	80	75	249	410	182	426	570	584	672	708	791	757	750	714	108	99.8	109	111.00	326	227				654	285	295	985	295	306	1830	707.4	712.6	654.2	811.2	687.2	731
Chromium	µg/l											2.7												2.9																					<3									<3
Cobalt	µg/l											2.4												3.6																													
Conductivity	µS/cm @ 25	3600	3700	3800	3840	3770	2270	2750	1591	1945	2280	1953		3680	3820	3880	3850	3770	1427	1871	2490	2850	2200	2850	3250	3420	3690	3580	3510	3640	3580	2990	2160	2080	2030	2040.00	2590	2310				3620	1988	2120	6,170.00	3490	2980	7390	3490	3470	2985	3218	2985	3,760.00
Copper	µg/l											23												8.8																					<4									9.99
Cyanide	mg/l CN											<0.05												<0.05																													<0.05
D.O.	% Saturation		<10			13			19			19			19			17			10			24			23			20					4.74	4.18	3.59	8.65	21	22	20	4.2	3.51		19	16	23	25	22	31	22	24	22
Fluoride	mg/l											0.18												0.69																					0.097									0.211
Iron	µg/l											1300												54																					2.26									39.9
Lead	µg/l											<1.0												<1.0																					<0.5									7.75
Magnesium	mg/l Mg											57												75																					203									93.2
Manganese	µg/l											1800												370																													2800
Mercury	µg/l											<0.050												<0.020																					0.198									0.124
Molybdenum	µg/l											<1.0												1.9																													
Nickel	µg/l											3.8												11																					11.5									14.9
o-Phosphate	mg/l P											0.15												0.018														-	-					<0.02									< 0.07
pH			7.2			7.6			6.7			6.8			7.1			7.2			7.1			7.2			7.1			7.3					7.08	7.17	7.28	7.16			7.14	7.2	7.31	6.96	7.1	7.14	7.1	7.2	7.2	7.2	7.2	7.2	6.94
Potassium	mg/l											42												55																					154									57.5
Residue on Evaporation	mg/l											1158												1673																													
Sampling Depth	m	4.4	4.2	4.6	4.5	4.2	4.2	3.9	4	3.9	4.1	5		5	nm	4	3.7	4.8	4.3	4.4	4.2	4.3	4.5	4.6	4.1	4.9	4.5	4.8	4.1	5.3	4.9	5.1																					
Selenium	µg/l											<1.0												<1.0																													
Silver	µg/l																																																						
Sodium	mg/l											75												290																					708									475
Strontium	µg/l											740												790																					2170									1090
Sulphate	mg/l SO4											99.9																									-	-						20.1									98.5
Suspended Solids	mg/l																							74																					12									1,960.00
Temp	°C		16.7			15.3			11.3			12.9			15.6			14			8.3			13			14.6			14.5							21.8	16.2	15.26	12.8	13.2	12.8	13.2		12.1	12.3	12.1	12.3	12.9	12.6	12.2	11.9	11.8
Thallium	µg/l											<1.0												<1.0																													
Time Sampled		12:10	13:15	12:20	13:00	12:25	13:25	12:25	12:20	12:15	12:55	12:15		11:50	12:35	13:20	12:30	12:00	11:25	11:50	13:10	12:15	11:30	11:35	08:05	14:10	13:00	13:15	10:30	14:40	13:20	12:30																					
Tin	µg/l																																																					
T.O.C.	mg/l		63.6			14.6			12.8			58.9			48.6			12.2			26.3			18.1			nm			14.7					7.33	6.07	14.4	14.2			25.1	12.4	13.6	27.7	18.7	18.7	20.9	10.69	11.02	9.8	10.2	10.2	21.6
T.O.N	mg/l N											<0.20												12														-	-					4.41									0.22
Total S Solids	mg/l																																											4070									
Uranium	µg/l											<1.0												<1.0																					<0.5									<0.5
Vanadium	µg/l											<1.0												<1.0																					<8									<8
Zinc	µg/l											49												17																					4.84									38.6
Water Level m OD		5.78	1.38	1.58	1.18	1.28	1.58	1.58	1.88	1.78	1.88	1.68	0.78		0.78		1.78	2.08	0.98	1.48	1.38	1.58		1.18	1.68	0.88	1.28	0.98	1.68																									

Dissolved oxygen (DO) was measured in mg/l from March to June 2016. DO was measured in % on site from July 2016.

Dundalk Landfill Site

GROUNDWATER QUALITY

Monitoring Point: WM10

RESULTS

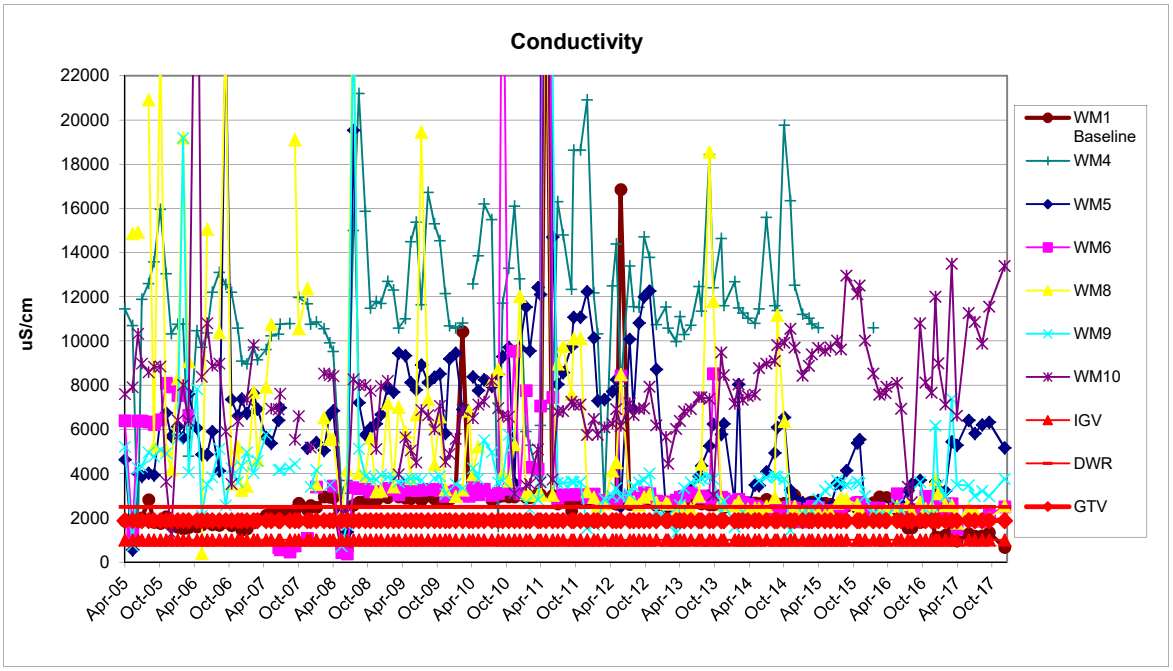
Date

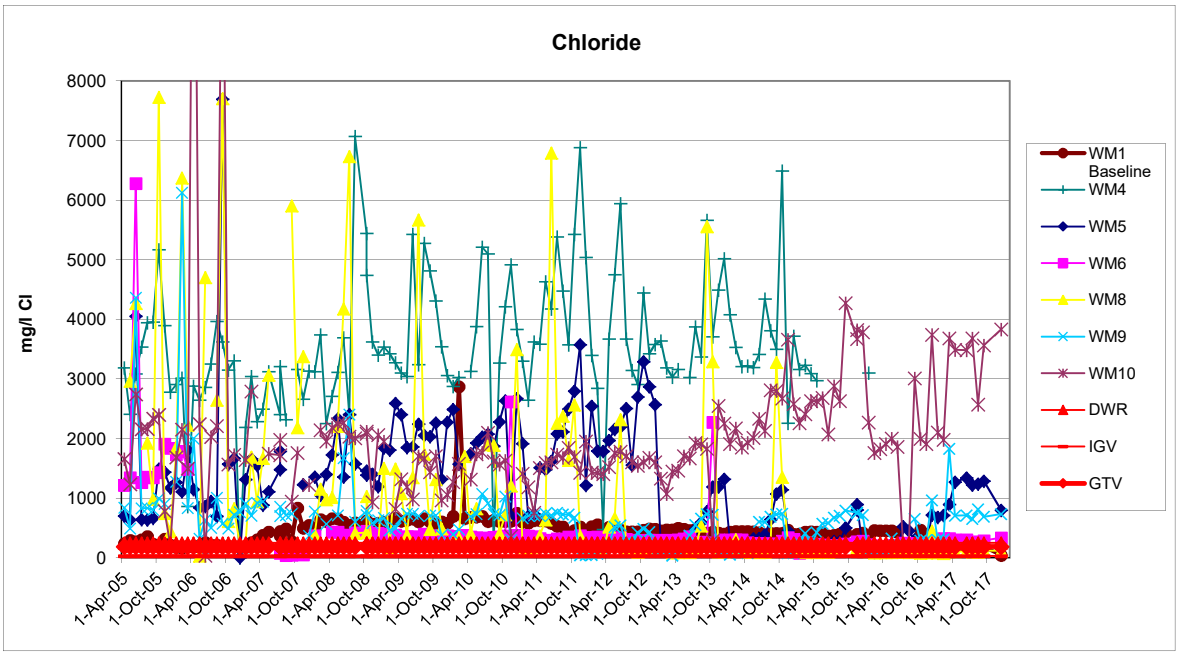
PARAMETERS	Units	10-Jun-13	22-Jul-13	06-Aug-13	16-Sep-13	########	18/11/2013	02/12/2013	########	########	########	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14
Alkalinity	mg/l CaCO3											720					
Aluminium	µg/l											10					
Ammonia	mg/l N	24.85	26.29	23.76	13.68	86.68	34	24	13	34	20	32	29	39	33	31	39
Antimony	µg/l											<1.0					
Arsenic	µg/l											1.7					
Barium	µg/l											100					
Beryllium	µg/l											<1.0					
B.O.D.	mg/l O2																
Boron	µg/l											1600					
Cadmium	µg/l											0.03					
Calcium	mg/l Ca											150					
C.O.D.	mg/l O2																
Chloride	mg/l Cl	1668	1923	1901	1827	289	2550	2250	1910	2170	1850	1930	2010	2330	2130	2810	2800
Chromium	µg/l											3.7					
Cobalt	µg/l											1.5					
Conductivity	µS/cm @ 25	6920	7460	7450	7390	3030	9480	8460	7160	8030	7340	7510	7570	8770	8980	9090	9810
Copper	µg/l											5.5					
Cyanide	mg/l CN											<0.05					
D.O.	% Saturation		16			<10			18			14			25		
Fluoride	mg/l											0.16					
Iron	µg/l											210					
Lead	µg/l											<1.0					
Magnesium	mg/l Mg											170					
Manganese	µg/l											97					
Mercury	µg/l											<0.050					
Molybdenum	µg/l											1.3					
Nickel	µg/l											4.9					
o-Phosphate	mg/l P											0.084					
pH			7.2			7.1			7.2			7.2			7.3		
Potassium	mg/l											98					
Residue on Evaporation	mg/l											4345					
Sampling Depth	m	4.9	4.5	4.5	4.9	4.9	4.3	4.5	4.9	4.4	4.6	5.3	5.5	5.5	nm	4.8	4.6
Selenium	µg/l											<5					
Silver	µg/l																
Sodium	mg/l											1400					
Strontium	µg/l											1300					
Sulphate	mg/l SO4											190.6					
Suspended Solids	mg/l																
Temp	°C		15.5			14.7			10.4			11.8			15		
Thallium	µg/l											<1.0					
Time Sampled		13:25	13:20	11:40	13:20	11:55	12:20	11:35	12:10	13:10	12:30	08:45	11:15	10:55	12:05	12:40	11:15
Tin	µg/l																
T.O.C.	mg/l		43			32			22.3			41.1			72.2		
T.O.N	mg/l N											3.9					
Total S Solids	mg/l																
Uranium	µg/l											1.2					
Vanadium	µg/l											<1.0					
Zinc	µg/l											20					
Water Level m OD	5.64	0.74	1.14	1.14	0.74	0.74	1.34	1.14	0.74	1.24	1.04	0.34	0.14	0.14		0.84	1.04

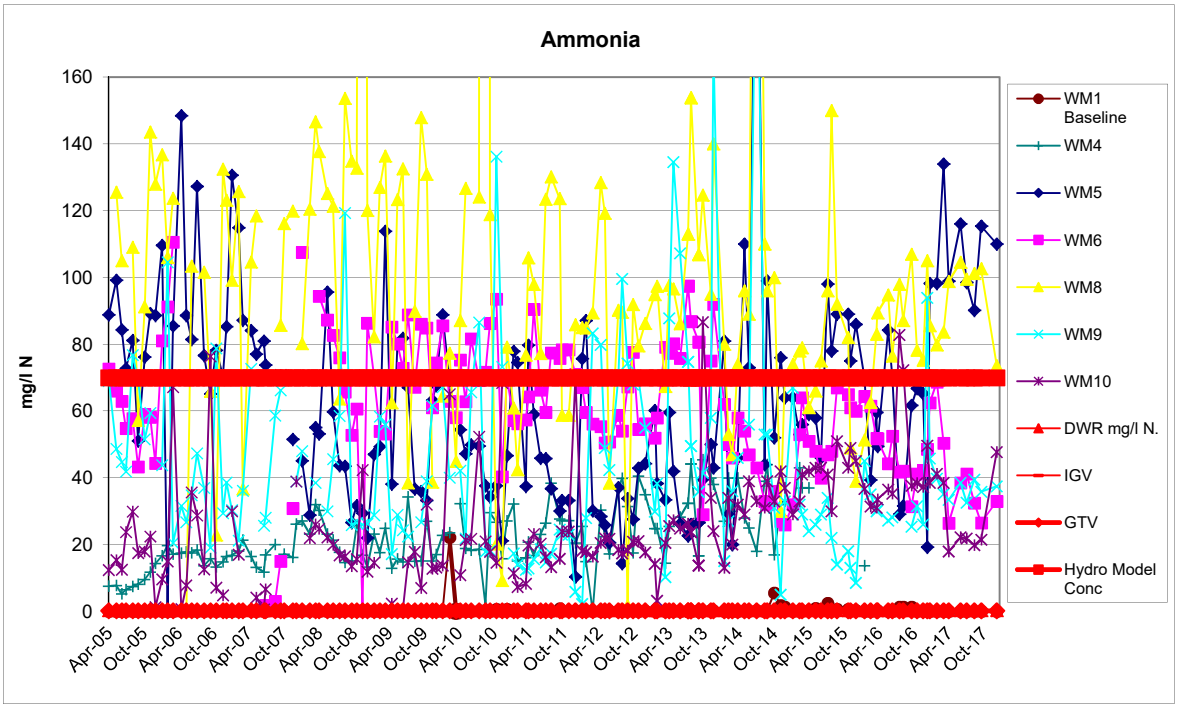
PARAMETERS	Units	15/10/2014	17/11/2014	08/12/2014	20/01/2015	23/02/2015	09/03/2015	13/04/2015	18/05/2015	15/06/2015	21-Jul-15	10-Aug-15	7-Sep-15	4-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16
Alkalinity	mg/l CaCO3							1115									
Aluminium	µg/l							<10.0									
Ammonia	mg/l N	33	42	37	29	33	41	42	43	43	41	30	51	43	49	45	36.7
Antimony	µg/l							<1.0									
Arsenic	µg/l							1.5									
Barium	µg/l							97									
Beryllium	µg/l							<1.0									
B.O.D.	mg/l O2																
Boron	µg/l							1800									
Cadmium	µg/l							0.04									
Calcium	mg/l Ca							180									
C.O.D.	mg/l O2																
Chloride	mg/l Cl	2670	3660	2580	2260	2410	2630	2630	2680	2070	2880	2630	4270	3670	3820	3780	2270
Chromium	µg/l							3.3									
Cobalt	µg/l							1.7									
Conductivity	µS/cm @ 25	9920	10550	9700	8430	8880	9400	9690	9560	9720	10020	9620	12960	12120	12510	10020	8530
Copper	µg/l							3.3									
Cyanide	mg/l CN							<0.05									
D.O.	% Saturation	17			22	nm		22			17			13			
Fluoride	mg/l							1									
Iron	µg/l							140									
Lead	µg/l							<1.0									
Magnesium	mg/l Mg							210									
Manganese	µg/l							250									
Mercury	µg/l							<0.020									
Molybdenum	µg/l							1.1									
Nickel	µg/l							4.2									
o-Phosphate	mg/l P							0.15									
pH		7.2			7.2	7.1		7.1			7.2			7.1			
Potassium	mg/l							110									
Residue on Evaporation	mg/l							5704									
Sampling Depth	m	4.9	4.2	4.9	4.2	4.3	4.4	4.7	4.2	4.9	4	5.2	3	4.8	4.3	4.5	
Selenium	µg/l							<1.0									
Silver	µg/l																
Sodium	mg/l							1600									
Strontium	µg/l							1700									
Sulphate	mg/l SO4																
Suspended Solids	mg/l							237									
Temp	°C	13.2			6.4	nm		11.8			13.2			12.8			
Thallium	µg/l							<1.0									
Time Sampled		11:30	10:45	10:30	11:50	11:30	11:00	10:30	07:35	12:50	12:10	12:35	11:15	13.55	13:00	12:10	
Tin	µg/l																
T.O.C.	mg/l	14.8			14.2	14		16.8			nm			15.5			
T.O.N	mg/l N							1.8									
Total S Solids	mg/l																
Uranium	µg/l							1.3									
Vanadium	µg/l							<5									
Zinc	µg/l							16									
Water Level m OD	5.64	0.74	1.44	0.74	1.44			0.94	1.44	0.74	1.64	0.44	2.64	0.84	1.34	1.14	

