

11th April 2012

Ms. Breege Rooney,
Inspector,
Environmental Protection Agency,
E.P.A. Headquarters,
P.O. Box 3000,
Johnstown Castle Estate,
Co. Wexford.

RE: AER Submission for 2011 for Waste License W0004-004 Arthurstown Landfill.

Dear Ms. Rooney,

Please find attached original and two copies of the Annual Environmental Report (AER) for Arthurstown Landfill.

If you require any further information in relation to this matter, do not hesitate to contact the undersigned.

Yours sincerely,

J. Smith,
Facility Manager.

M. Heffernan,
Deputy Facility Manager.



ANNUAL ENVIRONMENTAL REPORT

FOR

**ARTHURSTOWN LANDFILL
KILL, CO. KILDARE**

FOR THE PERIOD

1ST JANUARY 2011 – 31ST DECEMBER 2011

WASTE LICENSE NO: W0004-004

Prepared by:

Facility Management,
Arthurstown Landfill,
Kill,
Co. Kildare.



11th April 2012

AER 13

TABLE OF CONTENTS

	<u>PAGE</u>
1. INTRODUCTION	1
1.1. SITE LOCATION.....	1
1.2. PURPOSE.....	3
2. SITE DESCRIPTION AND ACTIVITIES	4
2.1. WASTE ACTIVITIES.....	4
2.2. WASTE QUANTITIES.....	5
2.3. REMAINING CAPACITY	5
2.3.1. <i>Current Filling Rates</i>	5
2.4. FUTURE TRENDS IN FILLING RATES.....	5
2.5. RESOURCE AND ENERGY CONSUMPTION	7
2.6. LEACHATE GENERATION	7
ENVIRONMENTAL MONITORING	8
2.7. MONITORING LOCATIONS.....	8
2.8. LANDFILL GAS.....	10
2.8.1. <i>Interpretation of Landfill Gas Results</i>	11
2.8.2. <i>Interpretation of Utilisation Emissions</i>	11
2.9. DUST DEPOSITION	13
2.9.1. <i>Dust Deposition</i>	13
2.9.2. <i>Interpretation of Dust Deposition Results</i>	13
2.10. NOISE	13
<i>Noise Results</i>	13
2.11. SURFACE WATER.....	14
2.11.1. <i>Surface Water Results</i>	14
2.11.2. <i>Interpretation of Surface Water Results</i>	14
2.11.3. <i>Groundwater Results</i>	17
2.11.4. <i>Interpretation of Groundwater Results</i>	18
2.12. PRIVATE WELLS (GROUNDWATER)	19
2.12.1. <i>Private Wells Results</i>	19
2.12.2. <i>Interpretation of Results</i>	19
2.13. LEACHATE	20
2.13.1. <i>Leachate Results</i>	20
2.13.2. <i>Interpretation of Leachate Results</i>	20
2.14. METEOROLOGICAL MONITORING	21
2.15. ODOUR AND ODOUR CONTROL AT ARTHURSTOWN	22
<i>Quarterly Odour Assessments:</i>	22
2.15.1. <i>Odour Results</i>	23
2.16. LANDFILL GAS EMISSIONS.....	24
2.17. INDIRECT EMISSIONS TO GROUNDWATER	27
2.18. WATER BALANCE	29
3. FACILITY DEVELOPMENT.....	31
3.1. SITE SURVEY	31
3.2. DEVELOPMENTS UNDERTAKEN IN 2011.....	31
3.2.1. <i>Capping Works</i>	31
3.2.2. <i>Bioverda Power Systems Utilisation Plant</i>	31
3.2.3. <i>Staff reductions during 2011</i>	31
3.3. DEVELOPMENTS PROPOSED FOR 2012.	31

3.3.1.	<i>Capping Works</i>	31
3.3.2.	<i>Leachate Treatment Trials</i>	31
	RESTORATION REPORT	32
3.3.3.	<i>Completed Cells</i>	32
3.3.4.	<i>Restoration</i>	32
4.	ENVIRONMENTAL OBJECTIVES AND TARGETS	33
4.1.	OBJECTIVES AND TARGETS.....	33
5.	FACILITY MANAGEMENT.....	34
5.1.	SUMMARY OF NEW WRITTEN PROCEDURES	34
5.2.	TANK, PIPELINE AND BUND TESTING.....	34
5.3.	REPORTED INCIDENTS AND COMPLAINTS	35
5.3.1.	<i>Reported Incidents</i>	35
5.3.2.	<i>Complaints</i>	35
5.4.	REPORT ON STAFF TRAINING.....	36
5.5.	NON-COMPLIANCES AT ARTHURSTOWN LANDFILL DURING 2011	37
5.6.	REPORTS OF FINANCIAL PROVISION	38
5.7.	LOCAL ENVIRONMENTAL PROJECT FUNDING	39

TABLE OF FIGURES

	<u>PAGE</u>
FIGURE 1.1	FACILITY LOCATION MAP..... 2
FIGURE 2.1	LAYOUT OF ARTHURSTOWN LANDFILL..... 6

LIST OF TABLES

	<u>PAGE</u>	
TABLE 2.1	WASTE INTAKE (TONNES)..... 5	
TABLE 2.2	RESOURCE USE AND ENERGY CONSUMPTION	7
TABLE 0.2	DEPTHS OF GROUNDWATER MONITORING WELLS	17
TABLE 0.3	CALCULATION OF DIRECT AND INDIRECT EMISSIONS TO GROUNDWATER	28
TABLE 5.2	STAFF TRAINING LOG 2011.....	36

LIST OF APPENDICES

- Appendix 3.1 Monitoring Locations Drawing
- Appendix 3.2 Landfill Gas Charts and Tables (perimeter monitoring wells)
- Appendix 3.3 Dust Tables for 2011
- Appendix 3.4 Noise Tables for 2011
- Appendix 3.5 Surface Water Tables for 2011
- Appendix 3.6 Groundwater Tables for 2011
- Appendix 3.7 Private Wells (Groundwater) Tables for 2011
- Appendix 3.8 Leachate Tables for 2011
- Appendix 3.9 Meteorological Monitoring (Monthly Summary Sheets)
- Appendix 4.1 Landfill Gas Emissions (gas extraction system)
- Appendix 5.1 Discharge to Sewer Results for 2011. Quarterly Reports.
- Appendix 6.1 Topographical Survey (A3 sheet)
- Appendix 7.1 PRTR Returns for 2011 (Copy of Submission)

1. INTRODUCTION

1.1. Site Location

Arthurstown landfill, Kill, Co. Kildare is owned and operated by South Dublin County Council (SDCC). SDCC was granted a waste licence to operate the site by the Environmental Protection Agency. Land-filling commenced in October 1997.

The current waste licence register number is W004-004 and was issued December 2009. The facility is located approximately 25 km south-west of Dublin City and caters for the Greater Dublin Region.

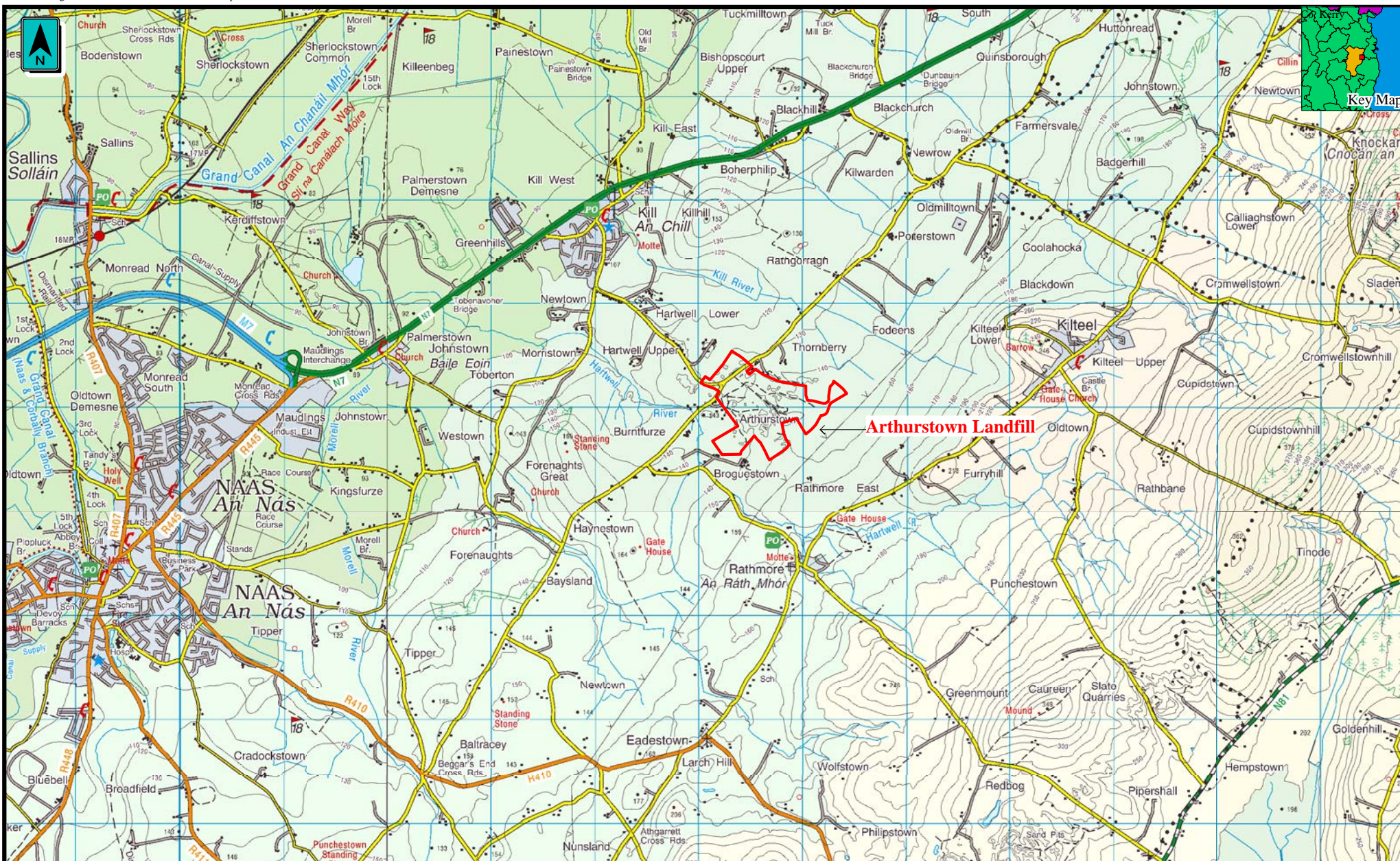
The national grid coordinates for the facility are E 295691 N 220936. Figure 1.1 is a site location map.

The prevailing land use in the area is the bloodstock industry and agriculture. The site was a disused quarry when purchased by SDCC in 1992. It had been a sand and gravel quarry. Some unauthorised dumping took place in the 1970's. SDCC carried out remediation and restoration works on the unauthorised "dump" known locally as "Gavin's Dump".

Groundwater generally flows in a north-westerly direction. There are two rivers in the area, the Hartwell River and the Kill River. Surface water run-off from the site is first collected and stored in the on-site surface water storage lagoon before being discharged to the Hartwell River along with pumped groundwater. Groundwater levels beneath the landfill were artificially reduced during cell construction using a cut-off pipe system so that the water table is maintained below the landfill lining system base level.

The prevailing winds are south to south westerly. The annual rainfall for the area is approximately 1,000 mm.

The landfill is now closed and is now in the aftercare phase. Final capping is continuing and should be complete by end 2013.



1.2. Purpose

This Annual Environmental Report (AER) has been prepared in compliance with Condition 11.5 of the waste licence. It is the 13th AER for the facility.

Condition 11.5.1 states that:

“Annual Environmental Report”

The licensee shall submit to the Agency for its agreement, by 31st March each year, an Annual Environmental Report (AER).

The AER shall include as a minimum the information specified in *Schedule F: Content of Annual Environmental Report*, of this licence and shall be reported in accordance with any relevant written guidance issued by the Agency”.

The AER includes all of the items that are required by Schedule F of the current waste licence for the facility.

This AER covers the operational period of the landfill from 1st January 2011 to 31st December 2011.

This is the first AER to cover the period of closure for the facility as this facility is now closed for receiving waste since 21st December 2010.

2. SITE DESCRIPTION AND ACTIVITIES

2.1. Waste Activities

Waste activities carried out at Arthurstown Landfill are in accordance with the licence as follows:

Licensed Waste Disposal Activities,
in accordance with the Third Schedule of the Waste Management Acts 1996-2003

Class 1 Deposit on, in or under land (including landfill):

This activity is limited to the deposit of baled municipal waste at the facility.

Class 4 Surface impoundment; including placement of liquid or sludge discards into pits, ponds or lagoons:

This activity is limited to the storage of leachate in the storage and treatment tank and lagoons and the storage of surface water and groundwater at the facility.

Class 5 Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment:

This activity is limited to the deposit of baled municipal waste into lined cells at the facility.

Class 6 Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule:

This activity is limited to the biological treatment of leachate arising from the waste disposed of on-site.

Class 7 Physico-chemical treatment not referred to elsewhere in this Schedule (including evaporation, drying and calcination) which results in final compounds or mixtures which are disposed of by means of any activity referred to in Paragraphs 1. to 10. of this Schedule:

This activity is limited to the physico-chemical treatment of leachate arising from the waste disposed of on-site.

2.2. Waste quantities

Table 2.1 is a list of waste material received at the facility for land-filling since operations commenced in 1997 until 21st December 2010 when landfilling ceased.

Table 2.1 Waste Intake (Tonnes)

Year	Waste Materials (Tonnes)	
	Cumulative Waste Inputs	Annual Waste Inputs
2010	4,779,021.09	191,553
2009	4,587,468	214,560
2008	4,372,908	301,828
2007	4,071,077	480,529
2006	3,590,548	591,755
2005	2,998,793	497,400
2004	2,501,393	423,626
2003	2,077,767	483,582
2002	1,594,185	463,436
2001	1,130,749	334,333
2000	796,416	274,642
1999	521,774	271,079
1998	250,695	216,284
1997	34,411	34,411

2.3. Remaining Capacity

2.3.1. Current Filling Rates

None.

2.4. Future Trends in Filling Rates

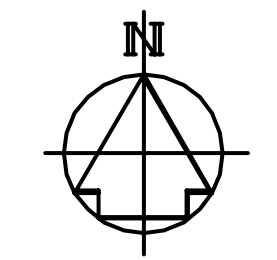
None.

Arthurstown Landfill is now closed and has now entered the aftercare and monitoring stages.

During 2011 a further 30,000 m² approx of final capping works were completed.

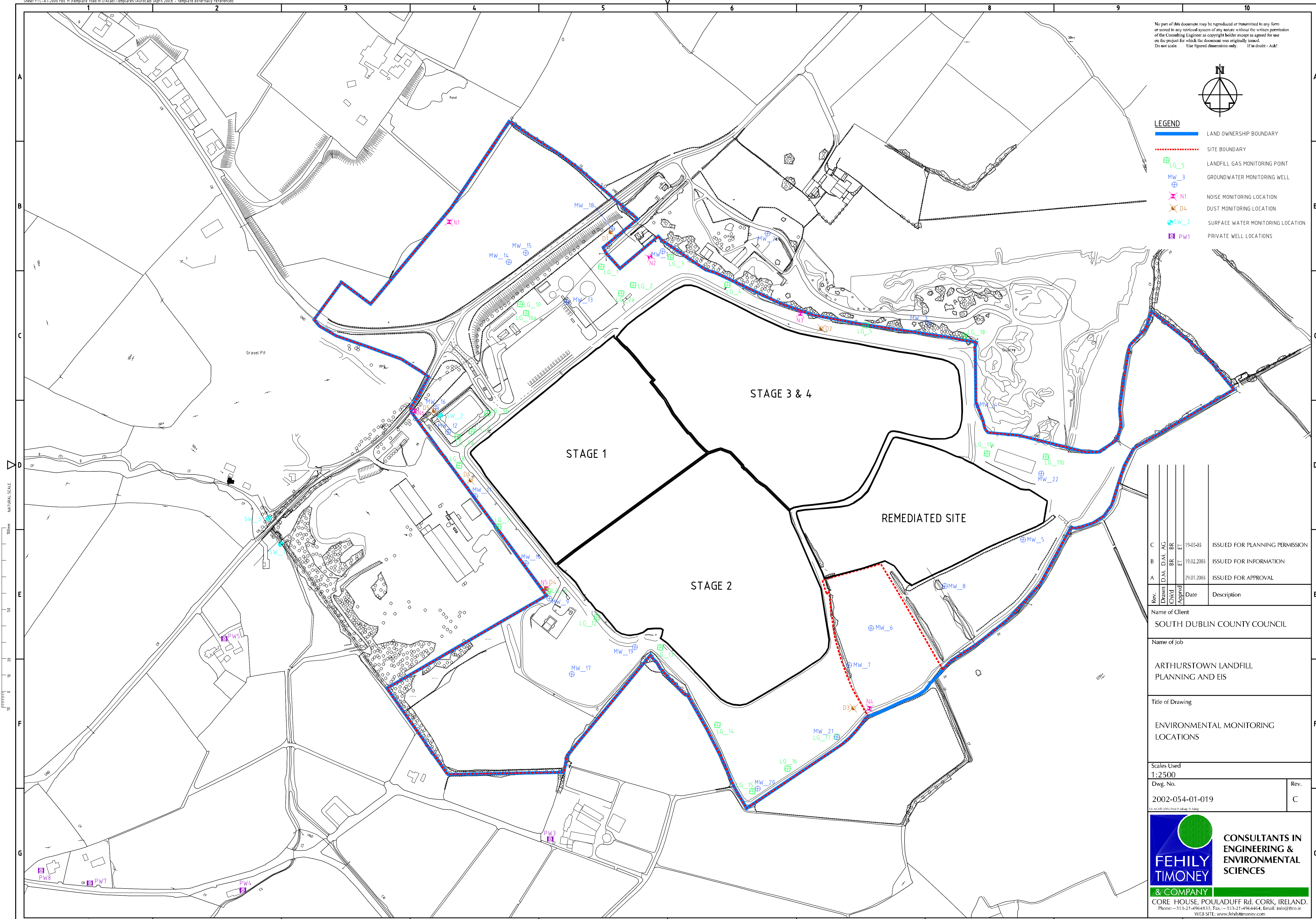
The Council hopes to begin the second last phase of final capping works during March / April 2012.

No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the Consulting Engineer as copyright holder except as agreed for use on the project for which the document was originally issued.
Do not scale. Use figured dimensions only. If in doubt - Ask!



LEGEND

- LAND OWNERSHIP BOUNDARY
- SITE BOUNDARY
- LG_5 LANDFILL GAS MONITORING POINT
- ⊕ MW_3 GROUND WATER MONITORING WELL
- ✕ N1 NOISE MONITORING LOCATION
- ✕ D4 DUST MONITORING LOCATION
- ⊕ SW_2 SURFACE WATER MONITORING LOCATION
- PW1 PRIVATE WELL LOCATIONS



Rev.	Drawn	Checked	Date	Description
C	D.M.	A.G.	19-05-03	ISSUED FOR PLANNING PERMISSION
B	B.R.	E.T.	19-02-2003	ISSUED FOR INFORMATION
A	B.R.	E.T.	29-01-2003	ISSUED FOR APPROVAL

Name of Client
SOUTH DUBLIN COUNTY COUNCIL

Name of Job
**ARTHURSTOWN LANDFILL
PLANNING AND EIS**

Title of Drawing
**ENVIRONMENTAL MONITORING
LOCATIONS**

Scales Used
1:2500

Dwg. No.
2002-054-01-019

Rev.
C

**FEHILY
TIMONEY
& COMPANY**
CONSULTANTS IN
ENGINEERING &
ENVIRONMENTAL
SCIENCES

CORE HOUSE, POULADUFF RD, CORK, IRELAND.
Phone: +353-21-4964133, Fax: +353-21-4964464, Email: info@fehilytimoney.com
WEB SITE: www.fehilytimoney.com

2.5. Resource and Energy Consumption

The principal resources consumed at the landfill facility are diesel oil and electricity. Site vehicles are fuelled by diesel oil.

Table 2.2 Resource Use and Energy Consumption

Resource/Energy	Units	Quantity Used in 2011
Diesel Oil	(Litres)	110,000 (Approx)
Electricity (As per SCADA)	(kWh)	551,471

Note: reduction in diesel consumption due to no waste transportation taking place.

2.6. Leachate Generation

In 2011 leachate was collected from the waste cells and pumped to the leachate treatment plant. It was subsequently removed from site by road tanker for discharge to an agreed foul sewer location. SDCC has received permission from the local authority Kildare County Council to commence the discharge of treated leachate only via the rising main during 2008. Table 2.3 lists the quantities of leachate tankered off site and treated leachate discharged to sewer in 2011.

The total quantity of leachate tankered off-site and discharged to sewer for 2011 is 98,223.92 tonnes or m³.

Table 2.3 Leachate Removal Off-Site for 2011.

Month	Tonnes leachate tankered off site 2011	Tonnes Leachate Discharged to Sewer 2011	Monthly Total Discharged
January	10091.90	1211.27	11,303.17
February	10707.80	1943.09	12,650.89
March	8990.57	1197.92	10,188.49
April	6941.64	1547.57	8489.21
May	7382.10	1662.87	9,044.97
June	4006.90	1425.27	5,432.17
July	3422.20	1309.59	4,731.79
August	8990.57	1141.84	10,132.41
September	6035.46	1338.46	7,373.92
October	5082.82	2302.70	7,385.52
November	3423.44	2208.97	5,632.41
December	2702.18	3156.79	5,858.97
Total	77,777.58	20,446.34	98,223.92

ENVIRONMENTAL MONITORING

This is a summary of results and interpretation of environmental monitoring carried out in the period 1st January 2011 to 31st December 2011.

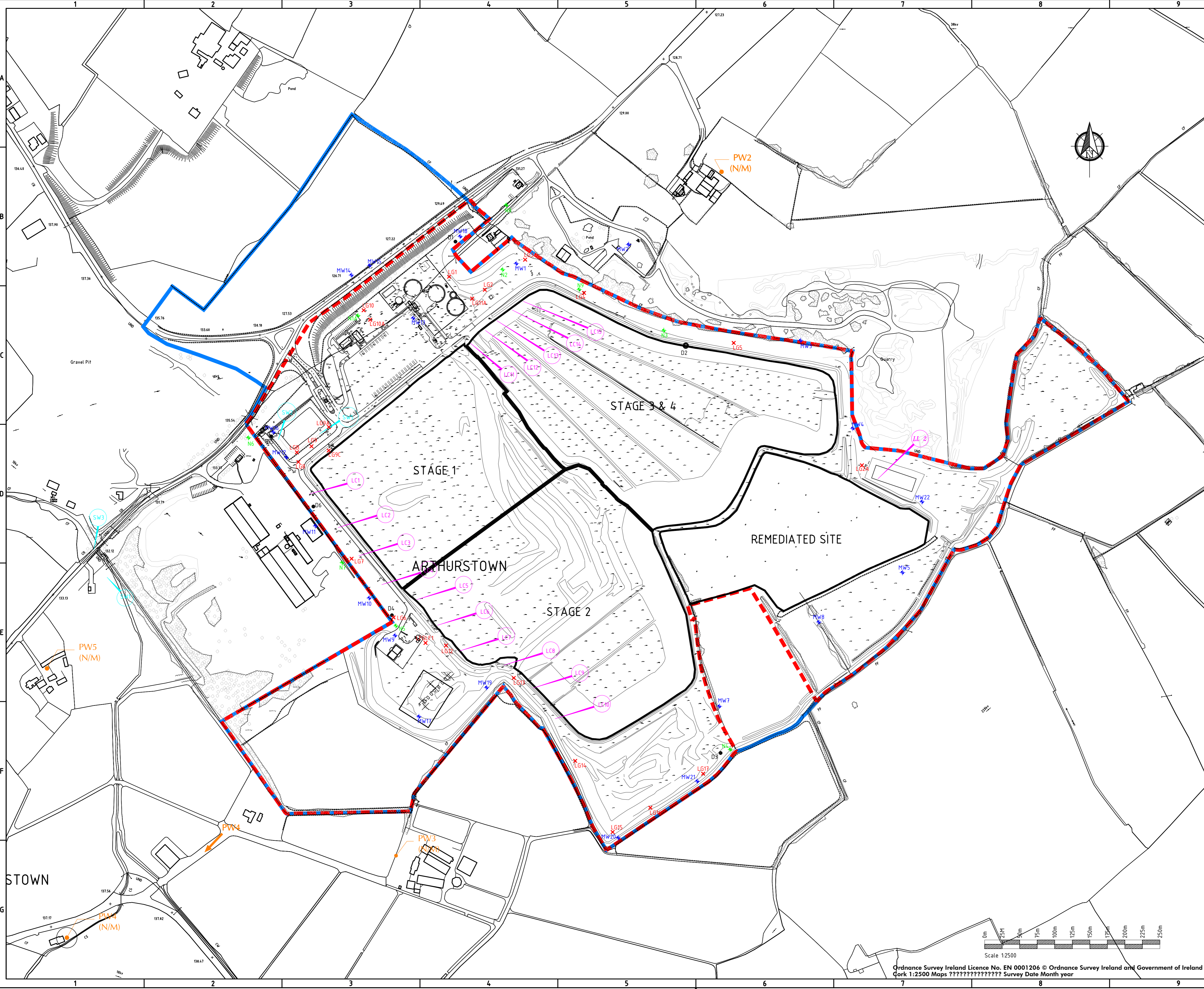
Environmental monitoring of the following is carried out in compliance with Condition 8 and Schedule D of the licence. (W0004-004)

- Landfill Gas
- Landfill Gas Utilisation Plant
- Dust Deposition
- Noise
- Surface Water including Biological Assessment
- Groundwater
- Private Wells (Groundwater)
- Leachate (including discharges to sewer)
- Nuisance
- Meteorological

Environmental monitoring is carried out on a monthly, quarterly, bi-annual and annual basis for various parameters of the various media. The AER presents the results of annual monitoring with interpretation. A review of the other results collected during the year is included.

2.7. Monitoring Locations

The environmental monitoring points are shown on Drawing Number AWL03 – 14. All samples were collected at the sampling points listed in Table D.1.1 of the licence unless specified otherwise in the following sections.



No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of Fehily Timoney & Company as copyright holder except as agreed for use on the project for which the document was originally issued.
Do not scale. Use figured dimensions only. If in doubt - Ask!

