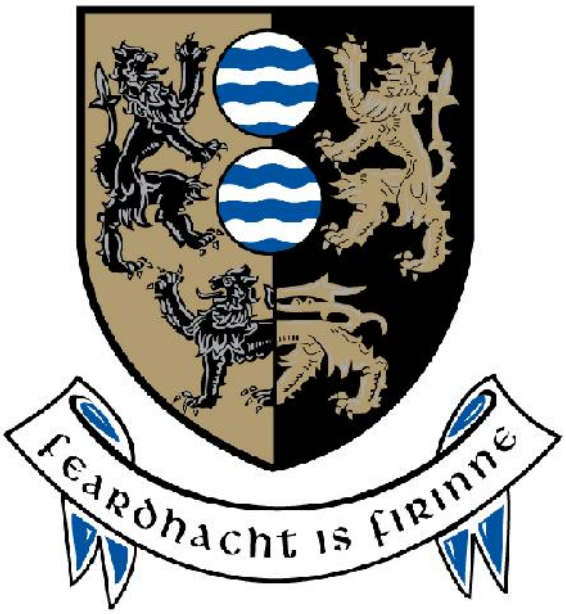
COMHAIRLE CHONDAE AN CABHÁIN

Cavan County Council



Annual Environmental Report 2012

Belturbet Landfill WL 92-1

Document Title	Annual Environmental Report 2012 Belturbet Landfill WL 0092-1		
Document ID	CCC-04-02-2012		
Revision	**Status**	**Author**	**Issue Date**
01	Draft	BK	2103/12
02	Checked By	CB/ SF	22/03/12
03	Final Issue	BK/CB	25/03/12

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to prepare the following Annual Environmental Report.

Contents

List of Tables

List of Graphs

List of Appendices

1.0 INTRODUCTION

Belturbet Landfill has been operated as waste disposal facility by Cavan County Council since the late 1979. The site was operated as a traditional landfill and is located on the Belturbet - Ballyconnell road (R200) approximately 4.5km west of Belturbet on the north side. The site was originally operated as a limestone quarry and comprises of some 1.65 acres. The rock is composed of the Darty Limestone Formation from the Lower Carboniferous period.

A Waste Licence for the facility was issued by the EPA on 13th February 2002, Ref WL 92-1. Condition 11.4 of Waste Licence requires the submission of an Annual Environmental Report for Belturbet Landfill facility. This document is produced in order to comply with requirements of Condition 11.4. The site at Belturbet was closed in February 2002. Prior to closing the site a temporary cap was placed on site.

The requirements for reporting of Annual Environmental Information arise under individual EPA licences issued under the EPA Acts 1992 – 2008, the Waste Management Acts 1996 – 2008 and other legislation.

This AER will provide information as outlined in Schedule F of the Licence "Content of the Annual Environmental Report".

2.0 REPORTING PERIOD

The reporting period for the purposes of this AER is 1st January 2012 to 31st December 2012.

3.0 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

There were no waste activities carried out at the facility.

4.0 QUANTITY AND COMPOSITION OF THE WASTE

There is no longer any waste being accepted at the site. The quantity of waste accepted is zero tonnes.

5.0 SUMMARY REPORT ON EMISSIONS

The PRTR Regulations are the European Communities (European Pollutant Release and Transfer Register) Regulation 2007, S.I. No. 123 of 2007), which signed into Irish Law on 22 March 2007 the E-PRTR Regulation, (EC) No 166/2006, concerning the establishment of a European Pollutant Release and Transfer Register. The summary of emissions is detailed in the (PRTR) Report which appears in Appendix A of this report. The PRTR has been uploaded onto the EPA website in accordance with our responsibility as Licensee.

A register of Environmental Monitoring is now established and shall be maintained. Cavan County Council now carries out sampling as required by the Licence.

5.1 Surface Water

Killynaher Lake is part of the Lough Oughter System and is a Special Area of Conservation. The lake quality is A2 status.

Table 5.1 Surface water summary results

	Parameter	Ammonia	pH	Cond	BOD	COD	Total Suspended Solids	Cl	DO
	Units	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l
SW Killynaher Lake	Qtr 4 2012	0.044	8	329	4	23	<5	17	8.9
	Qtr 3 2012	0.027	8.3	327	1	19	5	16	8.9
	Qtr 2 2012	0.018	8.2	318	2	14	<5	18	10.9
	Qtr 1 2012	0.041	8	309	<1.0	27	<5	16	10.8
S.I No. 294/1989		**0.2**	**≥5.5 and ≤8.5**	**1000**	**5**	**40**	**50**	**250**	

There were no exceedances in surface water monitoring during 2012

5.2 Groundwater

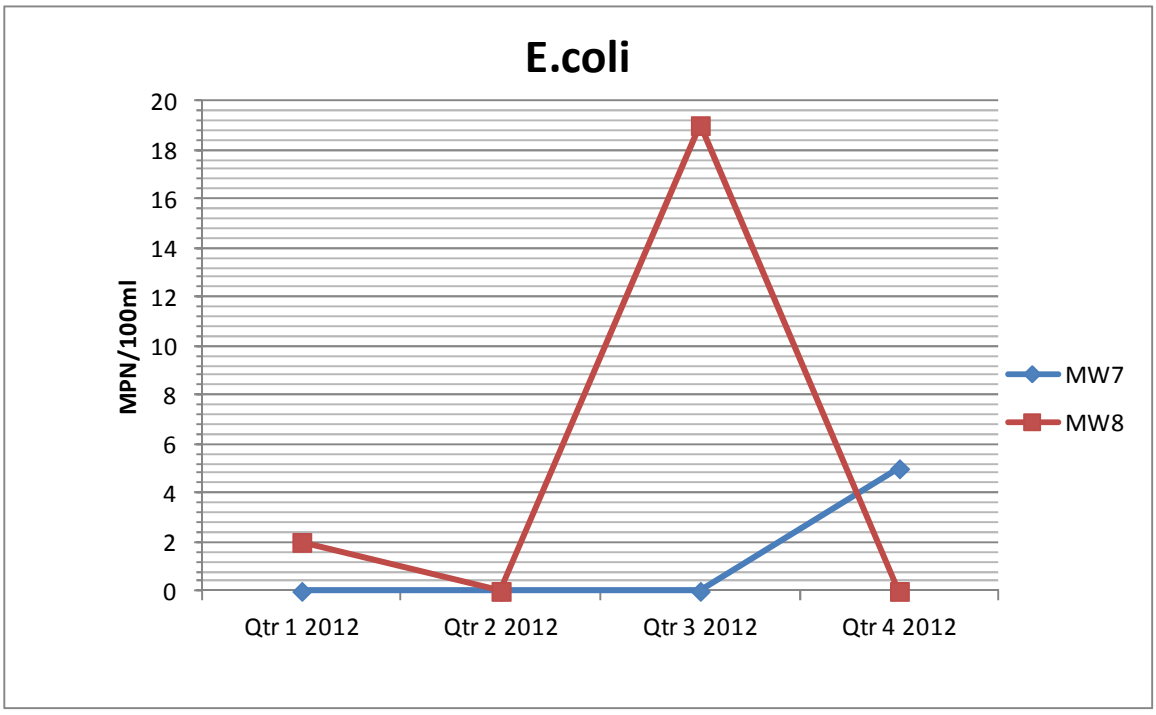
This landfill underwent the process of final capping during 2012. Ground water samples were extracted from MW 7 and MW 8 as per the waste licence. An addition ground water well was constructed along the South East boundary between the landfill and the nearest dwelling house,. This well was constructed in conjunction with the capping works and is labelled MW 9. Monitoring of this well will begin in 2013 as per the waste licence.

Table 5.2 Ground water summary results

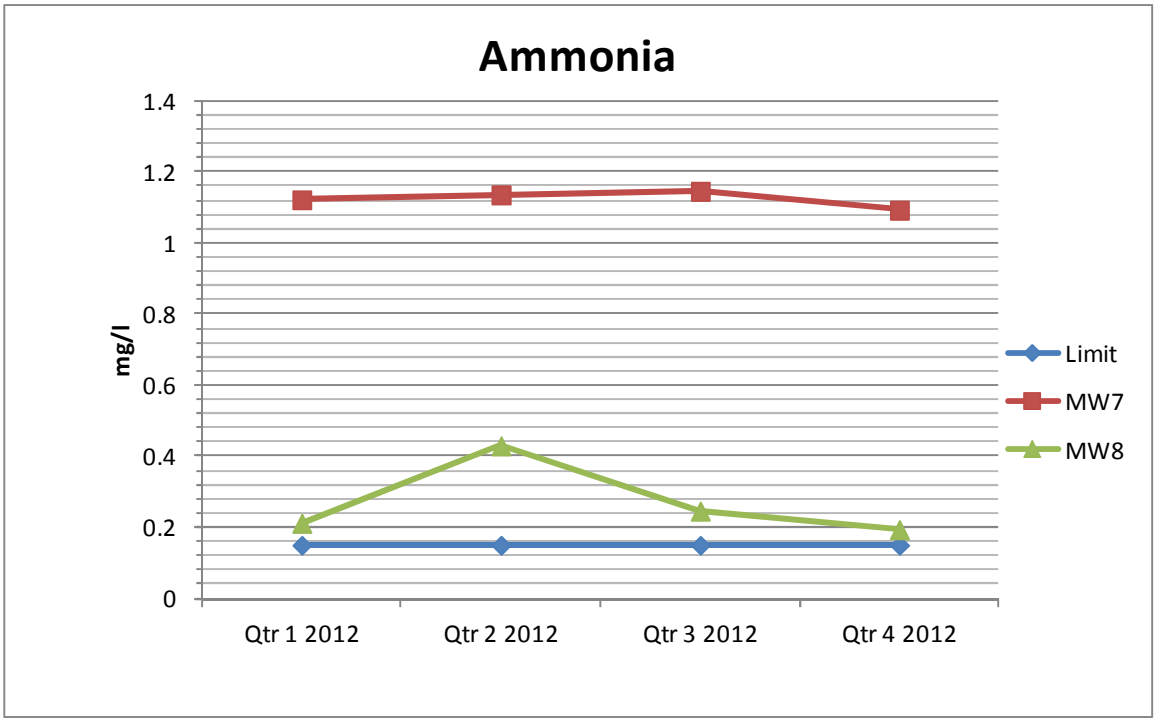
The following table and graphs show environmental monitoring results for the site.

	Parameter	E.Coli	Ammonia	Tot Coliforms	Cond	Cl	Fe	K
	Units	MPN/ 100ml	mg/l N	MPN/ 100ml	us/cm	mg/l	mg/l	mg/l
MW 7	Qtr 4 2012	5	1.093	172	639	11.6	61.6	8.8
	Qtr 3 2012	0	1.146	2	635	10	0.0466	8.7
	Qtr 2 2012	0	1.136	0	637	10.8	0.02	8.3
	Qtr 1 2012	0	1.122	22	631	9.4	0.0291	8.5
MW 8	Qtr 4 2012	0	0.194	74	1095	163.8	229.8	5.4
	Qtr 3 2012	19	0.246	179	1072	142.8	0.1909	5.1
	Qtr 2 2012	0	0.43	0	965	162.5	0.1216	5.3
	Qtr 1 2012	2	0.212	20	1067	250.2	0.136	5.4
Interim Guide Value		**0**	**0.15**	**0**	**1000**	**30**	**0.2**	**5**