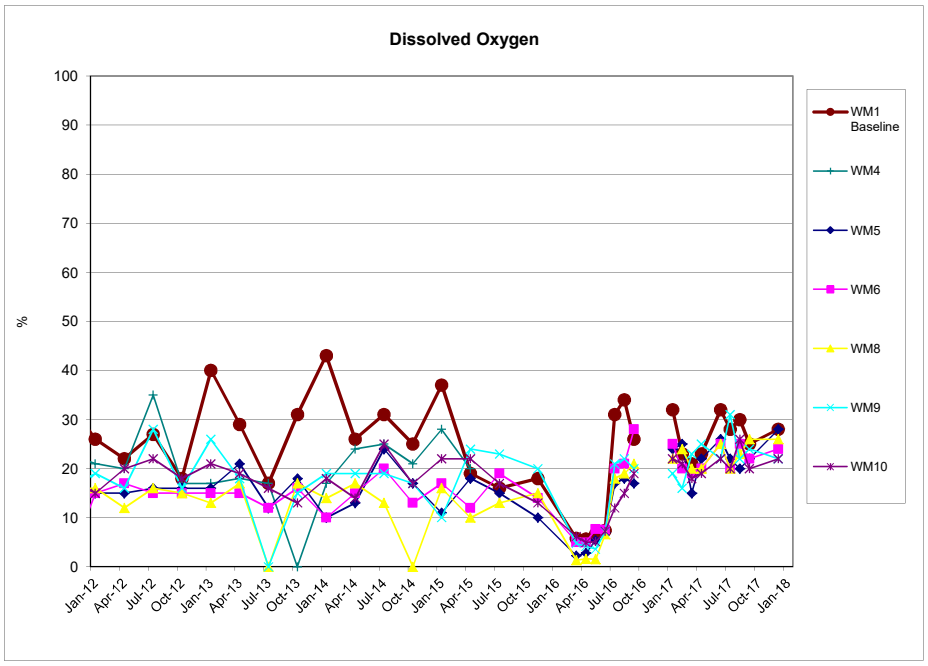
PARAMETERS	Units	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	mg/l CaCO3																				943
Aluminium	µg/l											717									121
Ammonia	mg/l N	31.4	31	33.50	36.5	35.3	82.8	72.3	37.7	38.4	37.3	49.6	38.5	41.2	38.5	17.92	22.18	21.8	19.8	21.5	47.7
Antimony	µg/l																				
Arsenic	µg/l																				
Barium	µg/l																				176
Beryllium	µg/l																				
B.O.D.	mg/l O2				-	-															
Boron	µg/l											1110									858
Cadmium	µg/l											<0.5									<0.5
Calcium	mg/l Ca											218									
C.O.D.	mg/l O2				-	-															
Chloride	mg/l Cl	1760	1820	1910.00	2000	1862	200	223	3010	1995	1910	3740	2100	1980	3680	3486.5	3481.7	3680.2	2568.1	3564	3,830.00
Chromium	µg/l											3.78									3.27
Cobalt	µg/l																				
Conductivity	µS/cm @ 25	7570	7650	7940.00	8110	6939	3400	2710	10800	8120	7660	12,000.00	8990	7118	13500	6620	11260	10860	9876	11560	13,400.00
Copper	µg/l											8.38									8.32
Cyanide	mg/l CN																				<0.05
D.O.	% Saturation		6.16	4.95	5.12	12.4	12	15	19	5.1	4.8		22	21	18	19	22	20	26	20	22
Fluoride	mg/l											0.349									0.411
Iron	µg/l											4.42									5.37
Lead	µg/l											2.32									2.21
Magnesium	mg/l Mg											282									286
Manganese	µg/l																				1820
Mercury	µg/l											<0.02									0.134
Molybdenum	µg/l																				
Nickel	µg/l											18.1									13.2
o-Phosphate	mg/l P				-	-						<0.02									< 0.07
pH			7.22	7.11	7.14	7.22	6.74	6.98	7.08	7.2	7.16	7.23	7.1	7.15	6.92	7.2	7.2	7.2	7.2	7.2	7.06
Potassium	mg/l											141									123
Residue on Evaporation	mg/l																				
Sampling Depth	m																				
Selenium	µg/l																				
Silver	µg/l																				
Sodium	mg/l											2060									1,040.00
Strontium	µg/l											2090									813
Sulphate	mg/l SO4				-	-						417									407
Suspended Solids	mg/l				-	-						58									8,010.00
Temp	°C				21.8	14.1	13.98	13.1	13.2	12.5	12.5		12.9	13	13	12.8	12.8	13	12.9	12.2	12.1
Thallium	µg/l																				
Time Sampled																					
Tin	µg/l																				
T.O.C.	mg/l		9.01	4.13	16.3	17.6	19.1	18.2	18.6	14.6	15.8	23.4	21.4	19.8	23.1	12.2	12.07	13.5	11.56	11.07	9.36
T.O.N	mg/l N				-	-						0.526									0.09
Total S Solids	mg/l											8220									
Uranium	µg/l											1.26									1.37
Vanadium	µg/l											<8									<8
Zinc	µg/l											38.6									20
Water Level m OD	5.64																				

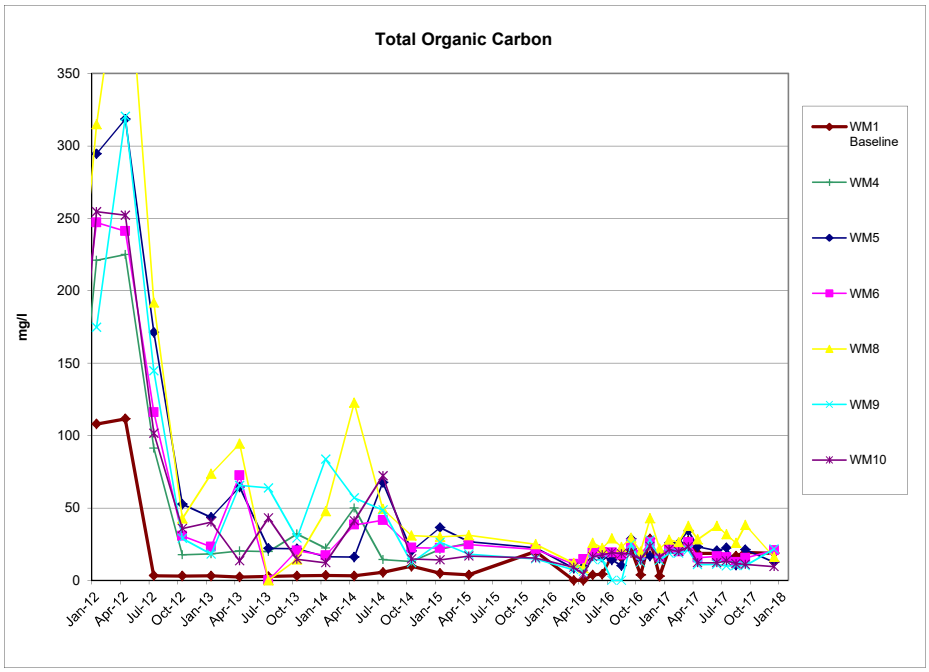
Dissolved oxygen (DO) was measured in mg/l from March to June 2016. DO was measured in % on site from July 2016.

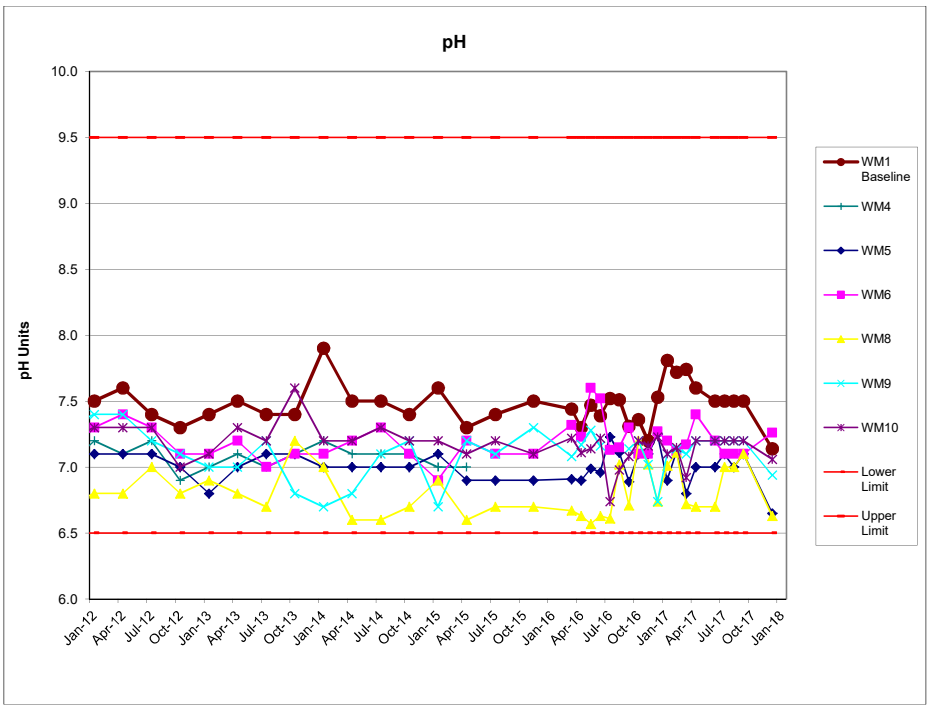

Conductivity
uS/cm
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Apr-05
Oct-05
Apr-06
Oct-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
Apr-14
Oct-14
Apr-15
Oct-15
Apr-16
Oct-16
Apr-17
Oct-17
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10
IGV
DWR
GTV


Chloride
mg/l Cl
8000
7000
6000
5000
4000
3000
2000
1000
0
1-Apr-05
1-Oct-05
1-Apr-06
1-Oct-06
1-Apr-07
1-Oct-07
1-Apr-08
1-Oct-08
1-Apr-09
1-Oct-09
1-Apr-10
1-Oct-10
1-Apr-11
1-Oct-11
1-Apr-12
1-Oct-12
1-Apr-13
1-Oct-13
1-Apr-14
1-Oct-14
1-Apr-15
1-Oct-15
1-Apr-16
1-Oct-16
1-Apr-17
1-Oct-17
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10
DWR
IGV
GTV


Ammonia
mg/l N
160
140
120
100
80
60
40
20
0
Apr-05
Oct-05
Apr-06
Oct-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11
Oct-11
Apr-12
Oct-12
Apr-13
Oct-13
Apr-14
Oct-14
Apr-15
Oct-15
Apr-16
Oct-16
Apr-17
Oct-17
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10
DWR mg/l N.
IGV
GTV
Hydro Model Conc


Dissolved Oxygen
%
100
90
80
70
60
50
40
30
20
10
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10


Total Organic Carbon
mg/l
350
300
250
200
150
100
50
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10


pH
pH Units
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
WM1 Baseline
WM4
WM5
WM6
WM8
WM9
WM10
Lower Limit
Upper Limit

Appendix F

Surface Water Results

Dundalk Landfill Site

SURFACE WATER QUALITY

Monitoring Point: **SW1**

Date

PARAMETERS	Units	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	17-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20-Jan-15	23-Feb-15	09-Mar-15
Alkalinity	mg/l CaCO3				316											
Aluminium	µg/l				60											
Ammonia	mg/l N	7	5	0.77	8.3	0.21	0.11	0.36	0.17	0.69	0.25	3.4	4.6	4.9	5.4	0.64
Antimony	µg/l				<1.0											
Arsenic	µg/l				1.2											
Barium	µg/l				100											
Beryllium	µg/l				<1.0											
B.O.D.	mg/l O2	11			5.6			20			19			12		
Boron	µg/l				190											
Cadmium	µg/l				<0.020											
Calcium	mg/l Ca				110											
C.O.D.	mg/l O2	145			35			250			55			101		
Chloride	mg/l Cl	60	75	157	75	79	174	238	125	301	270	69	98	249	74	89
Chromium	µg/l				1.6											
Cobalt (µg/l)	µg/l				1.3											
Conductivity	µS/cm @ 25	1031	869	1484	995	735	1099	1419	875	1559	1401	807	1035	1312	912	495
Copper	µg/l				2.3											
Cyanide	mg/l CN															
D.O.	% Saturation	27			45			44			104			50		
Fluoride	mg/l															
Iron	µg/l				180											
Lead	µg/l				<1.0											
Magnesium	mg/l Mg				16											
Manganese	µg/l				920											
Mercury	µg/l				<0.050											
Molybdenum	µg/l				3.7											
Nickel	µg/l				2.8											
o-Phosphate	mg/l P				<0.010											
pH		7			7.3			7.3			7.6			7.5		
Potassium	mg/l				22											
Residue on Evaporation	mg/l															
Sampling Depth	m															
Selenium	µg/l				<1.0											
Silver	µg/l															
Sodium	mg/l				49											
Strontium	µg/l				410											
Sulphate	mg/l SO4				66.1											
Suspended Solids	mg/l	1265			75			1235			332			650		
Temp	°C	6.9			9.8			15.5			13.3			4.5		
Thallium	µg/l				<1.0											
Time Sampled		10:40	09:45	11:00	10:45	09:35	12:35	10:25	10:20	10:50	10:10	10:30	10:10	10:30	10:15	10:40
Tin	µg/l															
T.O.C.	mg/l															
T.O.N	mg/l N	<0.20			0.4			0.52			0.63					
Total S Solids	mg/l															
Uranium	µg/l				<1.0											
Vanadium	µg/l				3.1											
Zinc	µg/l				4.3											

PARAMETERS	13-Apr-15	18-May-15	15-Jun-15	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16
Alkalinity	383												
Aluminium	<10.0												
Ammonia	4.9	9.8			0.69		0.68	7.8	9	5.77	12.9	13.8	13.4
Antimony	<1.0												
Arsenic	<1.0												
Barium	110												
Beryllium	<1.0												
B.O.D.	2.5						4.1					4.64	4.2
Boron	200												
Cadmium	<0.020												
Calcium	120												
C.O.D.	35						40					135	109
Chloride	70	62			52		215	71	59	46.2	47.3	59.2	58.6
Chromium	1.4												
Cobalt (µg/l)	<1.0												
Conductivity	960	996			891		1278	1160	977	805	1400	1320	1340
Copper	1.3												
Cyanide													
D.O.	61						44						
Fluoride													
Iron	130												
Lead	<1.0												
Magnesium	17												
Manganese	560												
Mercury	<0.020												
Molybdenum	2.1												
Nickel	1.7												
o-Phosphate	0.015												
pH	7.4						7.6					7.41	7.22
Potassium	16												
Residue on Evaporation													
Sampling Depth													
Selenium	<1.0												
Silver													
Sodium	59												
Strontium	420												
Sulphate	49												
Suspended Solids	44						90					363	265
Temp	9.5						11.3						
Thallium	<1.0												
Time Sampled	09:50	09:35			10:40		10:35	11:10	10:10				
Tin													
T.O.C.													
T.O.N							0.38					<0.1	0.127
Total S Solids	0.35												
Uranium	<1.0												
Vanadium	1.8												
Zinc	4.5												