- | | |
|--------------|---------------|
| LANDFILL GAS | LEACHATE |
| LG 1 | LC 1 |
| LG 2 | LC 2 |
| LG 3 | LC 3 |
| LG 4 | LC 4 |
| LG 5 | LC 2 |
| LG 6 | LC 1 |
| LG 7 | LC 2 |
| LG 8 | LC 8 |
| LG 9 | LC 8 |
| LG 10 | LC 11 |
| LG 2A | LC 11 |
| LG 12 | LC 12 |
| LG 13 | LC 13 |
| LG 14 | LC 14 |
| LG 15 | LC 15 |
| LG 16 | LC 5 |
| LG 17 | LC 6 |
| LFGF1 | LC 7 |
| LG 9A | LC 8 |
| LG 9B | LC 9 |
| LG 9C | LC 10 |
| LG10A | DUST |
| LG 11A | D 1 |
| GROUNDWATER | D 2 |
| MW 1 | D 3 |
| MW 2 | D 4 |
| MW 3 | D 5 |
| MW 4 | D 6 |
| MW 5 | NOISE |
| MW 6 | N1A |
| MW 6A | N2 |
| MW 7 | N3 |
| MW 8 | N4 |
| MW 9 | N5 |
| MW 10 | N6 |
| MW 11 | N7 |
| MW 12 | N8 |
| MW 13 | N9 |
| MW 14 | SURFACE WATER |
| MW 15 | SW 1 |
| MW 16 | SW 2 |
| MW 17 | SW 3 |
| MW 18 | SW 4 |
| MW 19 | SW 4 |
| MW 20 | SW 5 |
| MW 21 | |
| | PRIVATE WELLS |
| | PW 1 |
| | PW 2 |
| | PW 3 |
| | PW 4 |
| | PW 5 |

Drawn	CK	Cork	ISSUE FOR PLANNING
Checked	ME	14.12.06	
App'd	CC		

Rev.	Drawn	Checked	App'd	Rev Origin	Description
				Date	
Revision History A					

Name of Client
SOUTH DUBLIN COUNTY COUNCIL

Name of Job
**ARTHURSTOWN LANDFILL
PLANNING AND EIS**

Title of Drawing
ENVIRONMENTAL MONITORING LOCATIONS

Scales Used
1:2500

Dwg. No.
2006-054-03-FIG2.4

Rev.
A

**CONSULTANTS IN
ENGINEERING &
ENVIRONMENTAL
SCIENCES**

Core House, Pouladuff Rd, Cork, Ireland.
T: +353-21-4964133, F: +353-21-4964464

Mill House, Ashtown Gate, Navan Rd, Dublin 15, Ireland.
T: +353-1-6583500, F: +353-1-6583501

W: www.fehilytimoney.ie, E: info@ftco.ie

2.8. Landfill Gas

Perimeter Monitoring Wells

There are 23 no. perimeter gas monitoring wells at the facility. In accordance with Schedule D.2.1 of the licence, monitoring of the wells is carried out on a monthly basis. An investigation was carried out in 2005 into elevated levels of carbon dioxide and methane at a number of perimeter wells. The investigation concluded that the elevated levels of CH₄ and CO₂ were due to incidences of rotting vegetation, proximity to old percolation areas etc. and was not due to landfill gas migration.

Appendix 3.2 shows methane and carbon dioxide levels measured in perimeter wells in 2011. The levels are comparable to levels recorded in 2009 & 2010.

Landfill Gas Extraction Wells

The final capped areas are connected to the gas extraction system. This system is controlled and monitored by landfill gas field balancing. A gas balancing model is used by the staff at Arthurstown.

Experience to date at the facility shows that vents do not produce viable landfill gas until they are approximately 9 - 12 months old. The connection of vents is carried out if waste deposition in the area of the vent has either reached final levels or is to cease for 6 months or more. Temporary connections are also made on the instruction of the Facility Manager.

All vents on site are now connected to the gas extraction system for utilisation as the facility is now closed.

Site Buildings

There are four permanent gas monitors, one in each building on site:

- Administration building
- Staff services building
- Leachate plant building
- Maintenance building

The following is the report of monitoring for 2011.

- Quarter 1 – no exceedences
- Quarter 2 - no exceedences
- Quarter 3 - no exceedences
- Quarter 4 - no exceedences

2.8.1. Interpretation of Landfill Gas Results

Landfill gas results are typical for Arthurstown landfill.

Certain perimeter wells as indicated in the appendix table are above the limit for CH₄ and CO₂. The Facility Management staff already engaged Odour Monitoring Ireland on 17th June 2005 to investigate these levels of methane in some of the perimeter wells.

The report concluded that due to the high sulphuric content of the gas in the perimeter wells that the gas was not migrating from the landfill and that this was occurring naturally due to decaying vegetation in certain areas and as a result of an old percolation area in another location. Before land-filling took place there was also background monitoring carried out. Levels of methane were also detected at that stage. Please refer to the consultants report reference 090905A. This report was again submitted to the Agency during 2009.

Landfill Gas Utilisation Plant Emissions

In accordance with Schedule D.7.1 of the licence annual monitoring of the landfill gas utilisation plant was carried out.

The Landfill Gas Utilisation Plant commenced operations April 2004 with three no. Jensbacher landfill gas engines from Austria extracting gas at a rate of approximately 3,000 m³/hr. The Council requested that the enclosed flare operate in conjunction with the engines. This was carried out and the extraction rate increased to 4,900 m³ per hour. During December 2004 a fourth engine was installed and the rate further increased to approximately 5,700 m³ per hour. In 2005 an additional enclosed flare unit was installed. The extraction rate capacity in the utilisation plant is currently 10,000 m³/hour, this is generated by 11 no. engines and 2 no. enclosed flares. A further 2 no 2,500m³ per hour enclosed flares operated by SDCC to extract gas from the temporary capped areas are on stand-by as all landfill gas is now being diverted to the utilisation plant for electricity production. These last 2 flare units replaced all open flare units on site.

Annual monitoring of the landfill gas utilisation plant emissions is a requirement of the licence. Monitoring was carried out for the period 2011 and the tables are included in the appendix.

2.8.2. Interpretation of Utilisation Emissions

CO emission concentrations were above emission limit values established within Waste licence W0004-004 for Engine AR03. All other monitoring of flares and engine stacks showed all readings are in compliance with waste license W0004-004 for 2011.

2.9. Dust Deposition

Dust monitoring was carried out in accordance with the licence at 6 monitoring locations, three times in the year.

Dust monitoring was carried out over a 30 day period +/- 2 days. The periods were as follows:

- ___31st March 2011
- ___30th June 2011
- ___25th August 2011

2.9.1. Dust Deposition

Dust deposition results for 2011 are shown appendix 3.3.

2.9.2. Interpretation of Dust Deposition Results

The license limit for dust at the facility is 350 mg/m²/day. This was not exceeded during 2011.

2.10. Noise

In compliance with Schedule D (D.4) of the waste licence, noise monitoring was carried during 2011.

The noise monitoring event took place as follows:

Day time monitoring – 19th November 2011

Night time monitoring – 19th November 2011

As the landfill is now closed the Noise monitoring will be reduced to one round per year.

Noise Results

The results of noise monitoring events are shown in Appendix 3.4.

Noise levels are consistent with previous years monitoring. There were 2 out of 7 locations exceeded the day limit of 55 dB and 4 out of 7 locations exceeded the night limit of 45dB. These are mainly due to the close proximity of the meter to the adjacent facility and to traffic movements. As the landfill is now closed the elevated noise readings cannot be attributed to land-filling activities.

2.11. Surface Water

The following is a summary of annual surface water quality findings in 2011. More detailed information has been submitted in each of the quarterly reports from Bord Na Mona.

There are 5 no. surface water monitoring points. Chemical analyses are carried out at all 5 of the monitoring locations and a biological assessment was carried out at SW1, SW3 (Hartwell River) and at SW4 (Kill River). The 5 no. surface water monitoring points are located as follows:

- SW1 upstream of the outfall from the storm water lagoon in the Hartwell River
- SW2 outlet for the on site storm water pond
- SW3 downstream of the outfall from the storm water lagoon in the Hartwell River
- SW4 downstream of Arthurstown Road in the Kill River
- SW5 inlet to the storm water pond (storm and ground waters)

2.11.1. Surface Water Results

Chemical Analysis

The results of surface water analysis are shown in tables and charts in Appendix 3.5.

2.11.2. Interpretation of Surface Water Results

During 2011 the surface water quality has remained consistent with previous years as can be seen with the Q rating in table 3.1 below.

Quarterly monitoring is carried out by Bord Na Mona at all monitoring points for surface water.

Monitoring points SW2 and SW5 are within the on-site surface water storage pond. During 2011 there were elevated levels of NH₄ Ammonia at location SW2 and SW3. This was as a direct result of the severe weather conditions (winter 2010) eroding parts of the temporary cap area which may have lead to small amounts of "leachate breakout" entering the surface water swale. These areas were remediated immediately. On examining the results of the monitoring points in the Hartwell River (SW1 & SW3) there was no effect as a result of these ammonia levels and therefore no pollution caused. This proves that the surface water retention pond is working effectively.

During 2011 all SW reports were sent to the Agency, Kildare County Council and the Department of Inland Fisheries.

Biological Sampling

During 2011 biological sampling was carried out in the Hartwell and Kill Rivers. The Hartwell received a Q rating of 4 and the Kill River a Q rating of 4. This is consistent with 2010 & 2009 figures and an improvement of the Q rating figures compared to 2007.

Biological sampling is carried out annually in accordance with the licence. It was carried out during the third quarter of 2011. (2nd August 2011) The Q rating system

was used. This rating system recognises five macro-invertebrate communities/faunal groups ranging from A to E (i.e. most sensitive to most tolerant of pollution) and relates to their relative abundance, from a standard 2 minute kick sample, to a quality rating – the Q Index. The area surveyed is then assigned a Q rating from 5 to 1, 5 being pristine unpolluted waters to 1 gross polluted. Results of biological sampling are shown below in Table 3.12.

Q Rating of Surface Waters for 2011.

Biological Q Rating for Surface Waters (within rivers)			
Location	SW-1	SW-3	SW-4
Q-Rating	4	4	4

Table 3.12

Quality at point SW1 is consistent with last year's results. This point is upstream of the Arthurstown surface water discharge point. (note: discharge from ALCRETE Ltd is within 5m upstream of the discharge from Arthurstown Landfill)

Quality at point SW3 is consistent with previous years which indicate that discharges from the surface water retention pond from the landfill are having no impact on the surface water quality at point SW3.

Quality at point SW4 is also consistent with last year's results. This point is on the Kill River which is approximately 500m northeast of the site. No discharges are taking place to the Kill River from Arthurstown landfill.

The overall bio-diversity noted for the Hartwell River was very good. The results of the biological survey indicate that the quality of water in the Hartwell River is good (using the Q-value system) / excellent (using the LQI interpretation of water quality) upstream and downstream of the landfill.

Groundwater

There are 22 no. groundwater monitoring wells and 5. no. private wells. Table 3.13 shows the locations of the wells in relation to the facility and in relation to groundwater flow in the area. Table 3.14 shows the depths of groundwater wells. Private Wells are discussed in Section 3.7.

Table 3.13 Location of groundwater monitoring boreholes relevant to the facility and the groundwater flow in the area

<i>Well</i>	Direction with respect to the facility	Location with respect to groundwater flow*
<i>MW3</i>	260 m NE	US
<i>MW4</i>	400 m E	US
<i>MW5</i>	400 m E	US
<i>MW6</i>	100 m ESE	US
<i>MW7</i>	80 m SE	US
<i>MW8</i>	240 m ESE	US
<i>MW20</i>	150 m S	US
<i>MW21</i>	140 m SSE	US
<i>MW22</i>	400 m E	US
<i>MW2</i>	260 m NE	CG
<i>MW17</i>	100 m WSW	CG
<i>MW19</i>	20 m WSW	CG
<i>MW1</i>	140 m NE	DS
<i>MW9</i>	50 m W	DS
<i>MW10</i>	50 m W	DS
<i>MW11</i>	50 m W	DS
<i>MW12</i>	50 m NW	DS
<i>MW13</i>	100 m N	DS
<i>MW14</i>	200 m NNE	DS
<i>MW15</i>	200 m NNE	DS
<i>MW16</i>	90 m NNW	DS
<i>MW18</i>	170 m N	DS

*Note: US upstream
DS downstream
CS cross gradient
Wells highlighted in bold font are those that are required to be monitored by the waste licence.

The waste licence (W004-004), Schedule D.1 Table D.1. states that groundwater levels should be recorded for all wells on a monthly basis and that sampling for chemical parameters should be carried out in 7 no. wells. These 7 wells (as selected by the Agency) are highlighted in bold in Table 3.13.

Table 0.1 Depths of Groundwater Monitoring Wells

<i>Wells</i>	Base of wells m O.D (2006)*	Well height at ground level m O.D	Depth of Borehole (m)
<i>MW1</i>	130.04	138.67	8.63
<i>MW2</i>	130.22	137.00	6.78
<i>MW3</i>	131.67	140.20	8.53
<i>MW4</i>	141.72	143.40	1.68
<i>MW5</i>	146.12	148.00	1.88
<i>MW6A</i>	144.7	150.50	5.80
<i>MW7</i>	147	153.60	6.60
<i>MW8</i>	115.19	149.20	34.01
<i>MW9</i>	110.01	139.50	29.49
<i>MW10</i>	132.19	135.10	2.91
<i>MW11</i>	129.28	133.75	4.47
<i>MW12</i>	130.83	134.74	3.91
<i>MW13</i>	127.28	135.60	8.32
<i>MW14</i>	125.13	129.40	4.27
<i>MW15</i>	126.61	129.42	2.81
<i>MW16</i>	112.84	135.54	22.70
<i>MW17</i>	129.05	139.40	10.35
<i>MW18</i>	102.16	136.68	34.52
<i>MW19</i>	118.72	145.30	26.58
<i>MW20</i>	147.51	156.50	8.99
<i>MW21</i>	146.83	155.00	8.17
<i>MW22</i>	140.64	145.00	4.36

*Note: The total depths of wells are as per measurements in 2006. Wells can silt up gradually over time, diminishing their total depth.

2.11.3. Groundwater Results

Tables and charts showing groundwater results and trends are included in Appendix 3.6.

2.11.4. Interpretation of Groundwater Results

Annual Results

A total of twenty two groundwater monitoring boreholes are located at Arthurstown Landfill. During the annual sampling event for 2011 a total number of 7 boreholes were sampled.

Chemical analysis, Metals analysis, Organic analysis and Microbial Analysis were carried out as part of the annual analysis of the groundwater.

Appendix 3.6 Groundwater Annual outlines all elevated readings for the annual monitoring event and can be summarised as follows:

Ammonia-N was above the MAC at the following points: MW2, MW14 & MW22.
Chloride levels were above the MAC at MW2 & MW20.

Calcium levels were over the MAC limit at MW2, MW20 & MW22.
Iron levels were above the MAC limit at MW8, MW14, MW20 & MW22.

Manganese levels were above the MAC limit at all locations tested namely MW14, MW16, MW18, MW2, MW20, MW22, MW6A, MW8 and MW9.

Nickel levels were only exceeded at MW9.

Potassium levels were only above the MAC at location MW2.

Sodium levels only exceeded at location MW2.

Sulphate level was just above the MAC at MW20.

Total Dissolved Solids were elevated at locations MW2 and MW20.

Orthophosphate levels were above the MAC at locations MW2 & MW14.

Locations MW2 and MW3 are not within the boundary of the landfill and are in an agricultural location (i.e. a farm adjacent to slatted sheds).

MW2 and MW3 are adjacent to the landfill and located on a cross-gradient flow in relation to the groundwater contour flow below the landfill. The elevated readings at MW2 and MW3 cannot be attributed to the landfill due to its location.

External agricultural factors are contributing at these locations.

The majority of monitoring at all other locations is consistent with previous years monitoring results.

2.12. Private Wells (Groundwater)

There are 5 no. private groundwater monitoring wells, referred to as Private Wells. Monitoring of the wells is carried out on a quarterly and annual basis.

PW1 is sampled on a quarterly basis and wells PW2 – PW5 are sampled on an annual basis.

The location of the wells is shown on Drawing Number AWL03 – 14 inserted as Figure 3.1.

2.12.1. Private Wells Results

Copies of the analysis for private wells for 2011 are included in the appendix.

2.12.2. Interpretation of Results

Annual

All private wells (PW1 – PW5) are sampled on an annual basis.

There were slightly elevated readings for Nitrite at locations PW2 and PW3.

PW5 was also elevated in Sodium (mg/l).

The location of all wells are rural agricultural.

All other results for 2011 were below MAC limits.

Quarterly

PW 1 is the only private well that is sampled every quarter. See appendix for quarterly results for PW1 2011.

2.13. Leachate

The waste licence (W004-004), Schedule D.1 Table D.1. states that leachate levels should be recorded for all sumps and collection points on a continuous basis. This continued during 2011.

SDCC carries out quarterly and annual monitoring of all leachate cells and leachate storage points on site. However the waste licence stipulates sampling at 5 locations, LC1, LC3, LC11, LL (leachate lagoon) and LB (leachate balance tank).

2.13.1. Leachate Results

Tables and charts showing leachate results and trends are included as follows in Appendix 3.8:

2.13.2. Interpretation of Leachate Results

Leachate results for 2011 are typical for leachate analysis for Arthurstown Landfill depending on age of the waste in the cell being tested.

At the end of 2007 all 15 cells contained leachate.

During 2011 treated leachate was discharged to the twin rising main connection to the local sewer in Kill.

The annual leachate results are enclosed in Appendix 3.8.

2.14. Meteorological Monitoring

Condition 8.10.1 and schedule D.6.1. of the current Waste Licence W0004-004 requires the daily monitoring of rainfall, temperature (min/max), wind speed and direction, evaporation, humidity and atmospheric pressure at the landfill site.

All weather data has been recorded by the on site "VIASALA" Weather Station which was installed during March 2003.

The data indicates prevailing wind directions from a south to south-westerly direction.

Total annual rainfall during 2011 was approximately 796 mm, (0.8m) consistent with the annual average of 1000mm and only 19 mm less than the previous years total. There was 175.6 mm recorded in the month of October 2011 alone.

The data indicates prevailing wind directions from a south to south-westerly direction. (200 degrees approximately for the entire year 2011 – Actual average for 2011 is 198 degrees)

Monthly summaries of meteorological conditions are included in Appendix 3.9 for 2011.

2.15. Odour and Odour Control at Arthurstown

The facility management staff endeavour at all times to reduce odours and complaints at the facility.

The Facility is now closed since December 21st 2010. Odour control works are ongoing and involve the placement of the temporary clay capping. Final capping works will proceed as planned in the coming years subject to financial approval and weather permitting. The entire final cap is due for completion by end 2013.

The odour controls that have been used at Arthurstown are listed in greater detail in the odour management plan (OMP) part of the upcoming revision to the EMS 2012.

Quarterly Odour Assessments:

Waste license W0004-004 states in condition 8.14.5 that an independent odour assessment is carried out once every quarter. The quarterly odour audits are carried out by Odour Monitoring Ireland.

Landfill gas leakage is the predominant source of odour complaints in Ireland. Although the landfill site is situated in a predominantly rural area, in the past there have been a number of odour complaints from residential properties in the surrounding area. Over the years, the management staff at Arthurstown is endeavoring to reduce odour complaints from residents through the techniques mentioned earlier.

Quarterly surface emissions monitoring audits are carried out on site by Odour Monitoring Ireland Ltd. They took place on:

- Q1 – 24th March 2011
- Q2 – 27th June 2011
- Q3 – 29th September 2011
- Q4 – 15th December 2011

The methodologies employed include:

- Capping source monitoring using a continuous ppb PID and Jerome 631X analyser to detect areas of potential landfill gas release.
- Sniff odour assessments at pre-selected resident locations in the vicinity of the landfill
- Geo-referencing of detected leakage locations for remediation.

The new methodology used in the odour audit is very useful in identifying areas of potential leakage. It is concluded that this technique is very successful in the reduction of landfill odours in order to prevent odour impact downwind of the landfill operations. Once the quarterly odour audit is carried out, the findings are brought to the attention of the Facility Manager, who carries out the remediation.

2.15.1. Odour Results

The colour odour charts for the landfill that are produced for each quarter are contained in the following four pages.

The colour maps of the site highlight where the most problems arise due to the concentrations measured on the temporary capped areas.

At the end of each odour audit the consultant meets with the Facility Manager to highlight the areas for remediation. These works are carried out as soon as possible.

Complaints for 2011.

The total number of complaints for 2011 was 11. This is the lowest amount of complaints in one year at Arthurstown.

There was a severe weather event which was the cause of the majority of odour complaints towards the end of 2010.

The number of complaints is declining with the progression of the final capping works which are due for completion towards the end of 2013 finance and weather permitting.

Q1 – 2010	Total Complaints	5
Q2 – 2010	Total Complaints	9
Q3 – 2010	Total Complaints	4
Q4 – 2010	Total Complaints	20

Total Complaints for 2010 was 38.

Q1 – 2011	Total Complaints	4
Q2 – 2011	Total Complaints	1
Q3 – 2011	Total Complaints	4
Q4 – 2011	Total Complaints	2

Total Complaints for 2011 was 11.

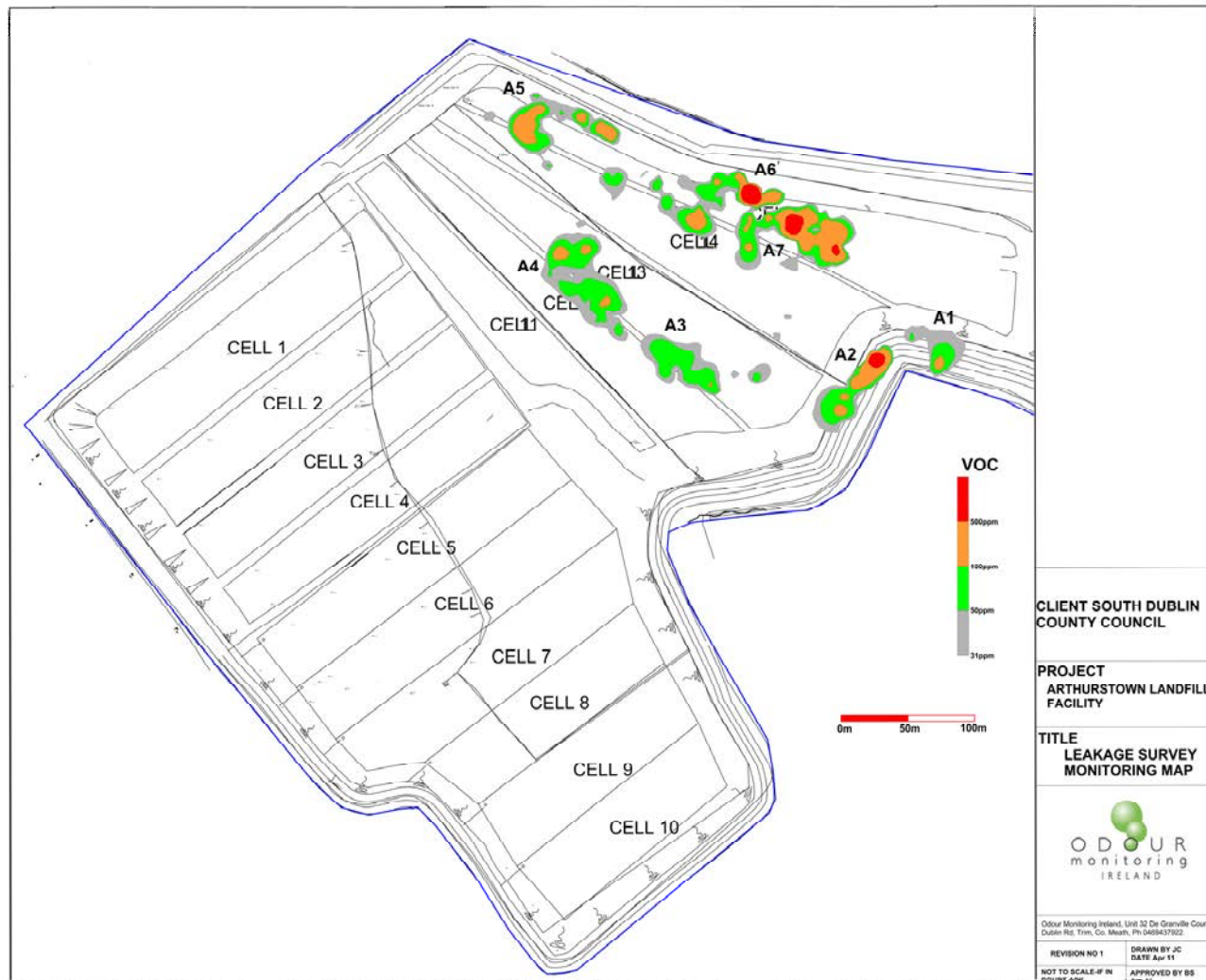


Figure 2.1. Capping source “Odour Hog” monitoring within the operating landfill facility (colour scale area indicating TVOC gas colour scale).