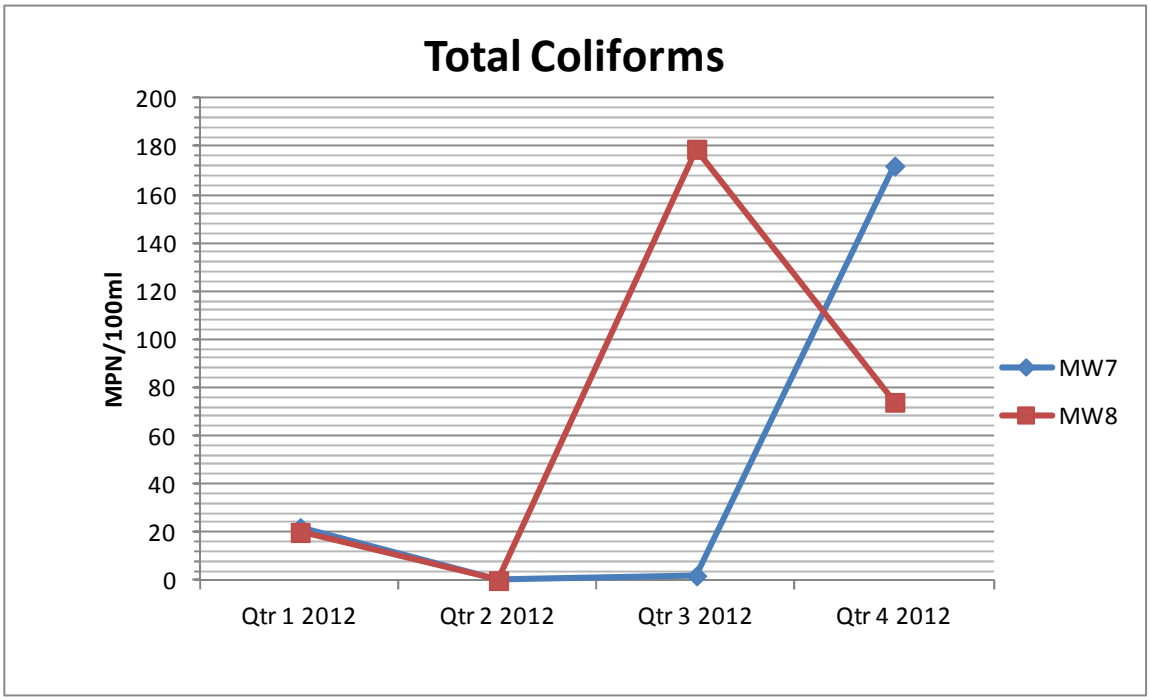
Graph 5.2



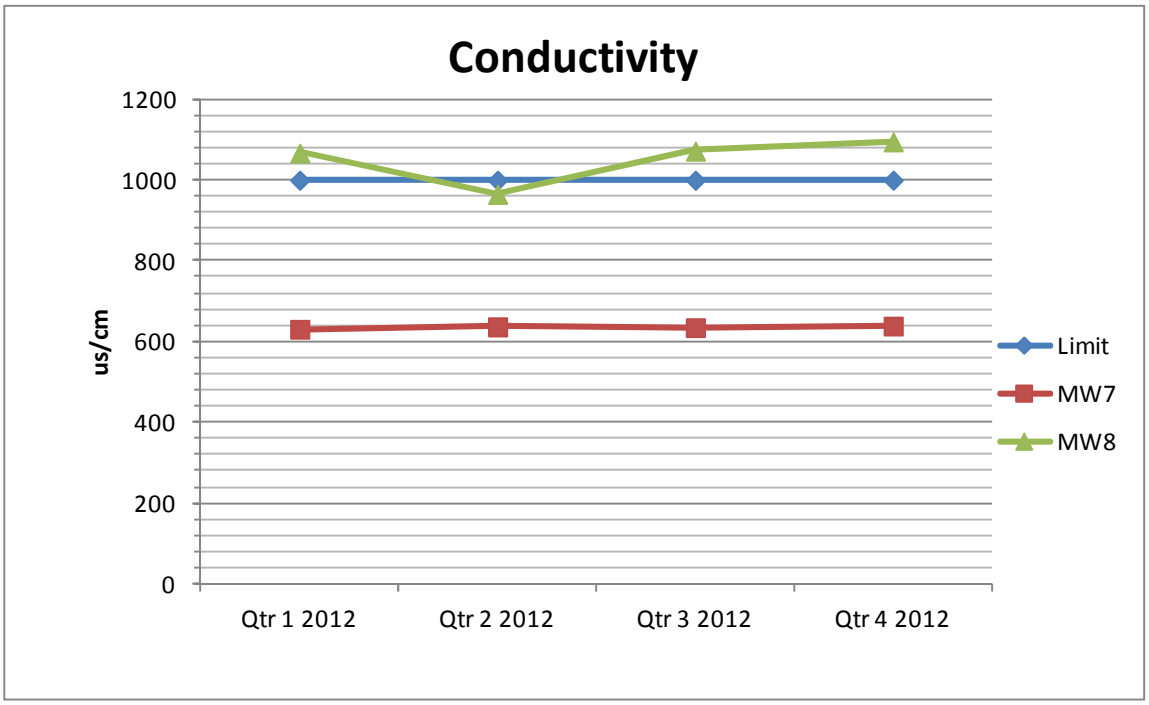
Graph 5.3



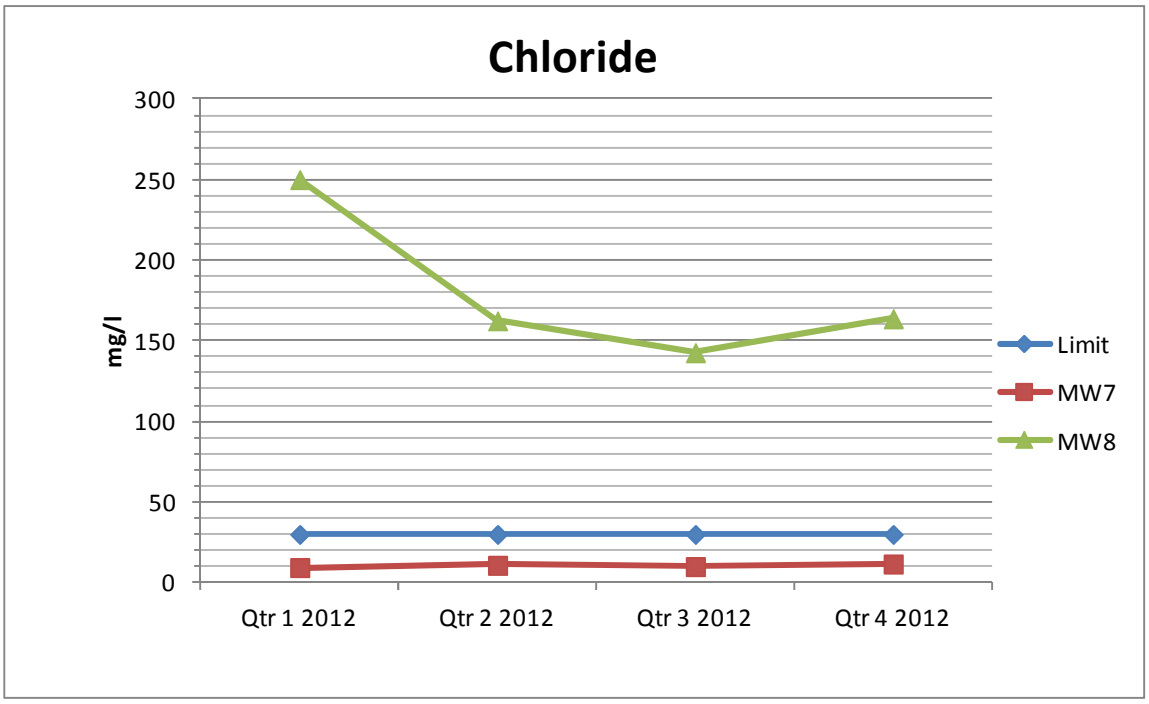
Graph 5.4



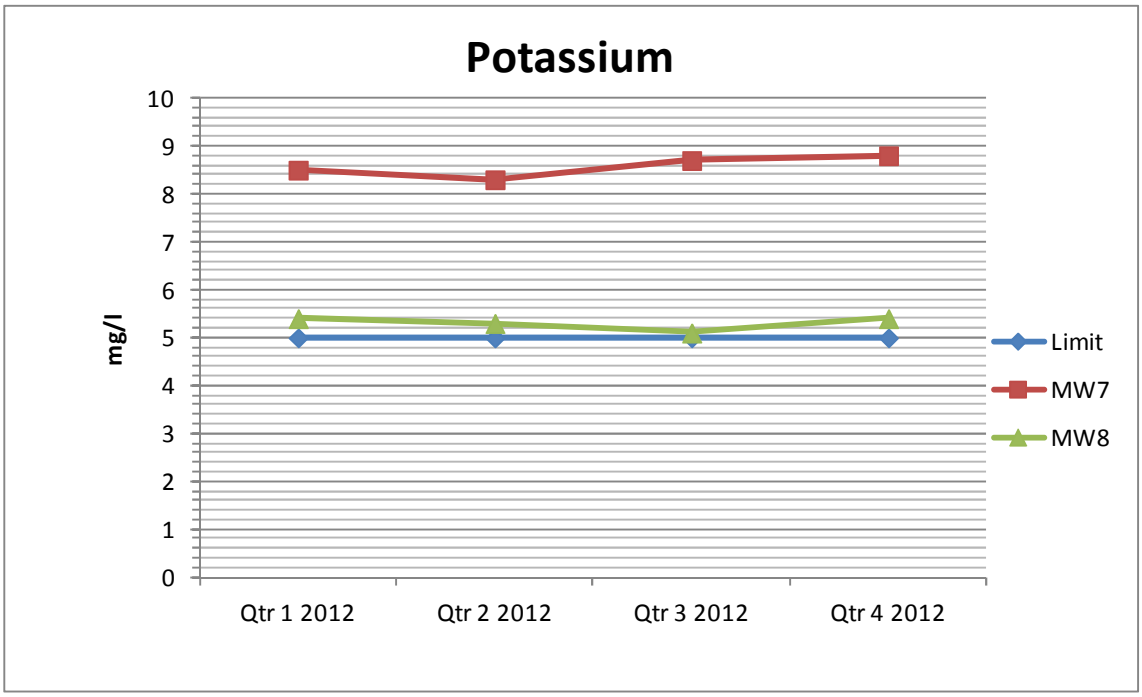
Graph 5.5



Graph 5.6



Graph 5.7



As detailed in the above graphs, there were numerous ground water exceedances at this landfill during 2012.

Exceedances occurred in the following parameters:

- Ammonia: Elevated levels of this parameter were prevalent during 2012. Levels such as those recorded are not unusual in a mature landfill such as this. Levels will gradually decrease as the landfill matures.
- Chloride: This parameter is a strong indication of contamination from a landfill source.
- Conductivity: Elevated levels of this parameter are commonly associated with pollution of an organic nature and therefore may be attributed to the landfill.
- E.Coli: The exceedance in this parameter is attributed to the capping process at this landfill. During the process, numerous wells were left unsealed and contamination from external sources may have occurred.
- Total Coliforms: Exceedances in this parameter are attributed to the natural decomposition of the organic materials in this landfill.

- Potassium: Elevated levels of potassium can be associated with landfill contamination but it can also be associated with contamination from agricultural sources such as fertilizers. Therefore direct contamination from the landfill cannot be concluded.
- Iron: Elevated levels of Iron in this instance are associated with the natural composition of the surrounding area

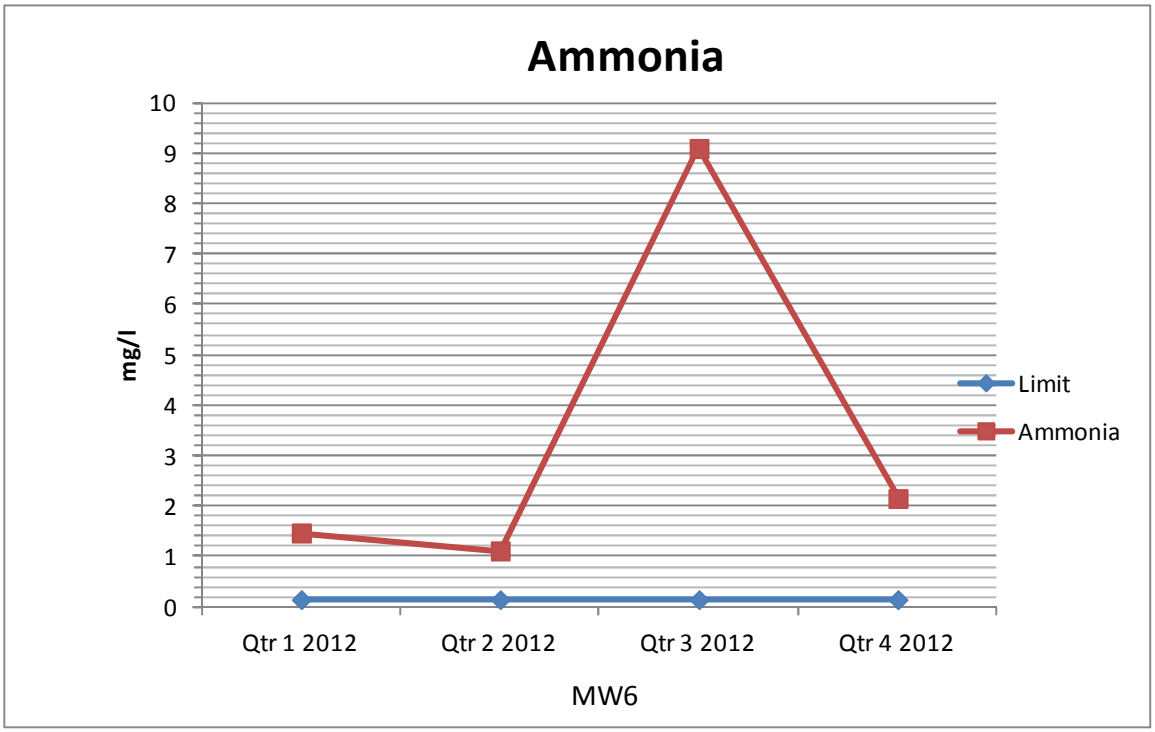
5.3 Leachate Monitoring

Monitoring Well MW5 is sampled for Leachate during quarter one of 2012. However after capping of the landfill the well was found to be dry and so a sample was obtained form Well MW6 for the remainder of the year.