PARAMETERS	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17	
Alkalinity																		
Aluminium																		
Ammonia																		
Antimony																		
Arsenic																		
Barium																		
Beryllium																		
B.O.D.																		
Boron																		
Cadmium																		
Calcium																		
C.O.D.																		
Chloride																		
Chromium																		
Cobalt (µg/l)																		
Conductivity																		
Copper																		
Cyanide																		
D.O.																		
Fluoride																		
Iron																		
Lead																		
Magnesium																		
Manganese																		
Mercury																		
Molybdenum																		
Nickel																		
o-Phosphate																		
pH																		
Potassium																		
Residue on Evaporation																		
Sampling Depth																		
Selenium																		
Silver																		
Sodium																		
Strontium																		
Sulphate																		
Suspended Solids																		
Temp																		
Thallium																		
Time Sampled																		
Tin																		
T.O.C.																		
T.O.N																		
Total S Solids																		
Uranium																		
Vanadium																		
Zinc																		

Dundalk Landfill Site

SURFACE WATER QUALITY

Monitoring Point: **SW2**

PARAMETERS	Units	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20-Jan-15	23-Feb-15	09-Mar-15	13-Apr-15	18-May-15	15-Jun-15	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**				456												471																													490
Aluminium	**µg/l**				<10.0												<10.0																													57.7
Ammonia	**mg/l N**	13	44	17	14	6.1	3.6	4.6	4.1	68	8.5	4.2	23	18	11	5.1	6.1	12	13	17	9.9	5.8	1.3	2.4	1.8	18.4	17.4	8.45	8.03																	0.86
Antimony					<1.0												<1.0																													
Arsenic					1.6												2.2																													
Barium					44												49																													44.9
Beryllium					<1.0												<1.0																													
B.O.D.	**mg/l O2**	4.2			22			180			6.1			28			5			4.6			5.7					1.86	1.37																	
Boron	**µg/l**				240												290																													<135
Cadmium	**µg/l**				<0.020												<0.020																													<0.5
Calcium	**mg/l Ca**				140												130																													
C.O.D.	**mg/l O2**	44			65			940			55			135			41			78			82					38	41																	47
Chloride	**mg/l Cl**	106	133	108	135	170	202	234	198	263	375	83	127	182	65	81	103	176	349	353	237	320	155	84	100	82.5	93.4	73.9	76.9																	82.4
Chromium	**µg/l**				1												1.3																													<3
Cobalt (µg/l)	**µg/l**				1.1												<1.0																													
Conductivity	**µS/cm @ 25**	1588	1869	1343	1456	1543	1638	1624	1284	2800	2210	1079	1751	1455	975	646	1240	1702	2260	2230	1819	2160	1596	1365	1147	1320	1400	1030	1060																	1,430.00
Copper	**µg/l**				1.4												1.7																													<4
Cyanide	**mg/l CN**																																													
D.O.	**% Saturation**	27			33			<10			69			53			53			82			40																							75
Fluoride	**mg/l**																																												
Iron	**µg/l**				80												180																													0.729
Lead	**µg/l**				<1.0												<1.0																													<0.5
Magnesium	**mg/l Mg**				30												27																													37
Manganese	**µg/l**				780												560																													2000
Mercury	**µg/l**				<0.050												<0.020																													<0.02
Molybdenum	**µg/l**				3.1												2.9																													
Nickel	**µg/l**				3.2												2.8																													5.85
o-Phosphate	**mg/l P**				0.062												0.043																													0.28
pH		7.1			7.4			7.3			7.5			7.2			7.4			7.8			7.9					7.72	7.61																	7.52
Potassium	**mg/l**				25												19																													16.9
Residue on Evaporation	**mg/l**																																													
Sampling Depth	**m**																																												
Selenium	**µg/l**				<1.0												<1.0																													
Silver	**µg/l**																																												
Sodium	**mg/l**				120												84																													101
Strontium	**µg/l**				480												490																													768
Sulphate	**mg/l SO4**				110.3												<2																													181
Suspended Solids	**mg/l**	18			46			11950			15			485			8			16			13					17	16																	13
Temp	**°C**	6.5			9.6			15.5			12.8			5.6			8.3			18.2			10.8																							11.6
Thallium	**µg/l**				<1.0												<1.0																													
Time Sampled		10:50	09:55	11:15	11:20	09:45	12:45	10:35	10:50	11:15	10:20	10:45	10:20	10:40	10:25	10:50	10:00	09:45	11:10	10:30	10:55	12:30	10:45	11:35	10:35																				
Tin	**µg/l**																																												
T.O.C.	**mg/l**																																												
T.O.N	**mg/l N**	0.79			0.4			2.7			1.9						1.1						0.22					2.18	1.98																	0.77
Total S Solids	**mg/l**																1.7																													
Uranium	**µg/l**				2												1.6																													3.21
Vanadium	**µg/l**				<1.0												1.3																													<8
Zinc	**µg/l**				2.3												4																													3.75

Dundalk Landfill Site

SURFACE WATER QUALITY

Monitoring Point: SW3

PARAMETERS	Units	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20-Jan-15	23-Feb-15	09-Mar-15	13-Apr-15	18-May-15	15-Jun-15	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	mg/l CaCO3				368												357																				405									431
Aluminium	µg/l				<10.0												12																				<50									582
Ammonia	mg/l N	5.3	19	17	7.3	0.15	1.2	0.46	0.33	1.7	0.099	2	15	16	4.4	9	2.2	12	14	8.8	1.5	0.68	1.3	3.6	5	16.7	14.4	6.85	7.09			2.67	<0.11				<0.2			0.42						0.46
Antimony					<1.0												<1.0																														
Arsenic					1												1																														
Barium					51												44																														61.6
Beryllium					<1.0												<1.0																														
B.O.D.	mg/l O2	7.4			11			8.8			6.9			19			2.3			1.8			5.2					1.9	1.49			2.78	3.16													
Boron	µg/l				310												250																				<135									<135
Cadmium	µg/l				0.02												0.07																				<0.5									<0.5
Calcium	mg/l Ca				130												110																				158									
C.O.D.	mg/l O2	<20			52			79			80			51			36			56			60					46	40			122	70							47.00						39
Chloride	mg/l Cl	82	103	134	115	101	252	238	258	305	214	93	182	126	68	168	86	176	327	322	273	256	222	105	120	108	110	95.6	95.5			263	253				185			256.00						107
Chromium	µg/l				1.1												1.2																				<3									4.09
Cobalt (µg/l)	µg/l				<1.0												<1.0																													
Conductivity	µS/cm @ 25	1233	1460	1533	1284	1070	1814	1556	1722	1938	1565	1187	1858	1580	842	1599	1000	1715	2200	1922	1758	1837	1780	1350	1266	1430	1460	1220	1250			1860	1520				1,630.00			2040.00						1,460.00
Copper	µg/l				2.6												2.5																				<4									5.81
Cyanide	mg/l CN																																														
D.O.	% Saturation	32			39			37			36			26			27			49			25									48								46.00						80
Fluoride	mg/l																																													
Iron	µg/l				35												58																				0.356									0.919
Lead	µg/l				<1.0												<1.0																				<0.5									2.95
Magnesium	mg/l Mg				25												22																				36.2									28.7
Manganese	µg/l				170												150																				67.9									875
Mercury	µg/l				<0.050												<0.020																														<0.02
Molybdenum	µg/l				3.1												1.9																														
Nickel	µg/l				3.8												2.8																				4.42									7.96
o-Phosphate	mg/l P				<0.010												<0.010																				0.0222									0.11
pH		7.3			7.4			7.3			7.3			7.3			7.3			7.6			7.6					7.77	7.51			7.5	7.4				7.74			7.42						7.39
Potassium	mg/l				23												17																				21									19.4
Residue on Evaporation	mg/l																																														
Sampling Depth	m																																														
Selenium	µg/l				<1.0												<1.0																														
Silver	µg/l																																														
Sodium	mg/l				83												63																				128									92
Strontium	µg/l				500												410																				596									748
Sulphate	mg/l SO4				91.7												63																				200									175
Suspended Solids	mg/l	<4			21			8			25			12			26			4			<4					26	5			96	10				< 3			38.00						23
Temp	°C	5.7			9.8			15.5			12			5.3			7.6			18.2			10.7									13.2							11.20						11.2
Thallium	µg/l				<1.0												<1.0																														
Time Sampled		11:05	10:10	11:35	11:35	10:00	13:05	10:55	11:10	11:35	10:35	11:05	10:35	10:50	10:40	11:00	10:30	10:10	11:30	10:45	11:15	12:40	11:00	11:55	10:50																					
Tin	µg/l																																														
T.O.C.	mg/l																																														
T.O.N	mg/l N	3.0			5.7			0.26			0.67									0.22			5.8					6.39	6.51			2.54	2.54				2.07			14.40						6.31
Total S Solids	mg/l																4.4																														
Uranium	µg/l				1.8												1.3																				2.19									2.39
Vanadium	µg/l				<1.0												1.2																				<8									<8
Zinc	µg/l				2.9												4.6																														12.2

Dundalk Landfill Site

SURFACE WATER QUALITY

Monitoring Point: **SW4**

PARAMETERS	Units	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20-Jan-15	23-Feb-15	09-Mar-15	13-Apr-15	18-May-15	15-Jun-15	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**				384												339																				412									
Aluminium	**µg/l**				<10.0												38																			<50									77.3
Ammonia	**mg/l N**	0.074	0.46	7.3	3.5	0.057	2.3	1.2	0.12	0.58	0.044	0.64	12	0.18	0.82	9.5	0.18	8.6	4.7	1.8	0.022	0.047	0.076	1.1	2.1	8.39	7.91	4.18	4.46	0.86	0.66	<0.11	<0.11	<0.2	0.62	0.58	<0.2	0.72	0.81	0.91						0.45
Antimony					<1.0												<1.0																													
Arsenic					1												1.2																													
Barium					41												24																													39.1
Beryllium					<1.0												<1.0																													
B.O.D.	**mg/l O2**	1.1			7.1			4.5			9.2			1.4			1.5			>23			1.5					1.47	1.84	2.2	1.26	3.3	2.2	1.6	2.60	2.60		1.50	2.50	1.80						
Boron	**µg/l**				230												140																			<135									<135
Cadmium	**µg/l**				<0.020												<0.020																			<0.5									<0.5
Calcium	**mg/l Ca**				130												100																			170.00									
C.O.D.	**mg/l O2**	22			80			109			156			57			42			174			61					39	38	119	56	80	72	75	119.00	122.00		52.20	53.10	60.00						48
Chloride	**mg/l Cl**	106	83	167	124	132	267	375	279	736	269	63	172	140	92	177	104	221	456	507	391	336	259	77	98	87.3	102	108	106	421	111	396	328	347	411.00	426.00	195.00	126.20	138.90	209.00						101
Chromium	**µg/l**				1.1												1.1																			<3									3.65
Cobalt (µg/l)	**µg/l**				<1.0												<1.0																												
Conductivity	**µS/cm @ 25**	1161	1023	1594	1290	1223	1926	2340	1892	3070	1795	958	1846	1326	915	1699	1053	1809	2420	2500	2050	2010	1872	1106	1019	1130	1190	1200	1230	2520	1745	2310	1483	2090	1975.00	1800.00	1640.00	1652.00	1589.00	1920.00						1,390.00
Copper	**µg/l**				2.4												2.4																			5.56									<4
Cyanide	**mg/l CN**																																													
D.O.	**% Saturation**	56			37			44			44			51			52			193			60							7.53	5.23		50	65	7.53	7.53		52.00	65.00	62.00						72
Fluoride	**mg/l**																																												
Iron	**µg/l**				150												330																			0.24									0.515
Lead	**µg/l**				<1.0												<1.0																			<0.5									<0.5
Magnesium	**mg/l Mg**				30												24																			35.90									31.2
Manganese	**µg/l**				160												83																			45.50									344
Mercury	**µg/l**				<0.050												0.02																												<0.02
Molybdenum	**µg/l**				2.7												2.3																												
Nickel	**µg/l**				3.2												2.4																			4.55									5.51
o-Phosphate	**mg/l P**				<1.0	<1.0											<0.010													-	-				-	-	0.02									0.28
pH		7.5			7.4			7.5			7.4			7.5			7.4			8.2			7.9					7.85	7.62	7.74	7.76	7.71	7.62	7.8	7.64	7.52	7.79	7.53	7.42	7.57						7.39
Potassium	**mg/l**				19												14																			22.30									22.9
Residue on Evaporation	**mg/l**																																												
Sampling Depth	**m**																																												
Selenium	**µg/l**				<1.0												<1.0																												
Silver	**µg/l**																																												
Sodium	**mg/l**				96												82																			132.00									90.9
Strontium	**µg/l**				510												440																			630.00									629
Sulphate	**mg/l SO4**				104.4												96													-	-					193.00									162
Suspended Solids	**mg/l**	4			22			17			215			43			4			64			<4					5	4	68	6	6	8	45	89.00	78.00	8.00	33.00	36.00	20.00						22
Temp	**°C**	6.1			9.6			15.9			12.2			4.8			8.2			19.4			11							22.3	15.4		12.5	12.7				11.20	11.30	12.10						11
Thallium	**µg/l**				<1.0												<1.0																												
Time Sampled		11:30	10:25	11:50	11:55	10:10	13:30	11:10	11:40	12:00	10:50	11:30	10:55	11:05	10:50	11:10	10:45	10:25	11:40	11:00	11:30	12:55	11:15	12:05	11:00																					
Tin	**µg/l**																																												
T.O.C.	**mg/l**																													-	-														
T.O.N	**mg/l N**	1.9			4.1			0.37			<0.20						1.4			1.4			3.9					6.01	6.31	4.7	2.2	1.11	1.61	0.877	3.90	4.10	3.37	10.20	11.20	12.70						7.09
Total S Solids	**mg/l**																2																												
Uranium	**µg/l**				1.7												1.2																			2.38									2.29
Vanadium	**µg/l**				<1.0												1.1																			<8									<8
Zinc	**µg/l**				2.5												3.1																			4.44									3.68

Dundalk Landfill Site

SURFACE WATER QUALITY

Monitoring Point: **SW5**

PARAMETERS	Units	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	########	23-Feb-15	09-Mar-15	13-Apr-15	18-May-15	15-Jun-15	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**				94																															95									93.7
Aluminium	**µg/l**				130																															529									347
Ammonia	**mg/l N**	0.19	0.19	0.17	0.11	0.57	0.15	0.48	0.36	0.53	0.35	0.067	0.22	0.54	0.14	0.2	0.24	0.24	0.35		0.2	0.14	0.17	0.084	0.094	0.334	2.13	<0.11	<0.11	<0.11	<0.11	0.92	0.68	<0.2	<0.11	<0.11	<0.2	0.13	0.12	0.20	0.93	1.01	0.97	0.95	1.05	< 0.11
Antimony					<1.0																																									
Arsenic					1.2																																									
Barium					36																																								41.4
Beryllium					<1.0																																								
B.O.D.	**mg/l O2**	2.2			1.6			4.1			1.9			1									1.9						1.72	1.63	4.3	2.1	4.52	2.81	<1	3.9	3.2		1.60	1.50	1.40	<2	<2	<2	<2	<2	
Boron	**µg/l**				23																															<135									<135
Cadmium	**µg/l**				0.05																															<0.5									<0.5
Calcium	**mg/l Ca**				34																															36.4									
C.O.D.	**mg/l O2**	40			26			1300			39			760									24						35	39	NR	36	75	75	30	28.5	42.8		<25	<25	< 25	590	470	482	358	480	36
Chloride	**mg/l Cl**	120	634	37	35	6770	423	7980	4020	15900	766	550	326	9900	85	255	249	249	14200		3770	2180	101	52	50	17.7	46.9	1810	1780	13100	1922	1890	682	382	459	399	85.8	1290.00	1310.00	1600.00	5865.8	5798.1	4980.7	6120	4987.2	52.4
Chromium	**µg/l**				<1.0																															<3									3.88
Cobalt (µg/)	**µg/l**				<1.0																																								
Conductivity	**µScm @ 25**	623	2310	368	351	18440	1722	27000	13100	44000	2850	1852	1407	33800	452	1102	1125	1125	4100		12050	6510	576	360	323	220	276	6350	6350	35300	7214	6740	5529	1660	2690	2660	504	4128.00	4890.00	5820.00	21900	21500	22328	19856	19804	406
Copper	**µg/l**				3.5																															17.7									8.65
Cyanide	**mg/l CN**																																												
D.O.	**% Saturation**	84			78			79			103			73									82								8.4	7.8	51	49	71	8.4	7.9		71.00	70.00	72.00	58	55	62	68	72	85
Fluoride	**mg/l**																																												
Iron	**µg/l**				440																															1.88									1.09
Lead	**µg/l**				<1.0																															6.19									4.17
Magnesium	**mg/l Mg**				6.8																															9.83									8.75
Manganese	**µg/l**				44																															69.2									92.4
Mercury	**µg/l**				<0.050																																								<0.02
Molybdenum	**µg/l**				<1.0																																								
Nickel	**µg/l**				2.6																															5.85									4.93
o-Phosphate	**mg/l P**				0.036																									-	-				-	<0.02									0.39
pH	-	7.7			7.9			7.5			8			7.8									8.1					7.75	7.69	8.28	7.85	8.29	7.72	7.84	7.92	7.85	7.79	7.90	7.70	7.89	7.7	7.5	7.4	7.4	7.4	7.77
Potassium	**mg/l**				3.4																															5.73									4.61
Residue on Evaporation	**mg/l**																																												
Sampling Depth	**m**																																												
Selenium	**µg/l**				<1.0																																								
Silver	**µg/l**																																												
Sodium	**mg/l**				21																															44.9									31.3
Strontium	**µg/l**				100																															123									110
Sulphate	**mg/l SO4**				13.8																									-	-					28.4									17.6
Suspended Solids	**mg/l**	102			11			78			24			33									14					14	16	78	21	92	27	12	68	80	7	41.00	39.00	40.00	118	81	78	78	83	17
Temp	**°C**	6.0			10.1			16.7			12.6			8.1									11.1							21.9	14.6	15.71	13.1	12.6				12.20	12.00	12.60	11.5	11.6	11.2	11.3	11.2	11.2
Thallium	**µg/l**				<1.0																																								
Time Sampled		11:55	11:00	13:45	12:40	13:45	12:40	13:00	15:00	13:00	12:45	12:25	12:40	11:30	13:05	11:25	10:50	10:50	12:40		13:45	13:10	12:00	10:50	12:25																						
Tin	**µg/l**																																												
T.O.C.	**mg/l**																													-	-														
T.O.N	**mg/l N**	2.5			2			1.9			1.5												1.7					0.915	0.905	<0.1	<0.1	1.28	1.28	1.42	<0.1	<0.1	2.26	2.16	2.21	2.85	2.25	1.58	1.23	1.38	1.53	2.41
Total S Solids	**mg/l**																																												
Uranium	**µg/l**				<1.0																															<0.5									<0.5
Vanadium	**µg/l**				<1.0																															<8									<8
Zinc	**µg/l**				120																															691									665