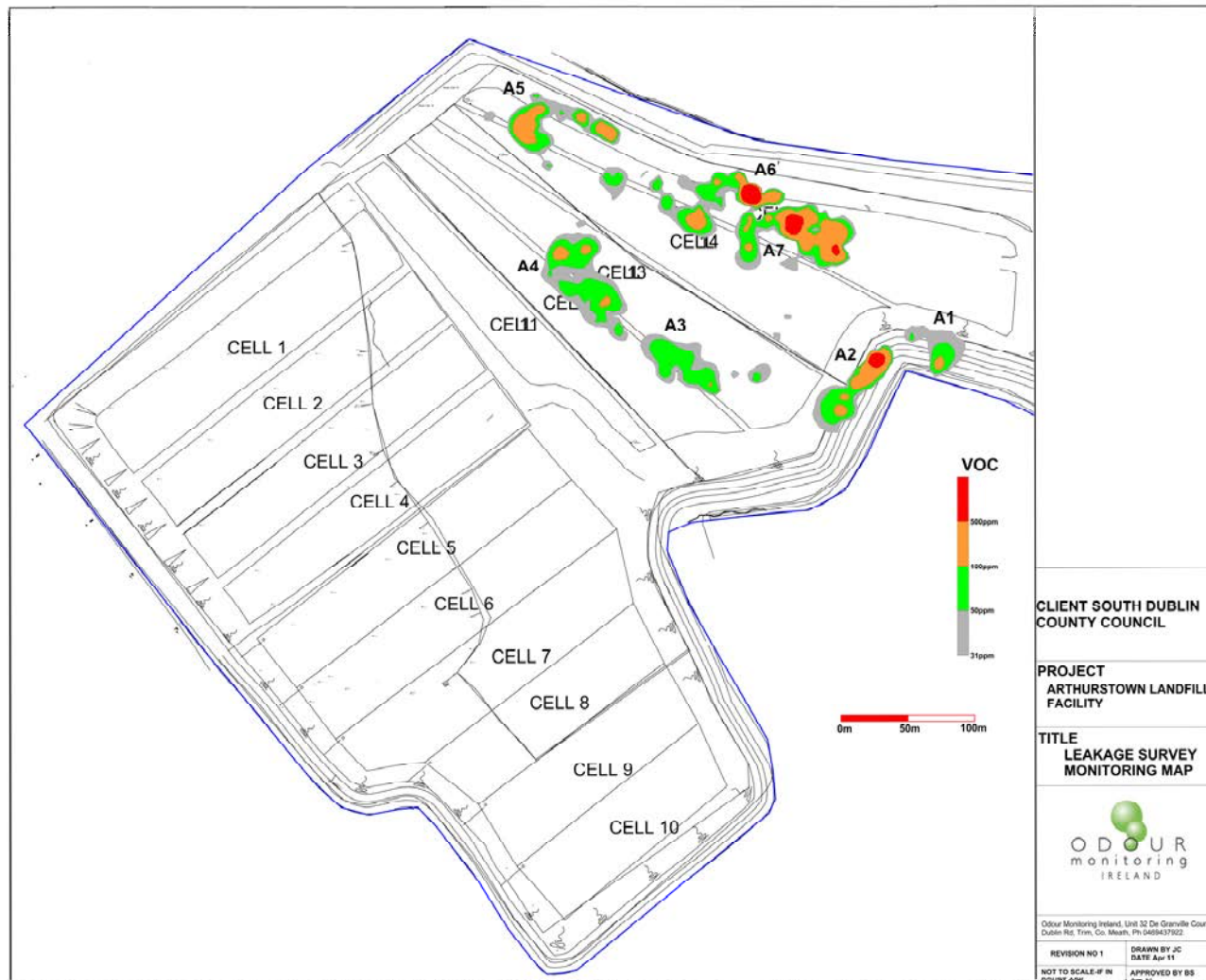


Figure 2.1. Capping source “Odour Hog” monitoring within the operating landfill facility (colour scale area indicating TVOC gas colour scale).

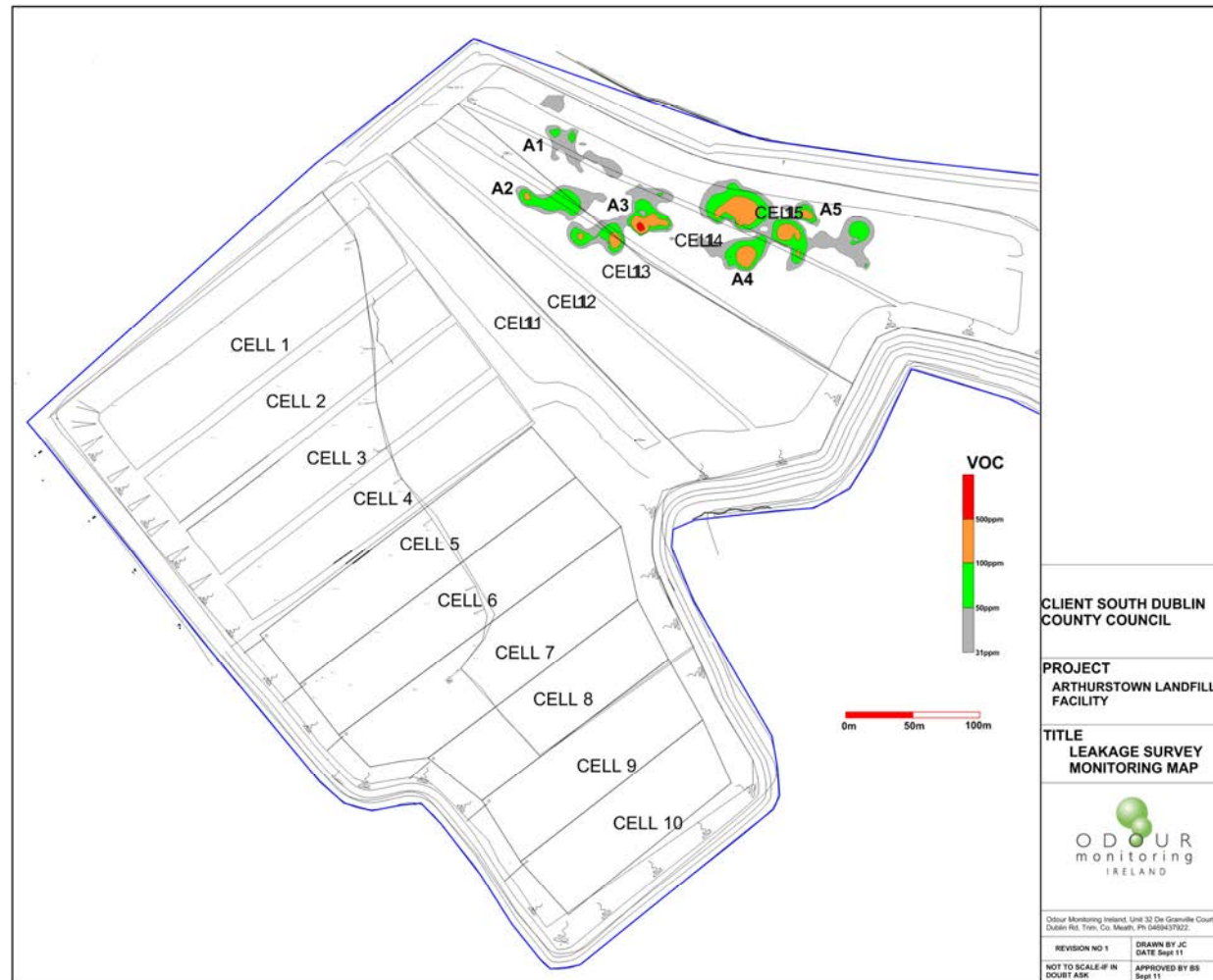


Figure 2.1. Capping source “Odour Hog” monitoring within the operating landfill facility (colour scale area indicating TVOC gas colour scale).

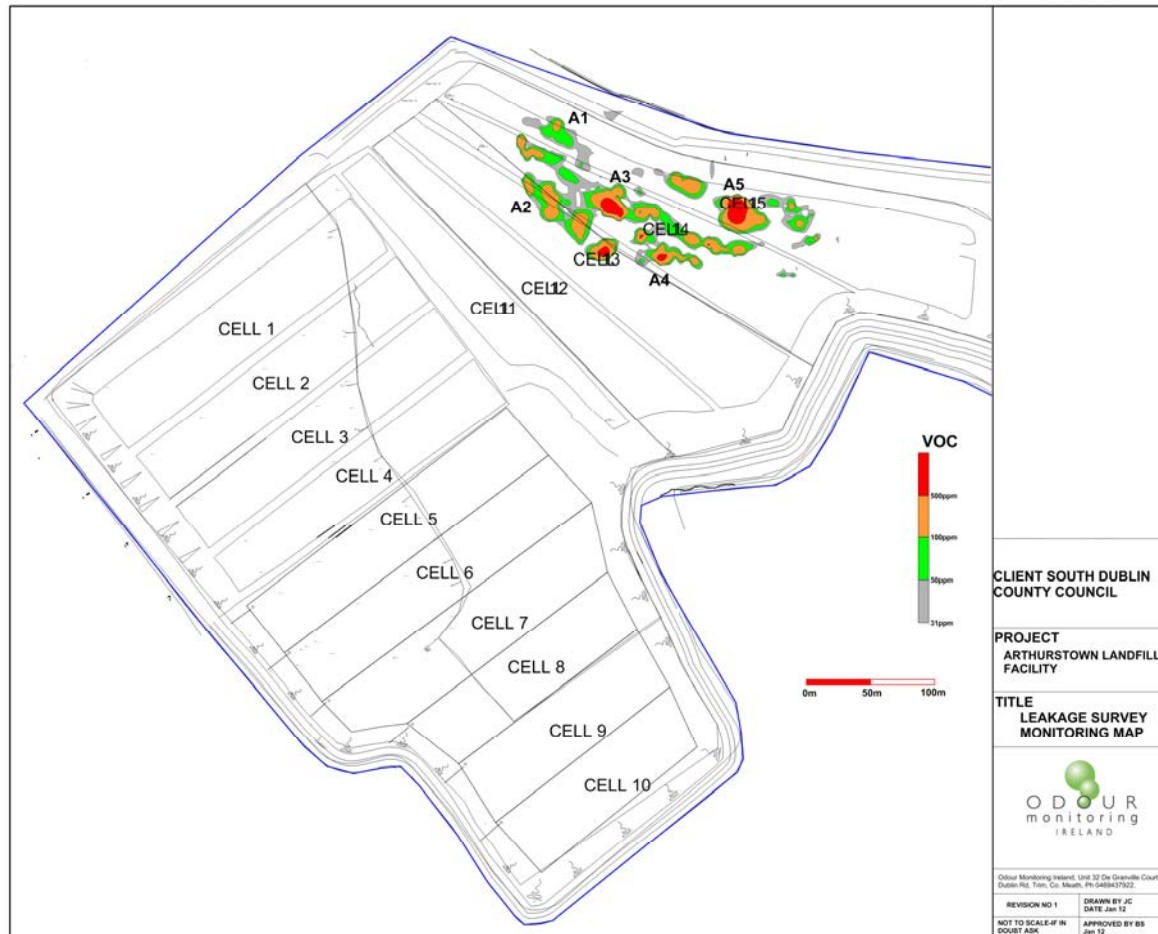


Figure 2.1. Capping source “Odour Hog” monitoring within the operating landfill facility (colour scale area indicating TVOC gas colour scale).

2.16. Landfill Gas Emissions

Approximately 61,320,000 m³ of landfill gas was utilised by the gas extraction system in 2011. **(based on an average of 7,000 m³ per hour)*

From July 2009 onwards all gas captured was sent to the utilisation plant.

But from time to time the 2 enclosed flares operated by SDCC were switched on during 2011. (Estimated at 20 days operating time during final capping works at 1,500 m³ per hour per flare)

Therefore the additional estimated landfill gas captured by flaring during 2011 is estimated at 1,440,000 m³ of landfill gas.

Total Landfill gas Collected (Captured) 2011 = 62,760,000 m³.

Estimates vary as to the efficiency with which gas collection systems in landfills gather the methane formed in waste. Modern gas wells installed throughout a landfill site may collect between 70% – 90%. The efficiency for Arthurstown landfill is estimated here as 90% because the wells are relatively new and in good condition, capping is well progressed (*85% of Landfill Area*) and the daily cover system is good. **Based on this efficiency it is estimated that the total landfill gas generated at Arthurstown Landfill in 2011 was 69,733,333 m³.**

Gas extracted from the landfill is managed in 3 different ways:

- Electricity production from landfill gas in 11 no. engines at the Bioverda compound (Approx. 13 MW)
- Flaring in 2 no. enclosed flares at the Bioverda compound.
- Flaring in 2 no. 2,500m³ /hour enclosed flares on the temporary capped areas.

All of the gas collected from the capped areas and a large volume of good quality gas from the uncapped areas is directed to the Bioverda compound for generation and flaring. The available generation capacity is 11,000 m³ per hour and the capacity to flare poor quality gas from the temporary gas collection system is 5,000m³. The maximum available extraction rate is approximately 16,000 m³/hour.

Note: The current average extraction rate is 7,000 m³ per hour.

All gas is now being extracted by the utilisation plant. The 2 no enclosed flares on the temporary capped areas are currently on stand by.

The table overleaf contains the results for the European PRTR in relation to the Utilisation plant and the enclosed flare units at Arthurstown Landfill.

European PRTR Table Arthurstown Landfill flares and gas utilisation engines only.

Table 1. Table for European-PRTR requirements for Landfill flare and Gas utilisation engines only 2011.

Location	Nitrogen Oxides (NO _x as NO ₂) (kg/yr)	Carbon Monoxide (CO) (kg/yr)	Sulphur dioxide (SO ₂) (kg/yr)	Total particulates (kg/yr)	TNMVOC's (kg/yr)	Methane (kg/yr)	Carbon dioxide (CO ₂) (kg/yr)
Flare 1	1,212	22	3,115	-	100	53	1,471,233
Flare 2	1,281	184	629	-	241	116	965,758
AR01 ¹	6,165	18,494	114	251	353	11,483	2,371,740
AR02 ¹	8,871	24,992	165	569	474	16,069	2,681,561
AR03 ¹	6,187	22,300	82	606	107	14,945	2,119,985
AR05 ¹	7,386	19,966	0	204	473	12,778	2,535,697
AR06 ¹	6,756	23,477	92	294	500	16,714	2,562,747
AR07 ¹	7,917	21,640	0	388	298	13,068	2,853,405
AR08 ¹	4,893	17,162	606	344	246	16,069	3,033,397
AR09 ¹	6,263	8,754	267	555	362	12,336	2,068,673
AR10 ¹	6,569	7,679	303	491	575	13,681	2,293,830
Totals	63,499	164,672	5,373	3,703	3,729	127,313	24,958,027

Notes:

¹ denotes that the total values reported are based on 24 hr per day 365 days per year operation and for gas engines only. If the hours of operation are known through site records then the total actual amount can be calculated by calculating the yearly total to an hourly figure and then multiply by the number of hours operation (e.g. Emissions (kg/yr) / 8760 hrs = kg/hr × hours operation = Total emission in kg/yr).

Estimated Landfill Gas Generation

In summary, 127,313 kg / year of methane and 164,672 kg / year of CO were produced at Arthurstown Landfill during 2011. (as per PRTR Table produced by Odour Monitoring Ireland Ltd. (as per Table 1.)



A GASSIM model for landfill gas production at Arthurstown was produced during 2008. The findings of the model did not reflect the actual gas production on site. This report on the capacity of the utilisation plant at Arthurstown and possible future capacity issues was submitted to the Agency on 03rd December 2008.

Table 4.2 Estimated Electricity Production at Arthurstown Landfill from Landfill Gas.

During 2011 the amount of electricity produced at Arthurstown Landfill by converting the landfill gas via the 11 gas engines is outlined as follows:

Month 2011	MW per month
January	7,608
February	6,317
March	7,220
April	7,102
May	7,303
June	6,968
July	7,061
August	6,965
September	6,796
October	6,945
November	6,543
December	6,649
Total 2011 MW produced	83,477 MW h

2.17. Indirect Emissions to Groundwater

Estimated Annual and Cumulative Quantity of Indirect Emissions to Groundwater.

Monitoring results to date do not indicate the presence of indirect emissions to ground waters. Considering that groundwater flow is in a generally north-westerly (NW to NNW) direction, monitoring wells can be deemed to be upstream, downstream, or cross-gradient of the landfill area. Table 4.3 below presents a summary assessment of monitoring well locations relative to the existing waste body. Parameters selected for this assessment, because they are known to exhibit high concentrations in landfill leachate at Arthurstown, are Ammonia-N, Chloride and Electrical Conductivity.

Condition 6.4.1 states that there shall be no direct emissions to groundwater.

Table 0.2 Calculation of Direct and Indirect Emissions to Groundwater

Location	Direction	Relative Position	Summary of Results since March 1999 - Dec 2011				
			Ammonia (mg/l)		Chloride (mg/l)	Conductivity (uS/cm)	
			Max	Avg	Avg	Max	Avg
MW3	260 m NE	US	2.45 _(April'04)	0.13	19.27	913 _(May'07)	669
MW4 **	400 m E	US	1.2	<0.31	7.5	952 _(Apr '02)	761
MW5 **	400 m E	US	<0.2	<0.2	10.6	686 _(Oct '99)	481
MW6A	100 m ESE	US	5.8 _(May'08)	0.18	14.6	838 _(Nov'08)	694
MW7	80 m SE	US	5.7 _(May'08)	1.20	16.4	987 _(Nov'08)	881
MW8	240 m ESE	US	1.04 _(April '05)	0.10	16.4	716 _(Nov '10)	665
MW20	150 m S	US	1.7 _(Feb '03)	0.06	26.7	2815 _(Nov '09)	1885
MW21	140 m SSE	US	1.5 _(May '01)	0.07	15.6	1568 _(Apr '05)	1071
MW22	400 m E	US	0.33 _(Feb '03)	0.12	11.7	805 _(Apr '05)	535
MW2	260 m NE	CG	1.5 _(May '01)	0.32	80.28	2363 _(Nov'10)	1155
MW17	100 m WSW	CG	0.6 _(May '01)	0.14	23.5	2097 _(May'07)	1234
MW19	20 m WSW	CG	3.08 _(July '07)	0.11	18.6	1204 _(Jul'06)	911
MW1	140 m NE	DS	Dry	Dry	Dry	Dry	Dry
MW9	50 m W	DS	1.2 _(July '01)	0.07	12.34	738 _(Nov'08)	634
MW10 **	50 m W	DS	Dry	Dry	Dry	Dry	Dry
MW11	50 m W	DS	0.36 _(April'04)	0.08	10.4	690 _(Apr'04)	617
MW12 **	50 m NW	DS	Dry	Dry	Dry	Dry	Dry
MW13 **	100 m N	DS	0.2 _(Nov '02)	<0.2	27.9	944 _(Nov'02)	944
MW14	200 m NNE	DS	24 _(Aug '11)	0.11	16.5	1042 _(Feb'09)	716
MW15 *	200 m NNE	DS	1.0 _(May'01)	<0.28	33	900 _(Feb'03)	802
MW16	90 m NNW	DS	0.7 _(July '01)	0.05	15.6	992 _(Nov'08)	741
MW18	170 m N	DS	1.2 _(May'01)	0.23	12.8	719 _(Nov '10)	650

DS – downstream

US – upstream

CG – cross gradient

Locations upstream from the landfill are located in an agricultural area and are therefore sprayed several times a year with “slurry”.

Only location MW14 showed an increase in ammonia levels during 2011. This can be attributed to agricultural activity on the lands adjacent.

Due to the upstream locations of the majority, cross gradient locations of other boreholes and proximity to agricultural activities, it can be assumed that emissions to groundwater are satisfactory for the period 2011.

2.18. Water Balance

A number of assumptions were made in the calculation of the water balance.

Evaporation

Due to the nature of baled waste, rainfall tends to flow through the edges of each bale quickly and makes its way deep into the waste body or onto the cell floor quickly. Hence a nominal value of 10% of the recorded evaporation in the calculation.

Capped Areas

Uncapped Area approx:	50,000 m ²
Final Capped Area approx.	240,000 m ²

Absorptive Capacity of Waste

Due to the nature of baled waste, cells with new waste will have a lower absorptive capacity. This increases with the age of the waste and as the waste is in contact with moisture for longer periods. An absorptive capacity of 15% of the traditional value of 0.07 m³/t has been assumed.

The volume of leachate tankered off-site and discharged to sewer in 2011 was 98,224 m³.

Results of the water balance calculation estimate that a theoretical figure of approximately 111,440 m³ of leachate was produced during 2011.

That leaves a remaining leachate figure of 13,216 m³.

The difference of 13,216 m³ can be attributed to the leachate that has been produced and was not removed from the cells and leachate in the treatment plant and storage lagoon. Due to the volumes of leachate being produced at Arthurstown, this prevented the full volume of leachate being removed from the site and this back log of leachate is now being removed by continuous pumping.

The pumping of the leachate from each cell will continue during 2012. The leachate levels are seasonal at Arthurstown with levels normalising during the drier months of April, May, June & July.

Facility management staff is endeavouring at all times to maintain the levels to the 1m limit by constant pumping of leachate.

A summary of the calculation is shown as Table 5.1.

Table 5.1 Water Balance Calculation Summary 2011.

Month	Rainfall	Evaporation	Effective Rainfall	Waste Input	Active Area	Intermediate Area (temporarily capped)	Fully Capped Area	Active Infiltration	Intermediate Infiltration *	Capped Infiltration	Active Leachate	Total Predicted Leachate	Cumulative Predicted Leachate	Actual leachate tankered off site	Actual SW/GW discharged to river
		(mm)	(mm)	(tonnes)	(m ²)	(m ²)	(m ²)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)	(m ³)
Jan-11	55.2	18.10	37.1	0	50,000	50,000	240,000	1,855.0	-	-	1855.0	1,855.0	1,855.0	11303	279.47
Feb-11	123.6	30.90	92.7	0	50,000	50,000	240,000	4,635.0	-	-	4635.0	4,635.0	6,490.0	12651	247.68
Mar-11	19.8	39.60	0.0	0	50,000	50,000	240,000	-	-	-	0	-	6,490.0	10189	198.45
Apr-11	45.0	66.20	0.0	0	50,000	50,000	240,000	-	-	-	0	-	6,490.0	8489	198.43
May-11	43.2	53.60	0.0	0	50,000	50,000	240,000	-	-	-	0	-	6,490.0	9045	210.83
Jun-11	87.6	56.40	31.2	0	50,000	50,000	240,000	1,560.0	-	-	1560.0	1,560.0	8,050.0	5432	178.61
Jul-11	46.8	40.20	6.6	0	50,000	50,000	240,000	330.0	-	-	330.0	330.0	8,380.0	4732	182.24
Aug-11	33.4	53.10	0.0	0	50,000	50,000	240,000	-	-	-	0	-	8,380.0	10132	7916.08
Sep-11	29.2	63.40	0.0	0	50,000	50,000	240,000	-	-	-	0	-	8,380.0	7374	237.07
Oct-11	175.6	44.50	131.1	0	50,000	50,000	240,000	6,555.0	-	-	6555.0	6,555.0	14,935.0	7386	6006.81
Nov-11	82.4	42.90	39.5	0	50,000	50,000	240,000	1,975.0	-	-	1975.0	1,975.0	16,910.0	5632	266.02
Dec-11	54.4	20.80	33.6	0	50,000	50,000	240,000	1,680.0	-	-	1680.0	1,680.0	18,590.0	5859	709.62
Total	796	530	372	-				18,590	-	-	18,590	18,590	111,440	98,224	16,631.3

3. FACILITY DEVELOPMENT

3.1. Site Survey

A topographical survey of the landfill facility was carried out by the facility management team during February 2011.

The survey is attached as Appendix 5.1.

3.2. Developments Undertaken in 2011.

3.2.1. Capping Works

Capping works commenced during the spring of 2011.

30,000 m² of final cap was installed on completion during October 2011.

Further capping works are planned for 2012 but are currently awaiting financial approval.

3.2.2. Bioverda Power Systems Utilisation Plant

The plant is now extracting on average 7,000 m³ of gas per hour.

No further works were carried out during 2011 as the plant is now operating at maximum.

3.2.3. Staff reductions during 2011

There was a reduction in the number of staff at Arthurstown during 2011.

Two members of S.D.C.C. left.

3 members of Blessington Plant Staff were made redundant.

This was as result of the closure to waste acceptance at Arthurstown Landfill.

3.3. Developments Proposed for 2012.

3.3.1. Capping Works

It is proposed to continue with final capping works in Spring/Summer 2012, weather and budget permitting.

The specified engineering works for this phase have already been submitted and approved.

3.3.2. Leachate Treatment Trials.

Approval has been received from the Agency for commencement of leachate treatment trials with BioCore Ireland / Biotain Ireland. Trials are due to start April / May 2012.

Restoration Report

3.3.3. Completed Cells

Cells 1-13 are now fully capped and restored.

All cells are now closed. The Landfill no longer accepts waste since 21st December 2010 due to the expiration of the planning permission.

The landfill is now in its restoration and aftercare phase.

3.3.4. Restoration

Further capping took place during 2011.

Additional capping is due to take place again during 2012.

Landscaping and fencing has been placed and is now established in these areas.

It is envisaged that all the final capping works will be complete by end 2013.

4. ENVIRONMENTAL OBJECTIVES AND TARGETS

4.1. Objectives and Targets

The list of objectives and targets for 2012 will be submitted as part of the EMP revision which will be submitted in the coming weeks.

5. FACILITY MANAGEMENT

5.1. Summary of New Written Procedures

The revision of the EMP in the coming weeks will include an updated EMS taking into account the recent closure and the need for a final EMP submission and a review of other annual monitoring requirements.

5.2. Tank, Pipeline and Bund Testing

Routine inspections of tank, pipeline and bund inspections are carried out once every three years.

Inspections are due again this year (2012) and the completed reports will be kept on site for the Agency's Inspection.

5.3. Reported Incidents and Complaints

5.3.1. Reported Incidents

A summary of reported incidents during 2011 is shown as per EPA draft AER submission sheet outlined overleaf.

Incidents are defined by Condition 1.6 of the current waste licence (W004-004).

There were 22 no. incidences reported to the EPA in 2011.

5.3.2. Complaints

There were 11 no. complaints to the facility in 2011.

Figure 8.1 is a graphical summary of complaints.

This represents a massive decrease on the number of complaints made in during the previous years. There were 382 complaints in 2007 and 174 during 2008.

Although the 38 complaints received during 2010 is an increase on the 26 complaints received during 2009.

The 2011 figure represents the lowest amount of complaints to date.