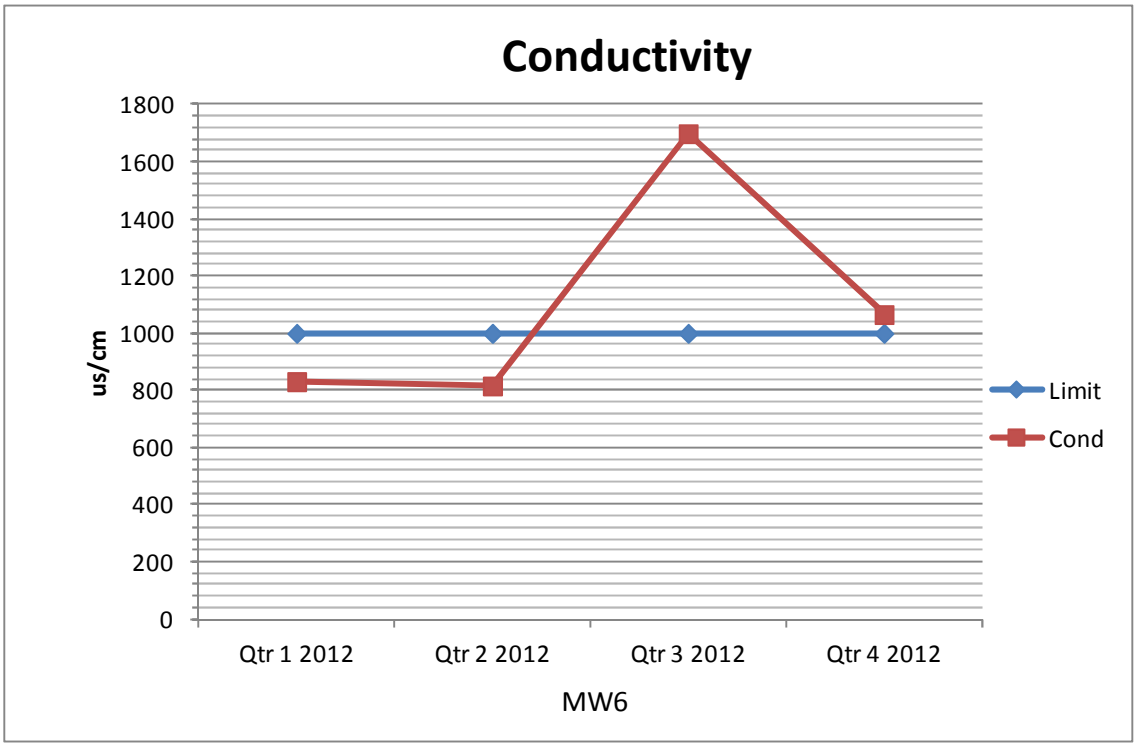
Table 5.3 Leachate summary results

	Parameter	Ammonia	Cond
	Units	mg/l N	us/cm
MW 6	Qtr 4 2012	2.156	1066
	Qtr 3 2012	9.094	1699
	Qtr 2 2012	1.117	816
	Qtr 1 2012	1.471	831
Interim Guide Values		**0.15**	**1000**

Graph 5.8



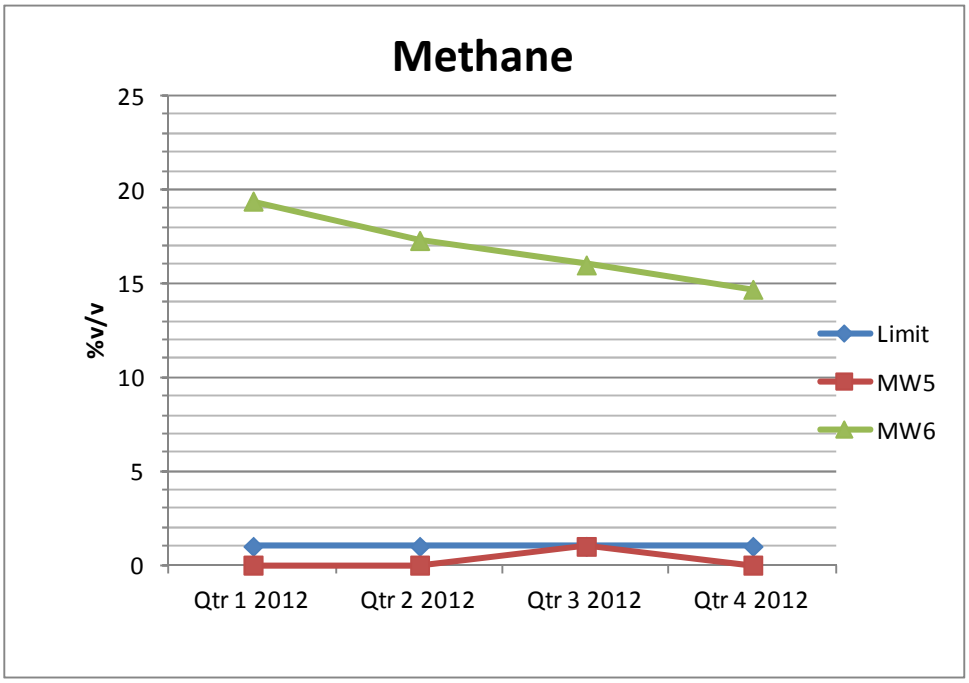
Graph 5.9



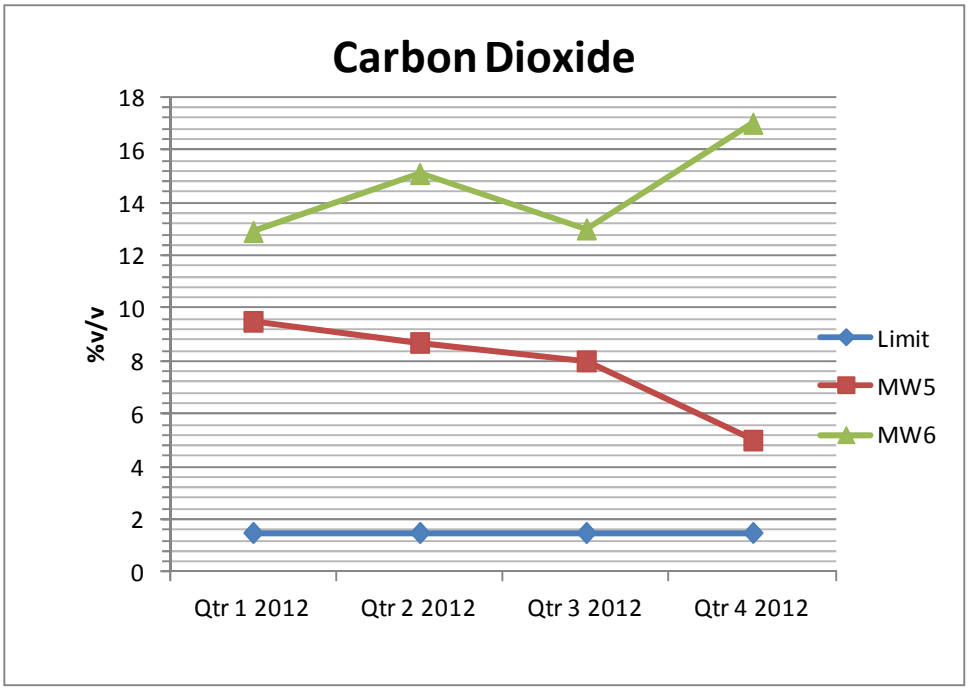
5.4 Gas Emissions monitoring summary results

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000
Parameter		CH_4	CO_2	O_2	H_2S	Barometric Pressure
Units		1% v/v	1.5 % v/v	%	PPM	mb
Client Ref	**Qtr**	-	-	-	-	-
MW 5	Qtr 4 2012	0	5	7.9	0	984
	Qtr 3 2012	1	8	19	0	995
	Qtr 2 2012	0.0	8.7	19.1	0.0	985
	Qtr 1 2012	0.0	9.5	19.8	0.0	1024
MW 6	Qtr 4 2012	14.7	17	0	0	984
	Qtr 3 2012	16	13	19	0	995
	Qtr 2 2012	17.3	15.1	20.1	0.0	985
	Qtr 1 2012	19.4	12.9	20.9	0.0	1023
MW9	Qtr 4 2012	0	4.5	15.2	0	984
	Limit	**1**	**1.5**			

Graph 6.0



Graph 6.1



Gas emissions have remained steady at locations MW 5 and MW 6 during 2012 and are typical of a mature landfill. Monitoring of MW 9 a newly constructed gas migration well begun in quarter 4 2012. Results obtained show that there is no methane present at this location.

6.0 SUMMARY OF RESULTS & INTERPRETATION OF ENVIRONMENTAL MONITORING

As presented in the information above and in Appendix 3, apart from slight elevations in certain parameters, there appears to be no environmental pollution associated with this landfill. We will continue to monitor this facility and monitoring will be increased following restoration works with the insertion of new boreholes on adjacent lands etc.

7.0 RESOURCE & ENERGY CONSUMPTION

There is no energy consumption or resource use on the site. There is no landfill gas of any value produced as can be seen from the PRTR Report

8.0 VOLUME OF LEACHATE PRODUCED

The volume of Leachate produced is unknown.

9.0 REPORT ON DEVELOPMENT WORKS UNDERTAKEN DURING THE REPORTING PERIOD AND A TIMESCALE FOR THOSE PROPOSED DURING THE COMING YEAR

Final capping of this landfill was completed during 2012. However the final phase is due for completion in 2013. This involves installation of a piped conduit for the surface water cap discharge to Killynaher Lake and the addition of monitoring boreholes on adjacent farmlands. Negotiations are ongoing with adjacent landowners and their solicitors.

10.0 REPORT ON THE RESTORATION OF COMPLETED CELLS/PHASES

Belturbet Landfill was capped in 2012 according to specifications submitted and approved by the EPA Castlebar office.

A fully engineered and lined system was installed and the site has been improved significantly. There is however some outstanding works unfinished. The cap surface water collection system and monitoring boreholes are due to be installed on Mr Reilly's lands as soon as agreement can be reached. Agreement was reached previously but other queries have arisen in the meantime. We hope to get a resolution to this issue by the end of 2013. Also the fencing of the site will be completed.

11.0 SITE SURVEY SHOWING THE EXISTING LEVELS OF THE FACILITY AT THE END OF THE REPORTING PERIOD

Site Survey is included in Appendix B.

12.0 ESTIMATED ANNUAL AND CUMULATIVE QUANTITIES OF LANDFILL GAS EMITTED FROM THE FACILITY

This information is reported in the PRTR Report attached in Appendix A. The estimated quantity of Methane released is 18,100kgs/yr. Page one from the Annual Gas Survey is also presented in Appendix A.

13.0 FULL TITLE AND A WRITTEN SUMMARY OF ANY PROCEDURES DEVELOPED BY THE LICENCE IN THE YEAR WHICH RELATES TO THE FACILITY

There are no written procedures required for this site.

14.0 TANK & BUND TESTING INSPECTION

There are no tanks or bunds on site.

15.0 REPORTING INCIDENTS & COMPLAINTS SUMMARIES

There were no complaints reported or recorded for this site during the reporting period.

16.0 REPORTS ON FINANCIAL PROVISION MADE UNDER THIS LICENCE, MANAGEMENT AND STAFFING STRUCTURE OF THE FACILITY AND A PROGRAMME FOR PUBLIC INFORMATION.

Provision will be made in Cavan County Council Official Estimates for Charges as required under Condition 12 of Waste Licence Ref. 92-1.

Table 16.1 Management Structure 2012-2012

Position	Name	Duties
Director of Services Environment	Eoin Doyle	Oversee and assign responsibilities to staff regarding landfill
Senior Executive Officer	John Brannigan	Oversee general supervision, monitoring and reporting of the site.
Landfill Operations Manager	Sinead Fox	Responsible for general supervision, monitoring and reporting of the site.

Contact Person for Sanitary Authority for 2012/ 2013:
John Brannigan
Senior Executive Officer
Waste Management Section
Cavan County Council
Farnham Street,
Cavan

Programme for Public Information:
Cavan County Council informs local residents of any works that are taking place at the landfill facility.

17.0 REPORT ON TRAINING OF STAFF

Landfill Operations Manager Sinead Fox for Cavan County Council deals with in full with any issues identified by the Agency Inspectors or any other party. Sinead has been fully trained by the FAS Waste Management Training Course, Control of Landfill Gas and carries a Safe Pass.

18.0 ANY OTHER ITEMS SPECIFIED BY THE AGENCY

No other items have been specified.

APPENDIX A

PRTR Emissions Report,

Landfill Gas Survey

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.15

REFERENCE YEAR	2012

1. FACILITY IDENTIFICATION

Parent Company Name	Cavan County Council
Facility Name	Belturbet Landfill
PRTR Identification Number	W0092
Licence Number	W0092-01

Waste or IPPC Classes of Activity

No.	class_name
3.1	Deposit on, in or under land (including landfill).
3.13	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.
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
4.13	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.
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.3	Recycling or reclamation of metals and metal compounds.
4.4	Recycling or reclamation of other inorganic materials.
Address 1	Rahaghan
Address 2	Belturbet
Address 3	Co Cavan
Address 4	
	Cavan
Country	Ireland
Coordinates of Location	-7.51132 54.0873
River Basin District	GBNIIENW
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Vincient Craig
AER Returns Contact Email Address	vcraig@cavancoco.ie
AER Returns Contact Position	Landfill Operations Manager
AER Returns Contact Telephone Number	0049-4378418
AER Returns Contact Mobile Phone Number	
AER Returns Contact Fax Number	
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	1
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
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) ?	