Dundalk Landfill Site

SURFACE WATER QUALITY

Monitoring Point: SW6

PARAMETERS	Units	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	20-Jan-15	23-Feb-15	09-Mar-15	13-Apr-15	18-May-15	15-Jun-15	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**				98																															100									90.9
Aluminium	**µg/l**				200																															62									189
Ammonia	**mg/l N**		0.18		0.1	0.56		0.49	0.3	0.47		0.26	0.12	0.57		0.1		0.29	0.34	0.04				0.055	0.12	<0.2	<0.11	<0.11	<0.11	0.11	0.11	0.2	0.21	<0.2	0.11	0.13	<0.2	<0.11	<0.11	< 0.11	0.191	0.259	0.312	0.311	0.31	< 0.11
Antimony					<1.0																																								
Arsenic					1.3																																								
Barium					38																																							45.4
Beryllium					<1.0																																							
B.O.D.	**mg/l O2**				2.1			4.8						<1.0						11								2.08	1.46	3.36	2.1	1.31	1.2	<1	3.36	5.2		1.20	1.10	1.40	<2	<2	<2	<2	<2	
Boron	**µg/l**				22																															<135									<135
Cadmium	**µg/l**				0.06																															<0.5									<0.5
Calcium	**mg/l Ca**				39																															34.1									
C.O.D.	**mg/l O2**				25			1170						717						75								62	34	NR	21.9	46	38	31	10.2	18.7		<25	<25	< 25	29	26	31	28	25	<25
Chloride	**mg/l Cl**		628		34	5600		8030	3850	16100		456	328	4860		228		2270	13800	723				50	54	18	24.2	63.1	57.7	13600	10630	1980	1520	364	6150	6289	45.8	42.80	39.90	59.50	1642.9	1667.7	1710.5	1783.2	1583.1	31
Chromium	**µg/l**				<1.0																															<3									<3
Cobalt (µg/l)	**µg/l**				<1.0																																							
Conductivity	**uS/cm @ 25**		2320		339	16730		27100	12480	44300		1857	1423	15780		1057		7200	4110	2650				357	345	225	276	410	398	36700	1580	6910	6120	1590	6120	6247	373	389.00	381.00	499.00	5660	5420	4890	5692	5120	325
Copper	**µg/l**				4																															<4									<4
Cyanide	**mg/l CN**																																											
D.O.	**% Saturation**				78			84						73						155										8.23	6.8	63	65	78	7.65	8.38		74.00	73.00	63.00	62	72	70	78	78	82
Fluoride	**mg/l**																																											
Iron	**µg/l**				570																															0.353									0.535
Lead	**µg/l**				<1.0																															<0.5									0.78
Magnesium	**mg/l Mg**				7.6																															7.34									8.97
Manganese	**µg/l**				53																															25.3									40.3
Mercury	**µg/l**				<0.050																																								<0.02
Molybdenum	**µg/l**				<1.0																																								
Nickel	**µg/l**				3.2																															3.13									3.86
o-Phosphate	**mg/l P**				0.036																									-	<0.07				-	-	0.0258									0.12
pH					7.9			7.6						7.8						8.7								8.1	8.04	8.24	7.95	8.17	8.12	7.65	7.7	7.6	7.85	7.92	7.88	8.14	7.9	7.7	7.6	7.6	7.6	7.76
Potassium	**mg/l**				3.7																															4.46									3.53
Residue on Evaporation	**mg/l**																																											
Sampling Depth	**m**																																											
Selenium	**µg/l**				<1.0																																							
Silver	**µg/l**																																											
Sodium	**mg/l**				22																															23.7									17.6
Strontium	**µg/l**				110																															112									123
Sulphate	**mg/l SO4**				13.1																									-	-					22.9									14.1
Suspended Solids	**mg/l**				11			94						21						30								10	10	35	21	8	9	10	26	32	6	6.00	10.00	9.00	24	23	21	21	26	6
Temp	**°C**				10.2			16.8			nm			8	nm					17.8										21.8	16.2	15.57	13.6	13.2				11.90	11.90	13.10	12.2	12.2	12	12.1	12.3	11.2
Thallium	**µg/l**				<1.0																																								
Time Sampled			12:50		09:50	11:30		14:00	13:55	11:20	nt	12:45	11:20	12:10	nt	11:35		08:40	14:20	13:45				12:30	11:20																					
Tin	**µg/l**																																											
T.O.C.	**mg/l**																													-	-													
T.O.N	**mg/l N**				2			1.1												1.4								1.54	1.56	<0.1	<0.1	0.492	0.36	1.51	<0.1	<0.1	2.26	1.90	2.10	2.70	1.39	1.84	1.64	1.56	1.79	2.23
Total S Solids	**mg/l**																																											
Uranium	**µg/l**				<1.0																															<0.5									<0.5
Vanadium	**µg/l**				1.3																															<8									<8
Zinc	**µg/l**				200																															109									69.9

Dundalk Landfill Site

SURFACE WATER QUALITY

Monitoring Point: **SW7**

PARAMETERS	Units	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	########	########	########	########	23-Feb-15	09-Mar-15	13-Apr-15	18-May-15	15-Jun-15	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**				100												94																			90										112
Aluminium	**µg/l**				110												57																			185										358
Ammonia	**mg/l N**	0.15	0.035	0.14	0.24	0.047	0.035	0.5	0.42	0.62	0.024	0.085	0.13	0.12	0.054	0.066	0.49	0.13	0.39	0.22	0.067	0.052	0.18	0.033	0.046	<0.2	<0.11	<0.11	<0.11	<0.11	<0.11	0.15	<0.11	<0.2	<0.11	<0.11	<0.2	<0.11	<0.11	<0.11	<0.11	0.171	0.238	0.214	0.21	0.238	< 0.11
Antimony					<1.0												<1.0																														
Arsenic					1.1												1.3																														
Barium					40												31																														43.5
Beryllium					<1.0												<1.0																														
B.O.D.	**mg/l O2**	1.3			<1.0			4.7			1.5			<1.0			4.5			5.1			1.7					2.51	1.77	2.71	1.62	1.32	1.1	<1	3.6	4.5		1.60	1.60	1.80	<2	<2	<2	<2	<2		
Boron	**µg/l**				18												33																			<135										<135
Cadmium	**µg/l**				0.03												0.05																			<0.5										<0.5
Calcium	**mg/l Ca**				40												33																			45.6										
C.O.D.	**mg/l O2**	20			23			1060			27			161			42			87			31					38	35	NR	26	28	25	52	11	15		<25	<25	26.00	27	29	22	28	28	33
Chloride	**mg/l Cl**	52	42	42	28	551	149	7330	6520	11400	483	56	142	1090	27	222	70	126	9620	1650	116	791	46	33	30	21.4	31.5	39.5	43.8	12300	9860	1490	1476	377	9700	10160	68.5	42.81	35.80	56.70	1230.7	1648.5	1568.2	1725.1	1582.1	63.7
Chromium	**µg/l**				<1.0												<1.0																			<3										<3
Cobalt (µg/l)	**µg/l**				<1.0												<1.0																												
Conductivity	**µS/cm @ 25**	423	409	395	330	2040	775	24700	14000	32400	1890	449	786	3840	269	994	455	704	2830	5490	636	2720	376	302	276	237	334	326	340	33800	21060	5370	4890	1650	21500	20800	454	457.00	398.00	500.00	4110	4120	3968	3890	3982	481
Copper	**µg/l**				3.1												3.8																			10.7										4.49
Cyanide	**mg/l CN**																																													
D.O.	**% Saturation**	82			70			78			97			72			94			144			78							9.02	6.6	68	68	81	8.2	8.2		72.00	67.00	68.00	70	73	80	83	85	90
Fluoride	**mg/l**																																												
Iron	**µg/l**				370												220																			1.83										0.943
Lead	**µg/l**				<1.0												<1.0																			4.1										1.66
Magnesium	**mg/l Mg**				7.2												8.3																			11.3										8.74
Manganese	**µg/l**				50												48																			87.7										99.7
Mercury	**µg/l**				<0.050												<0.020																												<0.02
Molybdenum	**µg/l**				<1.0												<1.0																												
Nickel	**µg/l**				2.7												2.7																			6.29										4.39
o-Phosphate	**mg/l P**				0.04												0.089													-	<0.07				-	-	0.0238										0.07
pH		7.6			7.9			7.7			8.3			7.8			7.7			8.4			7.9					7.86	7.72	8.33	7.78	8.13	7.92	7.67	7.81	7.72	7.83	7.90	7.78	8.15	8.1	7.9	7.8	7.8	7.8	7.62
Potassium	**mg/l**				3.5												5.8																			6.39										4.02
Residue on Evaporation	**mg/l**																																												
Sampling Depth	**m**																																												
Selenium	**µg/l**				<1.0												<1.0																												
Silver	**µg/l**																																												
Sodium	**mg/l**				17												38																			44.7										31.1
Strontium	**µg/l**				110												120																			146										147
Sulphate	**mg/l SO4**				13.2												19													-	-						26.9										21.6
Suspended Solids	**mg/l**	20			<7			90			27			12			11			24			8					21	14	60	15	13	16	9	46	49	3	10.00	12.00	8.00	20	46	38	39	44	20
Temp	**°C**	6.2			9.9			16.9			12.7			8.1			9.3			17.3			10.8							21.8	15.6	17.32	13.8	13.4				13.00	13.10	13.20	11.6	12.1	11.6	11.8	11.6	11.3
Thallium	**µg/l**				<1.0												<1.0																												
Time Sampled		13:50	11:30	14:30	13:30	14:30	13:15	12:15	15:45	13:15	12:55	12:20	11:50	13:05	15:05	11:50	11:20	11:20	14:40	14:35	15:00	12:00	13:00	14:10	12:05																					
Tin	**µg/l**																																												
T.O.C.	**mg/l**																													-	-														
T.O.N	**mg/l N**	2.8			2.1			1.1			1.5									1.4			1.7					1.57	1.57	<0.1	<0.1	1.06	1.12	1.47	<0.1	<0.1	2.21	2.16	2.22	2.67	1.49	1.62	1.42	1.48	1.52	2.18
Total S Solids	**mg/l**																3.4																												
Uranium	**µg/l**				<1.0												<1.0																			<0.5										<0.5
Vanadium	**µg/l**				<1.0												1.1																			<8										<8
Zinc	**µg/l**				5												4.6																			397										179