Complaints

Additional information

Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below

Yes	
-----	--

Table 1 Complaints summary

Date	Category	Other type (please specify)	Brief description of complaint (Free txt <20 words)	Corrective action< 20 words	Resolution status	Resolution date	Further information	
05/01/2011	Odour		Odour complaint	Called Complainant and	Complete	Jan-11		
21/01/2011	Odour		Odour complaint	Called Complainant and	Complete	Jan-11		
03/02/2011	Odour		Odour complaint	Called Complainant and	Complete	Feb-11		
24/03/2011	Odour		Odour complaint	Called Complainant and	Complete	Mar-11		
28/04/2011	Odour		Odour complaint	Called Complainant and	Complete	Apr-11		
12/07/2011	Odour		Odour complaint	Called Complainant and	Complete	Jul-11		
25/07/2011	Odour		Odour complaint	Called Complainant and	Complete	Jul-11		
23/08/2011	Odour		Odour complaint	Called Complainant and	Complete	Aug-11		
26/08/2011	Odour		Odour complaint	Called Complainant and	Complete	Aug-11		
04/11/2011	Odour		Odour complaint	Called Complainant and	Complete	Nov-11		
08/11/2011	Odour		Odour complaint	Called Complainant and	Complete	Nov-11		
Total complaints open at start of reporting year		0						
Total new complaints received during reporting year		11						
Total complaints closed during reporting year		11						
Balance of complaints end of reporting year		0						

Incidents

Additional information

Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below

Yes	
-----	--

*For information on how to report and what constitutes an incident [What is an incident](#)

Table 2 Incidents summary

Date of occurrence	Incident nature	Location of occurrence	Incident category*please refer to guidance	Receptor	Cause of incident	Other cause(please specify)	Activity in progress at time of incident	Communication	Occurrence	Corrective action<20 words	Preventative action <20 words	Resolution status	Resolution date	Likelihood of reoccurrence
25/01/2011	Trigger level reached	Other location (Leachate Sur	1. Minor	No Uncontrolled release	Adverse weather		Normal activities	EPA	Recurring	Pumping Continues & 2 Tankers		Ongoing		Medium
25/11/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
16/02/2011	Trigger level reached	Other location (Leachate Sur	1. Minor	No Uncontrolled release	Adverse weather		Normal activities	EPA	Recurring	Pumping Continues & 2 Tankers		Ongoing		Medium
16/02/2011	Trigger level reached	Other location (Leachate Sur	1. Minor	No Uncontrolled release	Not related to site	activities	Normal activities	EPA	Recurring	Pumping Continues & 2 Tankers		Ongoing		Medium
23/02/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
09/03/2011	Trigger level reached	Other location (Leachate Sur	1. Minor	No Uncontrolled release	Adverse weather		Normal activities	EPA	Recurring	Pumping Continues & 2 Tankers		Ongoing		Medium
31/03/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
01/04/2011	Trigger level reached	Other location (Leachate Sur	1. Minor	No Uncontrolled release	Adverse weather		Normal activities	EPA	Recurring	Pumping Continues & 2 Tankers		Ongoing		Medium
27/04/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
31/05/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
15/06/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
28/07/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
09/08/2011	Trigger level reached	Other location (Leachate Sur	1. Minor	No Uncontrolled release	Not related to site	activities	Normal activities	EPA	Recurring	Pumping Continues & 2 Tankers		Ongoing		Medium
30/08/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
29/09/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
02/11/2011	Trigger level reached	Other location (Leachate Sur	1. Minor	No Uncontrolled release	Adverse weather		Normal activities	EPA	Recurring	Pumping Continues & 2 Tankers		Ongoing		Medium
06/11/2011	Other(Shut Down of Utilisation Plan	Other location (Utilisation Pla	2. Limited	Air	Plant or equipment issues		Normal activities	EPA	New	Gas Field Checked		Complete		Low
27/10/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
22/11/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
22/12/2011	Trigger level reached	Other location (Gas Borehole	1. Minor	Ground	Not related to site	Background levels	Normal activities	EPA	Recurring	Continue Monitoring		Ongoing		Medium
Total number of incidents current year		20												
Total number of incidents previous year		22												
% reduction/increase		10% Reduction												

Review of Nuisance Controls

Litter

Litter is not a nuisance at the Arthurstown landfill. This was mainly due to the baling of the waste. A number of portable litter fences surround the top edge of the landfill in the off chance that litter should escape from the bale face. Litter patrols no longer take place at the facility as the site is now closed to waste intake. Final capping works are in progress and should be complete by end of 2013.

Birds & Vermin

Due to the excellent vector control programme, there were no nuisances caused by Birds and Vermin at this Facility. As a result of the excellent housekeeping in the Marshalling yard and again at the bale face, Vermin did not cause nuisance at this facility. There were also several different types of Birds of Prey on-site throughout the day, seven days a week. A Peregrine falcon, a Saker falcon, Harris hawks, American red-tailed Eagle and other cross breeds of falcon. All proved effective means of deterrent for birds which otherwise could cause nuisance at the site. The bird contractor is no longer on site due to the closure of Arthurstown Landfill.

Odour

Odour control mechanisms are constantly being reviewed and discussed at Arthurstown. The facility management team have also noticed a dramatic decrease in complaints during recent years due to the 11 landfill gas engines plus 4 enclosed 2,500 m³/hour flares on site in conjunction with the final capping programme. Currently all gas is now being utilised and two of the enclosed flare units are on stand-by or are activated when deemed necessary by the Facility manager. As indicated in the earlier section, complaints for 2011 are the lowest recorded to date.

5.4. Report on Staff Training

The following training courses/seminars were attended by the staff at Arthurstown Landfill during 2011.

Table 5.1 Staff Training Log 2011.

Training Course /Seminar	Staff Attendees
None / Due to budgetary constraints	None

5.5. Non-Compliances at Arthurstown Landfill during 2011.

During 2011 Arthurstown landfill received a total of 2 Non-compliances from the Environmental Protection Agency. They were for the following reasons:

Reason for NC	Number	EPA Site Visit
Leachate Management	1	Yes
Determination of BMW content of Municipal waste	1	Yes

Table 5.3 Non-Compliance Log for 2011.

All non compliances were responded to in writing by the facility management team and returned to the EPA.

The non compliances during 2011 were as a result of an EPA audit which was carried out on the 3rd February 2011. (Audit ref no: W0004-04/AR02DM)

The non compliances were issued for breach of the 1m leachate levels within the leachate sumps and determination of the BMW content of municipal waste.

Total number of non compliances for 2011 is 2.

5.6. Reports of Financial Provision

Report on Financial Provisions under Waste Licence

South Dublin County Council has taken out a bond in favour of Kildare County Council (the local authority in whose functional area the facility is located) in order to ensure satisfactory completion of Arthurstown Landfill. Significant contributions are made annually towards leachate treatment, environmental monitoring and landfill closure/aftercare.

Budgetary estimates for activities at Arthurstown during 2011 were in the region of €2.0 m.

Under the ELRA conditions of the waste license South Dublin County Council have contributed approximately €3.9 million Euro to the aftercare and restoration fund.

Report on Programme for Public Information

In accordance with Waste Licence W0004-004, information is made available on site and submitted to the EPA on a regular basis. During 2011 there were numerous visits conducted at the facility for interested parties including schools and university groups, local and other international visitors.

Information about the facility is available on the updated website which can be accessed at www.arthurstown.ie. Site contact numbers are posted at the facility entrance.

A site DVD is now complete since March 2003. This 9 minute short film describes the site from the landfill construction and operational perspectives. It is used during site visits to present visitors with a clear understanding of the nature of the site activities. The site has also featured in televised waste management documentaries as being the most state of the art and well managed landfill to date in Ireland.

Report on Management and Operation Structure

The site is owned and managed by South Dublin County Council, who also holds the Waste Licence and Planning Permission for the facility. Waste placement at the site is supervised by the Facility Manager (J. Smith) and Deputy Facility Manager (M.Heffernan).

At the end of 2011 South Dublin County Council had 5 direct employees engaged in full time management and administrative functions at the site, namely the Facility Manager (J. Smith), Deputy Facility Manager (M.Heffernan), Site Foreman (S. Finnegan), Assistant Site Foreman (S. Fitzgerald), and E. Comerford (GO).

The Senior Engineer for South Dublin County Council Environmental Services is Mr. Leo Magee and the Director of Services for Environment is now Mr. John Quinlivan.

5.7. Local Environmental Project Funding

Contributions to the Locality.

South Dublin County Council was conditioned by An Bord Pleanala to contribute the sum of € 100,000 annually to Kildare County Council.

The required committee was formed and funds were distributed.

There was a total of €300,000 to be distributed locally for the community.

During 2010 the committee awarded approximately €200,000 Euro to local community groups and projects in the environs of Kill, Killeel and Rathmore.

The final meeting of the committee took place during 2011 to allocate the remainder of the funds.

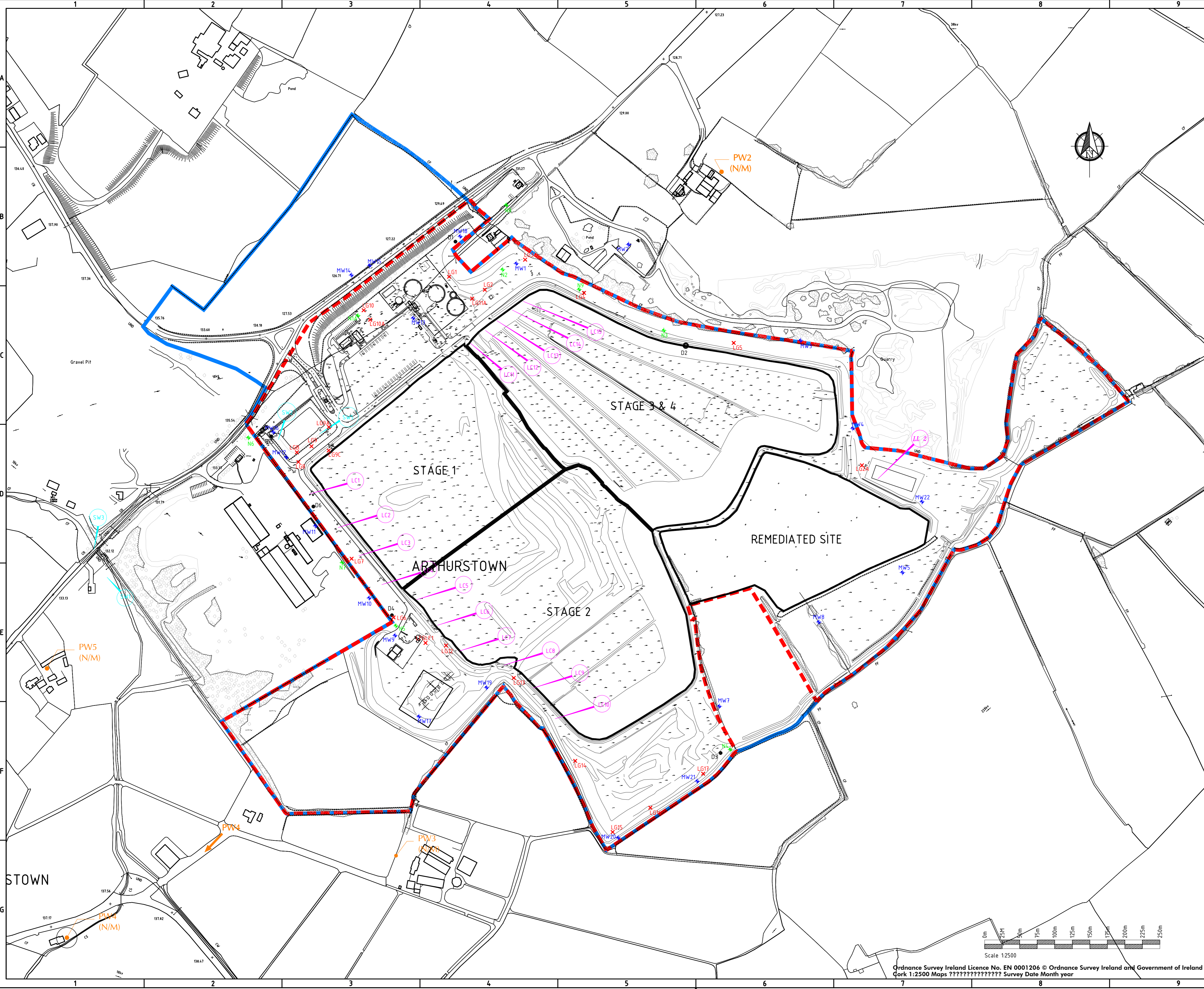
The committee has now fulfilled its duty and is no longer required to meet.

Some of the beneficiaries were:

Kill GAA
Rathmore Primary School
Kill Tidy Towns
Saplings School

APPENDIX 3.1

Monitoring Locations Drawing



No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of Fehily Timoney & Company as copyright holder except as agreed for use on the project for which the document was originally issued.
Do not scale. Use figured dimensions only. If in doubt - Ask!

- | | |
|--------------|---------------|
| LANDFILL GAS | LEACHATE |
| LG 1 | LC 1 |
| LG 2 | LC 2 |
| LG 3 | LC 3 |
| LG 4 | LC 4 |
| LG 5 | LC 2 |
| LG 6 | LC 1 |
| LG 7 | LC 2 |
| LG 8 | LC 8 |
| LG 9 | LC 8 |
| LG 10 | LC 11 |
| LG 2A | LC 11 |
| LG 12 | LC 12 |
| LG 13 | LC 13 |
| LG 14 | LC 14 |
| LG 15 | LC 15 |
| LG 16 | LC 5 |
| LG 17 | LC 6 |
| LFGF1 | LC 7 |
| LG 9A | LC 8 |
| LG 9B | LC 9 |
| LG 9C | LC 10 |
| LG10A | DUST |
| LG 11A | D 1 |
| GROUNDWATER | D 2 |
| MW 1 | D 3 |
| MW 2 | D 4 |
| MW 3 | D 5 |
| MW 4 | D 6 |
| MW 5 | NOISE |
| MW 6 | N1A |
| MW 6A | N2 |
| MW 7 | N3 |
| MW 8 | N4 |
| MW 9 | N5 |
| MW 10 | N6 |
| MW 11 | N7 |
| MW 12 | N8 |
| MW 13 | N9 |
| MW 14 | SURFACE WATER |
| MW 15 | SW 1 |
| MW 16 | SW 2 |
| MW 17 | SW 3 |
| MW 18 | SW 4 |
| MW 19 | SW 5 |
| MW 20 | SW 5 |
| MW 21 | PRIVATE WELLS |
| | PW 1 |
| | PW 2 |
| | PW 3 |
| | PW 4 |
| | PW 5 |

Drawn	CK	Cork	ISSUE FOR PLANNING
Checked	ME	14.12.06	
App'd	CC		

Rev.	Drawn	Checked	App'd	Rev Origin	Description
				Date	
Revision History A					

Name of Client
SOUTH DUBLIN COUNTY COUNCIL

Name of Job
**ARTHURSTOWN LANDFILL
PLANNING AND EIS**

Title of Drawing
ENVIRONMENTAL MONITORING LOCATIONS

Scales Used
1:2500

Dwg. No. **2006-054-03-FIG2.4**

Rev. **A**

FEHILY TIMONEY & COMPANY

CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES

Core House, Pouladuff Rd, Cork, Ireland.
T: +353-21-4964133, F: +353-21-4964464

Mill House, Ashdown Gate, Navan Rd, Dublin 15, Ireland.
T: +353-1-6583500, F: +353-1-6583501

W: www.fehilytimoney.ie, E: info@fteco.ie

APPENDIX 3.2

Landfill Gas Charts and Tables (Perimeter monitoring wells and Audit Sheet for Landfill Gas Wells)

Table A.3.2.1.x: All Stations, All Parameters for Landfill Gas Perimeter Monthly - AER Sample (Page: 1/4)

Sample Type: Landfill Gas Perimeter Monthly, Year: 2011

Sample Point --- Parameter --- MAC			25-Jan	23-Feb	31-Mar	27-Apr	31-May	15-Jun	28-Jul	30-Aug	29-Sep	27-Oct	22-Nov	22-Dec
			Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
LG1	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	1.2	1.2	1	0	0	2.5	1.8	1.5	1.8	2.2	1.3	1.1
	Oxygen (% v/v)		14.5	18.2	18.5	19.1	20.1	13	14.5	15	13	12	17.2	19
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG2	Methane (% v/v)	1	0	1.3	1.1	1.5	0.8	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0	3.6	2.8	2	2.2	0.1	0	0	0	0	0.7	0
	Oxygen (% v/v)		20.9	0.7	2	5	5.5	19.8	20.1	20.8	20.9	20.1	18.9	19.5
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG2A	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	2.5	0.3	0	0	0	0.4	0	0	0	2.1	0.3	0
	Oxygen (% v/v)		11	19.8	20.1	20.8	20.1	19	20	20.2	20.9	18	20.2	20.1
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG3	Methane (% v/v)	1	0	0	0	0	0							
	Carbon Dioxide (% v/v)	1.5	0	0	0	0	0							
	Oxygen (% v/v)		20.9	20.5	20.1	20.8	20.1							
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG4	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0	0	0	0	0	0	0	0	0	0	0	0
	Oxygen (% v/v)		19.2	20.6	20.2	20.8	20.1	20.4	20.1	20.2	20.9	20.8	20.8	20.1
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG5	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0	0.6	0	0	0	0	0	0	0	0	0	0
	Oxygen (% v/v)		20.9	18.3	19.8	20.1	20.1	20.4	20.1	20.2	20.9	20.8	20.8	20.1

Table A.3.2.1.x: All Stations, All Parameters for Landfill Gas Perimeter Monthly - AER Sample (Page: 2/4)

Sample Point --- Parameter --- MAC			25-Jan	23-Feb	31-Mar	27-Apr	31-May	15-Jun	28-Jul	30-Aug	29-Sep	27-Oct	22-Nov	22-Dec
			Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
LG5	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG6	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	2.4	0	0	0	2.2	1.4	1.2	0	0	0	1.8	1.5
	Oxygen (% v/v)		11	21.1	20.8	20.8	17.5	18	18.5	20.2	20.9	20.8	19.9	18
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG7	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	1.8	0	0	0	0.8	2	2.4	1.8	1.8	1.5	0	0
	Oxygen (% v/v)		13	20.9	20.9	20.8	19	18.1	15.5	12.5	18	18	20.7	20.1
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG8	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	2	1.7	2.1	2.5	3.3	1.1	0.8	0	0	0	4.6	3
	Oxygen (% v/v)		11	18	15.5	14	12	18.7	16	19.5	20	20	12.3	15
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG9	Methane (% v/v)	1	1.8	0	0	0	0	0	0	1.2	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0.4	7.1	5.5	3.8	3	0	0	0.8	1	1.8	0.3	0
	Oxygen (% v/v)		20	10	11.2	10.5	11	20.4	20.1	10.5	10.5	12	20.4	20.1
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG9A	Methane (% v/v)	1	2.8	11.1	9	5.5	2.8	0.5	0	0	0	0	0.8	0
	Carbon Dioxide (% v/v)	1.5	1.8	1.6	2.1	3	1.9	4.5	2.8	1.8	2.2	2.8	1.2	1
	Oxygen (% v/v)		5.5	12.5	5.5	4	6	7.3	11	12	11	8	14.2	17.5
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG9B	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0	12.3	7.5	3.5	2.1	1.1	2	0	0	0	1.1	0
	Oxygen (% v/v)		20.9	0.5	2.1	3	5.5	19.1	15	20.2	20.1	20.8	19.3	20.1

Table A.3.2.1.x: All Stations, All Parameters for Landfill Gas Perimeter Monthly - AER Sample (Page: 3/4)

Sample Point --- Parameter --- MAC			25-Jan	23-Feb	31-Mar	27-Apr	31-May	15-Jun	28-Jul	30-Aug	29-Sep	27-Oct	22-Nov	22-Dec
			Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
LG9B	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG9C	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0	0	0	0	0	0	0	0	0	0	0	0
	Oxygen (% v/v)		18.5	19.1	20.8	20.8	20.1	17.4	19	19	19	20.1	18.2	20.1
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG10	Methane (% v/v)	1	11.2	20.2	15.8	12.5	10.5	16.6	14.5	12.5	14.5	18.2	5.4	9
	Carbon Dioxide (% v/v)	1.5	7.2	0.7	3.8	5	6.5	0.9	1.4	2.8	4	8	0.3	4.5
	Oxygen (% v/v)		4	1.2	1.8	2.5	2	1.1	2	3	2	1	15.6	3
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG10A	Methane (% v/v)	1	14.6	0	0	0	0	0	0	0	0	5.5	0	0
	Carbon Dioxide (% v/v)	1.5	8.5	1.4	1.2	1.8	2	1.4	1.2	1.2	2.2	3	1.5	3
	Oxygen (% v/v)		2.8	18.8	17.5	15	11	18.7	17.5	17.5	15.5	5	18.6	12
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG11A	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0	0.4	0	0	0	0	0	0	0	1.8	0.5	0
	Oxygen (% v/v)		20.8	16.5	18.9	20.1	20.1	20.5	20.1	20.1	20.2	15.5	20	20.1
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG11B	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG12	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0	0.6	0	0	0	0.2	0	0	0	0	1	0
	Oxygen (% v/v)		19	19.3	20.1	20.8	20.1	20	19	19	20.2	20.1	18.7	19.5
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG13	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	3.5	7.2	5.2	3	2.4	2.1	2.8	2.8	2.2	2.5	4.4	3.8

Table A.3.2.1.x: All Stations, All Parameters for Landfill Gas Perimeter Monthly - AER Sample (Page: 4/4)

Sample Point --- Parameter --- MAC			25-Jan	23-Feb	31-Mar	27-Apr	31-May	15-Jun	28-Jul	30-Aug	29-Sep	27-Oct	22-Nov	22-Dec
			Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
LG13	Oxygen (% v/v)		9	9.8	10.1	5	8	17.6	14	14	12.5	10	14.9	14
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG14	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG15	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	2.8	4	5.5	3	2.8	0.2	0	0	0	0	0	0
	Oxygen (% v/v)		15.5	8.4	5.5	7	13.5	20.1	20.1	20.2	20.1	20.8	20.8	20.1
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG16	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0	0.5	0	1.8	0	0	0	0	0	0	0	0
	Oxygen (% v/v)		20.9	19.6	20.1	9	20.1	20.4	20.1	20.2	20.8	20.8	20.8	20.1
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG17	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	0	3.4	0	1.8	2.1	0	0	0	0	0	0	0
	Oxygen (% v/v)		20.4	12.8	2.8	9	12.5	20.4	20.1	20	20.5	20.1	20.1	20.1
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001
LG18	Methane (% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide (% v/v)	1.5	2.2	0	0	0	0	0	0	0	0	0	0.1	0
	Oxygen (% v/v)		16	20.6	20.8	20.8	20.1	20.4	20	20.2	20.1	20.8	19.3	18
	Atmospheric Pressure (mb)		1006	993	987	1011	1005	995	1010	1002	1002	990	1004	1001

MAC: Maximum Allowed Concentration - (values exceeded are shaded in yellow)

The MAC for methane and carbon dioxide in landfill gas perimeter wells is set by the waste licence.

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table.

APPENDIX 3.3

Dust Charts and Tables

Table A.3.3.x: All Stations, All Parameters for Dust - AER Sample (Page: 1/1)

Sample Type: Dust, Year: 2011

			31-Mar	30-Jun	25-Aug
Sample Point --- Parameter --- MAC			1st event	2nd event	3rd event
D1	Dust Deposition (mg/m2/day)	350	135	198	125
D2	Dust Deposition (mg/m2/day)	350	184	135	135
D3	Dust Deposition (mg/m2/day)	350	189	165	105
D4	Dust Deposition (mg/m2/day)	350	165	175	187
D5	Dust Deposition (mg/m2/day)	350	246	210	98
D6	Dust Deposition (mg/m2/day)	350	208	245	164

MAC: Maximum Allowed Concentration - (values exceeded are shaded in yellow)

The MAC for dust is set by the waste licence.

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table.

Results marked with '<' indicate that it is below the level of detection of the measuring instrument. The levels of detection used may have varied over time depending on the lab or the method of detection used.

APPENDIX 3.4

Noise Charts and Tables

Table A.3.4.x: All Stations, All Parameters for Noise Daytime - AER

Sample Type: Noise Daytime, Year: 2011

Sample Point	Variable	MAC	1st Event
N2	L(A)10(dB)		48 (19-Nov 12:0)
	L(A)90(dB)		45 (19-Nov 12:0)
	L(A)eq(dB)	55	49 (19-Nov 12:0)
N3	L(A)10(dB)		45 (19-Nov 12:0)
	L(A)90(dB)		46 (19-Nov 12:0)
	L(A)eq(dB)	55	46 (19-Nov 12:0)
N5	L(A)10(dB)		63 (19-Nov 12:0)
	L(A)90(dB)		61 (19-Nov 12:0)
	L(A)eq(dB)	55	62 (19-Nov 12:0)
N6	L(A)10(dB)		60 (19-Nov 12:0)
	L(A)90(dB)		58 (19-Nov 12:0)
	L(A)eq(dB)	55	59 (19-Nov 12:0)
N1A	L(A)10(dB)		57 (19-Nov 12:0)
	L(A)90(dB)		53 (19-Nov 12:0)
	L(A)eq(dB)	55	54 (19-Nov 12:0)
N4	L(A)10(dB)		47 (19-Nov 12:0)
	L(A)90(dB)		44 (19-Nov 12:0)
	L(A)eq(dB)	55	44 (19-Nov 12:0)
N9	L(A)10(dB)		47 (19-Nov 12:0)
	L(A)90(dB)		48 (19-Nov 12:0)
	L(A)eq(dB)	55	48 (19-Nov 12:0)

MAC: Maximum Allowed Concentration - (values exceeded are shaded in yellow)

The MAC for noise is set by the waste licence.

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table.

Table A.3.4.x: All Stations, All Parameters for Noise Night-time -

AFB Sample

Sample Type: Noise Night-time, Year: 2011

Sample Point	Variable	MAC	1st Event
N2	L(A)10(dB)		0 (19-Nov 12:0)
	L(A)90(dB)		0 (19-Nov 12:0)
	L(A)eq(dB)	45	0 (19-Nov 12:0)
N3	L(A)10(dB)		0 (19-Nov 12:0)
	L(A)90(dB)		0 (19-Nov 12:0)
	L(A)eq(dB)	45	0 (19-Nov 12:0)
N5	L(A)10(dB)		0 (19-Nov 12:0)
	L(A)90(dB)		0 (19-Nov 12:0)
	L(A)eq(dB)	45	0 (19-Nov 12:0)
N6	L(A)10(dB)		0 (19-Nov 12:0)
	L(A)90(dB)		0 (19-Nov 12:0)
	L(A)eq(dB)	45	0 (19-Nov 12:0)
N1A	L(A)10(dB)		0 (19-Nov 12:0)
	L(A)90(dB)		0 (19-Nov 12:0)
	L(A)eq(dB)	45	0 (19-Nov 12:0)
N4	L(A)10(dB)		0 (19-Nov 12:0)
	L(A)90(dB)		0 (19-Nov 12:0)
	L(A)eq(dB)	45	0 (19-Nov 12:0)
N9	L(A)10(dB)		0 (19-Nov 12:0)
	L(A)90(dB)		0 (19-Nov 12:0)
	L(A)eq(dB)	45	0 (19-Nov 12:0)

MAC: Maximum Allowed Concentration - (values exceeded are shaded in yellow)

The MAC for noise is set by the waste licence.