This question is only applicable if you are an IPPC or Quarry site

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
03	Carbon dioxide (CO2)	C	MAB	GASSIM	0.0	50700.0	0.0	50700.0
01	**Methane (CH4)**	C	MAB	GASSIM	0.0	18100.0	0.0	18100.0

* 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: Belturbet Landfill

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)	18100.0	C	MAB	GASSIM	N/A	
Methane flared	0.0				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)	18100.0	C	MAB	GASSIM	N/A	

Environmental Protection Agency

A survey of landfill sites to determine the quantity of methane flared and or recovered in utilisation plants for 2012

Please choose from the drop down menu the license number for your site	W0092
Please choose from the drop down menu the name of the landfill site	Belturbet Landfill
Please enter the number of flares operational at your site in 2012	0
Please enter the number of engines operational at your site in 2012	0
Total methane flared	0 kg/year
Total methane utilised in engines	0 kg/year

Please note that the closing date for reciept of completed surveys is 31/03/2013

Introduction

The Office of Climate Licensing and Resource Use (OCLR) of the Environmental Protection Agency acts as the inventory agency in Ireland with responsibility for compiling and reporting national greenhouse gas inventories to the European Commission and the United Nations Framework Convention on Climate Change. In addition to meeting international commitments Ireland's national greenhouse gas inventory informs national agencies and Government departments as they face the challenge to curb emissions and meet Ireland's targets under the Kyoto Protocol. The national inventory also informs data suppliers, making them aware of the importance of their contributions to the inventory process and a means of identifying areas where input data may be improved.

It is on this basis that the Environmental Protection Agency is asking landfill operators to partake in this survey so that the most uptodate information on methane flaring and recovery in utilisation plants at landfills sites is used in calculating the contribution of the waste sector to national greenhouse gas emissions

The Environmental Protection Agency wishes to thank you for partaking in this survey. If you have any questions about the survey and how to complete it please view the "Help sheet" worksheet. If however, your query is not answered by viewing the "Help sheet" worksheet please contact:
LFGProject@epa.ie

Once completed please send the completed file as an attachment clearly stating the name and or license number of the landfill site (e.g. W000 Xanadu landfill_2012) to:
LFGProject@epa.ie

APPENDIX B

Site Map

RAHAGHAN

0 25 50 75 Metres

Killynaher Lake

Belturbet closed landfill, outlined in red

ADJACENT AGRICULTURAL LANDS

GWMW 5
GWMW 6
GWMW 7
GWMW 8
SW 1
SW06/2 CL 66,00 IL 64,62
SW06/3 CL 66,00 IL 64,85
SW07 CL 66,00 IL 64,38
SW08 CL 66,00 IL 64,57
SW09 CL 66,00 IL 64,75
LMW B
Gas 1
Gas 2
Gas 3
Gas 4
Gas 5
Gas 6
Gas 7
Gas 8
Gas 9
Gas 10
Gas 11
Gas 12

Quarry
Quarry
Quarry
FF
FF
FF
CD
UND
ACCESS LANEWAY
N87

3.14
0.21
0.23
0.23
0.70
0.76
0.38
0.29
0.30
0.23
0.33

Please Note
Do not scale from drawing.
All dimensions should be verified on site before construction and any discrepancies found brought to the attention of the Engineer.

All drawings remain the property of the Boylan Engineering, permission must be sought to copy any drawing or section there of.

NOTES / LEGEND

Client: Cavan County Council

Project:
Belturbet Landfill

Boylan engineering
Main St., Mullagh, Kells, Co. Meath.
Phone: 046 - 928 6000
Email: info@boylanengineering.ie
Website: www.boylanengineering.ie

Drawn By	Approved by
A. Clarke	B. Keating

Drawing No.	Drawing Name
001	Monitoring Well Locations

Date	Scale	Rev.
11.06.2012	1:1000	000

APPENDIX C
Q4 Monitoring Report

ENVIRONMENTAL MONITORING REPORT FOR BELTURBET LANDFILL W0092-01

Client: **Cavan County Council**

Site Location: **Rahaghan, Belturbet**

Report No.: CCC-04-01-02-04-Rev-0

Produced by: Brona Keating, BSc, P.Grad.Dip. Environmental Eng.

Approved by: _____ **Date:** 30th November 2012
Cathal Boylan, BEng, CEng, MIEI
CHARTERED ENGINEER

Boylan Engineering
Company Reg. 430482
Address: Main St., Mullagh, Kells Co. Meath.
Phone: 046 – 928 6000 / 087 – 820 5470
Fax: 046 – 928 6002
Email: info@boylanengineering.ie
Web: www.boylanengineering.ie

Rev.	Date	Description

I SUMMARY

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to carry out Environmental Monitoring at Belturbet Landfill (W0092-01), Rahaghan, Belturbet, Co Cavan for quarter four 2012.

Brona Keating, Environmental Consultant carried out all monitoring. This report shall document the findings.

Table of Contents

List of Tables

Appendix

1. INTRODUCTION

Belturbet landfill was operated as a disposal facility by Cavan County Council from 1979 until its closure in February 2002. The facility was operated as a traditional landfill and is located on the Belturbet Ballyconnell road (R200) approximately 4.5 kilometres West of Belturbet town. The site which was originally a limestone quarry comprises some 0.65 hectares. The bedrock surrounding the landfill is Darty Limestone Formation from the Lower Carboniferous period. A waste licence was issued by the EPA on the 13th of February 2002. Some remedial works were carried out after the closure of the site.

Condition 8.1 of the waste licence requires that monitoring be carried out in accordance with Schedule D of the licence. The following reports give details of groundwater, surface water and leachate sampling programme conducted on site and also summarises findings and analytical results for quarter four 2012.

The purpose of environmental and landfill gas monitoring at closed landfills is to:

- Ensure the facility is compliant with the waste license
- Ensure the facility is not causing environmental pollution
- Ensure the facility is not posing a risk to human health
- Ensure the facility is not creating an unacceptable risk to atmosphere, water, soil, plants or animals.
- Ensure that the facility is not causing a nuisance through noise or odors
- Ensure the facility is not adversely affecting the countryside or places of interest.
- Compare actual site behavior with expected/modeled behavior
- Assess the effectiveness of gas control measures installed at the site
- Establish a reliable database of information for the landfill throughout its life.

According to the Response matrix for landfills, Belturbet landfill is situated in the R4 Zone. This zone was categorized using a vulnerability rating combined with the aquifer category for the area. Landfills situated in R4 Zones are unacceptable in accordance with today's standards detailed in the EPA Landfill Design Manual or conditions of a waste licence - (EPA, groundwater protection Responses for Landfills).Unfortunately this landfill was constructed prior to this guidance and conditions were issued only after its closure.

Landfill gas is generated by decomposition of organic materials in waste deposited at landfills. Typically, the gas is a mixture of Methane (up to 65% by volume) Carbon Dioxide (up to 35% per volume). It can also contain minor constituents at low concentrations (typically less than 1% volume contains 120-150 trace constituents).
The landfill directive requires that appropriate measures are taken in order to control the accumulation and migration of landfill gas.

The generation of Leachate is one of the main hazards to groundwater from the disposal of waste by land filling. The conditions within a landfill vary over time from aerobic to anaerobic thus allowing for different chemical reactions to take place. Most landfill leachates have a high BOD, COD, Ammonia, Chloride, Sodium, Potassium, Hardness and Boron levels - (EPA, groundwater protection Responses for Landfills).

2.0 METHODOLOGY

2.1 Environmental Sampling

The following procedure is conducted by Boylan Engineering to ensure accurate groundwater, surface water and leachate monitoring:

- ISO 5667: Guidance on sampling of groundwaters is adhered to.
- Prior to sampling, the depth of water in groundwater wells is measured by dipping. Dipping the wells before sampling allows for calculation of the volume of water in the well. This data is recorded on the field sheet for volume calculation which is presented in appendix 4.
- Once the volume was calculated the boreholes are purged three times their volume before sampling.
- Sampling is conducted using a Waterra inertial lift pump and associated tubing, pumping water directly from the borehole to the appropriate sampling bottles.
- Designated tubing is used at each location.
- Surface water samples are taken by grab sample using a Telescoup and Pendulum beaker.
- Having obtained a representative sample the following parameters are measured on-site using a Hanna HI 98129 combination waterproof high accuracy analyser and a Hanna 9164 Dissolved Oxygen meter, respectively.
    - Conductivity
    - Temperature
    - pH
    - DO

- Boylan Engineering operate a Sample Submission/Chain of Custody form, which accompanies the samples at all times. These forms are located in the appendix 5.

2.2 Laboratory Analysis

- Samples are sent to Environmental Laboratory Service (ELS) (Ireland) for analysis of the required parameters in designated cool boxes with ice packs. These boxes insure that samples are maintained at a consistent temperature between 0 ^{o}C and 4^{o}C on their journey to the laboratory.
- On arrival at the laboratory, samples are stored between 0 ^{o}C and 4 ^{o}C.
- All samples received are inspected by Laboratory Manager Mr. Brendan Murray.
- All samples are assigned a unique reference number and are recorded on the Laboratory Information Management System (LIMS)
- All staff involved in the analysis of samples hold a minimum honours science degree.
- In the event of a Quality Control Check failure for a given parameter, a note will be included on the analysis report detailing the QC fail.
- Analysis of samples is conducted under the INAB accreditation and associated quality control procedures are employed in every aspect of analysis.
- Analysis methods are listed in Appendix 3.

2.3 Landfill Gas Analysis

The following procedure is employed by Brona Keating of Boylan Engineering to ensure accurate monitoring:

- EPA, Landfill Manual, landfill monitoring 2nd Edition is adhered to.
- Prior to sampling, a dip meter is used to measure water levels, if present, in the wells.
- GA 2000 landfill gas analyser is used to measure the gas levels.
- The analyser is purged and connected to the sealed well monitoring nozzle.
- The monitoring nozzle is turned to the open position and the analyser measured the gas levels at 60 second intervals for no less than 10 minutes. The analyser is allowed to run for this period of time to allow for a representative average to be obtained.
- All data is recorded on the Gas Analysis field sheet.
- The instrument is removed after 10 minutes and the monitoring nozzle returned to the closed position.
- The GA2000 is switched off between each monitoring location so as to allow the instrument to purge.
- This process is repeated at each monitoring location.
- Data for the GA 2000 was downloaded in the Boylan Engineering office.

2.4 Monitoring Locations

Quartyer 4, 2012					
Monitoring Well	**Sample Type**	**Cover Level(OD Malin) M**	**Water Level M (OD Malin Head)**	**Water Depth M (Top of Casing)**	**National Grid Co-Ordinates**
MW5	Gas & Leachate	TBC	-	TBC	TBC
MW6	Gas & Leachate	TBC	-	TBC	TBC
MW7	GW	TBC	-	5.98	TBC
MW 8	GW	TBC	-	6.8	TBC
MW 9	Gas	TBC	-	n/a	TBC
Killynaher lake	SW	-	-	-	TBC

2.5 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	**Rainfall**	**Max**	**Min**	**Grass Min Temp**	**Mean Wind Speed**	**Gusts**	**Sunshine**
	(mm)	**Temp**	**Temp**	**(°C)**	**(knots)**	**(if >= 34 knots)**	**(hours)**
		(°C)	**(°C)**				
18/10/2012	1.6	12.8	8.1	6	4.1		
*Met Eireann, Climate Data & reports, Daily Data							

3.0 SUMMARY OF RESULTS

3.1 Ground Water

Table 1.0 4th Quarter Ground water monitoring 2012

Report Number		61183																
Monitoring Date:		18/10/2012																
Method		**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**Total Organic Carbon (TOC)**	**Coliforms**	**Ammonia**	**AQ2-UP1**	**Coliforms**	**Titralab**		**AQ2-UP2**	**Dissolved Oxygen**	**Ion Chromatography**	**Titralab**
Method Number		**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**EW123**	**MIC133**	**EW154M**	**EW154M**	**MIC133**	**EW153**		**EW154M-1**	**EW043**	**EW137**	**EW153**
Parameter		Sample temperature (to be tested onsite)	Cond	pH	DO	Water Level from TOC	Visual Inspection	Total Organic Carbon (TOC)	E. Coli	Ammonia (as N)	TON (as N)(Calc)	Total Coliforms	pH	Conductivity @20 DegC	Chloride	Dissolved Oxygen	Fluoride	Alkalinity Total (R2 pH4.5)
Units		**Deg C**	us/cm	pH units	mg/l	Meter's		mg/L	MPN/100 ml	mg/l N	mg/l N	MPN/100 ml	pH Units	uscm-1@20	mg/L	mg/L	mg/L	mg/L CaCO3
Limit of Detection		-	-	-	-	-	-	0.25	0	0.007	0.138	0	0.3	25	2.6	1.0	0.1	10
Date Testing Initiated		18.10.12						19.10.12										
ELS Ref	**Client Ref**																	
61183/001	MW7	11.2	640	7.9	8.8	5.54	clear	0.73	5	1.093	<0.138	172	7.8	639	11.6	8.7	2.54	310
61183/002	MW8	11.9	1099	7.8	4.9	5.74	clear	1.22	0	0.194	<0.138	74	7.1	1095	163.8	4.7	0.26	355.7
IGV			1000	≥6.5 and ≤9.5				NAC	0	0.15		0	≥6.5 and ≤9.5	1000	30	NAC	1	NAC