Dundalk Landfill Site

SURFACE WATER QUALITY

Monitoring Point: SW8

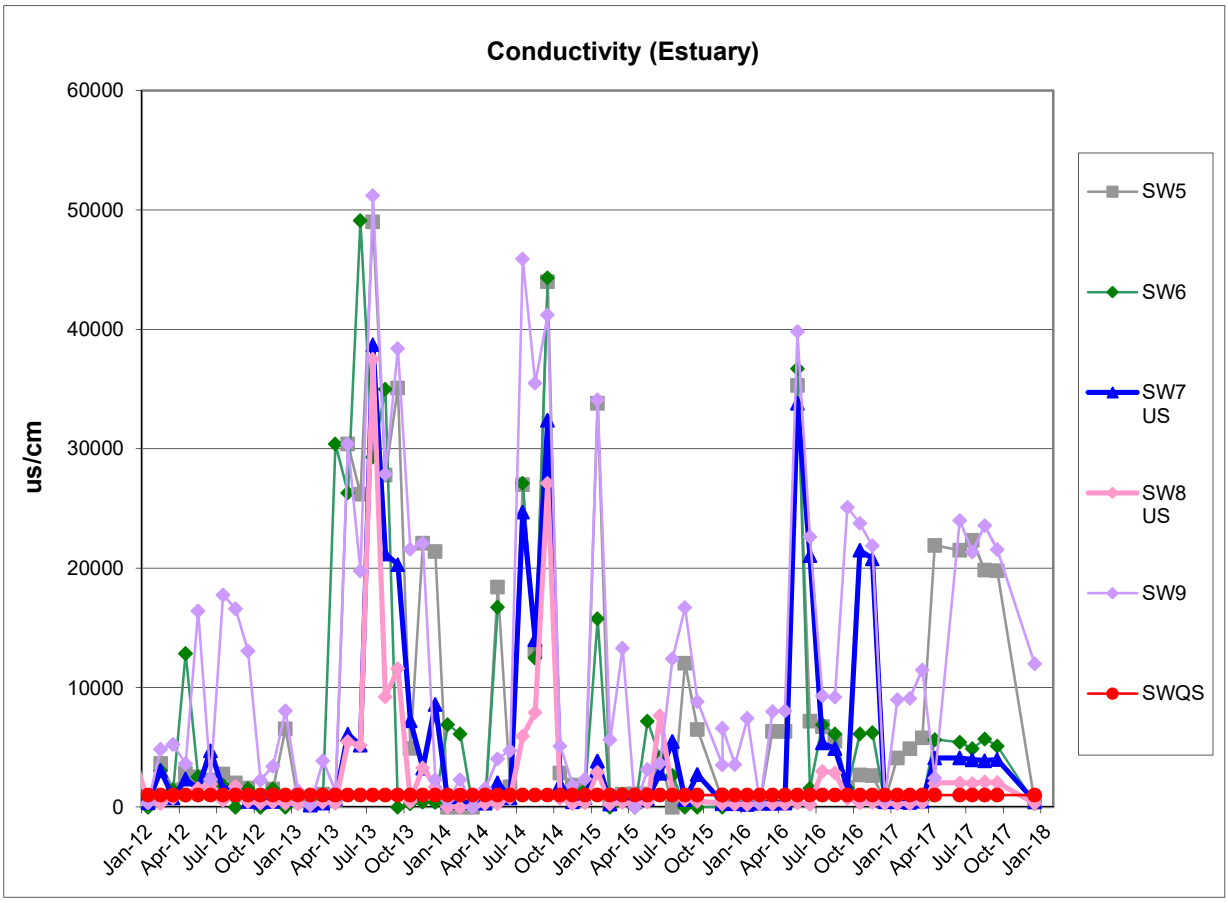
PARAMETERS	Units	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15/10/2014	17/11/2014	08/12/2014	########	23-Feb-15	09-Mar-15	13-Apr-15	18-May-15	15-Jun-15	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**				101												87																													98
Aluminium	**µg/l**				110												56																				133									209
Ammonia	**mg/l N**	0.059	0.037	0.14	0.031	0.16	0.054	0.16	0.23	0.72	0.021	0.041	0.059	0.11	0.053	0.059	0.44	<0.020	0.038	0.058	0.064	0.034	0.41	0.027	0.036	<0.2	<0.11	<0.11	<0.11	<0.11	<0.11	0.14	0.14	0.37	<0.11	<0.11	<0.2	<0.11	<0.11	< 0.11	0.27	0.314	0.286	0.289	0.29	< 0.11
Antimony					<1.0												<1.0																														
Arsenic					1.3												1.3																														
Barium					42												36																														47.6
Beryllium					<1.0												<1.0																														
B.O.D.	**mg/l O2**	1.1			<1.0			8.1			<1.0			1.1			3.3			8.3			1.1					2.07	1.77	<1	1.9	2.6	2.2	<1	<1	<1		1.60	1.60	1.60	<2	<2	<2	<2	<2	
Boron	**µg/l**				16												17																				<135									<135
Cadmium	**µg/l**				0.03												0.05																				<0.5									<0.5
Calcium	**mg/l Ca**				42												31																				36.5									
C.O.D.	**mg/l O2**	<20			29			173			20			144			37			65			26					30	31	<25	<25	29	22	28	<25	<25		<25	<25	< 25	19	27	23	25	26	25
Chloride	**mg/l Cl**	21	42	21	19	20	150	1550	2840	9790	139	21	28	811	28	36	22	40	2190	270	116	49	34	18	18	13.5	18.5	18.9	19.5	24.2	18.5	796	528	135	21.3	23.8	29	21.30	19.50	22.30	532.4	541.2	398	398.4	498.2	23
Chromium	**µg/l**				<1.0												<1.0																				<3									<3
Cobalt (µg/l)	**µg/l**				<1.0												<1.0																												
Conductivity	**µS/cm @ 25**	268	377	310	302	302	778	5930	7920	27100	730	284	356	2920	273	398	282	416	7660	1206	638	467	340	257	241	221	269	264	259	366	246	3000	2870	726	381	390	324	291.00	301.00	374.00	2010	2040	1982	2104	2045	307
Copper	**µg/l**				3.2												4																				<4									<4
Cyanide	**mg/l CN**																																													
D.O.	**% Saturation**	85			71			103			91			77			94			170			78							8.77	6	82	79	91	7.9	7.8		92.00	94.00	81.00	85	90	91	90	82	90
Fluoride	**mg/l**																																													
Iron	**µg/l**				400												210																				0.593									0.544
Lead	**µg/l**				<1.0												<1.0																				<0.5									0.683
Magnesium	**mg/l Mg**				6.7												5.5																				6.84									6.64
Manganese	**µg/l**				47												23																				53.6									42.1
Mercury	**µg/l**				<0.050												<0.020																												<0.02
Molybdenum	**µg/l**				<1.0												<1.0																												
Nickel	**µg/l**				2.5												3.2																				3.11									28.4
o-Phosphate	**mg/l P**				0.033												0.08													-	<0.07				-	-	0.0277									< 0.07
pH		7.6			7.8			7.8			8			7.8			7.6			8.6			7.9					7.82	7.7	7.4	7.68	7.89	7.81	7.66	7.4	7.3	7.59	7.92	7.89	8.06	7.9	7.8	7.7	7.8	7.6	7.67
Potassium	**mg/l**				3.3												4.4																				4.11									3.41
Residue on Evaporation	**mg/l**																																													
Sampling Depth	**m**																																													
Selenium	**µg/l**				<1.0												<1.0																														
Silver	**µg/l**																																													
Sodium	**mg/l**				12												12																				16									12.8
Strontium	**µg/l**				100												98																				109									131
Sulphate	**mg/l SO4**				12.3												12													-	-						20.3									13.9
Suspended Solids	**mg/l**	7			8			19			<8			13			5			17			<4					6	8	<3	6	16	21	<3	<3	<3	4	6.00	6.00	6.00	7	8	6	7	6	14
Temp	**°C**	6.2			10.2			16.4			12			7.3			9.2			17.4			11.1							21.9	15.8	17.1	12.1	13.4				12.50	12.60	12.20	12.1	12.4	12.1	12	11.5	11.2
Thallium	**µg/l**				<1.0												<1.0																												
Time Sampled		14:00	14:15	14:15	14:10	14:20	13:05	12:45	15:30	13:35	12:30	12:55	11:10	13:15	14:25	12:15	11:05	10:45	15:00	14:05	14:15	13:45	12:35	16:25	12:45																					
Tin	**µg/l**																																													
T.O.C.	**mg/l**																													-	-															
T.O.N	**mg/l N**	2.8			2.2			1.8			1.6									1.6			1.7					1.63	1.69	1.8	1.65	1.88	1.78	1.4	1.5	1.6	2.45	2.51	2.47	2.75	1.76	1.82	1.21	1.56	1.78	2.32
Total S Solids	**mg/l**																3.5																												
Uranium	**µg/l**				<1.0												<1.0																				<0.5									<0.5
Vanadium	**µg/l**				<1.0												1																				<8									<8
Zinc	**µg/l**				4.9												4.7																				10.7									6.03