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table.

APPENDIX 3.5

Surface Water Charts and Tables

Table A.3.5.x: All Stations, All Parameters for Surface Water Annual - AER Sample

Sample Type: Surface Water Annual, Year: 2011

Parameter --- MAC		SW1	SW2	SW3	SW4	SW5
		02-Aug	02-Aug	02-Aug	02-Aug	02-Aug
Ammoniacal Nitrogen (mg/l)	0.16	0.03	0.14	0.03	0.03	0.13
BOD (mg/l)	5	<2	<2	<2	<2	<2
Chloride (mg/l)	250	13	43	14	13	41
COD (mg/l)	40	49	38	10	10	90
Conductivity (µS/cm)	1000	506	901	532	557	857
Dissolved Oxygen (mg/l)		11.47	13.66	11.01	10.56	14.2
pH (pH units)	8.5	8.3	7.7	8.1	8.2	7.8
Temperature (C)	25	15.7	16.3	15.7	14.7	17.5
Total Suspended Solids (mg/l)	50	5	10	8	5	5
Boron (µg/l)	2000	13	59	15	15	62
Cadmium (µg/l)	5	<2	<2	<2	<2	<2
Calcium (mg/l)		98	157	99	113	150
Chromium (µg/l)	50	<2	<2	<2	<2	<2
Copper (µg/l)	50	<2	<2	<2	<2	<2
Iron (mg/l)	0.2		0.3	0.3	0.2	0.1
Lead (µg/l)	50	<2	<2	<2	<2	<2
Magnesium (mg/l)		8	13	8.3	7.6	12
Manganese (µg/l)	50		5	4	8	
Mercury (µg/l)	1	<1	<1	<1	<1	<1
Nickel (µg/l)		<2	<2	<2	<2	<2
Phosphate as P (mg/l)		<0.16	<0.16	<0.16	<0.16	<0.16
Potassium (mg/l)		1.4	2.1	1.5	1.6	2
Sodium (mg/l)		8.3	33	9.2	9.2	32
Sulphate (mg/l)	200	15.01	87.37	16.97	15.02	86.64
Total Alkalinity CaCO3 (mg/l)		228	292	247	274	296
Total Oxidised Nitrogen		1.48	2.08	1.47	0.6	1.98
Total Phosphorus (mg/l)		<0.05	<0.05	<0.05		<0.05
Zinc (µg/l)	3000	<2	<2	<3	<4	<5
Nitrate (mg/l)		1.59	2.04	1.62	0.62	2.1
Nitrite (mg/l)		<0.03	<0.03	<0.03	<0.03	<0.03

MAC: Maximum Allowed Concentration - (values exceeded are shaded in yellow)

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table.

Results marked with '<' indicate that it is below the level of detection of the measuring instrument. The levels of detection used may have varied over time depending on the lab or the method of detection used.

The MACs are the limits set for A1 waters by the Surface Water Regulations, 1989 (the limit is set for Ammonium at 0.2 mg/l. The lab reports this as Ammoniacal Nitrogen so the the standard has been converted for that.)

APPENDIX 3.6

Groundwater Charts and Tables

Table A.3.6.x: All Stations, All Parameters for Groundwater Annual - AER Sample (Page: 1/2)

Sample Type: Groundwater Annual, Year: 2011

Parameter --- MAC		MW14	MW16	MW2	MW20	MW22	MW8	MW9
		02-Aug	02-Aug	02-Aug	02-Aug	02-Aug	02-Aug	02-Aug
Ammoniacal Nitrogen (mg/l)	0.12	24	0.05	0.31		0.14	0.07	0.05
Chloride (mg/l)	30	10	13	370	32	11	17	12
pH (pH units)	9.5	7.4	7.5	7.1	7.3	7.7	7.6	7.7
Temperature (C)	25	14.6	11.2	11.9	10.3	11.8	11.8	11.4
Calcium (mg/l)	200	8.3	107	222	356	246	126	88
Iron (mg/l)	0.2	7.5	0.1		6.5	0.6	8.1	
Magnesium (mg/l)	50	11	19	17	13	21	13	6
Potassium (mg/l)	5	2.5	1.3	8.1	0.7	0.9	0.7	1.1
Sodium (mg/l)	150	19	14	239	23	13	9.6	12
Sulphate (mg/l)	200	1.87	17.53	116.93	513.85	22.79	12.2	21.35
Total Alkalinity CaCO3 (mg/l)		369	333	423	369	248	326	288
Nitrate (mg/l)	25		0.17	6.31	1.17	0.06	0.03	0.04
Nitrite (mg/l)	0.1		<0.03	<0.03	<0.03	<0.03	<0.03	
Total Organic Carbon (mg/l)				6				
Fluoride (mg/l)	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total dissolved solids (mg/l)	1000	328	392	1344	1252	320	390	352
Faecal Coliforms (cfu/100ml)	0		0		0	0	0	61
Orthophosphate (mg/l)	0.03	0.27	0.01	0.07				0.02
Total Oxidised Nitrogen (mg/l)				5.9	1.06			
Total Coliforms (cfu/100ml)	0	>100		>100	>100		>100	>100
Cyanide (total)(mg/l)	0.1			0.01				0.01

MAC: Maximum Allowed Concentration - (values exceeded are shaded in yellow)

The MACs are the IGVs taken from "Interim Guideline Value-Towards Setting Guideline Values for the Protection of Groundwater in Ireland Interim Report (EPA 2003). The limit is set for Ammonium at 0.15 mg/l. The lab reports this as Ammoniacal Nitrogen so the IGV standard has been converted for that.

APPENDIX 3.7

Private Wells (Groundwater) Charts and Tables

Table A.3.6.x: All Stations, All Parameters for Private Groundwater Wells Annual - AER Sample (Page: 1/1)

Sample Type: Private Groundwater Wells Annual, Year: 2011

Parameter --- MAC		PW1	PW2	PW3	PW4	PW5
		02-Aug	03-Aug	03-Aug	03-Aug	03-Aug
Ammoniacal Nitrogen (mg/l)	0.23	<0.02	<0.02	<0.02		<0.02
Chloride (mg/l)	250	53	13	12	21	53
pH (pH units)	9.5	7.2	7.3	7	7.3	7.3
Calcium (mg/l)	200	134	81	174	111	0.2
Iron (mg/l)	0.2	<0.1		<0.1	<0.1	<0.1
Magnesium (mg/l)	50	13	13	8	15	
Potassium (mg/l)	5	8.5	0.7	0.5	0.7	0.2
Sodium (mg/l)	200	26	12	8.4	7.3	189
Sulphate (mg/l)	250	10.44	11.14	16.51	26.85	27
Total Organic Carbon (mg/l)		<5	<5	<5	<5	<5
Fluoride (mg/l)	0.8	<0.1	<0.1	<0.1	<0.1	<0.1
Residue on Evaporation (mg/l)		566	322	438	416	514
Orthophosphate (mg/l)	0.03	<0.16		<0.01	<0.01	<0.01
Total Oxidised Nitrogen (mg/l)		5		0.9	4.76	2.68
Faecal Coliforms (MPN/100ml)	0	39	1	0	0	0
Total Coliforms (MPN/100ml)	0	39		0		49
Cyanide (total)(mg/l)			<0.01	<0.01	<0.01	<0.01

MAC: Maximum Allowed Concentration - (values exceeded are shaded in yellow)

The MACs are taken primarily from the European Communities Drinking Water (No. 2) Regulations, 2007 and where not available from the Interim Guideline Value-Towards Setting Guideline Values for the Protection of Groundwater in Ireland Interim Report (EPA 2003) (pH, T, Ca, Mg, K, Zn, TDS, PO4, Faecal Coli.).

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table.

Results marked with '<' indicate that it is below the level of detection of the measuring instrument. The levels of detection used may have varied over time depending on the lab or the method of detection used.

Table A.3.7.x: All Stations, All Parameters for Private Groundwater Wells Quarterly - AER Sample (Page: 1/1)

Sample Type: Private Groundwater Wells Quarterly, Year: 2011

			Ammoniacal Nitrogen (mg/l)	Chloride (mg/l)	Conductivity (µS/cm)	Dissolved Oxygen (mg/l)	pH (pH units)	Temperature (C)	Total Organic Carbon (mg/l)
Sample Point --- Sample Period --- Date			0.23	250	2500		9.5	25	
PW1	Qtr 1	01-Feb	0.07	27	821	8.16	7.1	8	<5
	Qtr 2	04-May	0.02	43	897	8.71	7.1	7.37	<5
	Qtr 4	17-Oct	<0.02	49	977	8.6	7.09	13.2	<5

MAC: Maximum Allowed Concentration - (values exceeded are shaded in yellow)

The MACs are taken primarily from the European Communities Drinking Water (No. 2) Regulations, 2007 and where not available from the Interim Guideline Value-Towards Setting Guideline Values for the Protection of Groundwater in Ireland Interim Report (EPA 2003) (i.e. pH & T).

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table.

Results marked with '<' indicate that it is below the level of detection of the measuring instrument. The levels of detection used may have varied over time depending on the lab or the method of detection used.

APPENDIX 3.8

Leachate Charts and Tables

Station	SampleDate	Comment	Visual Inspection	Odour	Ammoniacal Nitrogen	BOD	COD	Chloride	Conductivity	pH	Temperature	Boron	Cadmium	Calcium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Nickel	Potassium	Sodium	Zinc	Cyanide (total)	Fluoride	Mercury	Sulphate	Total Phosphorus	Orthophosphate	Nitrate	Nitrite	Total Oxidised Nitrogen		
Units			n/a	n/a	mg/l	mg/l	mg/l	mg/l	µS/cm	pH units	°C	µg/l	µg/l	mg/l	µg/l	µg/l	mg/l	µg/l	mg/l	µg/l	µg/l	mg/l	mg/l	µg/l	mg/l	µg/l	µg/l	mg/l	mg/l	mg/l	mg/l	mg/l			
LC1	02/08/11		black	pungent odour	2408	600	5660	2473	27370	7.7		3350	<20	66	466	35	3.9	<20	46	231	400	1010	1635	253	<1	<0.1	<10	92.98	29.23		<0.05	<0.03	<0.2		
LC2																																			
LC3																																			
LC4																																			
LC5																																			
LC6																																			
LC7																																			
LC8																																			
LC9																																			
LC10	02/08/11		brown	strong odour	2855	275	4490	2726	29150	7.7		1848	<20	26	147	<20	<1	<20	13	73	180	357	509	210	<1	<0.1	<10	79.37	35.05		<0.05	<0.03	<0.2		
LC11	02/08/11		brown	strong odour	2683	2125	7490	2376	27300	7.8		1511	<20	46	534	493	4	<20	46	201	400	854	1457	451	<1	<0.1	<10	26.04	31.06	1.44	<0.03	<0.2			
LC12																																			
LC13																																			
LC14																																			
LC15																																			
Leachate Lagoon (LL)	02/08/11		black	strong odour	2589	750	5575	2532	28100	7.7		1702	<20	58	502	73	4	<20	52	300	372	902	1682	372	<1	<0.1	<10	96.09	28.85		<0.05	<0.03	<0.2		
Balance Tank (LB)	02/08/11		black	no odour	29	17	3370	2654	27600	6		2458	<20	67	535	80	3	<20	46	316	414	908	3341	254	<1	<0.1	<10	203.47	35.61	3455	<0.03	2784			
Aeration Tank (LT1)																																			
Aeration Tank (LT2)																																			
Storage Tank (LST)																																			
Reed Bed (LR)																																			
LPW1																																			
LPW2																																			
LPW3																																			
LPW4																																			

Options
Do not change information in grey boxes
Select options from drop down lists or fill in own data
Fill in own data

Instructions
1. Fill in the Period (Cell B5) - without this the data cannot be transferred into the database.
2. Fill in data where applicable to all yellow and blue boxes.
3. The yellow boxes will only accept numerical data.
4. If there is no data for a parameter, please leave the box blank.
5. Any explanations for no data etc should be entered in the Comment box for that sample.
6. The user is obliged to insert the results in the units listed below each parameter.
This is for graphing purposes within the database.
7. This template is only designed for use for the standard round of sampling as per the licence. If additional samples are carried out due to elevated levels within the same sampling period, these results should be entered in a separate template, labelled as Additional Templates.

Questions for Sign-Off
1. Have you filled in the mandatory boxes?
2. Does the sample date match the sample period?
3. Are all of the sampling results entered according to the mandatory units?

Name Eamonn Lee Date #####

When you have completed the form, please email to arthurstownenvironmentaldata@gmail.com

APPENDIX 3.9

Meteorological Monitoring

Date	Evap (mm)	Rain (mm)	Temp oC			RH %			Atm P (mb)			NR (W/m2)			Indoor Temp oC			Wind Dir			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/01/2011	0.6	0.4	4.7	6.6	1.8	88	92	83	1012	1013	1011	-7	20	-62	18.4	19.2	17.8	178	360	1	1.0	6.4	0.0
02/01/2011	0.2	0.2	1.2	2.3	-0.1	78	92	64	1014	1015	1013	-14	3	-46	16.9	17.8	16.2	59	360	1	0.9	6.6	0.0
03/01/2011	0.3	0.0	0.5	3.4	-1.1	75	86	53	1008	1013	1002	-19	11	-60	16.2	17.7	15.6	200	355	2	1.0	5.4	0.0
04/01/2011	0.5	0.6	3.1	5.2	1.2	84	89	75	992	1002	982	-8	14	-55	17.6	18.9	16.1	229	324	1	4.5	14.4	0.5
05/01/2011	0.8	1.2	3.0	4.9	0.6	87	94	77	979	983	976	-31	74	-68	19.9	21.0	18.8	227	335	91	3.8	12.1	0.1
06/01/2011	0.6	0.0	0.6	3.7	-3.8	88	94	66	981	986	978	-26	44	-66	21.6	23.5	20.3	116	360	1	1.0	7.0	0.0
07/01/2011	0.3	14.8	1.0	4.3	-4.6	83	97	59	980	986	973	-14	40	-87	22.3	23.2	21.2	76	360	1	2.0	8.2	0.0
08/01/2011	0.6	1.8	1.0	3.3	-1.2	91	97	75	979	986	974	-26	46	-200	20.3	21.4	19.4	228	360	1	3.6	11.7	0.0
09/01/2011	0.5	0.0	2.2	5.0	-0.1	83	90	71	993	996	986	-40	11	-66	19.5	21.1	18.7	226	356	14	3.6	10.3	0.3
10/01/2011	0.8	6.8	6.9	8.7	3.8	88	94	78	984	994	976	-20	23	-68	20.8	22.3	19.5	207	337	100	4.6	15.4	0.3
11/01/2011	0.8	3.6	4.1	7.2	0.6	88	95	72	991	996	978	-18	55	-68	22.5	24.0	21.1	249	360	1	2.9	21.6	0.0
12/01/2011	0.7	2.6	10.1	11.2	6.3	92	94	82	988	989	987	-11	22	-53	21.2	22.6	19.3	221	332	89	5.0	20.5	0.9
13/01/2011	0.8	4.8	10.6	11.2	9.5	90	94	83	988	990	986	-9	43	-41	22.9	23.7	22.5	219	332	101	4.0	9.2	1.0
14/01/2011	0.7	0.4	8.2	9.9	5.5	82	91	73	987	991	985	-29	97	-80	20.8	22.6	18.6	226	360	4	5.5	14.2	1.0
15/01/2011	1.2	13.0	10.4	11.4	8.1	88	91	84	984	988	983	-25	24	-55	17.8	18.9	17.3	221	307	156	9.2	20.2	2.9
16/01/2011	1.0	0.4	9.0	11.0	5.2	80	90	65	990	999	984	-27	82	-66	17.1	17.9	16.6	232	343	91	6.1	19.9	1.1
17/01/2011	1.7	0.0	4.4	6.9	1.3	84	93	76	1002	1008	999	-34	19	-55	17.5	20.8	15.3	214	344	90	2.5	7.6	0.2
18/01/2011	0.5	0.0	2.1	6.3	0.3	88	94	73	1014	1019	1008	-39	31	-57	22.0	24.7	20.8	217	360	2	1.9	5.2	0.0
19/01/2011	0.5	0.0	1.5	7.1	-2.1	80	91	56	1020	1021	1019	-42	18	-69	23.7	26.4	22.3	196	316	4	1.7	5.0	0.0
20/01/2011	0.8	0.0	-0.1	6.0	-4.1	83	93	63	1022	1024	1020	-38	44	-69	23.1	24.8	20.5	183	360	1	0.8	4.7	0.0
21/01/2011	0.3	0.0	0.3	5.4	-2.5	87	94	65	1025	1026	1024	-17	59	-59	23.4	25.0	22.5	163	360	1	0.8	2.9	0.0
22/01/2011	0.3	0.4	0.8	4.6	-3.3	93	96	89	1026	1026	1025	-3	124	-58	23.6	23.9	22.9	99	360	1	0.6	6.3	0.0
23/01/2011	0.1	0.0	2.2	3.3	1.4	95	96	94	1024	1025	1024	5	65	-19	24.0	24.4	23.8	175	360	1	0.5	3.1	0.0
24/01/2011	0.1	0.0	3.3	5.7	1.3	94	96	89	1020	1024	1014	0	55	-20	23.9	24.3	23.6	246	360	1	1.6	5.2	0.0
25/01/2011	0.2	2.8	6.2	7.9	4.3	94	95	93	1006	1014	999	0	27	-14	23.9	24.5	23.4	275	360	1	2.4	8.6	0.1
26/01/2011	0.2	0.0	4.9	6.3	3.7	83	94	63	1000	1004	998	-12	32	-69	23.0	23.7	22.2	86	360	1	2.8	10.5	0.0
27/01/2011	0.9	1.0	2.8	4.5	1.5	76	93	66	1007	1010	1004	-18	98	-83	21.4	22.3	20.9	96	360	2	3.2	10.9	0.0
28/01/2011	0.8	0.0	0.3	3.7	-2.2	76	89	65	1009	1010	1008	-26	87	-75	21.7	23.2	21.0	135	360	1	1.6	7.3	0.0
29/01/2011	0.5	0.0	0.7	4.4	-2.6	80	91	60	1008	1009	1007	-19	93	-79	21.7	23.2	20.9	105	360	1	1.1	6.5	0.0
30/01/2011	0.4	0.0	0.3	2.3	-0.9	82	91	67	1008	1009	1007	-20	43	-54	22.0	23.3	21.5	221	358	6	1.7	6.1	0.0
31/01/2011	0.5	0.4	3.9	7.0	-1.1	82	90	68	1006	1008	1003	-15	67	-50	21.3	22.3	20.6	208	281	106	4.7	12.7	1.1
Monthly	Sum	Sum	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
	18.1	55.2	3.6	11.4	-4.6	85	97	53	1001	1026	973	-19	124	-200	21.0	26.4	15.3	185	360	1	2.8	21.6	0.0

Date	Evap (mm)	Rain (mm)	Temp oC			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp oC			Wind Dir			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/02/2011	1.1	2.2	7.5	9.7	5.1	88	95	78	1005	1008	1002	-17	141	-66	21.8	23.2	20.9	229	344	90	4.3	13.8	0.5
02/02/2011	0.8	1.8	8.2	11.2	3.9	80	90	66	999	1006	995	-20	72	-104	22.0	23.2	21.3	236	355	89	6.9	17.1	1.0
03/02/2011	1.7	6.2	5.7	8.9	2.6	83	90	74	998	1004	989	-27	87	-68	21.5	22.3	20.5	229	351	91	7.1	22.8	0.8
04/02/2011	1.2	5.0	10.7	12.5	7.6	83	94	70	989	992	988	-23	40	-61	23.3	24.8	22.2	243	351	42	7.8	20.3	0.9
05/02/2011	1.6	41.0	7.8	12.0	6.9	94	95	85	992	995	988	-6	42	-51	23.8	24.4	23.6	225	350	89	3.3	17.8	0.2
06/02/2011	0.6	17.8	8.2	11.1	6.3	93	96	86	993	995	990	-6	40	-44	24.4	24.7	24.0	218	360	1	4.0	18.5	0.0
07/02/2011	0.6	1.6	6.8	10.5	2.1	83	91	70	990	1002	978	-26	59	-79	23.8	24.6	22.7	247	360	1	6.4	21.8	0.3
08/02/2011	1.4	1.4	5.1	9.7	1.8	79	89	66	1000	1003	993	-26	73	-69	20.5	22.2	19.0	190	273	92	4.7	16.8	0.6
09/02/2011	1.3	16.8	9.1	10.3	6.7	90	94	86	993	994	991	-7	81	-45	20.8	22.1	20.3	216	360	1	4.5	13.3	0.0
10/02/2011	0.6	0.2	6.7	8.8	4.7	88	96	73	994	996	990	-1	199	-68	21.4	22.5	20.8	171	360	1	1.5	7.7	0.0
11/02/2011	0.5	2.0	8.3	10.3	5.5	87	92	82	990	994	988	-17	36	-66	22.8	23.6	22.0	204	334	82	3.3	10.8	0.2
12/02/2011	0.7	0.2	5.5	8.0	2.5	81	91	63	991	995	980	-21	77	-80	22.1	23.1	21.4	205	292	108	5.1	18.8	1.2
13/02/2011	1.3	8.8	6.2	9.1	3.4	87	94	67	977	980	976	-16	126	-87	21.7	22.7	20.8	215	359	2	3.0	16.6	0.0
14/02/2011	0.9	0.4	3.7	6.5	2.1	80	93	51	979	981	976	-11	152	-71	19.9	21.7	18.5	222	336	4	3.8	10.4	0.2
15/02/2011	1.3	7.8	5.2	7.6	2.7	83	92	75	967	976	962	-25	126	-77	20.7	21.7	20.1	164	322	26	5.1	15.7	0.9
16/02/2011	0.9	0.2	5.1	8.3	2.4	79	90	65	973	980	967	-19	208	-76	21.0	22.5	20.0	149	360	2	3.4	10.4	0.1
17/02/2011	1.1	3.8	3.9	7.3	0.3	93	96	86	987	992	980	-6	136	-73	20.8	22.2	19.8	155	360	1	0.8	5.1	0.0
18/02/2011	0.1	0.0	6.4	8.6	1.5	83	95	76	989	992	983	-19	83	-100	22.0	23.5	20.0	177	282	108	4.9	16.9	0.0
19/02/2011	0.9	0.0	8.3	12.6	5.7	82	91	60	990	994	984	-20	118	-62	19.7	21.3	18.6	203	320	101	3.2	9.9	0.1
20/02/2011	1.5	0.4	8.0	9.6	6.2	81	87	73	993	994	991	-16	124	-77	18.6	19.6	17.9	179	305	40	5.4	13.6	0.0
21/02/2011	1.3	1.4	8.3	13.3	6.0	82	90	60	992	996	991	-8	262	-74	18.8	22.0	17.2	205	360	1	2.4	10.8	0.0
22/02/2011	1.4	0.2	8.4	10.2	6.3	87	92	83	995	996	995	-3	81	-39	19.6	20.8	19.0	203	276	108	3.9	10.3	0.0
23/02/2011	0.7	0.6	10.8	13.5	8.8	85	94	75	995	999	993	-2	85	-48	19.7	21.1	18.9	224	347	80	4.3	12.5	0.6
24/02/2011	1.2	0.0	10.4	13.5	7.8	80	90	65	1001	1002	998	-7	97	-50	19.9	21.6	18.7	218	318	103	5.8	14.3	1.8
25/02/2011	1.9	0.8	10.6	13.2	8.6	82	91	69	1000	1002	998	-5	124	-50	19.6	20.2	19.1	223	359	97	5.8	17.5	1.2
26/02/2011	1.7	3.0	6.3	10.0	2.9	83	93	64	1001	1006	997	-14	197	-63	18.6	19.5	17.1	261	360	1	3.1	11.9	0.3
27/02/2011	1.1	0.0	4.9	10.7	0.3	80	91	52	1009	1015	1005	-11	204	-75	17.6	19.3	16.4	212	360	1	2.9	12.2	0.0
28/02/2011	1.5	0.0	3.5	10.5	-2.2	79	95	55	1018	1020	1015	-6	182	-67	17.8	20.6	15.7	161	360	1	1.4	4.7	0.0
Monthly	Sum	Sum	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
	30.9	123.6	7.1	13.5	-2.2	84	96	51	993	1020	962	-14	262	-104	20.9	24.8	15.7	207	360	1	4.2	22.8	0.0