Method		Metals-Dissolved													AQ2-UP2	Total Cyanide High (Sub)	Total Phosphorus-TP	Residue on Evaporation (Tot Solids-TS)
Method Number		EM130													EW154M-1	DEFAULT	EW146	EW060
Parameter		Iron-Dissolved	Potassium-Dissolved	Sodium-Dissolved	Cadmium-Dissolved	Chromium-Total	Manganese-Dissolved	Calcium-Dissolved	Copper-Dissolved	Lead-Dissolved	Magnesium-Dissolved	Mercury-Dissolved	Zinc-Dissolved	Boron-Dissolved	Sulphate	Total Cyanide High	Total Phosphorus-TP	Residue on Evaporation (Tot Solids-TS)
Units		ug/L	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/l P	mg/L
Limit of Detection		20.0	0.2	0.5	0.1	1	1	1	0.003	0.3	0.3	0.02	1	0.02	5	9	0.1	10
Date Testing Initiated		19.10.12																
ELS Ref	Client Ref																	
61183/001	MW7	61.6	8.8	55.8	0.1	5.1	12	46.1	<0.003	<0.3	46.9	<0.02	57	0.5	53	<10	<0.01	<10
61183/002	MW8	229.8	5.4	41.2	0.1	<1	53.9	180.7	<0.003	<0.3	45.8	<0.02	143.5	0.06	63.5	<10	<0.01	<10
IGV		200	5	150	5	30	50	200	0.03	10	50	1	100	1	200	10	-	-

Exceedance

NOTES

NAC- No Abnormal Change

IGV - Interim Guide Value

As there are no limits set in the waste licence for groundwater, results are compared to the Interim Guide Values for the protection of Groundwater in Ireland, where available.

3.2 Surface Water

Table 2.0 4th Quarter Surface water monitoring 2012

Report Number 20690		61181											
Monitoring Date:		18/10/2012											
Method		**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**AQ2**	**Titralab**		**5-Day**	**HACH**	**Gravimetric**	**AQ2**	**Inolab**
Method Number		**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**EW003**	**EW138**	**EW139**	**EW001**	**EW094**	**EW013**	**EW015**	**EW043**
Parameter		Sample temperature (to be tested onsite)	Cond	pH	DO	Ammonia	pH	Cond	BOD	COD	Total Suspended Solids	Cl	DO
Units		Deg C	us/cm	pH units	mg/l	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l
Limit of Detection		-	-	-	-	0.007	25	25	1	8	5	2.6	1.0
Date Testing Initiated		18.10.12				19.10.12							
ELS Ref	**Client Ref**												
61181/001	SW1 Lake	11.1	335	8.12	9.0	0.044	8	329	4	23	<5	16.9	8.9
S.I No. 294/1989						0.2	≥5.5 and ≤8.5	1000	5	40	50	250	-

Method		Metals-Dissolved											Metals-Total
Method Number													
Parameter		Iron-Dissolved	Manganese-Dissolved	Potassium-Dissolved	Sodium-Dissolved	Cadmium-Dissolved	Calcium-Dissolved	Copper-Dissolved	Lead-Dissolved	Magnesium-Dissolved	Mercury-Dissolved	Zinc-Dissolved	Chromium-Total
Units		ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	mg/L	ug/L	mg/L	ug/L	ug/L	ug/L
Limit of Detection		20	1	0.5	0.5	0.1	1	0.003	0.3	0.3	0.02	1	1
Date Testing Initiated		19.10.12											
ELS Ref	Client Ref												
61181/001	SW1 Lake	<20	4.7	3.4	12.2	<0.1	57.5	<0.003	<0.3	4.1	0.03	4.7	<1
S.I No. 294/1989		200	50	-	-	5	-	0.03	0.01	-	1	100	30

Exceedance of waste licence	
NOTES	
1	Sub-contract analysis denoted by *
2	ND - Concentration was below the limit of detection
3	NAC- No Abnormal Change

As there are no limits set in the waste licence for surface water, results are compared to S.I. No. 294/1989 — European Communities (Quality of Surface Water Intended For The Abstraction of Drinking Water) Regulations, 1989.

3.3 Leachate

Table 3.0 4th Quarter Leachate monitoring 2012

Report Number		61182															
Monitoring Date		18/10/2012															
Method		**Site Tests**	**Site Tests**	**Site Tests**	**AQ2**							**Coliforms**		**Ion Chromatography**	**AQ2-UP2**	**Total Cyanide High (Sub)**	
Method Number		**Site Tests**	**Site Tests**	**Site Tests**	**EW003**	**EW051**	**EW138**	**EW139**	**EW001**	**EW094**	**EW015**	**MIC133**		**EW137**	**EW154M-1**	**DEFAULT**	
Parameter		Sample temperature (to be tested onsite)	Water Level from TOC	Visual Inspection	Ammonia	TON	pH	Cond	BOD	COD	Cl	E. Coli	Total Coliforms	Fluoride	Sulphate	Total Cyanide High	
Units		Deg C	Meter's		mg/l N	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	MPN/100ml		mg/L	mg/L	ug/L	
Limit of Detection		-	-	-	0.035	0.69	0.3	25	1	8	13	10	10	0.1	5	9	
Date Testing		18.10.12			19.10.12												
ELS Ref	**Client Ref**																
61182/001	MW6	-	-	-	2.156	<0.69	7.2	1066	6	84	53.1	<10	365	0.95	193.9	<9	
IGV					0.15	NAC	≥6.5&≤9.5	1000	-	-	200	0	0	1	200	10	

Method		Total Phosphorus-TP	Metals-Total	Metals-Dissolved											
Method Number		EW146	EM130												
Parameter		Total Phosphorus-TP	Chromium-Total	Manganese-Dissolved	Potassium-Dissolved	Sodium-Dissolved	Cadmium-Dissolved	Calcium-Dissolved	Copper-Dissolved	Lead-Dissolved	Magnesium-Dissolved	Mercury-Dissolved	Zinc-Dissolved	Boron-Dissolved	Iron-Dissolved
Units		mg/l P	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	mg/L	ug/L	mg/L	ug/L	ug/L	ug/L
Limit of Detection		0.1	1	1	0.2	0.5	0.1	1	0.003	0.3	0.3	0.02	1	0.02	20
Date Testing		19.10.12													
ELS Ref	Client Ref														
61182/001	MW6	0.24	<1	417.7	12.2	21.4	0.2	167	<0.003	<0.3	59.8	<0.02	36.1	0.17	7015.5
IGV		-	30	50	5	150	5	200	0.03	10	50	1	100	1	200

Exceedance	
NOTES	
1	Sub-contract analysis denoted by *
2	ND - Concentration was below the limit of detection
3	NAC- No Abnormal Change
4	IGV - Interim Guide Value

As there are no limits set in the waste licence for leachate, results are compared to the Interim Guide Values for the protection of Groundwater in Ireland, where available.

3.4 Landfill Gas

Table 4.0 4th Quarter Landfill Gas monitoring 2012

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000
Parameter		CH_4	CO_2	O_2	H2S	Barometric Pressure
Units		% v/v	% v/v	%	PPM	mb
Date Testing		18/10	18/10	18/10	18/10	18/10
GA 2000 Ref	Client Ref					
1	MW 5	0	5	7.9	0	984
2	MW 6	14.7	17	0	0	984
3	MW9	0	4.5	15.2	0	984
	Limit	1	1.5			

Exceedance,outside waste mass

NOTES	
1	Instrument Serial No: GA 07721
2	Limit: Schedule C2, Licence

4.0 DISCUSSION

4.1 Ground water

Monitoring of groundwater is a common and necessary event in landfill sites both during their active life and post closure. The significance of such monitoring is so the facilities can demonstrate that there is no potential for the migration of hazardous constituents from the unit into the groundwater systems.

Monitoring was conducted on 18th October 2012. Results in Hatched Red indicate where the interim guide value has been exceeded. Results from the fourth quarter 2012 show that there were exceedances at the ground water monitoring locations for parameters; Ammonia, Total Coliforms, Conductivity, Chloride, Fluoride, Iron, Potassium, Manganese and Zinc as detailed in table 1.0

Previous results detailed in the historical data show that exceedances for these parameters are on par with previous monitoring events.

Historical results for comparison purposes are presented in tabular and graphic form in Appendix 1.

4.2 Surface Water

As there are no limits set in the waste licence for surface water, results are compared to limits detailed in S.I. No. 294/1989 — European Communities (Quality of Surface Water Intended or The Abstraction of Drinking Water) Regulations, 1989.
A surface water sample was taken at SW2 (Killynaher lake) which is in the vicinity of the landfill. Results show that all parameters were within levels stipulated by the afore mentioned document.

Historical results for comparison purposes are presented in tabular and graphic form in Appendix 1

4.3 Leachate

Leachate consists of water that has become contaminated as it passes through a waste disposal site. It contains insoluble waste constituents which have not degraded chemically or biochemically. This leachate can cause a treat to surrounding surface and ground waters. The composition of leachate will vary depending on the age of the landfill. As there are no limits set in the waste licence for leachate, results are compared to the Interim Guide Values for the protection of Groundwater in Ireland, where available. Results in Hatched Red indicate where the interim guide value has been exceeded. A leachate sample was abstracted from well MW6 during quarter four monitoring. Results show that the Interim Guide Value was exceeded at well MW6 on this occasion for the parameters Ammonia, conductivity, E-coli, Total Coliforms, Iron, Potassium, Manganese and Magnesium. These results are consistent with those obtained in previous monitoring events at MW6.

Historical results for comparison purposes are presented in tabular and graphic form in Appendix 1.

4.4 Landfill Gas

The rate of gas generation at a landfill site varies through the life of a landfill and is dependent on several factors such as waste type, depths, moisture content, degree of compaction, landfill pH, temperature and the length of time since the waste was deposited. Landfill gas can move in any direction within the waste body and migrate from a site. The potential for gas migration will depend on the gas quality, volume, the site engineering works, geological characteristics of the surrounding strata and on man-made pathways such as sewers and drains.

Results obtained from monitoring during quarter four, 2012 show elevated readings for Methane and Carbon Dioxide at well MW 6. However this well is located within the waste mass and elevated levels of these gases are not uncommon. This result is relatively consistent with previous readings. Although it is preferable that the results are within the limits stipulated within the licence, it is worth while noting that they have not increased dramatically since previous monitoring events.

5.0 CONCLUSION

5.1 Environmental Monitoring

The results obtained are relatively consistent with previous monitoring events and do not show any signs of dramatic exceedences. Therefore there is no evidence of any major negative environmental impact associated with this landfill. The next environmental and landfill gas monitoring event will take place during the first quarter 2013.

5.2 Landfill Gas

The results obtained from landfill gas analysis are also relatively consistent with previous monitoring events and do not show any signs of dramatic exceedances; therefore there is no evidence of any major negative environmental impact associated with this landfill. However, it is important to monitor the trend in exceedance of Methane at this landfill and any dramatic increase in the parameter should be regarded as critical. The Methane content of landfill gas is flammable, forming potentially explosive mixtures in certain conditions, which raises concern about its uncontrolled migration and release. The next environmental and landfill gas monitoring will be conducted in the first quarter of 2013.