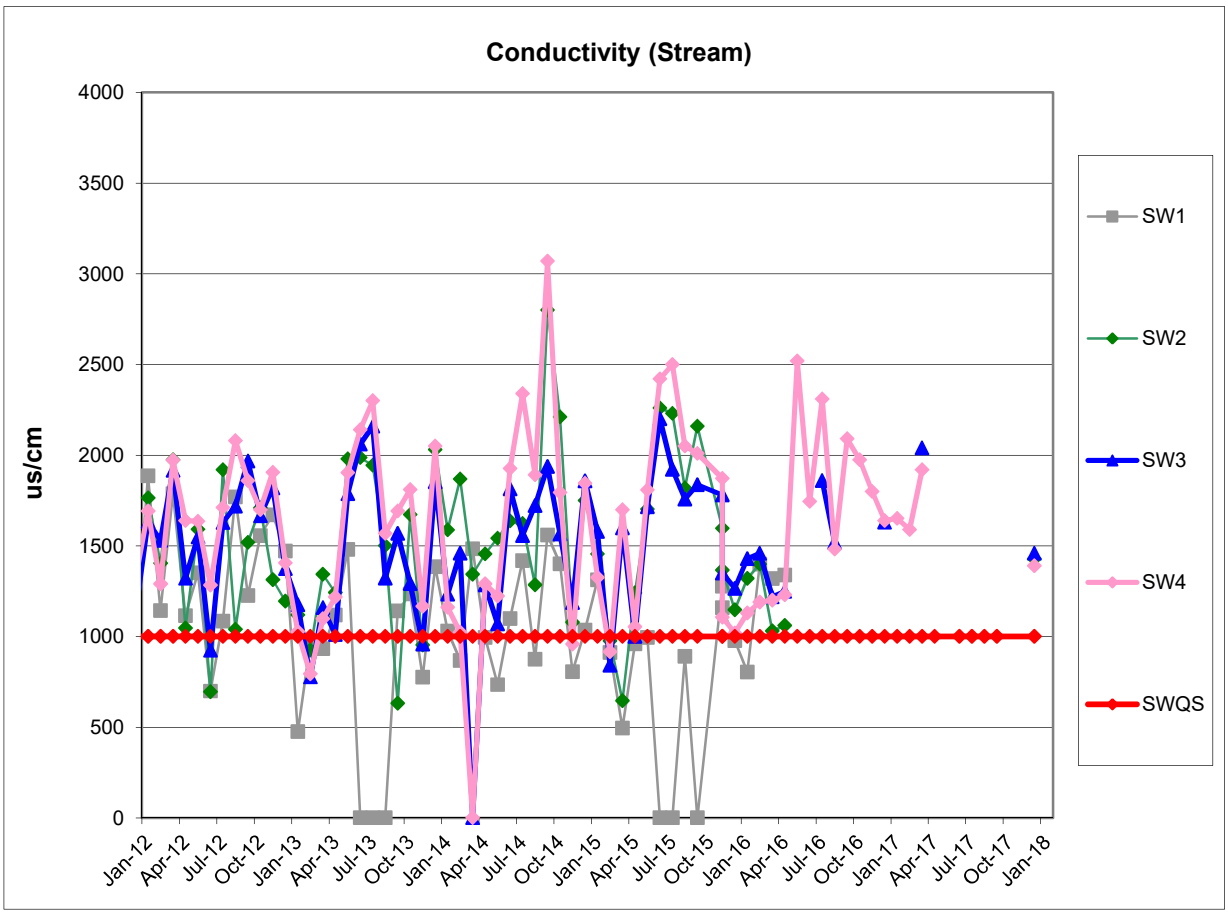
Dundalk Landfill Site

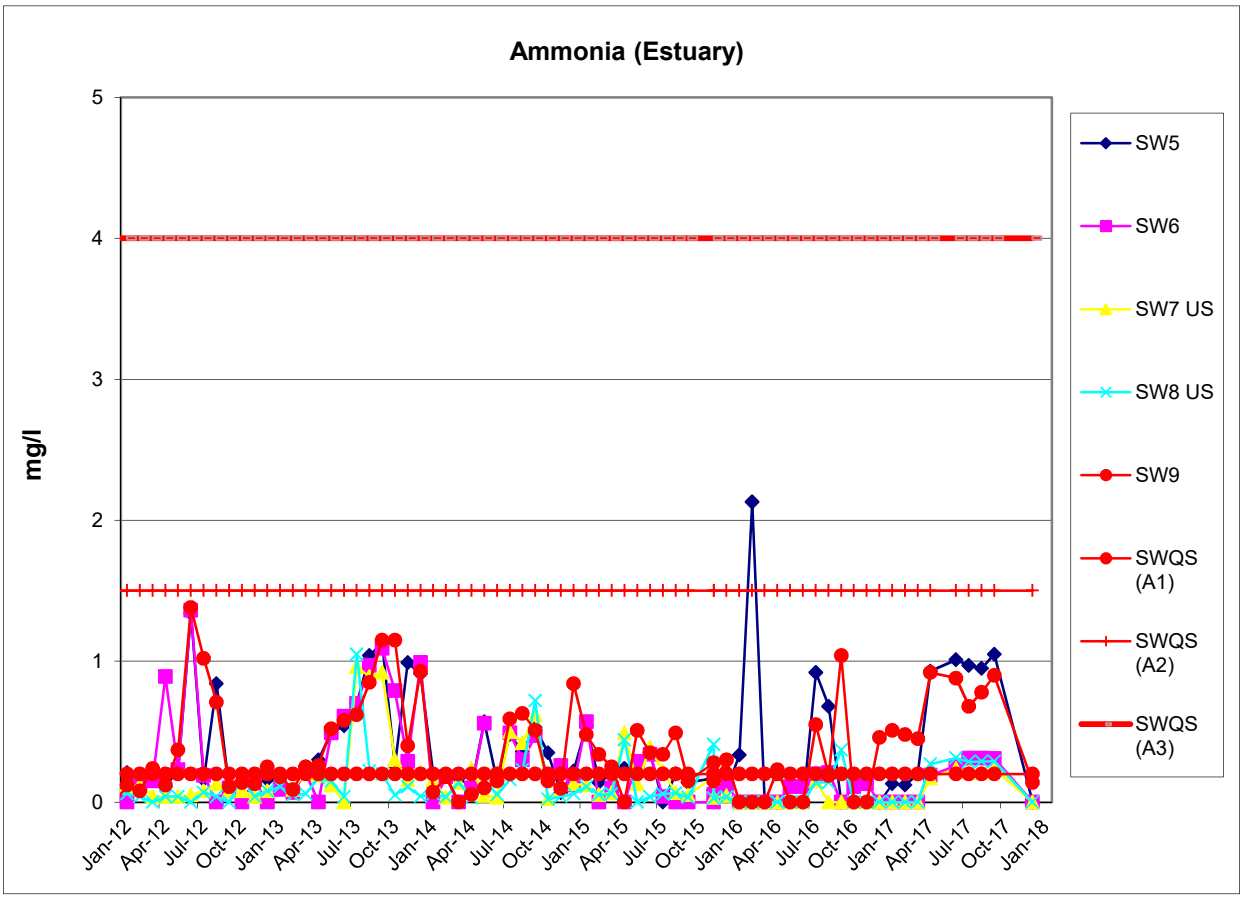
SURFACE WATER QUALITY

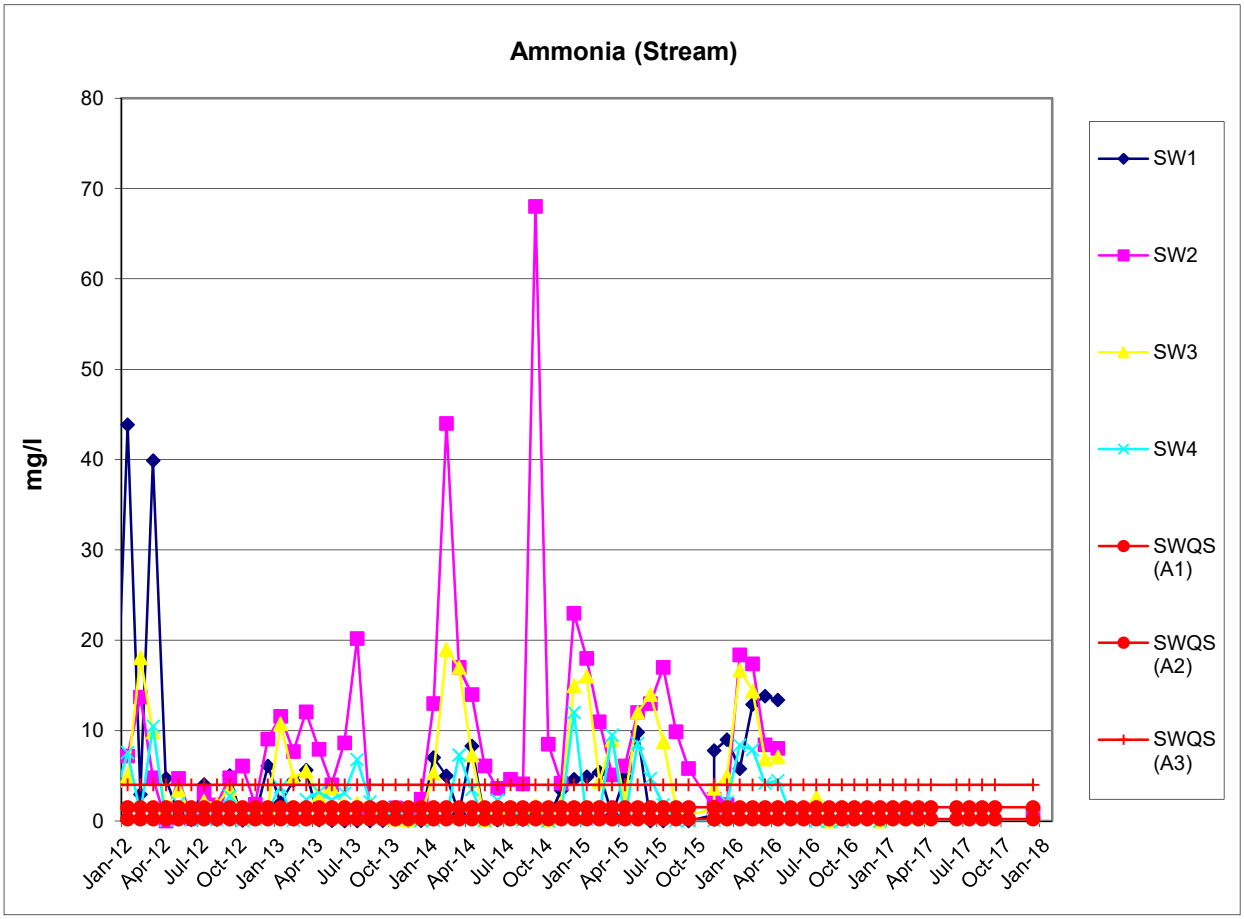
Monitoring Point: **SW9**

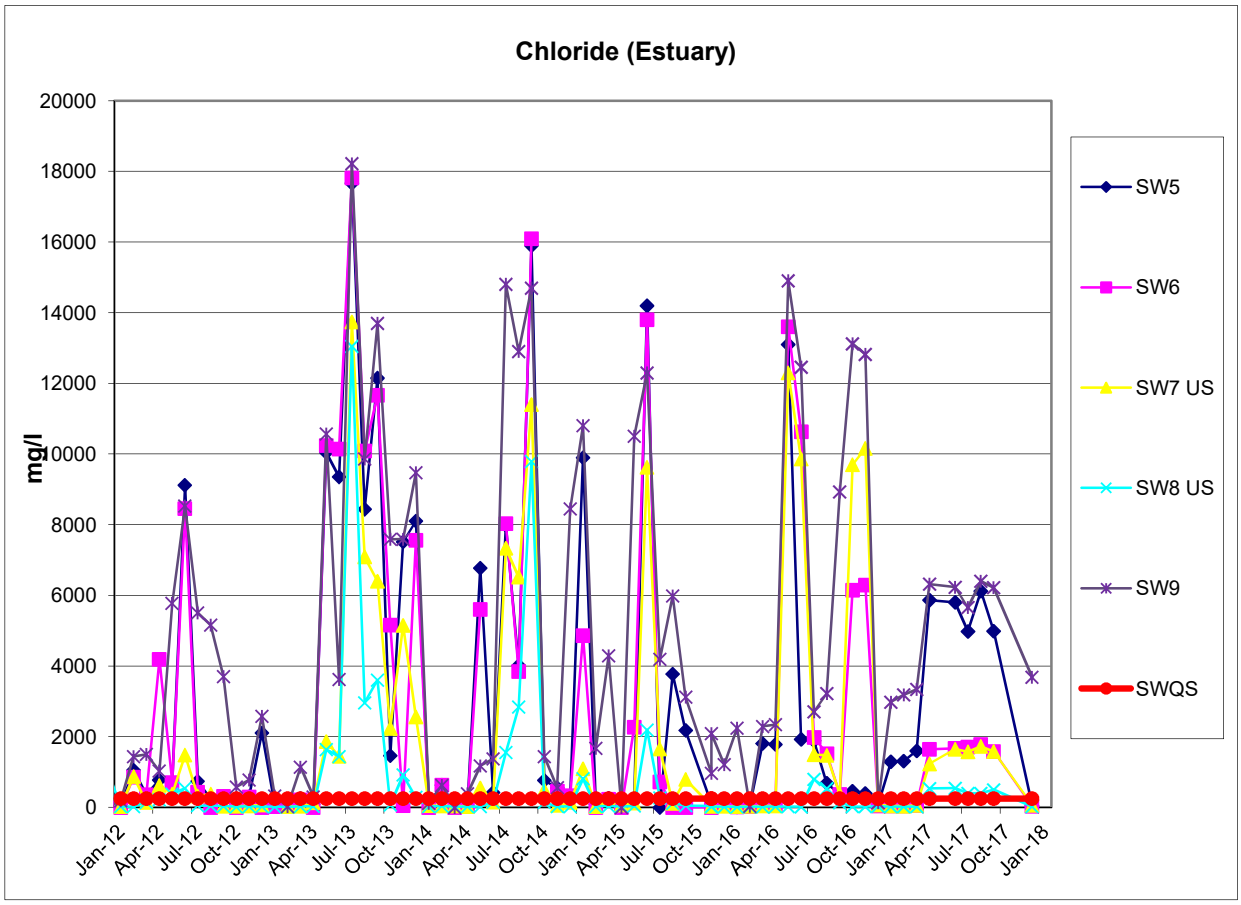
PARAMETERS	Units	27-Jan-14	17-Feb-14	10-Mar-14	07-Apr-14	13-May-14	04-Jun-14	14-Jul-14	26-Aug-14	08-Sep-14	15-Oct-14	17-Nov-14	08-Dec-14	20-Jan-15	23-Feb-15	09-Mar-15	13-Apr-15	18-May-15	15-Jun-15	21-Jul-15	10-Aug-15	07-Sep-15	04-Nov-15	16-Nov-15	14-Dec-15	28-Jan-16	29-Feb-16	31-Mar-16	5-Apr-16	31-May-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	3-Jan-17	9-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17
Alkalinity	**mg/l CaCO3**				97																															95									131
Aluminium	**µg/l**				420																															206									331
Ammonia	**mg/l N**	0.072	0.18		0.055	0.1	0.15	0.59	0.63	0.51	0.15	0.099	0.84	0.48	0.34	0.25		0.51	0.35	0.34	0.49	0.15	0.28	0.15	0.3	<0.2	<0.11	<0.11	0.23	<0.11	<0.11	0.55	0.19	1.04	<0.11	<0.11	0.46	0.51	0.48	0.45	0.92	0.88	0.68	0.78	0.9	0.14
Antimony					<1.0																																									
Arsenic					1.5																																									
Barium					36																																								43.6
Beryllium					<1.0																																								
B.O.D.	**mg/l O2**	2.3			2.1			3.7			1.7			1.3						11			1.6					1.57	1.78	2.76	1.62	2.85	1.82	1.6	2.6	<1		1.60	2.50	1.70	<2	<2	<2	<2	<2	
Boron	**µg/l**				110																															<135									766
Cadmium	**µg/l**				0.05																															<0.5									<0.5
Calcium	**mg/l Ca**				44																															38									
C.O.D.	**mg/l O2**	27			31			367			67			1550						1190			38							NR	26	NR	78	NR	NR	NR		<25	<25	NR	520	480	360	398	462	82
Chloride	**mg/l Cl**	118	625		384	1170	1370	14800	12900	14700	1440	557	8450	10800	1670	4290		10500	12300	4190	5980	3120	961	2090	1210	2240	36.2	2290	2340	14900	12460	2700	3218	8930	13120	12820	132	2980.00	3182.00	3340.00	6314.3	6231.1	5654.1	6402	6220.1	3,680.00
Chromium	**µg/l**				1.3																															<3									5.11
Cobalt (µg/l)	**µg/l**				<1.0																																							
Conductivity	**µS/cm @ 25**	605	2310		1547	4050	4750	45900	35500	41200	5120	1852	2360	34100	5650	13320		3150	3660	12440	16710	8840	3520	6600	3570	7440	321	8010	8070	39800	22640	9330	9215	25100	23760	21890	670	8990.00	9112.00	11500.00	2430	24000	21360	23580	21560	12,000.00
Copper	**µg/l**				4.3																															5.32									6.57
Cyanide	**mg/l CN**																																												
D.O.	**% Saturation**	85			76			86			92			74						114			71							8.84	7.2	78	85	76	7.9	8.1		85.00	84.00	89.00	79	92	78	80	90	90
Fluoride	**mg/l**																																												
Iron	**µg/l**				1000																															1.41									1.04
Lead	**µg/l**				1.6																															<0.5									1.56
Magnesium	**mg/l Mg**				31																															13.2									271
Manganese	**µg/l**				86																															70.1									80
Mercury	**µg/l**				<0.050																																								<0.02
Molybdenum	**µg/l**				<1.0																																								
Nickel	**µg/l**				3.7																															4.03									5.27
o-Phosphate	**mg/l P**				0.035																									-	<0.07				-	-	0.03									< 0.07
pH		7.6			7.9			7.8			7.9			7.8						7.9			7.9					7.8	7.63	8.34	7.91	8.18	7.96	7.67	7.92	7.81	7.64	7.79	7.89	7.89	7.6	7.5	7.6	7.6	7.5	7.56
Potassium	**mg/l**				12																															6.84									77.4
Residue on Evaporation	**mg/l**																																												
Sampling Depth	**m**																																												
Selenium	**µg/l**				<1.0																																								
Silver	**µg/l**																																												
Sodium	**mg/l**				230																															69.6									2,020.00
Strontium	**µg/l**				250																															151									1700
Sulphate	**mg/l SO4**				62.85																									-	-					34.3									523
Suspended Solids	**mg/l**	35			37			130			16			35						46			20					16	22	67	23	42	31	71	39	49	< 3	45.00	39.00	35.00	99	81	56	76	76	39
Temp	**°C**	5.7			10.8			16.8			12.5			7.6						17			11.1							22	16.3	19.19	14.2	12.2				11.80	12.20	12.20	12.3	12.1	12.2	12.2	11.7	11
Thallium	**µg/l**				<1.0																																								
Time Sampled		14:20	11:15		13:00	14:00	12:50	13:40	15:10	14:30	13:00	12:55	12:15	12:00	13:30	12:00		11:05	15:20	14:20	14:35	13:25	12:15	16:00	13:10																						
Tin	**µg/l**																																												
T.O.C.	**mg/l**																													-	-														
T.O.N	**mg/l N**	3.3			2			<0.20			1.5									1.3			2.1					0.626	0.638	<0.1	0.36	0.278	0.32	<0.1	<0.1	<0.1	2.25	2.48	2.24	3.28	1.33	1.56	1.32	1.45	1.42	0.33
Total S Solids	**mg/l**																																												
Uranium	**µg/l**				<1.0																															<0.5									0.899
Vanadium	**µg/l**				1.9																															<8									<8
Zinc	**µg/l**				69																															358									93

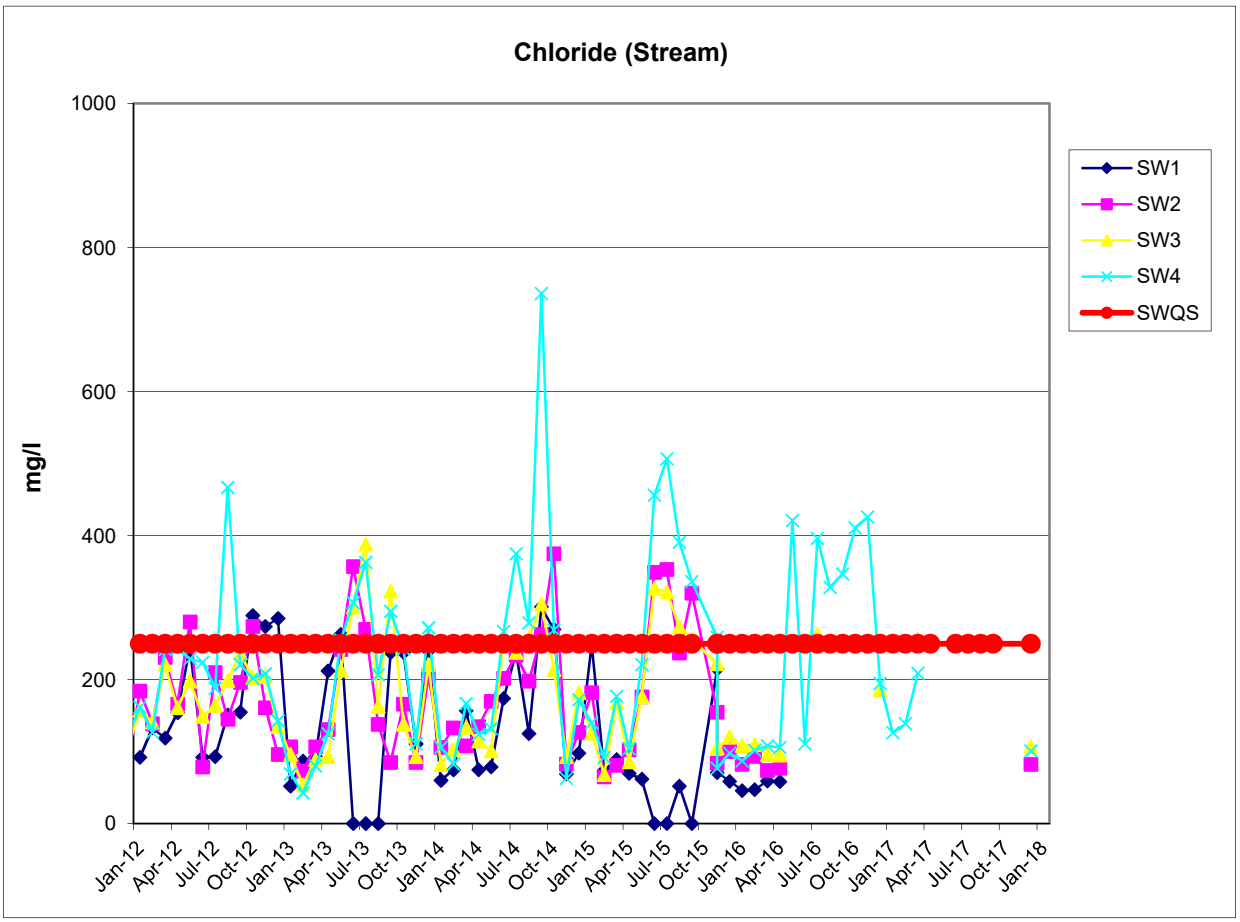

Conductivity (Estuary)
us/cm
60000
50000
40000
30000
20000
10000
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW5
SW6
SW7 US
SW8 US
SW9
SWQS

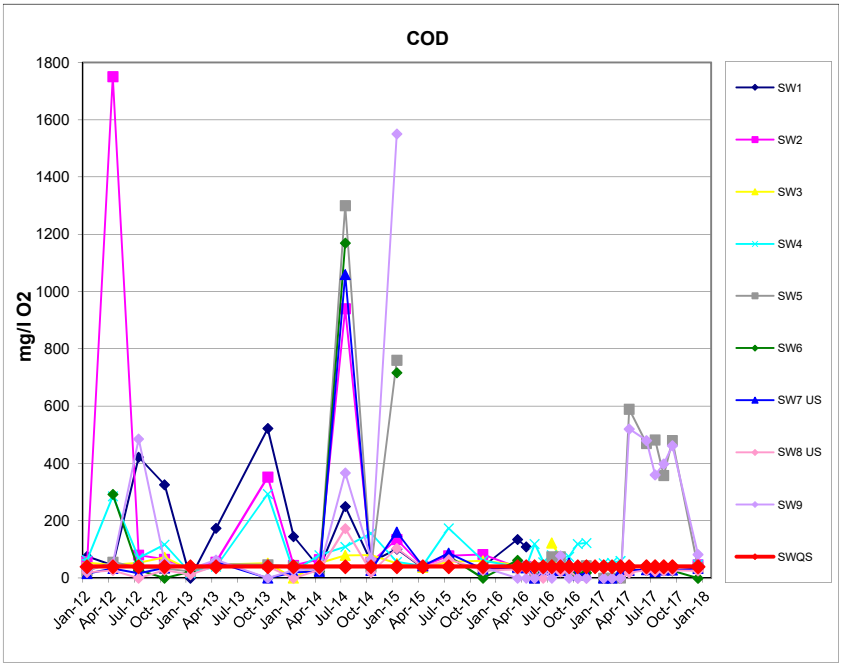

Conductivity (Stream)
us/cm
4000
3500
3000
2500
2000
1500
1000
500
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW1
SW2
SW3
SW4
SWQS

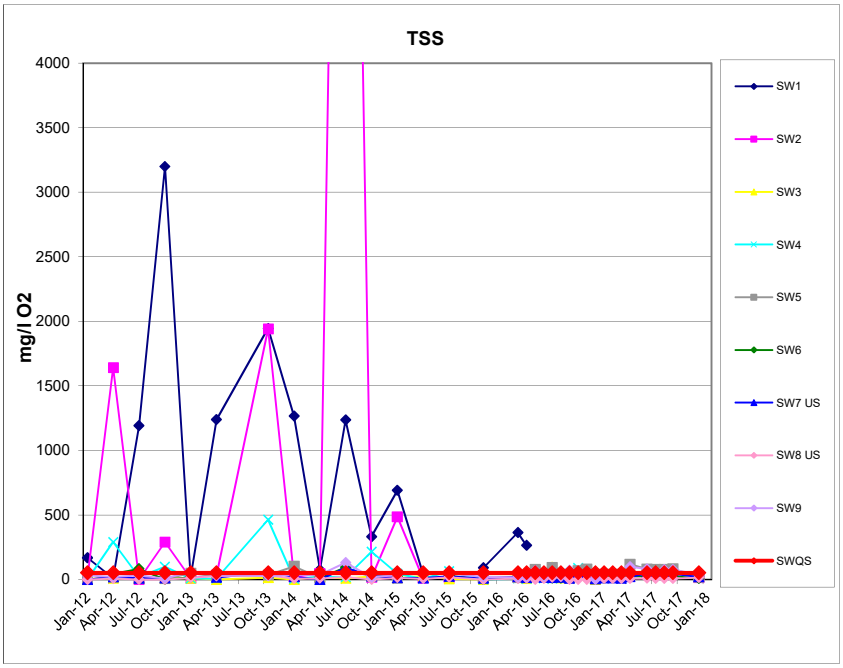

Ammonia (Estuary)
mg/l
5
4
3
2
1
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW5
SW6
SW7 US
SW8 US
SW9
SWQS (A1)
SWQS (A2)
SWQS (A3)