Date	Evap (mm)	Rain (mm)	Temp oC			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp oC			Wind Dir			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/03/2011	0.8	0.0	4.6	12.1	-0.3	70	85	49	1023	1024	1020	-21	81	-63	20.1	22.9	17.8	199	360	1	1.6	4.7	0.0
02/03/2011	1.2	0.0	3.0	9.1	-1.6	78	90	59	1022	1023	1021	-24	128	-71	20.1	22.4	18.1	211	360	1	1.4	4.9	0.0
03/03/2011	0.7	0.0	2.4	9.2	-5.1	83	95	56	1021	1022	1019	1	202	-83	19.6	22.0	17.5	102	360	1	1.7	7.6	0.0
04/03/2011	0.9	0.0	5.7	10.4	1.8	83	93	67	1017	1019	1016	5	158	-58	19.3	20.7	17.8	98	360	1	1.7	6.5	0.0
05/03/2011	0.8	0.0	6.2	9.2	4.4	86	92	71	1016	1017	1015	3	183	-31	20.7	21.3	20.3	98	360	1	1.2	6.7	0.0
06/03/2011	0.5	0.0	5.8	7.0	3.3	83	91	69	1014	1015	1014	5	81	-44	20.7	21.0	20.4	156	287	26	2.2	8.1	0.0
07/03/2011	0.7	0.0	5.3	11.2	2.1	71	85	49	1012	1014	1009	-13	93	-61	20.2	22.8	18.2	202	360	1	2.1	5.5	0.0
08/03/2011	1.5	0.2	4.8	8.7	0.4	83	91	66	1002	1009	996	-14	179	-76	19.8	21.3	18.2	220	342	29	4.3	11.6	0.6
09/03/2011	1.2	0.4	6.9	10.1	3.8	75	87	55	997	999	994	-5	191	-77	20.8	22.3	19.8	263	360	5	5.1	15.2	0.6
10/03/2011	1.9	2.4	7.1	9.9	3.2	76	88	58	993	997	990	-10	272	-81	21.5	22.7	20.9	265	360	2	5.6	18.0	0.9
11/03/2011	1.8	6.4	5.7	9.1	2.3	86	92	80	992	997	986	-15	104	-58	20.2	21.6	19.5	218	308	79	5.0	13.6	0.6
12/03/2011	0.8	2.0	5.7	9.7	2.4	86	93	72	981	986	979	-7	325	-80	18.2	19.5	17.4	223	359	3	4.2	13.5	0.0
13/03/2011	1.0	0.0	2.7	8.3	-0.2	87	95	63	985	992	981	4	386	-69	16.4	17.7	15.3	256	360	1	3.0	13.1	0.0
14/03/2011	1.0	0.0	4.7	9.3	0.3	76	92	49	997	1000	992	11	288	-66	17.2	19.6	15.4	182	360	1	1.7	7.4	0.0
15/03/2011	1.1	1.6	5.7	11.4	1.2	79	93	46	1000	1002	999	12	342	-77	20.6	23.1	19.2	102	360	1	1.1	5.5	0.0
16/03/2011	0.9	0.0	5.0	12.6	-1.6	74	93	37	999	1002	996	5	235	-87	18.8	21.0	16.1	146	360	1	1.3	5.2	0.0
17/03/2011	1.3	0.8	5.8	10.2	2.0	75	93	43	1001	1005	996	9	253	-54	18.5	19.6	17.6	237	360	1	2.0	8.0	0.0
18/03/2011	1.4	0.0	5.7	12.1	-0.4	69	87	34	1007	1013	1004	-1	125	-55	18.4	20.8	16.8	226	360	1	1.9	8.6	0.0
19/03/2011	1.8	1.2	6.3	11.3	1.8	76	88	50	1014	1016	1011	-5	165	-60	18.6	20.0	17.6	206	346	86	4.2	15.2	0.0
20/03/2011	2.0	0.8	9.7	14.8	6.4	82	93	62	1011	1014	1009	13	262	-57	18.4	20.5	17.3	228	360	2	4.3	14.3	0.4
21/03/2011	1.9	0.0	10.6	14.4	6.8	81	93	61	1016	1019	1014	13	198	-57	19.4	20.5	18.4	218	345	76	2.3	6.6	0.0
22/03/2011	1.4	0.0	10.6	16.0	5.8	73	90	54	1022	1024	1019	12	258	-63	20.6	22.5	18.9	182	360	1	1.5	5.1	0.0
23/03/2011	1.4	0.0	10.1	17.1	2.9	66	88	43	1023	1025	1022	-10	169	-71	20.8	22.8	18.4	192	360	1	1.5	6.1	0.0
24/03/2011	1.7	0.0	9.6	15.3	2.8	66	87	51	1018	1022	1013	3	186	-75	20.9	23.5	19.1	107	360	1	2.1	8.7	0.0
25/03/2011	1.7	0.0	7.7	12.1	2.3	74	91	56	1006	1013	1003	5	203	-74	20.2	21.8	18.6	80	360	1	2.4	9.3	0.0
26/03/2011	1.4	0.0	4.2	8.9	-1.2	84	92	69	1000	1003	999	3	128	-80	18.4	20.4	17.5	113	360	1	1.6	7.6	0.0
27/03/2011	0.6	0.0	7.1	11.2	2.6	76	92	54	999	1000	998	17	253	-71	18.1	20.8	16.7	83	360	1	2.6	8.5	0.0
28/03/2011	1.4	0.0	7.4	14.3	1.8	75	90	53	999	1001	997	7	269	-62	18.2	19.7	16.4	141	360	1	1.3	7.0	0.0
29/03/2011	1.1	1.8	8.7	10.6	5.4	86	90	80	994	997	992	2	131	-54	18.6	19.3	17.6	207	360	1	1.8	7.9	0.0
30/03/2011	0.6	1.2	10.7	16.0	6.9	75	89	47	989	992	986	15	312	-88	18.6	21.0	16.9	224	354	2	4.8	13.7	0.4
31/03/2011	3.0	1.0	12.2	16.3	9.3	73	91	55	988	993	980	8	270	-65	19.6	21.4	18.4	238	356	11	6.2	20.2	1.2
Monthly	Sum 39.6	Sum 19.8	Avg 6.7	Max 17.1	Min -5.1	Avg 78	Max 95	Min 34	Avg 1005	Max 1025	Min 979	Avg 1	Max 386	Min -88	Avg 19	Max 23.5	Min 15.3	Avg 181	Max 360	Min 1	Avg 2.7	Max 20.2	Min 0.0

Date	Evap (mm)	Rain (mm)	Temp oC			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp oC			Wind Direction			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/04/2011	2.8	0.2	11.4	12.2	10.6	86	91	78	989	992	985	3	155	-59	19.6	20.5	18.7	215	302	108	8.8	20.5	2.7
02/04/2011	1.4	19.8	9.3	14.4	5.3	83	93	53	989	993	983	20	345	-160	18.8	20.2	18.0	222	352	70	4.8	18.8	0.2
03/04/2011	2.4	0.2	8.1	13.1	5.0	74	91	39	995	999	993	7	363	-67	18.7	21.5	17.4	234	360	1	3.2	10.7	0.6
04/04/2011	2.3	3.4	9.4	15.3	4.3	81	91	64	996	999	992	6	358	-58	18.1	19.4	16.9	220	345	89	6.5	17.4	1.3
05/04/2011	2.2	6.2	13.1	16.8	10.1	86	93	74	995	1001	992	15	186	-49	19.2	20.6	18.1	225	331	95	6.8	17.5	1.6
06/04/2011	1.8	2.2	13.0	16.3	11.2	76	91	57	1003	1008	1000	13	179	-52	20.4	23.1	19.2	217	335	108	6.3	15.6	1.9
07/04/2011	2.8	0.4	11.9	16.6	7.6	84	93	65	1012	1015	1008	15	318	-53	21.4	23.9	20.3	237	360	1	2.1	8.5	0.0
08/04/2011	1.3	0.2	11.7	19.8	3.8	74	95	16	1012	1015	1009	20	220	-75	21.5	24.5	19.4	142	360	1	1.3	6.4	0.0
09/04/2011	2.6	0.0	14.2	18.7	7.1	53	78	10	1006	1009	1005	9	195	-79	22.3	23.7	20.9	181	360	1	2.9	11.4	0.0
10/04/2011	4.6	0.0	14.9	20.7	9.2	69	86	45	1007	1009	1006	18	158	-53	23.2	25.9	21.4	211	360	1	2.5	8.0	0.0
11/04/2011	3.0	4.8	9.6	13.6	3.8	79	90	53	1008	1015	1005	13	353	-147	23.6	25.2	22.7	254	360	1	3.5	17.9	0.2
12/04/2011	2.0	1.4	7.5	13.1	3.1	74	87	50	1014	1016	1009	18	329	-136	21.3	23.4	19.4	225	360	1	3.2	11.9	0.4
13/04/2011	2.0	4.2	8.5	11.8	5.8	84	91	75	1000	1009	996	10	264	-71	20.4	23.2	18.5	205	307	93	5.6	16.3	0.0
14/04/2011	1.3	0.0	10.7	13.9	7.7	85	94	71	1000	1002	998	11	181	-37	22.6	23.5	21.9	186	360	1	1.1	4.6	0.0
15/04/2011	0.6	0.0	11.6	16.0	8.2	73	90	50	1003	1005	1002	35	294	-54	21.3	22.5	20.2	228	360	1	1.6	7.5	0.0
16/04/2011	1.7	0.8	9.9	14.9	5.5	80	93	57	1007	1009	1004	12	468	-57	21.3	22.7	20.5	240	360	1	1.3	5.4	0.0
17/04/2011	1.1	0.0	9.7	15.0	2.3	71	91	54	1009	1010	1007	1	278	-68	20.8	22.9	19.3	164	360	1	1.8	7.8	0.0
18/04/2011	1.4	0.0	12.2	17.3	7.5	63	77	40	1001	1007	997	6	280	-70	20.9	23.3	19.4	157	355	4	3.4	10.5	0.0
19/04/2011	3.4	0.0	12.4	17.6	6.2	60	79	42	999	1001	996	20	224	-66	21.9	25.4	19.8	105	360	1	2.3	7.9	0.0
20/04/2011	2.6	0.0	13.3	21.3	4.8	62	84	39	1000	1001	998	22	289	-66	23.1	26.3	20.3	112	360	1	1.1	5.1	0.0
21/04/2011	1.9	0.0	14.9	22.2	7.1	62	89	33	996	999	993	32	256	-72	25.6	31.9	23.0	136	360	1	2.4	7.7	0.0
22/04/2011	3.6	0.0	16.2	20.5	11.9	60	85	44	990	993	988	13	257	-68	27.5	29.7	26.4	182	359	91	4.5	14.6	0.4
23/04/2011	4.1	0.0	11.5	17.1	6.6	67	86	35	999	1003	993	13	261	-59	25.3	27.3	24.1	239	360	1	1.6	8.1	0.0
24/04/2011	2.1	0.0	11.4	18.5	5.1	71	81	50	1006	1009	1003	18	281	-56	21.7	24.1	20.3	188	360	1	1.7	17.5	0.0
25/04/2011	2.0	0.0	10.3	13.7	7.9	75	90	58	1012	1014	1009	16	198	-60	21.0	21.8	20.4	98	360	1	1.8	7.3	0.0
26/04/2011	1.3	1.2	9.3	14.0	6.4	77	90	50	1012	1014	1011	35	400	-70	21.1	23.4	19.2	82	360	1	2.3	8.7	0.0
27/04/2011	1.8	0.0	10.7	19.3	3.8	72	93	45	1011	1012	1010	31	292	-60	23.0	26.7	20.7	136	360	1	1.1	7.0	0.0
28/04/2011	1.6	0.0	11.3	18.1	4.3	59	91	35	1007	1010	1004	18	263	-108	23.5	26.2	22.1	125	360	1	1.8	9.0	0.0
29/04/2011	2.3	0.0	11.2	15.6	5.2	71	87	55	1001	1004	998	26	247	-84	22.7	24.8	21.0	86	360	1	3.1	11.9	0.0
30/04/2011	2.1	0.0	11.7	16.4	9.0	71	88	45	997	999	995	16	293	-70	22.7	24.7	21.5	80	360	1	4.6	16.1	0.4
Monthly	Sum 66.2	Sum 45.0	Avg 11.4	Max 22.2	Min 2.3	Avg 73	Max 95	Min 10	Avg 1003	Max 1016	Min 983	Avg 16	Max 468	Min -160	Avg 21.8	Max 31.9	Min 16.9	Avg 178	Max 360	Min 1	Avg 3.2	Max 20.5	Min 0.0

Date	Evap (mm)	Rain (mm)	Temp oC			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp oC			Wind Direction			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/05/2011	3.2	0.0	11.9	17.0	8.1	62	81	34	995	997	995	30	312	-77	22.2	24.7	20.9	95	360	2	5.2	13.9	0.2
02/05/2011	4.2	0.0	11.4	15.5	8.1	56	70	39	997	998	996	31	278	-73	21.9	24.7	20.6	98	359	2	5.8	16.1	0.8
03/05/2011	4.2	0.0	9.4	13.2	5.8	59	73	41	1000	1001	997	23	281	-75	21.1	23.4	19.4	135	263	26	4.4	13.8	0.0
04/05/2011	3.1	0.6	11.4	14.6	8.4	63	85	40	1000	1001	998	28	330	-117	21.9	23.4	20.4	158	271	9	4.5	15.5	0.0
05/05/2011	3.2	1.4	12.8	15.4	11.2	79	86	62	996	998	993	17	309	-74	22.3	23.4	21.5	189	288	98	4.7	14.6	0.5
06/05/2011	2.3	3.2	13.4	16.8	11.3	78	88	59	992	993	991	23	332	-76	22.2	23.0	21.4	201	300	108	5.6	15.5	0.4
07/05/2011	2.8	7.4	14.1	17.3	11.7	79	92	66	989	992	986	24	394	-111	22.9	24.8	21.8	171	301	51	4.2	13.2	0.0
20/05/2011	2.3	1.0	10.5	15.4	7.6	70	89	44	999	1002	997	28	447	-73	21.8	23.3	20.5	232	360	1	4.0	11.4	0.5
21/05/2011	2.8	9.2	10.7	14.5	7.0	81	93	72	994	1002	988	-2	167	-79	21.3	22.8	20.6	207	350	11	6.0	18.0	0.8
22/05/2011	1.6	0.6	10.9	16.3	7.6	70	88	47	994	1000	986	41	514	-86	20.7	23.2	19.3	242	360	1	5.4	16.4	0.5
23/05/2011	3.3	5.8	10.6	13.9	7.1	72	91	46	995	1002	988	37	463	-104	21.4	23.9	20.3	239	360	2	7.2	22.0	0.7
24/05/2011	3.1	0.0	10.4	16.4	5.1	64	87	37	1007	1010	1002	29	341	-63	22.0	25.8	19.9	240	360	1	4.3	16.3	0.2
25/05/2011	3.4	1.2	10.8	13.2	8.7	76	91	62	997	1009	987	17	302	-72	22.1	23.8	21.5	201	299	99	7.0	19.5	1.2
26/05/2011	2.2	7.0	10.2	14.3	6.2	81	94	55	994	1004	986	26	429	-64	21.7	24.4	20.8	274	360	1	4.2	15.6	0.2
27/05/2011	2.1	0.6	9.2	14.6	4.4	79	93	55	1003	1005	997	14	339	-62	20.4	22.2	18.8	239	360	1	3.5	10.9	0.2
28/05/2011	2.0	0.8	11.6	16.0	9.2	76	93	50	994	997	991	45	423	-30	19.2	20.7	18.3	245	359	1	4.1	14.6	0.4
29/05/2011	2.6	0.2	12.6	17.4	9.5	71	92	46	991	994	988	50	395	-43	20.2	21.9	19.1	244	360	1	4.6	14.8	0.2
30/05/2011	3.2	4.2	9.6	14.9	6.0	74	87	46	995	998	993	30	394	-134	21.7	25.9	19.8	229	360	1	2.5	12.3	0.0
31/05/2011	2.2	0.0	10.6	17.2	4.6	70	88	40	1004	1009	998	32	439	-68	21.4	23.7	20.1	231	360	1	3.1	10.7	0.3
Monthly	Sum 53.6	Sum 43.2	Avg 11.2	Max 17.4	Min 4.4	Avg 72	Max 94	Min 34	Avg 997	Max 1010	Min 986	Avg 28	Max 514	Min -134	Avg 21.5	Max 25.9	Min 18.3	Avg 204	Max 360	Min 1	Avg 4.7	Max 22.0	Min 0.0

Date	Evap (mm)	Rain (mm)	Temp oC			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp oC			Wind Direction			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/06/2011	3.0	0.0	13.8	19.7	10.7	77	84	64	1011	1016	1009	16	195	-59	21.1	22.3	20.1	219	360	1	4.0	11.4	0.2
02/06/2011	2.6	0.0	15.0	22.0	10.8	77	90	54	1019	1020	1016	32	366	-63	23.1	29.6	21.2	155	360	1	1.6	6.6	0.0
03/06/2011	2.1	0.0	17.0	24.8	8.1	67	92	40	1017	1020	1015	55	310	-89	25.3	34.5	22.6	97	360	1	1.5	7.3	0.0
04/06/2011	2.9	0.0	14.1	19.7	9.1	77	93	54	1011	1015	1006	48	354	-65	26.8	29.7	25.2	75	360	1	2.3	8.8	0.0
05/06/2011	2.2	2.2	11.0	12.8	7.3	85	91	68	1000	1006	996	4	191	-64	24.3	26.8	23.1	151	360	1	2.4	9.3	0.0
06/06/2011	1.1	0.0	10.0	15.3	4.4	75	91	51	991	996	985	33	356	-64	22.6	23.7	21.1	218	360	1	2.8	9.5	0.0
07/06/2011	2.0	8.6	9.9	12.4	7.3	84	94	64	982	985	980	40	485	-128	21.5	22.9	20.0	209	356	4	3.5	12.2	0.0
08/06/2011	1.5	5.0	10.2	15.6	7.2	84	93	63	986	994	982	32	557	-122	21.3	22.6	20.4	258	360	1	3.1	13.3	0.3
09/06/2011	1.7	0.0	8.8	14.2	4.8	72	89	44	996	998	994	34	480	-105	21.4	24.5	20.0	237	360	1	2.4	9.4	0.0
10/06/2011	2.1	0.0	9.8	17.0	4.3	66	85	36	998	1001	997	27	326	-142	21.3	22.9	20.1	214	360	1	2.1	8.7	0.0
11/06/2011	2.5	0.0	10.5	17.2	5.1	68	89	35	1000	1001	999	19	361	-61	21.0	23.6	19.7	200	360	1	1.9	6.7	0.0
12/06/2011	2.4	6.2	10.0	14.1	5.0	83	92	71	990	999	983	34	274	-104	20.7	22.1	19.8	119	360	1	3.4	15.7	0.0
13/06/2011	1.4	0.2	13.5	20.0	7.9	72	93	41	994	1002	986	33	408	-58	22.1	28.2	20.3	242	360	1	2.6	9.7	0.0
14/06/2011	3.0	0.0	12.6	18.8	4.6	66	87	44	1000	1002	994	33	279	-66	22.9	26.1	21.5	192	338	95	3.7	12.3	0.0
15/06/2011	3.3	0.2	15.4	20.7	11.7	70	91	38	993	994	993	41	409	-112	23.4	27.8	22.0	237	360	1	3.4	12.6	0.1
16/06/2011	3.9	10.4	11.4	15.6	8.6	74	91	49	991	994	990	31	476	-200	23.5	25.3	22.2	219	359	6	3.4	13.6	0.2
17/06/2011	2.4	20.4	11.7	16.1	9.3	82	93	61	983	990	980	-1	409	-92	20.6	22.7	19.1	215	360	1	3.8	15.2	0.0
18/06/2011	2.0	11.2	11.7	17.2	9.0	84	92	64	984	992	981	26	511	-200	21.3	25.6	20.1	245	360	1	2.9	9.8	0.1
19/06/2011	1.8	0.0	12.5	17.9	7.9	75	92	52	995	997	992	30	485	-99	21.9	24.9	20.6	240	360	1	2.2	9.1	0.0
20/06/2011	2.0	8.4	11.8	17.1	7.0	79	92	45	993	997	989	9	450	-136	22.3	23.1	21.1	139	360	1	2.0	8.1	0.0
21/06/2011	2.0	8.2	13.5	18.2	10.7	84	94	59	988	989	987	50	485	-122	22.6	24.3	21.6	199	343	27	3.7	13.5	0.0
22/06/2011	2.4	6.2	12.5	17.8	10.0	86	95	57	991	996	987	32	562	-114	22.9	26.2	22.0	254	360	1	2.5	9.9	0.0
23/06/2011	2.0	0.0	12.7	17.9	9.4	71	91	47	1000	1005	996	38	375	-63	22.4	25.7	21.1	266	360	1	2.8	10.3	0.3
24/06/2011	2.6	0.2	10.7	14.5	7.2	82	91	67	1003	1006	995	-7	119	-87	21.1	23.1	20.1	205	359	84	3.8	16.0	0.2
25/06/2011	1.6	0.2	17.5	22.0	14.5	82	93	64	1000	1003	996	35	345	-43	21.5	25.7	20.3	236	359	3	4.3	12.6	0.6
Monthly	Sum	Sum	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
	56.4	87.6	12.3	24.8	4.3	77	95	35	997	1020	980	29	562	-200	22.4	34.5	19.1	202	360	1	2.9	16.0	0.0

Date	Evap (mm)	Rain (mm)	Temp oC			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Dir			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/07/2011	1.9	0.0	14.1	19.6	9.4	68	88	45	1011	1013	1008	31	355	-50	22.5	24.3	21.4	201	360	1	1.1	5.7	0.0
10/07/2011	2.4	0.0	15.0	21.0	10.4	76	88	51	1002	1005	1000	20	420	-51	23.0	24.5	22.0	209	360	1	1.3	6.9	0.0
11/07/2011	1.8	0.0	14.6	20.4	8.9	77	94	55	1006	1007	1005	41	368	-53	23.2	24.3	22.3	141	360	1	1.5	7.5	0.0
12/07/2011	1.8	0.0	14.8	18.5	11.5	71	84	52	1006	1007	1005	45	360	-62	23.1	24.9	22.3	78	360	1	2.3	9.0	0.0
13/07/2011	2.4	0.0	15.3	21.5	7.9	66	91	39	1006	1007	1006	39	338	-57	23.3	28.0	21.6	138	360	1	1.4	5.9	0.0
14/07/2011	2.3	1.0	16.6	22.7	11.6	68	90	45	1005	1007	1003	35	322	-57	23.8	25.3	22.3	217	360	1	2.1	8.0	0.0
15/07/2011	3.0	3.0	14.7	17.0	12.2	84	93	64	997	1003	989	30	244	-68	23.0	25.0	21.8	215	358	2	3.4	11.0	0.0
16/07/2011	1.9	10.6	13.8	18.1	11.2	87	93	61	981	989	976	46	492	-109	21.8	22.7	21.1	236	360	1	3.6	13.1	0.4
17/07/2011	2.2	2.6	12.4	14.1	11.4	91	94	84	979	982	975	0	85	-27	20.8	21.9	20.1	266	360	1	3.7	13.7	0.4
18/07/2011	0.8	2.0	12.5	15.9	11.1	88	93	76	982	986	981	10	543	-128	20.1	21.2	19.3	256	360	1	3.4	11.6	0.2
19/07/2011	1.3	0.4	13.4	16.8	10.3	78	91	60	991	994	986	19	508	-47	20.5	21.7	19.7	270	360	1	2.2	10.4	0.0
20/07/2011	1.7	0.8	12.8	18.1	9.3	75	90	52	995	999	993	31	411	-51	20.7	21.5	19.8	156	360	1	1.5	7.9	0.0
21/07/2011	1.7	4.8	11.5	13.4	9.7	90	93	86	1001	1005	999	10	165	-67	20.9	21.4	20.4	150	360	1	1.3	5.9	0.0
22/07/2011	0.4	0.0	12.1	19.4	4.9	73	93	42	1004	1005	1003	38	494	-62	20.7	23.5	19.6	190	360	1	1.3	7.1	0.0
23/07/2011	1.8	0.0	14.7	22.4	6.2	68	92	36	1001	1003	999	42	275	-79	22.3	28.5	20.2	217	360	1	1.5	5.8	0.0
24/07/2011	2.7	0.4	15.5	20.3	12.1	81	90	68	997	999	995	20	206	-46	23.7	25.7	23.0	201	360	1	1.0	4.5	0.0
25/07/2011	1.0	0.0	16.0	21.6	10.9	73	91	40	996	998	995	23	251	-56	22.9	24.1	21.6	183	360	1	0.9	5.9	0.0
26/07/2011	1.6	3.6	16.4	20.6	13.1	81	94	63	1002	1005	998	31	544	-44	23.4	24.0	22.8	184	360	1	1.0	4.5	0.0
27/07/2011	1.1	5.2	18.2	25.3	14.8	76	92	44	1006	1007	1005	36	355	-44	23.8	25.3	22.6	168	360	1	0.9	6.1	0.0
28/07/2011	1.9	6.8	14.5	17.2	12.4	84	95	65	1010	1011	1007	20	200	-23	24.3	25.1	23.7	142	360	1	1.6	6.9	0.0
29/07/2011	1.2	2.2	13.3	17.0	10.6	85	93	74	1009	1011	1007	24	361	-60	22.7	25.7	22.0	102	360	1	2.0	8.6	0.0
30/07/2011	1.1	0.0	15.6	20.8	10.6	78	91	63	1004	1008	999	28	350	-108	22.0	22.9	21.1	169	360	1	2.9	9.9	0.0
31/07/2011	2.2	3.4	15.6	19.0	13.8	86	92	79	995	999	994	21	281	-50	20.8	21.7	20.0	202	360	1	4.2	12.8	0.0
Monthly	Sum 40.2	Sum 46.8	Avg 14.5	Max 25.3	Min 4.9	Avg 78	Max 95	Min 36	Avg 999	Max 1013	Min 975	Avg 28	Max 544	Min -128	Avg 22.3	Max 28.5	Min 19.3	Avg 187	Max 360	Min 1	Avg 2.0	Max 13.7	Min 0