APPENDIX 1- Historical Data- Tables

Groundwater

	Parameter	TOC	E.Coli	Ammonia	TON	Tot Coliforms	pH	Cond	Cl	DO	Fe	K	Na
	Units	mg/l	MPN/ 100ml	mg/l N	mg/l N	MPN/ 100ml	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l
MW 7	Qtr 4 2012	0.73	5	1.093	<0.138	172	7.8	639	11.6	8.7	61.6	8.8	55.8
	Qtr 3 2012	1.23	0	1.146	<0.138	2	7.8	635	10	7.9	0.0466	8.7	10.3
	Qtr 2 2012	1.13	0	1.136	<0.138	0	7.8	637	10.8	3.1	0.02	8.3	53.1
	Qtr 1 2012	1.12	0	1.122	<0.138	22	7.8	631	9.4	3.4	0.0291	8.5	46.2
MW 8	Qtr 4 2012	1.22	0	0.194	<0.138	74	7.1	1095	163.8	4.7	229.8	5.4	41.2
	Qtr 3 2012	1.12	19	0.246	<0.138	179	7	1072	142.8	5.1	0.1909	5.1	33.1
	Qtr 2 2012	1.53	0	0.43	<0.138	0	7.2	965	162.5	7.7	0.1216	5.3	31.3
	Qtr 1 2012	1.61	2	0.212	<0.138	20	7.1	1067	250.2	5.7	0.136	5.4	33.1
Interim Guide Value		**NAC**	**0**	**0.15**	**NAC**	**0**	**≥6.5 &≤9.5**	**1000**	**30**	**NAC**	**0.2**	**5**	**150**

Surface water

	Parameter	Ammonia	pH	Cond	BOD	COD	Total Suspended Solids	Cl	DO
	Units	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l
SW Killynaher Lake	Qtr 4 2012	0.044	8	329	4	23	<5	17	8.9
	Qtr 3 2012	0.027	8.3	327	1	19	5	16	8.9
	Qtr 2 2012	0.018	8.2	318	2	14	<5	18	10.9
	Qtr 1 2012	0.041	8	309	<1.0	27	<5	16	10.8
S.I No. 294/1989		**0.2**	**≥5.5 and ≤8.5**	**1000**	**5**	**40**	**50**	**250**	

Leachate

	Parameter	Ammonia	TON	pH	Cond	BOD	COD	Cl
	Units	mg/l N	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l
MW 6	Qtr 4 2012	2.156	<0.69	7.2	1066	6	84	53.1
	Qtr 3 2012	9.094	<0.69	6.9	1699	30	260	19.4
	Qtr 2 2012	1.117	<0.6	7.4	816	6	233	65.6
	Qtr 1 2012	1.471	<0.69	7.3	831	<1.0	20	55.6
Interim Guide Values		**0.15**	**NAC**	**≥6.5&≤9.5**	**1000**			**200**

Landfill Gas

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000
Parameter		CH_4	CO_2	O_2	H_2S	Barometric Pressure
Units		1% v/v	1.5 % v/v	%	PPM	mb
Client Ref	Qtr	-	-	-	-	-
MW 5	Qtr 4 2012	0	5	7.9	0	984
	Qtr 3 2012	1	8	19	0	995
	Qtr 2 2012	0.0	8.7	19.1	0.0	985
	Qtr 1 2012	0.0	9.5	19.8	0.0	1024
MW 6	Qtr 4 2012	14.7	17	0	0	984
	Qtr 3 2012	16	13	19	0	995
	Qtr 2 2012	17.3	15.1	20.1	0.0	985
	Qtr 1 2012	19.4	12.9	20.9	0.0	1023
MW9	Qtr 4 2012	0	4.5	15.2	0	984
	Limit	**1**	**1.5**			

Exceedance

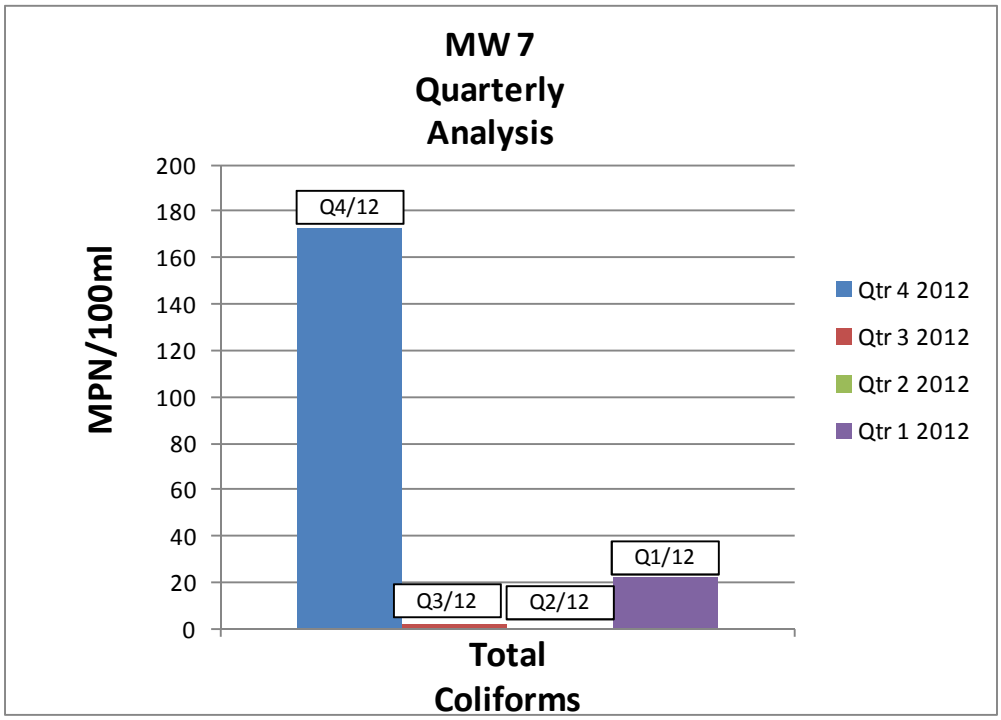
NOTES

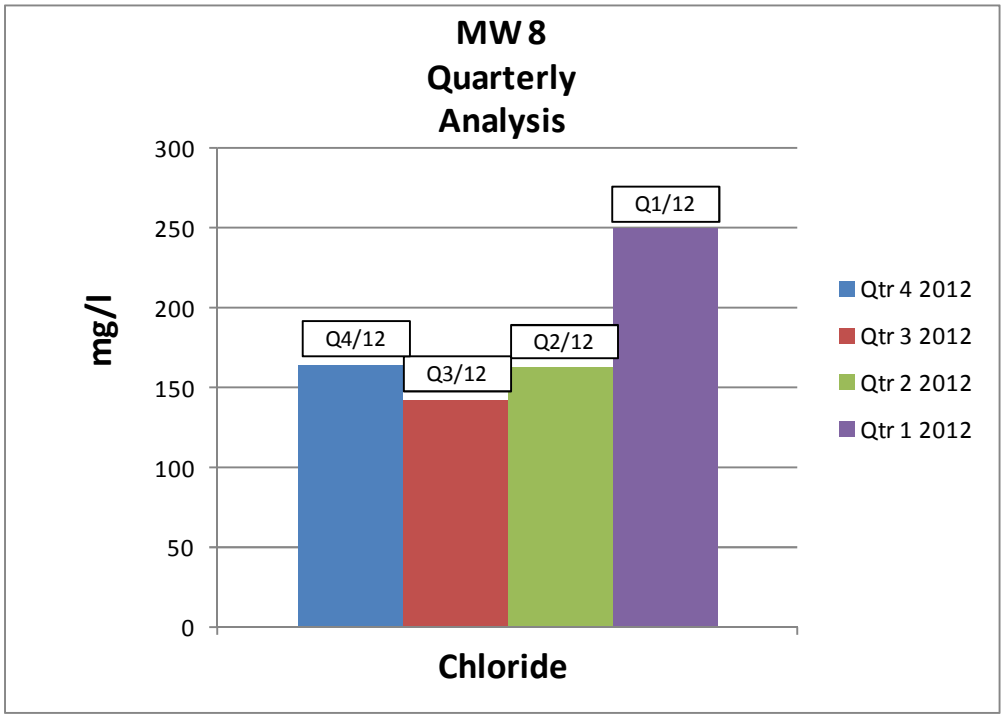
1 Instrument Serial No: GA 07721

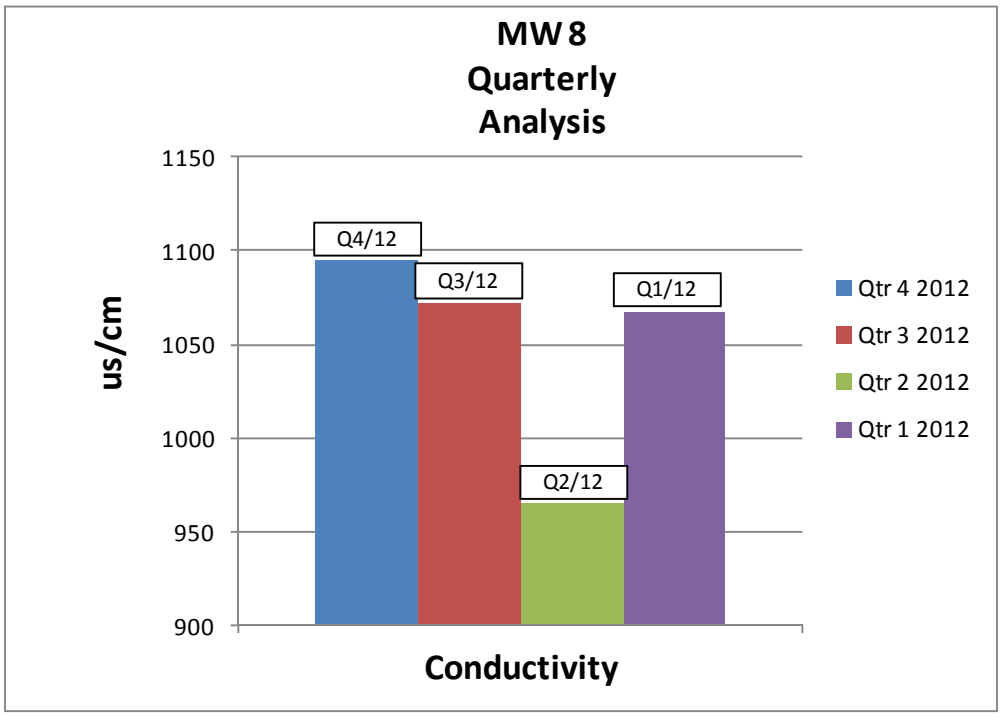
2 Limit: Schedule C2, Licence

HISTORICAL RESULTS- Graphs

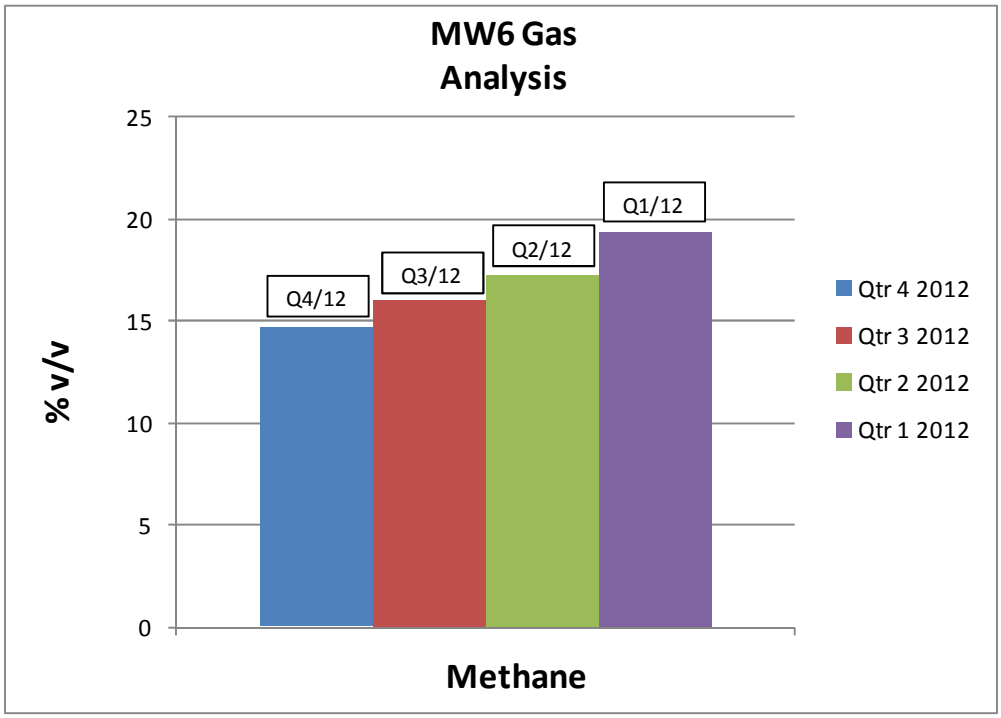
Groundwater

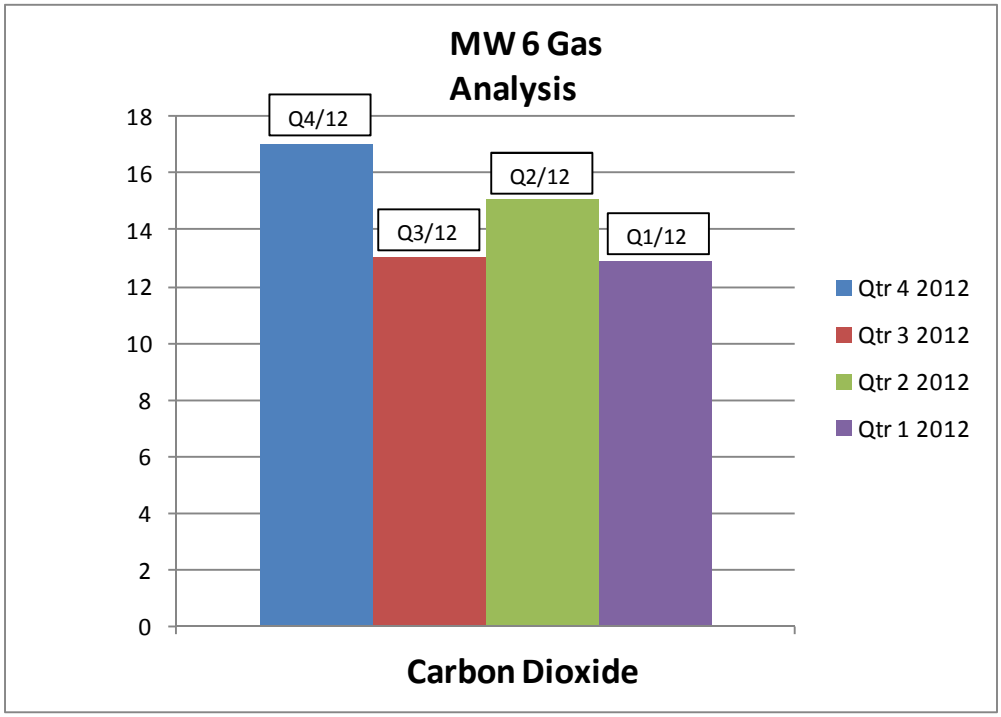






Landfill Gas




MW 6 Gas Analysis
18
16
14
12
10
8
6
4
2
0
Q4/12
Q3/12
Q2/12
Q1/12
Qtr 4 2012
Qtr 3 2012
Qtr 2 2012
Qtr 1 2012
Carbon Dioxide