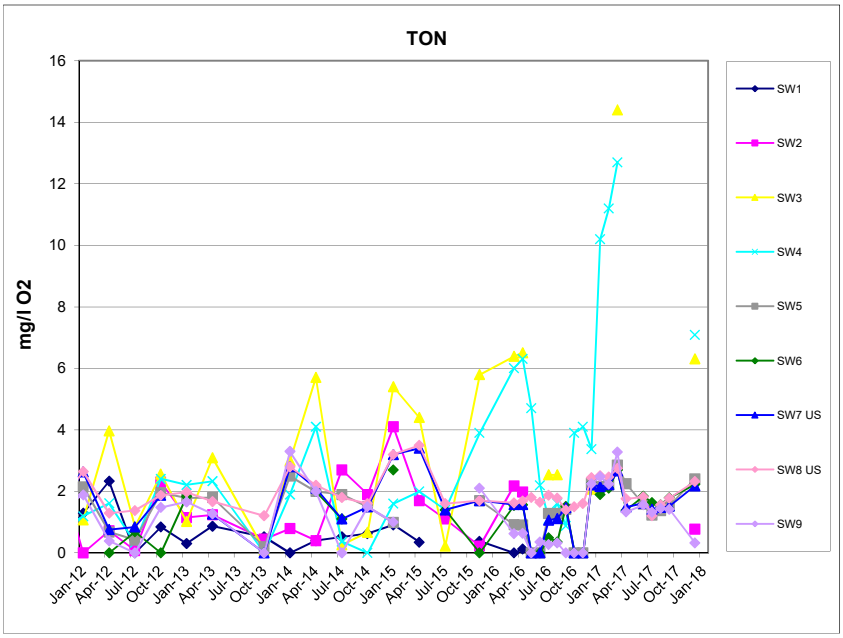

Ammonia (Stream)
mg/l
80
70
60
50
40
30
20
10
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW1
SW2
SW3
SW4
SWQS (A1)
SWQS (A2)
SWQS (A3)

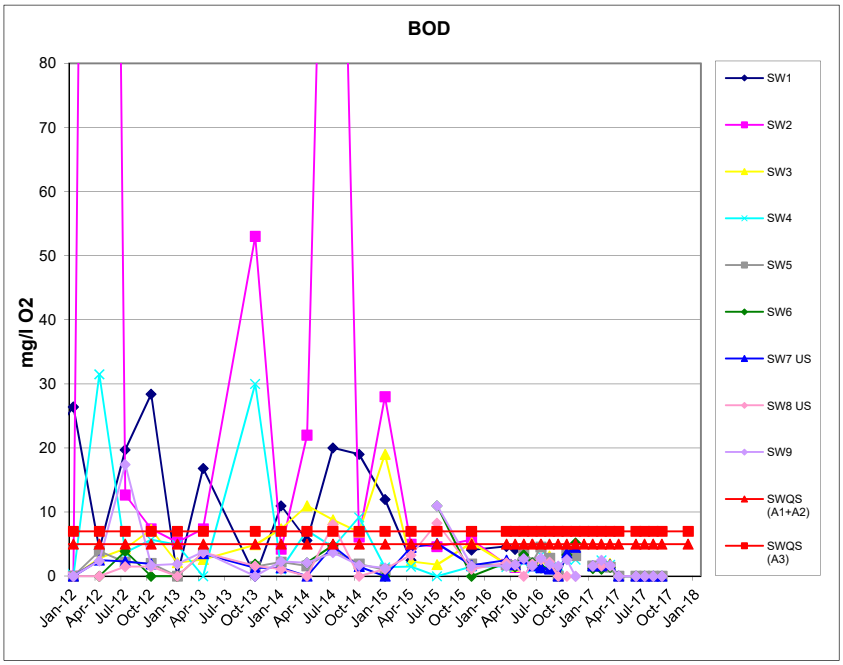

Chloride (Estuary)
mg/l
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW5
SW6
SW7 US
SW8 US
SW9
SWQS

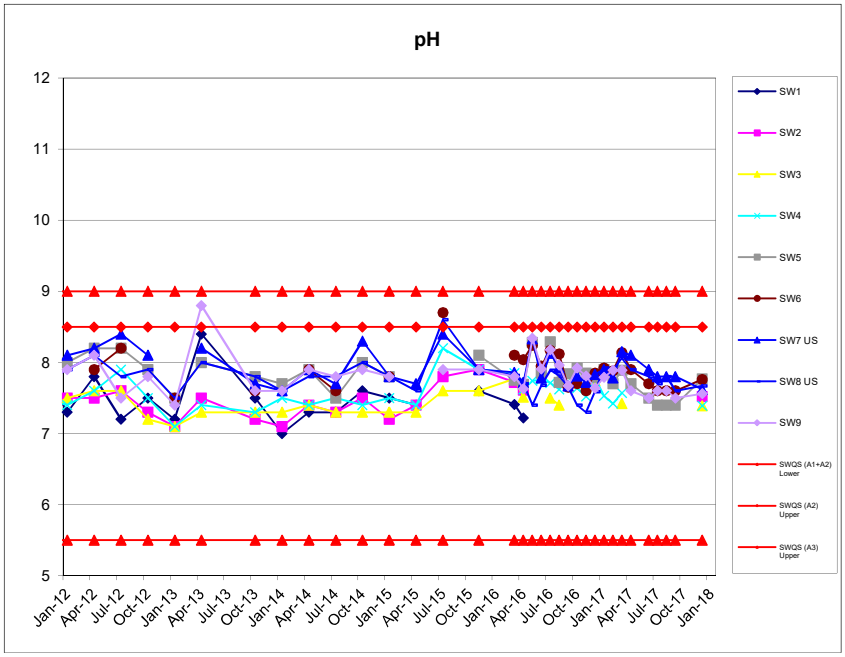

Chloride (Stream)
mg/l
1000
800
600
400
200
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW1
SW2
SW3
SW4
SWQS


COD
mg/l O2
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW1
SW2
SW3
SW4
SW5
SW6
SW7 US
SW8 US
SW9
SWQS


TSS
mg/l O2
4000
3500
3000
2500
2000
1500
1000
500
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW1
SW2
SW3
SW4
SW5
SW6
SW7 US
SW8 US
SW9
SWQS


TON
mg/l O2
16
14
12
10
8
6
4
2
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW1
SW2
SW3
SW4
SW5
SW6
SW7 US
SW8 US
SW9


BOD
mg/l O2
80
70
60
50
40
30
20
10
0
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW1
SW2
SW3
SW4
SW5
SW6
SW7 US
SW8 US
SW9
SWQS (A1+A2)
SWQS (A3)


pH
12
11
10
9
8
7
6
5
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
SW1
SW2
SW3
SW4
SW5
SW6
SW7 US
SW8 US
SW9
SWQS (A1+A2) Lower
SWQS (A2) Upper
SWQS (A3) Upper

Appendix G

Discharge to Sewer

Dundalk Landfill Site

DISCHARGE TO SEWER

Monitoring Point: **S1**

RESULTS

PARAMETERS	Units	Date																														
		30-Jan-13	11-Feb-13	25-Mar-13	15-Apr-13	22-Jul-13	07-Oct-13	28-Jan-14	07-Apr-14	14-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	31-Mar-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	03-Jan-17	09-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17	
Alkalinity	**mg/l CaCO3**																															
Aluminium	**µg/l**																														191	
Ammonia	**mg/l N**	0.38	47.31		12.46	1.35	67.92	1.4	21	6.7	11	6.3	19	3.4		0.23	0.5	0.3		2.9	3.6	18.5									0.98	
Antimony (µg/l)																																
Arsenic (µg/l)																																
Barium (µg/l)																															75.6	
Beryllium (µg/l)																																
B.O.D.	**mg/l O2**	8.1	nm		29.3	1,824	>170	2.2	22	25	250	27	<40	22	132	52	5.66	6.1	1.5	6.2	7.3		20.5	21.5	1.8	26	20	22	21	22		
Boron	**µg/l**																														<135	
Cadmium	**µg/l**																														<0.5	
Calcium	**mg/l Ca**																															
C.O.D.	**mg/l O2**	42	86		191	5,440	1840	22	133	160	623	175	349	73	5120	112	41	39	25	88	71		42	45	<25	249	90	85	89	92	26	
Chloride	**mg/l Cl**															-	22.9	24.5													23.4	
Cobalt (µg/l)																																
Chromium	**µg/l**																														<3	
Conductivity	**µS/cm @ 25**															-	345	411													389	
Copper	**µg/l**																														<4	
Depth	**m**																															
D.O.	**% Saturation**															-																
Fluoride	**mg/l**																															
Iron	**µg/l**																														0.649	
Lead	**µg/l**																														5.42	
Magnesium	**mg/l Mg**																														7.8	
Manganese	**µg/l**																														36.2	
Molybdenum (µg/l)																																
Mercury	**µg/l**																														0.0638	
Nickel																															3.93	
o-Phosphate	**mg/l P**															-															0.4	
pH		7.7	7		7.1	7	7	6.9	7.3	7.2	7	7.4	7.2	7.5	7.35	7.24	7.29	7.31	7.58	7.41	7.51	7.24	7.5	7.4	7.6	7.2	7.3	7.2	7.2	7.2	7.3	
Potassium	**mg/l**																														5.86	
Sampling Depth	**mg/l CN**																															
Selenium (µg/l)																																
Silver (µg/l)																																
Residue on Evaporation																																
Strontium (µg/l)																															143	
Sodium	**mg/l**																														13.7	
Sulphate	**mg/l SO4**	5.8	10.9		62	5,160	51	18	40.9	37	50	40	4	44	33.2	33.6	3	4	45.3		45	14.5	32.5	31.5	47.7	48.84	49.09	38.2	48.2	51.2	48.5	
Suspended Solids (mg/l)					82.1	2.8	281	47.5	200	27.7	40	47	430	12	6320	44	48	38	37	42	39	8	16	26	9	55	37	36	36	34	40	
Thallium (µg/l)		41	95													12.3																
Temp	**°C**	6.5	nm		13	7.2	16.4	5.6	10.4	16.9	13.4	6.4	10.7	17.3					17.8													
Tin (µg/l)																																
Time Sampled		11:05	14:30		12:10	14:30	11:40	13:10	12:45	12:00	12:00	12:45	13:15	11:30																		
T.O.C.	**mg/l**															-																
T.O.N	**mg/l N**															-																
Uranium (µg/l)																															<0.5	
Vanadium (µg/l)																															<8	
Total S Solids	**mg/l**																															
Zinc	**µg/l**																														25.1	
No sample																																

Dundalk Landfill Site

DISCHARGE TO SEWER

Monitoring Point:		S3																																
		RESULTS																																
		Date																																
PARAMETERS	Units	30-Jan-13	11-Feb-13	25-Mar-13	15-Apr-13	22-Jul-13	07-Oct-13	28-Jan-14	07-Apr-14	14-Jul-14	15-Oct-14	20-Jan-15	13-Apr-15	21-Jul-15	31-Mar-16	22-Jun-16	28-Jul-16	17-Aug-16	30-Sep-16	28-Oct-16	29-Nov-16	20-Dec-16	03-Jan-17	09-Feb-17	16-Mar-17	11-Apr-17	12-Jun-17	14-Jul-17	23-Aug-17	28-Sep-17	18-Dec-17	
Alkalinity	mg/l CaCO3																																	
Aluminium	µg/l																																2920	
Ammonia	mg/l N																																< 0.11	
Antimony (µg/l)																																		
Arsenic (µg/l)																																		
Barium (µg/l)																																	38.9	
Beryllium (µg/l)																																		
B.O.D.	mg/l O2																																	
Boron	µg/l																																<135	
Cadmium	µg/l																																<0.5	
Calcium	mg/l Ca																																	
C.O.D.	mg/l O2																																32	
Chloride	mg/l Cl																																8.61	
Cobalt (µg/l)																																		
Chromium	µg/l																																6.79	
Conductivity	µS/cm @ 25																																303	
Copper	µg/l																																9.57	
Depth	m																																	
D.O.	% Saturation																																	
Fluoride	mg/l																																	
Iron	µg/l																																4.1	
Lead	µg/l																																11.5	
Magnesium	mg/l Mg																																6.37	
Manganese	µg/l																																90	
Molybdenum (µg/l)																																		
Mercury	µg/l																																<0.02	
Nickel																																	9.3	
o-Phosphate	mg/l P																																0.09	
pH																																	7.68	
Potassium	mg/l																																4.36	
Sampling Depth	mg/l CN																																	
Selenium (µg/l)																																		
Silver (µg/l)																																		
Residue on Evaporation																																		
Strontium (µg/l)																																	109	
Sodium	mg/l																																6.76	
Sulphate	mg/l SO4																																28.2	
Suspended Solids (mg/l)																																	76	
Thallium (µg/l)																																		
Temp	°C																																	
Tin (µg/l)																																		
Time Sampled																																		
T.O.C.	mg/l																																	
T.O.N	mg/l N																																	
Uranium (µg/l)																																	2.45	
Vanadium (µg/l)																																	8.68	
Total S Solids	mg/l																																	
Zinc	µg/l																																665	
No sample																																		

Appendix H
Landfill Gas Monitoring Results

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)			
Site Name: DUNDALK LANDFILL		**Site Address**: NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference**: 1632-12	
Site Status: Closed		**Date** 03-01-2017	**Time**: 15.00
Instrument used: GEM5000	**Normal Analytical Range**:	**Date Next Calibration**: June 2017	
Monitoring Personnel: Damien Holmes		**Weather**: Dry	**Barometric pressure**: 1018mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.2	1.1	19.3	
G2	PIEZO		0	0.2	20.4	
G3	PIEZO		0	0.2	20.4	
G4	PIEZO		0	0.2	20.6	
G5	PIEZO		0	0.4	19.6	
G6	PIEZO		0	0.2	20.4	
G7	PIEZO		0	0.0	20.6	
G8	PIEZO		0	0.2	20.4	
G9	PIEZO		0	0.2	20.6	
G10	PIEZO		0.8	1.1	19.0	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0	0.2	20.4	
G20	PIEZO		0	0.4	20.4	
G21	PIEZO		0	0.4	20.2	
GM1	PIEZO		0	0.2	20.4	
GM2	PIEZO		0	0.0	20.6	
GM3	PIEZO		0	0.2	20.4	
GM4	PIEZO		0	0.0	20.4	
GM5	PIEZO		0	0.0	20.4	
GM6	PIEZO		0	0.2	20.4	
GM24	PIEZO		0	0.2	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**
Site Name: DUNDALK LANDFILL		**Site Address**: NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference**: 1632-12	
Site Status: Closed		**Date** 03-01-17	**Time**: 15:00
Instrument used: GEM5000	**Normal Analytical Range**:	**Date Next Calibration**: June 2017	
Monitoring Personnel: Damien Holmes		**Weather**: Dry	**Barometric pressure**: 1018mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE			26	24	2.1	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)						
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 09-02-2017		**Time**: 15:00	
Instrument used: GEM5000	**Normal Analytical Range**:		**Date Next Calibration**: June 2017			
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1022mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.7	1.1	18.8	
G2	PIEZO		0	0.2	20.4	
G3	PIEZO		0	0.2	20.4	
G4	PIEZO		0	0.2	20.4	
G5	PIEZO		0	0.2	20.6	
G6	PIEZO		0	0.2	20.6	
G7	PIEZO		0	0.3	20.2	
G8	PIEZO		0	0.2	20.4	
G9	PIEZO		0	0.2	20.6	
G10	PIEZO		0	0.4	20.2	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0	0.2	20.4	
G20	PIEZO		0	0.0	20.6	
G21	PIEZO		0	1.1	19.0	
GM1	PIEZO		0	0.2	20.4	
GM2	PIEZO		0	0.8	20.0	
GM3	PIEZO		0	0.2	20.4	
GM4	PIEZO		0	0.2	20.4	
GM5	PIEZO		0	0.2	20.4	
GM6	PIEZO		0	0.2	20.4	
GM24	PIEZO		0	0.2	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 09-02-17		**Time**: 15;00	
Instrument used: GEM5000		**Normal Analytical Range**:		**Date Next Calibration**: June 2017		
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1022mb	