Date	Evap (mm)	Rain (mm)	Temp oC			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp (oC)			Wiind Dir			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/08/2011	1.5	0.0	16.1	20.1	13.4	82	93	58	995	996	995	35	420	-78	21.4	22.7	20.5	192	360	1	1.1	6.6	0.0
02/08/2011	1.3	0.0	15.4	21.0	11.5	74	92	49	998	1000	996	25	308	-54	22.2	24.5	21.0	213	360	1	1.4	5.2	0.0
03/08/2011	1.9	0.0	15.6	19.9	10.8	74	87	54	997	1000	993	33	364	-58	22.2	23.1	21.4	179	360	1	2.1	10.4	0.0
04/08/2011	2.3	6.0	16.6	23.6	12.6	81	91	52	992	996	990	38	475	-165	22.0	23.6	20.9	228	360	1	3.1	10.3	0.2
05/08/2011	3.4	0.0	13.5	18.8	8.4	76	92	50	996	998	994	23	412	-69	20.6	22.0	19.6	211	360	1	1.7	6.8	0.0
06/08/2011	1.9	13.0	13.1	18.9	11.0	82	93	54	988	994	984	20	469	-90	20.3	21.1	19.7	200	360	1	1.5	7.8	0.0
12/08/2011	2.2	1.6	16.0	19.1	13.8	86	92	75	991	994	987	27	299	-54	22.0	22.7	21.4	204	359	1	3.5	12.8	0.3
13/08/2011	1.7	0.0	14.8	18.0	12.3	81	92	66	987	989	986	31	391	-104	21.5	22.1	20.8	225	359	1	3.4	10.0	0.2
14/08/2011	2.0	0.0	14.3	20.0	11.1	75	91	47	991	996	988	26	345	-80	21.5	25.0	20.5	226	360	1	2.6	15.2	0.3
15/08/2011	2.8	4.4	13.1	17.7	9.5	81	91	54	997	999	995	6	234	-90	21.4	22.7	20.6	207	359	2	3.4	10.1	0.3
16/08/2011	2.4	2.0	14.8	20.2	9.7	79	94	47	997	1002	992	25	493	-157	21.5	25.2	20.7	239	360	1	2.9	**	0.0
17/08/2011	2.9	0.0	12.8	20.9	6.1	71	93	34	1002	1003	1002	29	291	-63	22.1	23.8	20.7	175	360	1	1.5	6.3	0.0
18/08/2011	2.5	0.0	12.8	16.9	8.3	75	85	57	1002	1003	1001	9	219	-53	21.8	23.3	20.6	134	360	1	1.2	5.9	0.0
19/08/2011	1.2	0.0	13.0	15.6	9.9	79	88	63	999	1002	996	1	153	-99	20.1	20.8	19.6	206	358	71	4.5	16.4	0.5
20/08/2011	2.2	0.0	14.1	18.6	10.2	79	89	62	997	999	994	12	235	-90	20.2	24.0	19.0	205	357	87	3.7	9.8	0.4
21/08/2011	2.3	0.0	15.2	20.1	11.9	77	90	60	997	1003	994	15	316	-56	21.3	22.6	20.3	222	360	1	2.5	7.5	0.0
22/08/2011	2.1	0.0	13.3	21.0	6.8	68	93	37	1004	1005	1002	16	375	-62	21.7	23.1	20.7	175	360	1	1.3	5.1	0.0
23/08/2011	2.1	0.0	14.5	20.7	8.1	65	86	40	998	1002	995	17	210	-58	21.6	22.8	20.3	169	360	1	1.0	7.0	0.0
24/08/2011	1.8	3.0	13.1	18.1	10.6	74	89	45	993	995	991	10	260	-114	21.8	24.1	20.8	209	360	1	3.0	16.5	0.1
25/08/2011	2.8	2.0	13.3	17.3	9.4	73	88	53	989	991	987	22	437	-140	21.4	24.0	20.1	170	352	6	3.6	10.6	0.0
26/08/2011	2.6	0.0	12.8	20.0	6.2	77	94	49	991	995	989	30	347	-61	22.0	24.0	20.8	217	360	1	1.5	9.8	0.0
27/08/2011	1.9	1.4	12.3	17.1	9.0	84	93	65	997	1001	995	16	329	-80	21.6	22.8	20.7	234	360	1	2.6	11.1	0.0
28/08/2011	1.6	0.0	12.4	18.4	9.5	80	95	50	1002	1004	1000	28	361	-130	21.6	24.0	20.7	242	360	1	2.0	12.7	0.0
29/08/2011	2.0	0.0	10.6	15.6	5.7	81	93	65	1005	1005	1004	3	316	-70	21.3	22.4	20.5	227	360	1	1.6	8.5	0.0
30/08/2011	1.0	0.0	12.0	15.6	9.6	78	89	64	1003	1005	1001	7	276	-25	20.8	21.2	20.2	207	360	1	0.9	4.0	0.0
31/08/2011	0.8	0.0	12.7	15.7	10.6	75	88	61	1000	1001	1000	16	116	-57	20.7	21.5	20.1	105	360	1	1.5	5.9	0.0
Monthly	Sum	Sum	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
	53.1	33.4	13.8	23.6	5.7	77	95	34	996	1005	984	20	493	-165	21.4	25.2	19.0	201	360	1	2.3	16.5	0.0

Date	Evap (mm)	Rain (mm)	Temp (oC)			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Dir			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/09/2011	1.3	0.0	14.8	19.4	9.3	68	82	52	996	1000	992	21	225	-63	21.0	22.5	19.7	164	318	49	3.1	9.7	0.0
02/09/2011	2.9	0.0	15.8	18.7	14.1	77	88	56	991	993	989	17	316	-89	21.8	22.5	21.3	218	360	1	4.0	12.8	0.2
03/09/2011	2.8	0.0	14.2	16.6	10.1	85	94	65	988	990	986	-3	156	-59	21.3	22.0	20.7	208	360	1	3.1	12.9	0.2
04/09/2011	1.6	0.0	11.6	15.3	8.9	79	92	61	986	990	984	-5	329	-113	20.1	21.4	19.3	193	336	74	3.7	10.9	0.1
05/09/2011	1.8	0.0	11.9	17.1	8.8	86	91	62	989	992	983	9	332	-57	19.0	19.7	18.3	225	360	1	4.7	16.8	0.4
06/09/2011	2.3	0.0	13.1	15.2	10.8	80	91	64	983	990	980	1	227	-130	19.0	19.6	18.6	241	359	1	5.5	18.7	0.5
07/09/2011	2.1	0.0	11.9	14.5	10.6	84	93	70	992	994	990	7	160	-98	18.9	19.5	18.4	243	360	2	3.9	13.2	0.4
08/09/2011	1.5	0.0	14.2	18.6	11.0	85	94	70	989	991	988	21	409	-32	19.2	20.4	18.3	206	360	1	2.8	10.0	0.0
09/09/2011	1.6	0.0	16.9	20.7	14.6	84	93	64	988	990	983	28	317	-53	21.0	22.5	20.1	204	323	91	4.9	14.1	0.9
10/09/2011	2.7	0.0	16.1	18.6	12.6	80	89	61	978	983	976	9	286	-96	21.4	22.4	20.8	204	351	2	7.2	19.9	1.2
11/09/2011	3.1	0.0	13.1	15.6	11.1	79	90	66	979	982	975	-7	313	-102	19.5	21.1	18.8	213	358	3	6.3	19.2	0.8
12/09/2011	2.2	0.0	14.3	16.3	11.4	76	91	64	979	989	971	-1	220	-81	19.5	20.0	19.0	240	360	1	6.9	20.9	1.2
13/09/2011	2.5	0.0	11.5	15.9	8.9	75	88	49	993	998	989	5	298	-109	19.4	20.7	18.5	240	360	1	5.2	16.3	0.7
14/09/2011	3.0	0.0	11.7	15.6	7.9	81	90	67	1002	1004	998	7	195	-53	19.2	20.2	18.3	217	360	2	2.5	8.7	0.0
15/09/2011	1.4	0.0	12.7	17.1	9.8	77	91	57	1003	1004	1000	10	259	-62	20.1	21.1	19.4	177	317	83	2.2	7.8	0.0
16/09/2011	1.8	0.2	13.3	17.1	11.0	81	92	69	992	1000	988	10	327	-86	20.2	21.3	19.3	194	359	2	3.9	11.8	0.3
17/09/2011	1.8	0.0	11.0	14.8	9.3	87	92	72	987	988	986	7	322	-154	20.0	20.8	19.3	225	360	1	3.2	13.0	0.1
18/09/2011	1.3	0.0	12.0	15.4	10.0	85	93	70	991	996	986	4	155	-53	20.0	20.6	19.6	258	360	1	2.9	11.3	0.0
19/09/2011	1.3	0.0	13.3	17.0	10.0	88	93	78	994	996	992	4	157	-53	19.9	20.6	19.3	211	359	3	4.0	12.6	0.4
20/09/2011	1.3	0.0	11.4	14.5	8.7	80	93	61	998	999	995	3	230	-62	19.8	20.4	19.1	213	358	3	3.1	11.2	0.3
21/09/2011	1.6	0.0	11.2	14.3	9.0	81	88	68	996	999	993	-12	186	-63	18.6	19.5	17.9	217	356	2	5.0	17.1	0.6
22/09/2011	1.8	0.0	11.8	16.4	8.9	83	92	67	1001	1002	999	-4	198	-63	18.3	19.3	17.5	211	356	3	3.2	9.4	0.4
23/09/2011	1.6	0.0	13.5	16.2	11.3	79	87	62	996	1001	991	5	161	-40	18.8	19.5	18.2	205	335	91	5.8	17.5	1.3
24/09/2011	2.6	0.0	13.7	17.5	11.1	79	91	56	993	994	991	8	258	-63	19.2	20.6	18.3	200	341	72	3.9	12.7	0.5
25/09/2011	2.5	0.2	13.8	15.9	11.4	80	89	71	991	995	990	-11	134	-95	19.2	19.9	18.6	204	328	36	5.5	14.8	0.8
26/09/2011	1.9	0.0	12.3	16.9	8.0	74	87	57	1002	1005	995	0	219	-59	18.8	20.1	17.7	200	350	74	3.5	9.7	0.8
27/09/2011	2.3	0.0	14.9	18.0	12.8	85	88	79	1007	1008	1005	2	157	-50	19.5	20.3	18.7	204	307	108	6.0	14.7	1.2
28/09/2011	1.8	0.0	17.9	22.0	15.5	74	86	56	1003	1006	1001	-5	110	-55	21.0	23.1	19.6	206	344	77	6.4	16.8	0.4
29/09/2011	4.1	0.0	17.5	19.1	16.1	79	89	62	1002	1003	1000	2	179	-50	22.4	23.6	21.5	204	320	108	6.0	15.5	1.1
30/09/2011	3.0	28.8	17.2	19.5	13.7	77	95	56	1001	1005	998	-11	115	-94	22.3	22.8	21.8	200	360	1	4.5	14.4	0.0
Monthly	Sum	Sum	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
	63.4	29.2	13.6	22.0	7.9	80	95	49	993	1008	971	4	409	-154	19.9	23.6	17.5	212	360	1	4.4	20.9	0.0

Date	Evap (mm)	Rain (mm)	Temo (oC)			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Direction			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/10/2011	2.8	28.8	13.6	14.3	13.1	96	96	95	1006	1007	1004	3	73	-12	21.4	22.1	21.1	104	360	1	1.3	5.8	0.0
02/10/2011	0.2	2.4	15.9	18.0	13.5	92	96	84	1004	1007	1002	-2	79	-51	21.2	21.7	20.9	178	360	1	2.3	7.7	0.0
03/10/2011	0.7	0.0	14.6	19.6	8.9	83	93	69	999	1002	994	-4	158	-72	20.4	21.4	18.6	217	360	1	4.3	14.1	0.5
04/10/2011	2.0	0.0	11.6	15.3	8.7	80	91	59	1001	1003	998	6	133	-58	19.1	20.6	17.0	211	357	1	4.5	13.3	0.8
05/10/2011	2.2	4.6	14.6	18.4	9.3	83	92	73	993	998	990	-7	166	-85	20.9	22.0	20.2	224	360	2	5.7	18.7	0.8
06/10/2011	1.9	1.8	8.9	12.9	6.2	79	88	55	994	1001	992	-13	197	-87	20.1	21.2	19.2	234	360	1	4.9	18.2	0.7
07/10/2011	2.2	0.0	10.1	15.0	7.6	81	88	62	1007	1011	1001	-1	191	-58	20.0	21.3	19.1	250	360	1	3.0	10.8	0.3
08/10/2011	1.7	0.4	12.8	18.5	7.9	88	95	70	1007	1011	1004	9	279	-33	20.3	21.2	19.4	212	360	1	3.3	11.2	0.2
09/10/2011	1.6	0.0	15.6	16.9	14.7	88	92	83	1000	1004	997	-1	64	-31	21.5	22.1	21.0	232	359	2	4.9	14.9	0.5
10/10/2011	1.3	2.6	15.3	16.2	14.8	88	93	81	997	998	995	-8	51	-48	22.4	23.3	21.9	238	360	1	5.7	18.5	0.8
11/10/2011	1.3	2.0	15.0	16.3	13.9	90	94	83	1001	1003	998	-4	82	-37	22.1	22.8	21.6	233	360	2	3.9	16.8	0.6
12/10/2011	1.0	1.6	14.4	17.2	12.4	88	94	78	1005	1009	1001	4	184	-43	21.9	22.7	21.0	215	360	1	2.5	8.5	0.0
13/10/2011	1.0	0.0	13.9	18.2	11.1	85	94	65	1010	1011	1009	4	204	-53	22.7	24.3	21.6	161	359	2	1.3	6.8	0.0
14/10/2011	1.1	0.0	13.5	15.3	9.4	85	93	77	1009	1011	1007	-11	43	-59	21.9	23.4	21.2	194	360	1	3.6	13.3	0.0
15/10/2011	1.1	4.8	12.9	14.3	9.9	88	94	82	1005	1007	1003	-6	47	-42	20.5	21.1	20.2	201	360	1	4.3	11.2	0.0
16/10/2011	0.9	0.0	10.7	14.4	7.9	79	94	54	1004	1006	1001	-7	196	-85	20.6	21.8	19.6	203	354	52	3.5	11.3	0.5
17/10/2011	1.9	7.2	8.9	13.4	4.7	83	96	69	993	1001	984	-23	115	-94	19.5	20.6	18.5	207	360	1	6.0	21.7	0.2
18/10/2011	1.5	0.2	6.6	11.1	4.0	80	90	62	994	999	992	-24	175	-72	17.9	19.1	16.2	221	360	1	3.8	14.2	0.1
19/10/2011	1.5	0.0	5.6	10.0	3.1	83	92	65	1005	1012	999	-14	205	-62	19.4	20.8	18.4	231	360	1	2.1	9.6	0.0
20/10/2011	0.9	0.6	7.1	10.2	3.5	84	91	73	1009	1012	1004	-11	57	-55	19.8	20.3	19.3	195	351	2	3.8	12.6	0.0
21/10/2011	1.0	0.0	11.5	13.3	9.7	82	92	74	1000	1004	995	-3	68	-46	20.3	21.2	19.7	202	313	96	6.0	15.6	1.3
22/10/2011	1.5	7.0	11.2	12.3	8.6	83	93	71	988	996	984	-22	93	-69	20.7	21.0	20.5	196	344	67	6.3	16.3	0.1
23/10/2011	1.5	22.2	11.9	15.6	8.7	83	90	74	978	984	968	-47	38	-157	20.9	21.1	20.6	182	284	96	5.8	24.3	0.2
24/10/2011	1.6	67.0	11.4	15.3	7.7	87	96	73	970	973	966	-25	20	-134	21.3	22.2	20.7	190	360	1	4.6	24.5	0.0
25/10/2011	1.3	7.4	8.3	12.0	6.3	86	96	61	975	979	971	-13	168	-69	21.5	22.1	19.8	186	360	1	2.5	9.7	0.0
26/10/2011	1.1	0.0	8.5	11.2	6.1	77	85	66	981	984	979	-29	58	-70	18.4	20.0	17.5	193	299	108	4.2	11.7	0.8
27/10/2011	1.5	0.0	9.1	13.8	5.4	81	89	69	991	999	984	-18	80	-58	17.8	18.8	17.1	199	360	1	2.6	10.8	0.2
28/10/2011	1.2	0.0	9.2	12.2	5.2	79	88	70	1002	1004	999	-19	78	-81	17.6	18.4	16.5	195	279	108	5.6	19.8	1.4
29/10/2011	1.6	4.4	12.7	15.3	10.9	84	93	71	994	999	991	-20	115	-95	18.9	20.1	18.2	203	358	68	6.5	19.7	0.9
30/10/2011	1.8	0.2	13.1	15.8	10.1	86	90	75	995	996	991	-8	136	-71	19.3	20.1	18.6	199	300	108	5.2	12.6	1.4
31/10/2011	1.6	10.4	13.1	15.7	9.9	87	94	79	987	992	985	-21	105	-83	19.9	20.2	19.3	200	349	48	6.0	16.9	0.4
Monthly	Sum	Sum	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
	44.5	175.6	11.7	19.6	3.1	84	96	54	997	1012	966	-11	279	-157	20.3	24.3	16.2	203	360	1	4.2	24.5	0.0

Date	Evap (mm)	Rain (mm)	Temp (oC)			RH %			Atm Pr (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Direction			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/11/2011	1.3	0.0	9.5	12.6	6.3	80	93	62	988	990	985	-27	71	-85	19.2	20.4	18.2	195	312	83	4.4	15.7	0.9
02/11/2011	1.6	2.0	13.7	14.7	12.5	77	89	66	977	985	969	-24	81	-107	19.2	20.3	18.4	189	276	105	8.3	20.7	2.0
03/11/2011	2.3	1.2	13.1	14.8	10.8	80	87	71	968	970	966	-35	118	-111	21.0	21.9	20.3	193	288	48	5.1	16.8	0.2
04/11/2011	1.8	0.0	9.3	13.7	5.4	84	94	58	978	987	970	-22	99	-77	21.5	22.5	20.3	196	360	1	1.8	7.2	0.0
05/11/2011	1.1	0.0	5.2	11.3	1.4	87	95	68	997	1006	987	-31	85	-67	18.6	20.3	17.6	210	360	1	1.4	4.6	0.0
06/11/2011	0.6	0.2	4.9	11.9	1.1	79	94	52	1010	1013	1006	-31	48	-73	17.0	18.3	15.7	190	329	77	1.9	4.4	0.3
07/11/2011	1.2	0.0	6.4	11.5	0.4	75	93	51	1008	1012	1001	-24	54	-73	16.9	18.7	15.2	153	360	1	2.2	7.7	0.0
08/11/2011	1.3	0.2	10.6	11.9	9.7	81	91	72	996	1001	992	-5	33	-58	18.9	19.6	18.4	145	360	1	2.7	8.1	0.1
09/11/2011	1.1	1.4	12.4	14.8	10.4	80	89	59	991	993	989	-19	161	-81	19.8	21.1	19.1	188	319	79	4.7	12.8	0.5
10/11/2011	2.2	0.0	11.5	14.1	9.7	79	86	64	996	998	993	-35	52	-77	19.3	20.7	18.4	173	265	78	3.8	10.8	0.3
11/11/2011	1.8	15.4	12.6	14.0	11.3	81	89	71	990	995	987	-36	64	-106	19.1	19.6	18.5	175	272	92	7.1	17.6	2.0
12/11/2011	1.9	1.4	10.9	12.9	8.4	78	87	65	1003	1009	992	-33	48	-83	18.1	19.0	17.4	178	276	56	4.2	15.2	0.9
13/11/2011	1.6	0.0	13.6	15.6	12.0	78	87	65	1006	1008	1004	-24	70	-62	18.5	19.4	18.0	145	360	1	5.5	15.9	0.2
14/11/2011	2.3	0.0	11.6	13.8	7.6	82	90	68	1004	1005	1002	-24	52	-56	18.8	19.1	18.2	127	360	1	2.4	9.6	0.0
15/11/2011	1.1	0.0	9.5	12.7	6.6	83	93	65	1000	1002	999	-26	54	-64	18.1	19.1	17.3	148	360	1	2.3	11.6	0.0
16/11/2011	1.1	6.0	9.8	12.3	5.7	85	93	76	997	999	994	-18	27	-61	17.5	18.1	16.8	164	360	1	2.6	10.5	0.0
17/11/2011	0.8	2.2	10.4	12.9	6.4	85	93	74	992	995	989	-36	38	-74	17.3	17.8	16.7	198	355	22	7.4	23.8	0.7
18/11/2011	1.4	0.8	12.9	13.9	12.3	83	90	76	991	992	989	-22	90	-83	18.8	19.4	17.8	201	294	108	7.4	17.6	2.0
19/11/2011	1.6	0.0	12.8	14.2	12.0	78	85	72	995	999	991	-12	42	-62	19.0	19.4	18.7	191	266	107	4.4	13.3	0.8
20/11/2011	1.7	1.6	12.0	13.4	10.9	82	91	70	998	1000	995	-14	44	-60	19.3	20.1	18.9	195	303	90	3.5	9.1	0.7
21/11/2011	1.4	2.8	10.0	11.8	6.7	89	94	82	995	999	994	-18	15	-66	19.4	19.9	18.9	208	360	1	2.0	7.6	0.0
22/11/2011	0.5	0.2	6.0	8.9	2.0	85	95	67	1003	1005	999	-31	49	-59	18.8	19.7	17.9	202	360	1	2.8	10.3	0.0
23/11/2011	0.9	0.2	10.7	12.3	8.0	84	89	79	1004	1005	1003	-19	43	-54	18.2	18.6	17.7	203	325	81	6.1	14.9	1.7
24/11/2011	1.2	13.2	11.3	12.3	6.5	83	94	72	1000	1005	994	-14	32	-62	18.3	18.5	18.0	208	360	1	7.7	20.7	0.3
25/11/2011	1.5	0.2	6.5	8.6	4.8	83	94	67	1005	1009	998	-32	39	-75	17.8	18.7	16.6	213	360	1	4.7	14.8	0.7
26/11/2011	1.1	0.0	10.8	13.0	7.4	82	86	75	1001	1008	992	-10	35	-51	19.0	20.1	18.5	211	331	93	7.4	18.8	1.4
27/11/2011	1.7	4.8	7.9	12.7	4.8	78	93	65	1002	1009	990	-32	19	-79	20.4	21.5	19.9	233	360	1	4.6	19.3	0.4
28/11/2011	1.6	2.6	9.5	12.6	5.2	78	90	67	997	1008	985	-10	42	-60	20.2	20.7	19.7	197	292	108	6.8	18.4	1.8
29/11/2011	1.8	17.0	8.0	12.5	3.7	85	94	71	982	993	973	-29	69	-86	20.1	21.1	19.6	220	360	1	7.3	23.8	0.7
30/11/2011	1.5	9.0	7.3	9.9	3.9	81	92	75	991	996	979	-39	21	-90	18.5	19.4	18.0	205	343	85	7.6	21.0	1.7
Monthly	Sum	Sum	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
	42.9	82.4	10.0	15.6	0.4	82	95	51	995	1013	966	-24	161	-111	18.9	22.5	15.2	189	360	1	4.7	23.8	0.0

Date	Evap (mm)	Rain (mm)	Temp (oC)			RH (%)			Atm Pr (mb)			NR %			Indoor Temp (oC)			Wind Direction			Wind Speed (m/s)		
			Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/12/2011	1.2	1.2	3.7	6.4	0.4	86	94	77	988	993	981	-37	24	-71	18.4	18.9	17.9	206	353	79	3.2	14.2	0.0
02/12/2011	0.6	3.6	4.2	9.6	0.9	91	94	85	992	997	984	-24	8	-57	17.9	18.6	17.5	201	349	2	4.8	14.3	0.6
03/12/2011	0.6	0.6	7.2	9.7	5.6	80	93	68	987	988	984	-23	80	-69	18.8	19.4	17.7	243	360	4	3.7	13.0	0.8
04/12/2011	1.1	1.6	3.7	5.8	0.7	87	91	78	986	988	983	-33	20	-67	18.7	19.2	18.1	232	360	3	3.4	11.3	0.6
05/12/2011	0.6	0.0	2.1	4.4	0.6	85	90	76	990	991	988	-37	84	-67	17.6	18.2	17.0	226	358	3	3.6	12.0	0.7
06/12/2011	0.6	2.8	3.7	6.7	1.3	89	93	87	989	991	985	-24	26	-65	17.2	17.7	16.7	206	359	68	4.2	11.3	0.3
07/12/2011	0.5	1.0	4.4	6.8	2.7	80	87	70	993	1000	985	-41	19	-79	18.7	20.5	17.5	248	360	1	4.8	20.7	1.0
08/12/2011	1.1	5.0	6.3	10.5	1.7	82	92	70	987	999	981	-33	36	-88	20.8	21.4	20.2	246	358	1	6.9	24.3	0.7
09/12/2011	1.4	0.0	2.1	4.4	-0.1	82	87	72	994	998	990	-43	40	-69	20.6	21.5	19.9	242	359	3	3.6	11.3	0.4
10/12/2011	0.7	0.2	2.4	6.8	-0.5	86	91	81	996	999	991	-26	22	-59	18.9	20.5	18.1	205	310	103	4.7	13.9	0.6
11/12/2011	0.7	3.6	4.8	7.5	1.5	91	94	86	986	991	983	-24	34	-66	19.2	20.1	18.0	215	360	1	4.0	13.8	0.0
12/12/2011	0.5	7.0	4.7	9.2	1.7	86	90	70	977	985	962	-35	28	-72	18.9	20.2	18.3	216	360	37	6.0	22.6	1.2
13/12/2011	1.2	2.6	2.4	5.9	0.7	82	91	73	965	968	962	-45	47	-94	19.9	20.5	19.1	235	354	5	7.3	24.5	1.1
14/12/2011	1.0	2.6	2.1	4.7	0.4	81	89	74	971	973	968	-35	11	-62	19.1	19.5	18.6	214	360	1	5.1	14.7	0.0
15/12/2011	0.8	1.0	2.4	5.0	-0.2	87	93	76	978	983	971	-26	74	-65	20.4	21.5	19.4	220	360	1	3.0	11.1	0.0
16/12/2011	0.5	0.0	0.8	3.8	-1.4	89	93	80	978	992	972	-18	59	-84	20.5	21.0	19.9	244	360	1	2.4	9.0	0.0
17/12/2011	0.4	0.2	1.6	4.7	0.0	89	93	81	997	1003	992	-37	59	-68	20.9	21.8	20.4	247	360	1	2.5	9.3	0.1
25/12/2011	0.9	0.2	11.2	12.8	9.2	87	93	80	1005	1008	1003	-10	30	-39	16.4	17.4	15.4	229	356	87	6.4	15.4	1.6
26/12/2011	1.1	0.2	11.0	12.2	9.1	82	89	77	1009	1010	1008	-12	26	-61	17.6	17.9	17.4	224	345	95	7.0	19.2	1.4
27/12/2011	1.4	0.6	9.2	9.7	8.7	84	93	72	1008	1012	997	-10	37	-57	17.5	17.8	17.2	215	307	108	6.6	20.8	1.4
28/12/2011	1.3	5.8	5.5	8.7	3.1	80	91	71	1001	1009	996	-37	60	-85	17.3	17.5	16.9	250	359	1	5.5	16.5	0.8
29/12/2011	1.2	8.2	6.3	8.5	3.6	85	92	77	1005	1009	1002	-25	6	-57	16.8	17.1	16.5	269	360	1	5.0	18.7	0.2
30/12/2011	0.9	6.0	8.6	11.4	5.3	91	94	85	999	1005	993	-7	25	-56	17.3	18.1	17.0	238	359	1	3.8	11.4	0.2
31/12/2011	0.6	0.4	10.7	12.2	9.1	89	94	79	990	993	985	-15	30	-65	18.6	19.0	18.2	237	357	3	5.0	12.6	0.8
Monthly	Sum	Sum	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
	20.8	54.4	5.0	12.8	-1.4	85	94	68	990	1012	962	-27	84	-94	19	21.8	15.4	230	360	1	4.7	24.5	0.0

APPENDIX 4.1

Landfill Gas Emissions (gas extraction system)

Table 2.7. Emission value results for landfill gas flare 1.