APPENDIX 2- LANDFILL GAS BREAKDOWN

MW 5

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S	Barometric Pressure (mb)
18/10/2012 09:45	0	6.8	3.6	0	984
18/10/2012 09:46	0	6.3	4.5	0	984
18/10/2012 09:47	0	5.7	5.3	0	984
18/10/2012 09:48	0	5.4	5.9	0	984
18/10/2012 09:49	0	5	6.6	0	984
18/10/2012 09:50	0	4.7	6.9	0	984
18/10/2012 09:51	0	4.4	10.5	0	984
18/10/2012 09:52	0	4.2	11.3	0	984
18/10/2012 09:53	0	3.9	11.9	0	984
18/10/2012 09:54	0	3.7	12.4	0	984

MW 6

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S	Barometric Pressure (mb)
18/10/2012 10:28	14.7	17	0	0	984
18/10/2012 10:29	14.6	17	0	0	984
18/10/2012 10:30	14.7	17	0	0	984
18/10/2012 10:31	14.7	17.1	0	0	984
18/10/2012 10:32	14.7	17.1	0	0	984
18/10/2012 10:33	14.7	17	0	0	984
18/10/2012 10:34	14.7	17	0	0	984
18/10/2012 10:35	14.7	17	0	0	984
18/10/2012 10:36	14.6	17	0	0	984
18/10/2012 10:37	14.8	17	0	0	984

MW 9

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S	Barometric Pressure (mb)
18/10/2012 10:46	0	3.6	16.1	0	984
18/10/2012 10:47	0	3.7	15.9	0	984
18/10/2012 10:48	0	3.9	15.8	0	984
18/10/2012 10:49	0	4.1	15.5	0	984
18/10/2012 10:50	0	4.3	15.3	0	984
18/10/2012 10:51	0	4.5	15.1	0	984
18/10/2012 10:52	0	4.8	14.8	0	984
18/10/2012 10:53	0	5	14.6	0	984
18/10/2012 10:54	0	5.3	14.4	0	984
18/10/2012 10:55	0	5.6	14.1	0	984

APPENDIX 3- ANALYSIS METHODS

ELS LTD INAB ACCREDITATION SCHEDULE SUMMARY SHEET

Miscellaneous (P,G,W,S)
Ammonia/Ammonium 0.007-1mg/l N EW003
Chloride 2.6-250 mg/l EW015
Flouride 0.1 - 2 mg/l EW137
COD 8-1500 mg/l EW094
Nitrate 0.12-50 mg/l N EW034
Nitrite 0.013-1 mg/l N EW035
pH 4 – 10 pH Units EW138
Phosphate 0.009-1 mg/l P EW007
TOC 0.25-100mg/l EW123
Total Phosphorous 0.03-1 mg/l P EW002

Miscellaneous (P,G,S)
Bromate 1 to 50ug/l BRO3 (EW137)
Colour 2.5-50mg/l PtCCo (EW021)
Conductivity 132-6000 us/cm EW139
Dissolved Oxygen 1 to 10 mg/l (EW043)
Sulphate 1-250mg/l SO4(EW016)
Suspended Solids 5-1000mg/l (EW013)
Total Dissolved Solids 1-1000mg/l (EW046)
Total Hardness 3-330mg/l CaCO3 (EM099)
Total Oxidised Nitrogen 0.138-51mg/l N (EW051)

Metals EM130 (P,G,S)
Aluminium 5.0 – 500 µg/l
Antimony 0.1 – 10µg/l
Arsenic 0.2 - 20µg/l
Barium 1.0 - 100µg/l
Boron 0.02 – 2mg/l
Cadmium 0.1 – 10µg/l
Calcium 1.0 – 100mg/l
Chromium 1.0 - 100µg/l
Cobalt 1.0 - 100µg/l
Copper 3 - 4000µg/l
Iron 5.0 - 500µg/l
Lead 0.3 - 30µg/l
Magnesium 0.3 – 20mg/l
Manganese 1.0 - 100µg/l
Mercury 0.02 - 2µg/l
Molybdenum 1.0 - 100µg/l
Nickel 0.5 - 50µg/l
Potassium 0.2 – 20mg/l
Selenium 0.2 - 20µg/l
Sodium 0.5 – 50mg/l
Strontium 1.0 - 100µg/l
Tin 1.0 - 100µg/l
Vanadium 1.0 - 100µg/l
Zinc 1.0 - 100µg/l

SI439 Potable Water VOCs & THM EO025 (P,G,S)
Benzene 0.1-35 µg/l
1.2-Dichloroethane 0.1-35 µg/l
Tetrachloroethene 0.1-35 µg/l
Trichloroethene 0.1-35 µg/l
Chloroform 1.0-150 µg/l
Bromoform 1.0-35 µg/l
Dibromochloromethane 1.0-35 µg/l
Bromodichloromethane 2.0-35 µg/l

Other VOC's EO025 (P,G,S)
Bromomethane 0.5 - 35 µg/l
Ethyl Ether/Diethyl Ether0.5 - 35 µg/l
11 Dichloroethene0.5 - 35 µg/l
Iodomethane/Mehyl Iodide 0.5 - 35 µg/l
Carbon Disulphide 0.5 - 35 µg/l
Allyl Chloride0.5 - 35 µg/l
Methylene Chloride/DCM 5.0 - 35 µg/l
2-Propenenitrile/Acrylonitrile 2.0 - 35 µg/l
Chlormethyl Cyanide 0.5 - 35 µg/l
Hexachlorobutadiene0.5 - 35 µg/l
Trans-1,2 Dichloroethene0.5 - 35 µg/l
MtBE0.5 - 35 µg/l
11 Dichloroethane0.5 - 35 µg/l
22 Dichloropropane0.5 - 35 µg/l
Cis-12 Dichloroethene0.5 - 35 µg/l
Methyl Acrylate5.0 - 35 µg/l
Bromochloromethane0.5 - 35 µg/l
Tetrahydrofuran5.0 - 35 µg/l
111 Trichloroethane0.5 - 35 µg/l
1-Chlorobutane0.5 - 35 µg/l
Carbon Tetrachloride0.5 - 35 µg/l
11 Dichloropropene0.5 - 35 µg/l
12 Dichloropropane0.5 - 35 µg/l
Dibromomethane0.5 - 35 µg/l
Methyl Methacrylate0.5 - 35 µg/l
13 Dichloropropene, cis2.0 - 35 µg/l
MIBK/4 Methyl 2 Pentanone 2.0 - 35 µg/l
Toluene0.5 - 35 µg/l
13 Dichloropropene,trans2.0 - 35 µg/l
Ethyl Methacrylate2.0 - 35 µg/l
112 Trichloroethane0.5 - 35 µg/l
13 Dichloropropane0.5 - 35 µg/l
2 Hexanone1.0 - 35 µg/l
12 Dibromoethane0.5 - 35 µg/l
Chlorobenzene0.5 - 35 µg/l
1112 Tetrachloroethane2.0 - 35 µg/l
Ethyl Benzene0.5 - 35 µg/l
m & p Xylene0.5 - 35 µg/l
O Xylene0.5 - 35 µg/l
Stryene2.0 - 35 µg/l
Isopropyl Benzene0.5 - 35 µg/l
Bromobenzene0.5 - 35 µg/l
1122 Tetrachloroethane0.5 - 35 µg/l
123 Trichloropropane2.0 - 35 µg/l
Propyl Benzene0.5 - 35 µg/l
2-Chlorotoluene0.5 - 35 µg/l
4 Chlorotoluene0.5 - 35 µg/l
135 Trimenthylbenzene0.5 - 35 µg/l
Tert Butyl Benzene0.5 - 35 µg/l
124 Trimethlbenzene0.5 - 35 µg/l
Sec Butyl Benzene0.5 - 35 µg/l
13 Dichlorobenzene0.5 - 35 µg/l
P Isopropyltoluene0.5 - 35 µg/l
14 Dichlorobenzene0.5 - 35 µg/l
12 Dichlorobenzene0.5 - 35 µg/l
N Butyl Benzene0.5 - 35 µg/l
Hexachloroethane5.0 - 35 µg/l
12 Dibromo 3Chloropropane 2.0 - 35 µg/l
124 Trichlorobenzene0.5 - 35 µg/l
123 Trichlorobenzene0.5 - 35 µg/l

PAH EO129 (P,G,S)
Range 0.01 - 0.2 µg/l
Acenaphthene
Benzo (a) Anthracene
Benzo (a) Pyrene
Benzo (b) Fluoranthene
Benzo (ghi) Perylene
Benzo (k) Fluoranthene
Chrysene
Dibenzo (ah) Anthracene
Fluoranthene
Fluorene
Indeno (123-cd) Pyrene
Phenanthrene
Pyrene

Acid Herbicides (P,G,S)
Range 0.01 - 0.2 µg/l
2,4,5-T H
2,4-D H
2,4-DB H
MCPA H
Picloram H

Organophosphorus Pesticides(P,G,S)
Range 0.01 - 0.2 µg/l
Famphur OP
Methyl Parathion OP
Parathion OP
Thionazin OP

Organochlorine Pesticides (P,G,S)
Range 0.01 - 0.2 µg/l
Aldrin
BHC Alpha isomer OC
BHC Beta isomer OC
BHC Delta isomer OC
Dieldrin OC
Endosulphan Alpha isomer OC
Endosulphan Beta isomer OC
Endosulphan Sulphate OC
Endrin OC
Heptachlor Epoxide OC
Heptachlor OC
Lindane OC
P,P' DDE OC
P,P'-DDD OC
P,P'-DDT OC

Notes
1.Sample Matrix:P=Potable Water (Drinking) , G=Ground Water , S=Surface Water, W=Waste Water

APPENDIX 4 – FIELD SHEETS

Landfill Gas Monitoring Form

Facility Name: Belferbet **Waste Licence No:** 92-01	**Facility Address:** Belferbet landfill
Licensee: Cavan Co Co	
Date of Licensing: 2003	**Date of sampling:** 18/11/12
Instrument Used: GA 2000	**Date next full calibration:** 2013 **Last field calibration: (inc date & gases)**
Monitoring Personnel: Brenda Keating	**Weather:** Dry

Results

Station Number	Time	GA2000 ID	CH_4	CO_2	O_2	CO	H_2S	Barometric Pressure (mbar)	Comments
MW5	09:45	✓	0	6.8	3.6	1	0	984	
MW6	10:28	✓	14.7	17	0	1	0	984	
MW9	10:46	✓	0	3.6	16.1	1	0	984	

General Comments:

ON SITE SAMPLING FORM

Facility Name: Belturbet	**Waste Licence No:** 92-01
Report To: Cavan County Council	
Sampling Date: 18/11/12	**Sample Type (GW, SW,Leachate)** All
Personnel: Brian Martin	**Weather:** Dry
Other Remarks:	**GPS:**

Sample Ref No	Sample Type	Time	DO Level	Elec Cond (us)	pH pH units	Temp °C	Visual	Instrument
SW1	SW	10:30	9.0	335	8.12	11.1	Clear	
MW7	GW	11:45	8.8	640	7.76	11.2	Clear	
MW8	GW	12:15	4.9	1029	7.94	11.9	Clear	

COMMENTS:

Boylan engineering

CAVAN COUNTY COUNCIL

CLOSED LANDFILL MONITORING INTEGRITY FORM

SITE Belturbet DATE 18/11/12 PERSONNEL [illegible]

ITEM	CONDITION			COMMENTS
	GOOD	NEEDS MAINTENANCE	N/A	
GROUNDWATER MONITORING WELLS				
-Labeled	✓			
-Well cap integrity	✓			
-Water drainage	✓			
-Locks	None			
LANDFILL GAS VENTS				
-Riser condition	✓			
-Concrete collar condition	✓			
-Screen condition	✓			
LANDFILL GAS MONITORING WELLS				
-Labeled	✓			
-Well cap integrity	✓			
-Water drainage	✓			
-Traffic protection	✓			
-Concrete collar condition	✓			
-Screen Condition	✓			
-Locks	None			
SURFACE WATER MONITORING LOCATIONS				
-Access	✓			
-Disturbance	✓			