Results

Sample Station Number	**Borehole/ spike/other**	**Survey Depth**	**CH_4 (% v/v)**	**CO_2 (% v/v)**	**O_2 (% v/v)**	**Comments**
FLARE			28	22	3.1	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 16-03-2017		**Time**: 11:00	
Instrument used: GEM5000	**Normal Analytical Range**:		**Date Next Calibration**: June 2017			
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1022mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		1.0	1.2	18.5	
G2	PIEZO		0.2	0.5	19.2	
G3	PIEZO		0	0.2	20.4	
G4	PIEZO		0	0.2	20.6	
G5	PIEZO		0	0.2	20.6	
G6	PIEZO		0	0.2	20.6	
G7	PIEZO		0	0.2	20.4	
G8	PIEZO		0	0.4	20.2	
G9	PIEZO		0	0.2	20.4	
G10	PIEZO		0	0.2	20.4	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0.2	1.4	18.8	
G20	PIEZO		0	0.2	20.6	
G21	PIEZO		0	0.2	20.4	
GM1	PIEZO		0	0.2	20.6	
GM2	PIEZO		0	0.2	20.6	
GM3	PIEZO		0	0.4	20.4	
GM4	PIEZO		0	0.2	20.6	
GM5	PIEZO		0	0.2	20.6	
GM6	PIEZO		0	0.2	20.4	
GM24	PIEZO		0	0.0	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**
Site Name: DUNDALK LANDFILL		**Site Address**: NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference**: 1632-12	
Site Status: Closed		**Date** 16-03-17	**Time**: 11:00
Instrument used: GEM5000	**Normal Analytical Range**:	**Date Next Calibration**: June 2017	
Monitoring Personnel: Damien Holmes		**Weather**: Dry	**Barometric pressure**: 1022mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE			28	24	3.2	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)			
Site Name: DUNDALK LANDFILL		**Site Address**: NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference**: 1632-12	
Site Status: Closed		**Date** 13-04-2017	**Time**: 12.00
Instrument used: GEM5000	**Normal Analytical Range**:	**Date Next Calibration**: June 2017	
Monitoring Personnel: Damien Holmes		**Weather**: Dry	**Barometric pressure**: 1020mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.2	1.0	19.2	
G2	PIEZO		0.2	0.4	20.0	
G3	PIEZO		0	0.2	20.4	
G4	PIEZO		0	0.2	20.4	
G5	PIEZO		0	0.4	19.8	
G6	PIEZO		0.2	0.2	20.4	
G7	PIEZO		0	0.0	20.6	
G8	PIEZO		0	0.2	20.4	
G9	PIEZO		0	0.2	20.6	
G10	PIEZO		0.4	1.2	19.2	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0	0.2	20.4	
G20	PIEZO		0	0.2	20.6	
G21	PIEZO		0	0.4	20.2	
GM1	PIEZO		0	0.2	20.4	
GM2	PIEZO		0	0.0	20.6	
GM3	PIEZO		0	0.2	20.4	
GM4	PIEZO		0	0.0	20.4	
GM5	PIEZO		0	0.0	20.4	
GM6	PIEZO		0	0.2	20.4	
GM24	PIEZO		0	0.2	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**
Site Name: DUNDALK LANDFILL		**Site Address**: NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference**: 1632-12	
Site Status: Closed		**Date** 13-04-17	**Time**: 12:00
Instrument used: GEM5000	**Normal Analytical Range**:	**Date Next Calibration**: June 2017	
Monitoring Personnel: Damien Holmes		**Weather**: Dry	**Barometric pressure**: 1020mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE			22	24	4.1	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 25-05-2017		**Time**: 10:00	
Instrument used: GEM5000		**Normal Analytical Range**:		**Date Next Calibration**: June 2017		
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1020mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.6	0.8	19.2	
G2	PIEZO		0.2	0.5	19.2	
G3	PIEZO		0	0.2	20.4	
G4	PIEZO		0	0.2	20.6	
G5	PIEZO		0	0.2	20.6	
G6	PIEZO		0	0.2	20.6	
G7	PIEZO		0	0.2	20.6	
G8	PIEZO		0	0.4	20.2	
G9	PIEZO		0	0.2	20.4	
G10	PIEZO		0	0.2	20.4	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0.4	1.2	18.6	
G20	PIEZO		0	0.2	20.6	
G21	PIEZO		0	0.2	20.6	
GM1	PIEZO		0	0.2	20.6	
GM2	PIEZO		0	0.2	20.6	
GM3	PIEZO		0	0.4	20.4	
GM4	PIEZO		0	0.2	20.6	
GM5	PIEZO		0	0.2	20.6	
GM6	PIEZO		0	0.2	20.6	
GM24	PIEZO		0	0.0	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 25-05-17		**Time**: 10:00	
Instrument used: GEM5000		**Normal Analytical Range**:		**Date Next Calibration**: June 2017		
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1020mb	

Results

Sample Station Number	**Borehole/ spike/other**	**Survey Depth**	**CH_4 (% v/v)**	**CO_2 (% v/v)**	**O_2 (% v/v)**	**Comments**
FLARE			22	24	5.2	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 20-06-2017		**Time**: 10:00	
Instrument used: GEM5000	**Normal Analytical Range**:		**Date Next Calibration**: June 2017			
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1022mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.9	1.3	18.2	
G2	PIEZO		0.4	0.5	19.4	
G3	PIEZO		0	0.2	20.4	
G4	PIEZO		0	0.2	20.4	
G5	PIEZO		0	0.2	20.6	
G6	PIEZO		0	0.2	20.2	
G7	PIEZO		0	0.4	20.2	
G8	PIEZO		0	0.2	20.4	
G9	PIEZO		0	0.2	20.4	
G10	PIEZO		0	0.6	20.0	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0	0.2	20.4	
G20	PIEZO		0	0.0	20.6	
G21	PIEZO		0	1.2	19.0	
GM1	PIEZO		0	0.2	20.4	
GM2	PIEZO		0	0.6	19.8	
GM3	PIEZO		0	0.2	20.4	
GM4	PIEZO		0	0.2	20.4	
GM5	PIEZO		0	0.2	20.4	
GM6	PIEZO		0	0.2	20.4	
GM24	PIEZO		0	0.2	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 20-06-17		**Time**: 10:00	
Instrument used: GEM5000		**Normal Analytical Range**:		**Date Next Calibration**: June 2017		
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1022mb	

Results

Sample Station Number	**Borehole/ spike/other**	**Survey Depth**	**CH_4 (% v/v)**	**CO_2 (% v/v)**	**O_2 (% v/v)**	**Comments**
FLARE			20	22	5.1	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 14-07-2017		**Time**: 14:00	
Instrument used: GEM5000	**Normal Analytical Range**:		**Date Next Calibration**: Dec 2017			
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1020mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.9	1.4	18.1	
G2	PIEZO		0.5	0.8	19.4	
G3	PIEZO		0	0.0	20.6	
G4	PIEZO		0	0.0	20.4	
G5	PIEZO		0	0.0	20.6	
G6	PIEZO		0	0.2	20.2	
G7	PIEZO		0	0.4	20.2	
G8	PIEZO		0	0.2	20.4	
G9	PIEZO		0	0.2	20.4	
G10	PIEZO		0	0.8	20.0	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0	0.2	20.4	
G20	PIEZO		0	0.0	20.6	
G21	PIEZO		0	1.3	19.0	
GM1	PIEZO		0	0.2	20.4	
GM2	PIEZO		0	0.6	20	
GM3	PIEZO		0	0.2	20.4	
GM4	PIEZO		0	0.2	20.4	
GM5	PIEZO		0	0.0	20.4	
GM6	PIEZO		0	0.2	20.4	
GM24	PIEZO		0	0.2	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**
Site Name: DUNDALK LANDFILL		**Site Address**: NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference**: 1632-12	
Site Status: Closed		**Date** 14-07-2017	**Time**: 10:00
Instrument used: GEM5000	**Normal Analytical Range**:	**Date Next Calibration**: Dec 2017	
Monitoring Personnel: Damien Holmes		**Weather**: Dry	**Barometric pressure**: 1020mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE			22	24	4.5	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)						
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 23-08-2017		**Time**: 12.00	
Instrument used: GEM5000	**Normal Analytical Range**:		**Date Next Calibration**: Dec 2017			
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1022mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.8	1.5	18.6	
G2	PIEZO		0.5	0.8	19.4	
G3	PIEZO		0	0.0	20.4	
G4	PIEZO		0	0.2	20.4	
G5	PIEZO		0	0.4	19.8	
G6	PIEZO		0.2	0.2	20.4	
G7	PIEZO		0	0.0	20.6	
G8	PIEZO		0	0.2	20.4	
G9	PIEZO		0	0.2	20.6	
G10	PIEZO		0.5	1.1	19.2	
G16	PIEZO		0	0.2	20.2	
G17	PIEZO		0	0.2	20.4	
G20	PIEZO		0	0.2	20.6	
G21	PIEZO		0	0.4	20.2	
GM1	PIEZO		0	0.0	20.4	
GM2	PIEZO		0	0.0	20.6	
GM3	PIEZO		0	0.2	20.4	
GM4	PIEZO		0	0.0	20.4	
GM5	PIEZO		0	0.0	20.4	
GM6	PIEZO		0	0.2	20.4	
GM24	PIEZO		0	0.2	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM		**(Baseline☐ Ambient☐)**	
Site Name: DUNDALK LANDFILL		**Site Address**: NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference**: 1632-12	
Site Status: Closed		**Date** 23-08-2017	**Time**: 12:00
Instrument used: GEM5000	**Normal Analytical Range**:	**Date Next Calibration**: Dec 2017	
Monitoring Personnel: Damien Holmes		**Weather**: Dry	**Barometric pressure**: 1020mb

Results

Sample Station Number	**Borehole/ spike/other**	**Survey Depth**	**CH_4 (% v/v)**	**CO_2 (% v/v)**	**O_2 (% v/v)**	**Comments**
FLARE			20	22	4.8	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 28-09-2017		**Time**: 14:00	
Instrument used: GEM5000	**Normal Analytical Range**:		**Date Next Calibration**: Sept 2017			
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1020mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.6	1.0	19.0	
G2	PIEZO		0.2	0.5	19.2	
G3	PIEZO		0	0.2	20.4	
G4	PIEZO		0	0.2	20.6	
G5	PIEZO		0	0.0	20.6	
G6	PIEZO		0	0.2	20.6	
G7	PIEZO		0	0.2	20.4	
G8	PIEZO		0	0.4	20.2	
G9	PIEZO		0	0.2	20.4	
G10	PIEZO		0	0.2	20.4	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0.3	1.1	18.6	
G20	PIEZO		0	0.2	20.6	
G21	PIEZO		0	0.2	20.6	
GM1	PIEZO		0	0.2	20.6	
GM2	PIEZO		0	0.2	20.6	
GM3	PIEZO		0	0.4	20.4	
GM4	PIEZO		0	0.2	20.6	
GM5	PIEZO		0	0.0	20.6	
GM6	PIEZO		0	0.2	20.6	
GM24	PIEZO		0	0.0	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 23-09-2017		**Time**: 14:00	
Instrument used: GEM5000		**Normal Analytical Range**:		**Date Next Calibration**: Dec 2017		
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1020mb	

Results

Sample Station Number	**Borehole/ spike/other**	**Survey Depth**	**CH_4 (% v/v)**	**CO_2 (% v/v)**	**O_2 (% v/v)**	**Comments**
FLARE			22	24	5.0	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 24-10-2017		**Time**: 10:00	
Instrument used: GEM5000		**Normal Analytical Range**:		**Date Next Calibration**: Dec 2017		
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1010mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.1	0.5	21.1	
G2	PIEZO		0.2	0.4	19.5	
G3	PIEZO		0	0.1	21.0	
G4	PIEZO		0	0.0	21.0	
G5	PIEZO		0	0.0	20.6	
G6	PIEZO		0	0.2	20.6	
G7	PIEZO		0	0.2	18.4	
G8	PIEZO		0	0.4	20.2	
G9	PIEZO		0	0.2	20.4	
G10	PIEZO		0	0.2	20.4	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0.3	1.1	18.6	
G20	PIEZO		0	0.2	20.6	
G21	PIEZO		0	0.2	20.6	
GM1	PIEZO		0	0.6	21.1	
GM2	PIEZO		0	0.2	20.6	
GM3	PIEZO		0	0.4	20.4	
GM4	PIEZO		0	0.2	20.6	
GM5	PIEZO		0	0.0	20.6	
GM6	PIEZO		0	0.2	20.6	
GM24	PIEZO		0	0.0	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**
Site Name: DUNDALK LANDFILL		**Site Address**: NEWRY ROAD, DUNDALK	
Operator: DUNDALK TOWN COUNCIL		**National Grid Reference**: 1632-12	
Site Status: Closed		**Date** 24-10-2017	**Time**: 10:00
Instrument used: GEM5000	**Normal Analytical Range**:	**Date Next Calibration**: Dec 2017	
Monitoring Personnel: Damien Holmes		**Weather**: Dry	**Barometric pressure**: 1010mb

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
FLARE			21.4	19.8	4.9	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 23-11-2017		**Time**: 14:00	
Instrument used: GEM5000		**Normal Analytical Range**:		**Date Next Calibration**: Dec 2017		
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1014mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0	0.6	19.4	
G2	PIEZO		0	0.6	19.8	
G3	PIEZO		0	0.0	20.6	
G4	PIEZO		0	0.0	20.4	
G5	PIEZO		0	0.0	20.6	
G6	PIEZO		0	0.2	20.2	
G7	PIEZO		0	0.4	20.2	
G8	PIEZO		0	0.2	20.4	
G9	PIEZO		0	0.2	20.4	
G10	PIEZO		0	0.8	20.0	
G16	PIEZO		0	0.2	20.4	
G17	PIEZO		0	0.2	20.4	
G20	PIEZO		0	0.0	20.6	
G21	PIEZO		0	1.1	20.1	
GM1	PIEZO		0	0.2	20.4	
GM2	PIEZO		0	0.6	20	
GM3	PIEZO		0	0.2	20.4	
GM4	PIEZO		0	0.2	20.4	
GM5	PIEZO		0	0.0	20.4	
GM6	PIEZO		0	0.2	20.4	
GM24	PIEZO		0	0.2	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 23-11-2017		**Time**: 14:00	
Instrument used: GEM5000		**Normal Analytical Range**:		**Date Next Calibration**: Dec 2017		
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1014mb	

Results

Sample Station Number	**Borehole/ spike/other**	**Survey Depth**	**CH_4 (% v/v)**	**CO_2 (% v/v)**	**O_2 (% v/v)**	**Comments**
FLARE			22.7	20.4	3.9	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM (Baseline☐ Ambient☐)						
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 18-12-2017		**Time**: 12.00	
Instrument used: GEM5000	**Normal Analytical Range**:		**Date Next Calibration**: Dec 2017			
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1016mb	

Results

Sample Station Number	Borehole/ spike/other	Survey Depth	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Comments
G1	PIEZO		0.2	1.5	18.6	
G2	PIEZO		0.5	0.8	19.4	
G3	PIEZO		0	0.0	20.4	
G4	PIEZO		0	0.2	20.4	
G5	PIEZO		0	0.4	19.8	
G6	PIEZO		0.2	0.2	20.4	
G7	PIEZO		0	0.0	20.6	
G8	PIEZO		0	0.2	20.4	
G9	PIEZO		0	0.2	20.6	
G10	PIEZO		0	1.1	19.2	
G16	PIEZO		0	0.2	20.2	
G17	PIEZO		0	0.2	20.4	
G20	PIEZO		0	0.2	20.6	
G21	PIEZO		0	0.4	20.2	
GM1	PIEZO		0	0.0	20.4	
GM2	PIEZO		0	0.0	20.6	
GM3	PIEZO		0	0.2	20.4	
GM4	PIEZO		0	0.0	20.4	
GM5	PIEZO		0	0.0	20.4	
GM6	PIEZO		0	0.2	20.4	
GM24	PIEZO		0	0.2	20.4	

LANDFILL GAS MONITORING

LANDFILL GAS MONITORING FORM			**(Baseline☐ Ambient☐)**			
Site Name: DUNDALK LANDFILL			**Site Address**: NEWRY ROAD, DUNDALK			
Operator: DUNDALK TOWN COUNCIL			**National Grid Reference**: 1632-12			
Site Status: Closed			**Date** 18-12-2017		**Time**: 12:00	
Instrument used: GEM5000		**Normal Analytical Range**:		**Date Next Calibration**: Dec 2017		
Monitoring Personnel: Damien Holmes			**Weather**: Dry		**Barometric pressure**: 1016mb	

Results

Sample Station Number	**Borehole/ spike/other**	**Survey Depth**	**CH_4 (% v/v)**	**CO_2 (% v/v)**	**O_2 (% v/v)**	**Comments**
FLARE			28.7	24.2	2.4	