Cavan County Council Groundwater & Leachate Sampling Ref:

Site Reference: Belturbet **Permit No.** 92-01 **Date:** 18/10/12 **Personnel:** Brona Keating

Sample Ref (Shallow /Deep)	Depth of Well (m) *A*	Depth of water below Ground Level (m) *B*	Depth of Water column (m) *A-B= h*	Diameter of Well (m) *C*	Radius of Well (m) *(C/2)= r*	Radius Squared (m^2) r^2	Volume of Water in Well (m^3) $\Pi r^2 h$	Volume of Water in well – Litres (m3 x 1000)	Volume of water to purge (Litres x 3)	Time to Purge (mins)
MW7	31.2	5.45	25.75	0.05	0.025	0.000625	0.050534	50.53	151.60	25 min Purge
MW8	31.2	5.74	25.38	0.05	0.025	0.000625	0.049808	49.80	149.42	25 min Purge
				0.05	0.025	0.000625				
				0.05	0.025	0.000625				
				0.05	0.025	0.000625				

APPENDIX 5 – CHAIN OF CUSTODY/SAMPLE SUBMISSION

els

Environmental Laboratory Services Ltd
Acorn Business Campus
Mahon Industrial Park
Blackrock
Cork
Tel. [illegible]

SAMPLE SUBMISSION FORM

3998

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name / Address: Baylar Bros, Mullingar, County [illegible]

Customer Name: Baylar Bros
PO Number:
NOTE: Use a separate sheet for different PO Numbers
For all customers a PO Number must be provided with the samples

CONTRACT DETAILS

ELS Quote No: 606
NOTE: To reduce potential for error this field must be completed
Use a separate sheet for different Quote Numbers

Results Due (Tick): ☐ 1 Day ☐ 3 Days ☐ 5 Days ☐ 7 Days ☑ Standard ☐ 10 Days

NOTE: Standard lead time is 10 working days and 15 working days for test sub-contract. Deviations should be agreed in advance and may incur an extra charge

SAMPLE DETAILS

Number	Sample Reference NOTE: Whatever appears in this section, is the ONLY detail that will appear on the analysis report (Do not write the required detail on the bottles as it is normally not clear)	Tests Requested NOTE: To reduce potential for error please complete this field clearly indicating per quote, per sheet attached or list the specific tests below	Number of bottles submitted	Sample Type Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil, Silt, Solvent, Air
1	MW 6	See QN	Full Vial	Leachate
2				
3				
4				
5				

61182

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples

Signature: [signature]
Phone No: 046 928[illegible]
Date: 18/10/12
No. samples submitted: 1
No. of pages: 2 of 5
Additional Info (If any):

To be filled by ELS Ltd

Signature: [signature]
Date: 18-10
Time:
Condition: ☐ Satisfactory ☐ Unsatisfactory - See notes above
Additional Info.: FW

NOTES FOR CUSTOMER

1. Feel free to save this submission sheet to your desktop
2. This form is designed to allow key details to be typed in and re-used as necessary
3. Failure to submit the form with samples may lead to errors which may be outside the control of ELS Ltd
4.
5.

NOTES FOR ELS LTD

1. If the customer details are not on the system or if the name and address differ greatly with that on the system consult the Customer Service Agent
2. Always ensure the "Contact Name" above is used on the report, if that field is blank use the default name on the system
3. Click "Po Req" where samples have been received from County Councils without PO Numbers
4. Always log in samples with different PO Numbers on different reports
5. Do not enter sample details in block capitals eg sample ref ACORN DRINKING WATER should read Acorn Drinking Water

els

Environmental Laboratory Services Ltd
[illegible]
Tel: 021-[illegible]

SAMPLE SUBMISSION FORM

3999

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: [illegible]
Address: Boylan [illegible] Cavan

Customer Name: Boylan [illegible]
PO Number:
NOTE: Use a separate sheet for different PO Numbers. For all customers a PO Number must be provided with the samples

CONTRACT DETAILS

ELS Quote No: 606
NOTE: To reduce potential for error this field must be completed. Use a separate sheet for different Quote Numbers

Results Due (Tick)
NOTE: Standard lead time is 10 working days and 15 working days for test sub-contract. Deviations should be agreed in advance and may incur an extra charge

SAMPLE DETAILS

Number	Sample Reference	Tests Requested	Number of bottles submitted	Sample Type
	NOTE: Whatever appears in this section, is the ONLY detail that will appear on the analysis report (Do not write the required detail on the bottles as it is normally not clear)	NOTE: To reduce potential for error please complete this field clearly indicating per-quote, per sheet attached or list the specific tests below		Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil/Silt, Solvent, Air
1	GW 1	See on	Full kit	GW
2				
3				
4				
5				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples

Signature	[illegible]	Phone No.	[illegible]
Date	[illegible]		
No. samples submitted	1	No. of pages	3 of 3
Additional Info (if any)			

To be filled by ELS Ltd

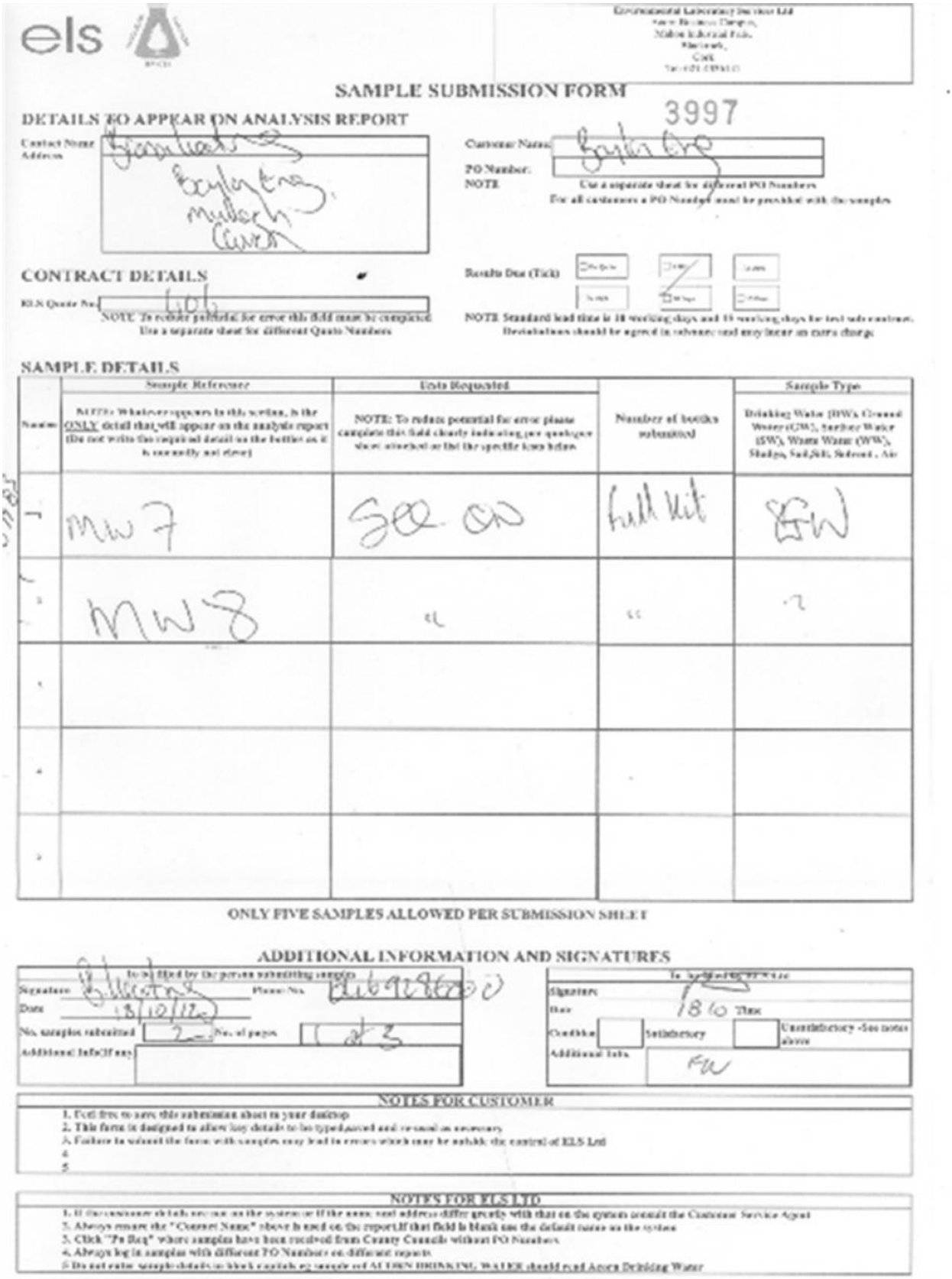
Signature	[illegible]		
Date	[illegible]	Time	
Condition		Satisfactory	Unsatisfactory (See notes above)
Additional Info.	FW		

NOTES FOR CUSTOMER

1. Feel free to save this submission sheet to your desktop
2. This form is designed to allow key details to be typed in and re-used as necessary
3. Failure to submit the form with samples may lead to errors which may be outside the control of ELS Ltd
4
5

NOTES FOR ELS LTD

1. If the customer details are not on the system or if the name and address differ greatly with that on the system consult the Customer Service Agent
2. Always ensure the "Contact Name" above is used on the report; if that field is blank use the default name on the system
3. Click "Po Req" where samples have been received from County Councils without PO Numbers
4. Always log in samples with different PO Numbers on different reports
5. Do not enter sample details in block capitals eg sample ref ACORN DRINKING WATER should read Acorn Drinking Water



els

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

3997

Contact Name
Address

Customer Name:

PO Number:

NOTE: Use a separate sheet for different PO Numbers. For all customers a PO Number must be provided with the samples.

CONTRACT DETAILS

Results Due (Tick)

ELS Quote No:

NOTE: To reduce potential for error this field must be completed. Use a separate sheet for different Quote Numbers.

NOTE: Standard lead time is 10 working days and 15 working days for test sub-contract. Deviations should be agreed in advance and may incur an extra charge.

SAMPLE DETAILS

Number	Sample Reference NOTE: Whatever appears in this section, is the ONLY detail that will appear on the analysis report (Do not write the required detail on the bottles as it is currently not done)	Tests Requested NOTE: To reduce potential for error please complete this field clearly indicating per sample/per sheet attached or tick the specific tests below	Number of bottles submitted	Sample Type Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil/Silt, Solvent, Air
1	MW7	See on	full kit	GW
2	MW8	"	"	"
3				
4				
5				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled in by the person submitting samples

Signature:
Date: 18/10/12
No. samples submitted: 2
No. of pages: 1 of 3
Additional Info (If any):

To be filled in by ELS

Signature:
Date: 18/10
Time:
Condition: Satisfactory / Unsatisfactory - See notes above
Additional Info: FW

NOTES FOR CUSTOMER

1. Do not use to save this submission sheet to your desktop
2. This form is designed to allow key details to be typed,saved and re-used as necessary
3. Failure to submit the form with complete easy lead to errors which may be outside the control of ELS Ltd
4.
5.

NOTES FOR ELS LTD

1. If the customer details on the system or if the name and address differ greatly with that on the system consult the Customer Service Agent
2. Always ensure the "Contact Name" above is used on the report,if that field is blank use the default name on the system
3. Click "To Bag" where samples have been received from County Councils without PO Numbers
4. Always log in samples with different PO Numbers on different reports
5. Do not write 'sample details' in block capitals eg 'sample ref ALTERN DRINKING WATER' should read Altern Drinking Water

APPENDIX 6 – CALIBRATION CERTIFICATE-GA2000

Calibration Certificate

Issued by	Environmental monitoring	**Certificate number**	1125

Instrument	GA2000	**Calibrated by**	AT

Serial no	531	**Ambient temp**	17
Service done	09/11/11	**Ambient pressure**	1001
Calibration date	02/02/2012	**Calibration due**	02 Feb 2013
Job number	NA	**Linearity check**	n/a
Logger	Pass	**Battery**	Pass
Filter	pass	**Overall result**	pass

Test Method
The instrument was calibrated by applying a know concentration of gas at a set flow rate and pressure.
The results are recorded on this sheet **after** adjustment and a constant reading is obtained.
The results are compared to that of a reference certified set of gases

Test reference	Cert tracability	Instrument reading	pass/fail
CO2	5.0%	4.7%	pass
02	17.8%	17.9%	pass
CH4	2.5%	2.3%	pass
CO	199ppm	197ppm	pass
H2S	5ppm	5.0ppm	pass

Address
environmental monitoring
Unit 9a
Lake District Business Park
Mint Bridge Road
Kendal
Cumbrial
Tel 01782 435100
email : **environmonitoring@btconnect.co.uk**

APPENDIX D
Declaration

Cavan County Council
Comhairle Chontae an Chabháin
Teach Na Cúirte, An Cabháin
Courthouse, Cavan

Declaration

Belturbet Landfill W0092-01

Cavan County Council hereby certifies that the content of the full pdf AER W0092-012012AER.pdf uploaded to the EPA website is a true copy of the original AER.

Signed Sinead Fox Dated 15/3/13

Sinead Fox
Landfill Operations Manager
Cavan County Council