Flare 1	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	33	67.65	106.50	0.14	20.14	<150 mg/Nm ³	As Normal
CO (ppm)	1	1.25	1.97	0.003	10.41	<50 mg/Nm ³	As Normal
Total Organic Carbon (mg/m ³)	1.85	2.96	4.66	0.01	15.84	<10 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.44	0.44	0.69	0.0009	-	<50 mg/Nm ³ (at mass flow > 0.30 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	0.34	0.34	0.54	0.0007	-	<5 mg/Nm ³ (at mass flow > 0.050 kg/hr)	As Normal
SO ₂ (ppm)	61	173.85	273.70	0.36	-	-	As Normal
O ₂ (%)	9.53	9.53	-	-	-	-	As Normal
Temperature (degrees)	1008	-	1281K	-	-	>1,273K	As Normal
CO ₂ (%)	6.58	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	-	-	1,299 ²	-	-	<3,000 ²	As Normal
Efficiency (%)	>99	-	-	-	-	-	As Normal

Notes: ¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources.
² denotes units m³N/hr

Table 2.8. Emission value results for landfill gas flare 2.

Flare 2	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	17	34.85	97.47	0.15	19.5	<150 mg/Nm ³	As Normal
CO (ppm)	4	5	13.98	0.02	12.55	<50 mg/Nm ³	As Normal
Total Organic Carbon (mg/m ³)	1.98	3.16	8.86	0.01	21.64	<10 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	1.16	1.16	3.26	0.004	-	<50 mg/Nm ³ (at mass flow > 0.30 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	0.53	0.53	1.49	0.002	-	<5 mg/Nm ³ (at mass flow > 0.050 kg/hr)	As Normal
SO ₂ (ppm)	6	17.1	47.83	0.07	-	-	As Normal
O ₂ (%)	14.5	14.5	-	-	-	-	As Normal
Temperature (degrees)	1009	-	1282K	-	-	>1,273K	As Normal
CO ₂ (%)	3.74	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	-	-	1501 ²	-	-	<3,000 ²	As Normal
Efficiency (%)	>99	-	-	-	-	-	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources.
² denotes units m³N/hr

Table 2.9. Emission value results for landfill gas utilisation AR01.

AR01	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 5% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	150	307.5	373	0.70	3.87	<500 mg/Nm ³	As Normal
CO (ppm)	738	922.5	1,119	2.11	6.32	<1,400 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.44	0.44	0.54	0.001	-	50 mg/Nm ³ (at mass flows >0.3 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	0.32	0.32	0.39	0.0007	-	5 mg/Nm ³ (at mass flows >0.05 kg/hr)	As Normal
SO ₂ (ppm)	2	5.7	6.92	0	-	-	As Normal
Particulates (mg/m ³)	12.5	12.5	15.17	0.03	1.38	<130 mg/Nm ³	As Normal
Average TVOC (ppm)	358	572.8	695.23	1.31	8.65	<1,000 mg/Nm ³	As Normal
TNMVOC (ppm)	11	17.6	21.36	0.04	3.14	<75 mg/Nm ³	As Normal
O ₂ (%)	7.8	-	-	-	-	-	As Normal
Temperature (degrees)	455	728.15K	-	-	-	-	As Normal
CO ₂ (%)	7.31	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	6,244	2,342	1,886	-	-	<3,000	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources

Table 2.10. Emission value results for landfill gas utilisation AR02.

AR02	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	187	383.35	488	1.01	5.45	<500 mg/Nm ³	As Normal
CO (ppm)	864	1,080	1,374	2.85	5.31	<1,400 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.44	0.44	0.56	0.0012	-	50 mg/Nm ³ (at mass flows >0.3 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	1.70	1.70	2.17	0.0045	-	5 mg/Nm ³ (at mass flows >0.05 kg/hr)	As Normal
SO ₂ (ppm)	2.5	7.13	9.07	0.018	-	-	As Normal
Particulates (mg/m ³)	24.6	24.60	31.32	0.06	1.45	<130 mg/Nm ³	As Normal
Average TVOC (ppm)	434	694	883	1.83	7.10	<1,000 mg/Nm ³	As Normal
TNMVOC (ppm)	12.8	20.48	26.07	0.05	2.34	<75 mg/Nm ³	As Normal
O ₂ (%)	8.41	8.41	-	-	-	-	As Normal
Temperature (degrees)	452	-	725K	-	-	-	As Normal
CO ₂ (%)	7.51	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	7,013	2,642	2,075	-	-	<3,000	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources

Table 2.11. Emission value results for landfill gas utilisation AR03.

AR03	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	158	323.9	411	0.71	8.45	<500 mg/Nm ³	As Normal
CO (ppm)	934	1167.5	1,481	2.55	15.34	<1,400 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.20	0.20	0.26	0.0004	-	50 mg/Nm ³ (at mass flows >0.3 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	0.13	0.13	0.16	0.0003	-	5 mg/Nm ³ (at mass flows >0.05 kg/hr)	As Normal
SO ₂ (ppm)	1.5	4.275	5.42	0.009	-	-	As Normal
Particulates (mg/m ³)	31.7	31.7	40.23	0.07	1.34	<130 mg/Nm ³	As Normal
Average TVOC (ppm)	489	782.4	992.83	1.71	9.45	<1,000 mg/Nm ³	As Normal
TNMVOC (ppm)	3.5	5.6	7.11	0.01	2.41	<75 mg/Nm ³	As Normal
O ₂ (%)	8.37	8.37	-	-	-	-	As Normal
Temperature (degrees)	441	-	714K	-	-	-	As Normal
CO ₂ (%)	7.17	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	5701	2180	1718	-	-	<3,000	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources

Table 2.12. Emission value results for landfill gas utilisation AR05.

AR05	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	182.7	374.53	441.12	0.84	4.15	<500 mg/Nm ³	As Normal
CO (ppm)	810	1012.5	1192.50	2.28	11.74	<1,400 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.42	0.42	0.49	0.0009	-	50 mg/Nm ³ (at mass flows >0.3 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	1.66	1.66	1.96	0.0037	-	5 mg/Nm ³ (at mass flows >0.05 kg/hr)	As Normal
SO ₂ (ppm)	0	0	0	0	-	-	As Normal
Particulates (mg/m ³)	10.37	10.37	12.21	0.02	1.32	<130 mg/Nm ³	As Normal
Average TVOC (ppm)	405	648	763.20	1.46	12.74	<1,000 mg/Nm ³	As Normal
TNMVOC (ppm)	15	24	28.27	0.05	2.87	<75 mg/Nm ³	As Normal
O ₂ (%)	7.4	7.4	-	-	-	-	As Normal
Temperature (degrees)	468	-	741K	-	-	-	As Normal
CO ₂ (%)	7.71	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	6,108	2,251	1,911	-	-	<3,000	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources

Table 2.13. Emission value results for landfill gas utilisation AR06.

AR06	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	153	313	384	0.77	3.15	<500 mg/Nm ³	As Normal
CO (ppm)	872	1090	1,335	2.68	5.48	<1,400 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.61	0.61	0.75	0.001	-	50 mg/Nm ³ (at mass flows >0.3 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	1.23	1.23	1.51	0.003	-	5 mg/Nm ³ (at mass flows >0.05 kg/hr)	As Normal
SO ₂ (ppm)	1.5	4.27	5.24	0.01	-	-	As Normal
Particulates (mg/m ³)	13.64	13.64	16.71	0.03	1.35	<130 mg/Nm ³	As Normal
Average TVOC (ppm)	485	776	950	1.91	10.47	<1,000 mg/Nm ³	As Normal
TNMVOC (ppm)	14.5	23.2	28.42	0.06	3.74	<75 mg/Nm ³	As Normal
O ₂ (%)	7.92	-	-	-	-	-	As Normal
Temperature (degrees)	460.7	-	733.15K	-	-	-	As Normal
CO ₂ (%)	7.42	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	6,606	2,459	2,007	-	-	<3,000	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources

Table 2.14. Emission value results for landfill gas utilisation AR07.

AR07	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	174	356	420	0.90	2.37	<500 mg/Nm ³	As Normal
CO (ppm)	780	975	1,150	2.47	11.4	<1,400 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.46	0.46	0.54	0.001	-	50 mg/Nm ³ (at mass flows >0.3 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	1.60	1.60	1.89	0.004	-	5 mg/Nm ³ (at mass flows >0.05 kg/hr)	As Normal
SO ₂ (ppm)	0	0	0	0	-	-	As Normal
Particulates (mg/m ³)	17.5	17.50	20.64	0.04	1.67	<130 mg/Nm ³	As Normal
Average TVOC (ppm)	368	588.8	694	1.49	13.58	<1,000 mg/Nm ³	As Normal
TNMVOC (ppm)	8.4	13.44	15.85	0.03	4.58	<75 mg/Nm ³	As Normal
O ₂ (%)	7.42	-	-	-	-	-	As Normal
Temperature (degrees)	463.7	-	736K	-	-	-	As Normal
CO ₂ (%)	7.72	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	6,832	2,534	2,148	-	-	<3,000	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources

Table 2.15. Emission value results for landfill gas utilisation AR08.

AR08	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	101	207	245	0.56	3.85	<500 mg/Nm ³	As Normal
CO (ppm)	581	726	862	1.96	9.45	<1,400 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.23	0.23	0.27	0.0006	-	50 mg/Nm ³ (at mass flows >0.3 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	2.03	2.03	2.42	0.005	-	5 mg/Nm ³ (at mass flows >0.05 kg/hr)	As Normal
SO ₂ (ppm)	9	25.65	30.46	0.07	-	-	As Normal
Particulates (mg/m ³)	14.57	14.57	17.30	0.04	2.14	<130 mg/Nm ³	As Normal
Average TVOC (ppm)	425	680	807.47	1.83	8.95	<1000 mg/Nm ³	As Normal
TNMVOC (ppm)	6.5	10.4	12.35	0.03	2.14	<75 mg/Nm ³	As Normal
O ₂ (%)	7.51	-	-	-	-	-	As Normal
Temperature (degrees)	465.8	-	738K	-	-	-	As Normal
CO ₂ (%)	7.76	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	7,284	2,696	2,272	-	-	<3,000	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources

Table 2.16. Emission value results for landfill gas utilisation AR09.

AR09	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	212	434.6	485	0.71	4.91	<500 mg/Nm ³	As Normal
CO (ppm)	486	607.5	678	1.00	6.12	<1,400 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.26	0.26	0.28	0.0001	-	50 mg/Nm ³ (at mass flows >0.3 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	0.93	0.93	1.03	0.002	-	5 mg/Nm ³ (at mass flows >0.05 kg/hr)	As Normal
SO ₂ (ppm)	6.5	18.52	20.68	0.03	-	-	As Normal
Particulates (mg/m ³)	38.54	38.54	43.03	0.06	1.24	<130 mg/Nm ³	As Normal
Average TVOC (ppm)	535	856	955	1.41	7.54	<1,000 mg/Nm ³	As Normal
TNMVOC (ppm)	15.7	25.12	28.05	0.04	2.84	<75 mg/Nm ³	As Normal
O ₂ (%)	6.66	-	-	-	-	-	As Normal
Temperature (degrees)	487.5	-	760K	-	-	-	As Normal
CO ₂ (%)	8.16	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	4,581	1,645	1,473	-	-	<3,000	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources

Table 2.17. Emission value results for landfill gas utilisation AR10.

AR10	Conc.	Normalised (mgN/m ³)	Oxygen corrected emission concentration to flare (mgN/m ³) 3% ref.	Mass Kg/hr	Expanded uncertainty as percentage of limit value (%) ¹	Emission limit Values	Operating Status
Total NOx [as NO ₂] (ppm)	205	420.25	457	0.75	6.54	<500 mg/Nm ³	As Normal
CO (ppm)	393	491.25	535	0.88	8.54	<1,400 mg/Nm ³	As Normal
Average Hydrogen Chloride (mg/m ³)	0.41	0.40	0.44	0.0007	-	50 mg/Nm ³ (at mass flows >0.3 kg/hr)	As Normal
Average Hydrogen Fluoride (mg/m ³)	0.16	0.15	0.16	0.0003	-	5 mg/Nm ³ (at mass flows >0.05 kg/hr)	As Normal
SO ₂ (ppm)	6.8	19.38	21	0.034	-	-	As Normal
Particulates (mg/m ³)	31.4	31.40	34	0.06	1.10	<130 mg/Nm ³	As Normal
Average TVOC (ppm)	547	875.2	952	1.56	10.54	<1,000 mg/Nm ³	As Normal
TNMVOC (ppm)	23	36.8	40	0.07	2.87	<75 mg/Nm ³	As Normal
O ₂ (%)	6.29	-	-	-	-	-	As Normal
Temperature (degrees)	501	-	774K	-	-	-	As Normal
CO ₂ (%)	8.13	-	-	-	-	-	As Normal
Volumetric Airflow (m ³ /hr)	5,057	1,784	1,640	-	-	<3,000	As Normal

Notes:¹ denotes that expanded uncertainty is elevated as the equation has not been validated for use with high temperature sources

APPENDIX 5.1

Discharge to Sewer Results
(as per PRTR reporting)

4.3 RELEASES TO WASTEWATER OR SEWER

[Link to previous years emissions data](#)

| PRTR# : W0004 | Facility Name : Arthurstown Landfill | Filename : PRTR 2011 draft_W0004_2011.x

16/04/2012 10:22

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				
No. Annex II	Name	M/C/E	Method Code	Method Used	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
				Designation or Description				
06	Ammonia (NH3)	M		sewer	98.1408	98.1408	0.0	0.0
79	Chlorides (as Cl)	M	EN ISO 15682:2001		480889.92	480889.92	0.0	0.0
20	Copper and compounds (as Cu)	M	EN ISO 11885:1997		10.223	10.223	0.0	0.0
82	Cyanides (as total CN)	M	EN ISO 14403:2002		4.0892	4.0892	0.0	0.0
			EN ISO 10304-1 to					
83	Fluorides (as total F)	M	4:1995		204.46	204.46	0.0	0.0
18	Cadmium and compounds (as Cd)	M	EN ISO 5961:1995		0.1962816	0.1962816	0.0	0.0
19	Chromium and compounds (as Cr)	M	EN ISO 11885:1997		0.20446	0.20446	0.0	0.0
23	Lead and compounds (as Pb)	M	EN ISO 11885:1997		2.45352	2.45352	0.0	0.0
21	Mercury and compounds (as Hg)	M	EN 1483:1997		0.010223	0.010223	0.0	0.0
22	Nickel and compounds (as Ni)	M	EN ISO 11885:1997		112.453	112.453	0.0	0.0
24	Zinc and compounds (as Zn)	M	EN ISO 11885:1997		77.6948	77.6948	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				
Pollutant No.	Name	M/C/E	Method Code	Method Used	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
				Designation or Description				
303	BOD	M			9200.7	9200.7	0.0	0.0
306	COD	M			511150.0	511150.0	0.0	0.0
320	Magnesium	M			18401.4	18401.4	0.0	0.0
321	Manganese (as Mn)	M			89.9624	89.9624	0.0	0.0
327	Nitrate (as N)	M			515648.12	515648.12	0.0	0.0
372	Nitrite (as N)	M			310.7792	310.7792	0.0	0.0
387	Ortho-phosphate (as P)	M			5315.96	5315.96	0.0	0.0
370	Selenium	M			0.61338	0.61338	0.0	0.0
343	Sulphate	M			26579.8	26579.8	0.0	0.0
240	Suspended Solids	M			73605.6	73605.6	0.0	0.0
351	Total Organic Carbon (as C)	M			179924.8	179924.8	0.0	0.0
301	Acetate	M			0.0	0.0	0.0	0.0
					0.0	0.0	0.0	0.0

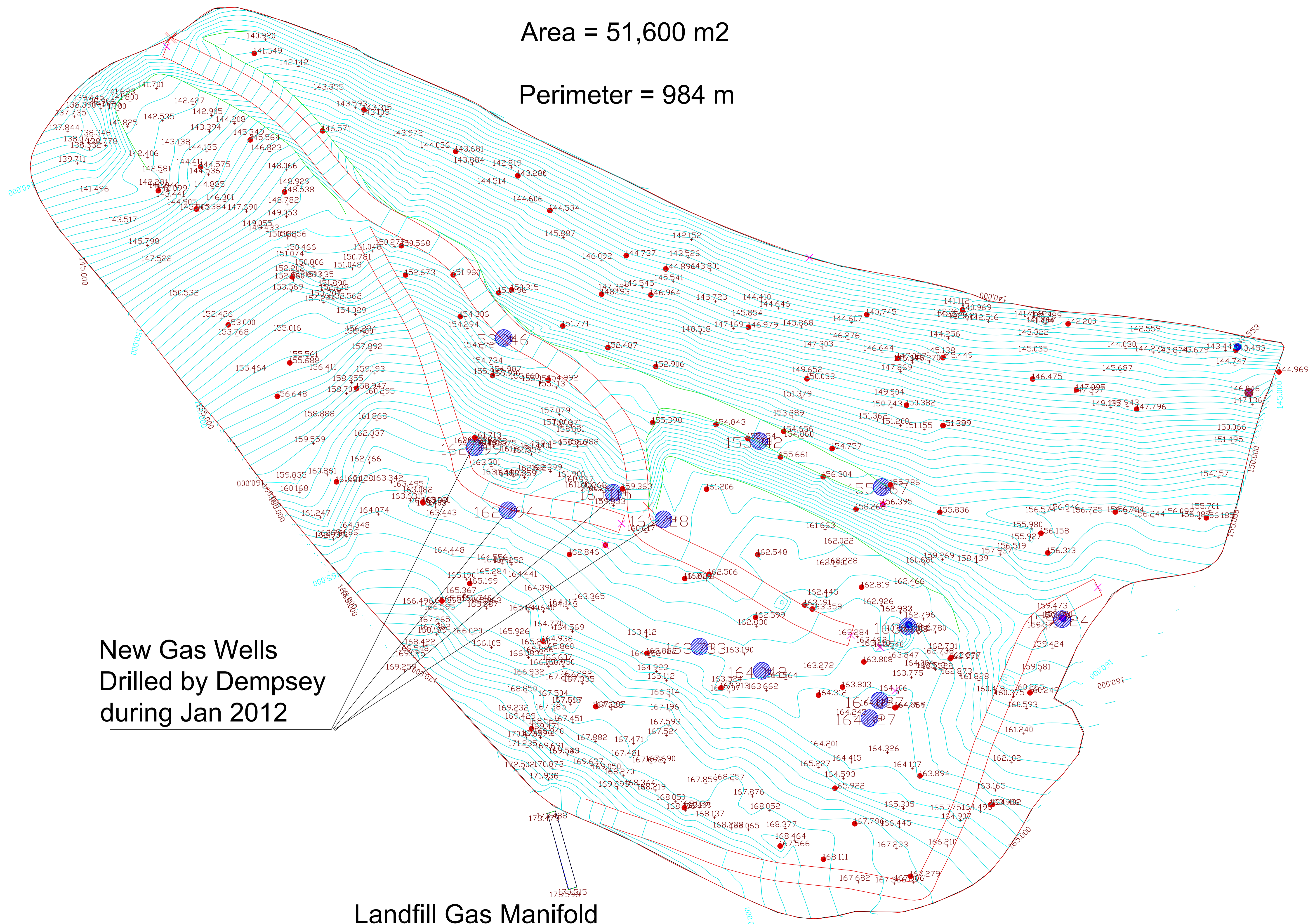
* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

APPENDIX 6.1

Topographical Survey

Area = 51,600 m²

Perimeter = 984 m



New Gas Wells
Drilled by Dempsey
during Jan 2012

Landfill Gas Manifold

APPENDIX 7.1

PRTR Returns



[Guidance to completing the PRTR workbook](#)

AER Returns Workbook

Version 1.1.13

REFERENCE YEAR	2011
-----------------------	------

1. FACILITY IDENTIFICATION

Parent Company Name	South Dublin County Council
Facility Name	Arthurstown Landfill
PRTR Identification Number	W0004
Licence Number	W0004-04

Waste or IPPC Classes of Activity

No.	class_name
3.5	Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
3.1	Deposit on, in or under land (including landfill).
3.4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
3.6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.
3.7	#####
Address 1	Arthurstown
Address 2	Kill
Address 3	Co. Kildare
Address 4	
	Kildare
Country	Ireland
Coordinates of Location	-8.10013 54.5569
River Basin District	IEEA
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	John Smith
AER Returns Contact Email Address	arthurstownlandfilla@eircom.net
AER Returns Contact Position	Facility manager
AER Returns Contact Telephone Number	045 877674
AER Returns Contact Mobile Phone Number	0868371729 0863860942
AER Returns Contact Fax Number	045 877849
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	0
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

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

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

Is it applicable?	NO
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 ?	

4.1 RELEASES TO AIR

[Link to previous years emissions data](#)

| PRTR# : W0004 | Facility Name : Arthurstown Landfill | Filename : PRTR 2011 draft_W0004_2011.xls | Return Year : 2011 |

18/04/2012 10:22

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

POLLUTANT		METHOD			Please enter all quantities in this section in KG:										QUANTITY		
No. Annex II	Name	M/C/E	Method Used		Flare 1 Emission Point 1	Flare 2 Emission Point 2	AR01 Emission Point 3	AR02 Emission Point 4	AR03 Emission Point 5	AR05 Emission Point 6	AR06 Emission Point 7	AR07 Emission Point 8	AR08 - AR10 Emission Point 9	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year	
			Method Code	Designation or Description													
08	Nitrogen oxides (NOx/NO2)	C	OTH	Flue gas analyser, Testo 350/454 MXL	1212.0	1281.0	6165.0	8871.0	6187.0	7386.0	6756.0	7917.0	17725.0	63500.0	0.0	0.0	
02	Carbon monoxide (CO)	C	OTH	Flue gas analyser, Testo 350/454 MXL	22.0	184.0	18494.0	24992.0	22300.0	19966.0	23477.0	21640.0	33595.0	164670.0	0.0	0.0	
11	Sulphur oxides (SOx/SO2)	C	OTH	Flue gas analyser, Testo 350/454 MXL	3115.0	629.0	114.0	165.0	82.0	0.0	92.0	0.0	1176.0	5373.0	0.0	0.0	
07	Non-methane volatile organic compounds (NMVOC)	C	ALT	EN 13526:2002	100.0	241.0	353.0	474.0	107.0	473.0	500.0	298.0	1183.0	3729.0	0.0	0.0	
01	Methane (CH4)	C	ALT	EN 13526:2002	53.0	116.0	11483.0	16069.0	14945.0	12778.0	16714.0	13068.0	42086.0	299444.13	0.0	172132.13	
03	Carbon dioxide (CO2)	C	OTH	Flue gas analyser, Testo 350/454 MXL	1471233.0	965758.0	2371740.0	2681561.0	2119985.0	2535697.0	2562747.0	2853405.0	7395900.0	24958026.0	0.0	0.0	

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

SECTION B : REMAINING PRTR POLLUTANTS

POLLUTANT		METHOD			Please enter all quantities in this section in KG:					QUANTITY		
No. Annex II	Name	M/C/E	Method Used		Emission Point 1	Emission Point 2	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year			
			Method Code	Designation or Description								
					0.0	0.0	0.0	0.0	0.0			
					0.0	0.0	0.0	0.0	0.0			
					0.0	0.0	0.0	0.0	0.0			
					0.0	0.0	0.0	0.0	0.0			
					0.0	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)

POLLUTANT		METHOD			Please enter all quantities in this section in KG:										QUANTITY		
Pollutant No.	Name	M/C/E	Method Used		Flare 1 Emission Point 1	Flare 2 Emission Point 2	AR01 Emission Point 3	AR02 Emission Point 4	AR03 Emission Point 5	AR05 Emission Point 6	AR06 Emission Point 7	AR07 Emission Point 8	AR08 - AR10 Emission Point 9	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year	
			Method Code	Designation or Description													
244	Total Particulates	C	ALT	ISO9096:2003	0.0	0.0	251.0	569.0	606.0	204.0	294.0	388.0	1390.0	3702.0	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:		Arthurstown Landfill			
Please enter summary data on the quantities of methane flared and / or utilised		M/C/E	Method Used		Facility Total Capacity m3 per hour
	T (Total) kg/Year		Method Code	Designation or Description	
Total estimated methane generation (as per site model)	17634650.13	C	Prediction model	Prediction model	N/A
Methane flared	42326.0	M	measured at flares	measured at flares	5000.0 (Total Flaring Capacity)
Methane utilised in engine/s	17420192.0	M	measured at engines	measured at engines	6400.0 (Total Utilising Capacity)
Net methane emission (as reported in Section A above)	172132.13	C	calculated	calculated	N/A

4.3 RELEASES TO WASTEWATER OR SEWER

[Link to previous years emissions data](#)

| PRTR# : W0004 | Facility Name : Arthurstown Landfill | Filename : PRTR 2011 draft_W0004_2011.x

16/04/2012 10:22

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					
No. Annex II	Name	M/C/E	Method Code	Method Used		Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
				Designation or Description					
06	Ammonia (NH3)	M		sewer		98.1408	98.1408	0.0	0.0
79	Chlorides (as Cl)	M	EN ISO 15682:2001			480889.92	480889.92	0.0	0.0
20	Copper and compounds (as Cu)	M	EN ISO 11885:1997			10.223	10.223	0.0	0.0
82	Cyanides (as total CN)	M	EN ISO 14403:2002			4.0892	4.0892	0.0	0.0
			EN ISO 10304-1 to						
83	Fluorides (as total F)	M	4:1995			204.46	204.46	0.0	0.0
18	Cadmium and compounds (as Cd)	M	EN ISO 5961:1995			0.1962816	0.1962816	0.0	0.0
19	Chromium and compounds (as Cr)	M	EN ISO 11885:1997			0.20446	0.20446	0.0	0.0
23	Lead and compounds (as Pb)	M	EN ISO 11885:1997			2.45352	2.45352	0.0	0.0
21	Mercury and compounds (as Hg)	M	EN 1483:1997			0.010223	0.010223	0.0	0.0
22	Nickel and compounds (as Ni)	M	EN ISO 11885:1997			112.453	112.453	0.0	0.0
24	Zinc and compounds (as Zn)	M	EN ISO 11885:1997			77.6948	77.6948	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					
Pollutant No.	Name	M/C/E	Method Code	Method Used		Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
				Designation or Description					
303	BOD	M				9200.7	9200.7	0.0	0.0
306	COD	M				511150.0	511150.0	0.0	0.0
320	Magnesium	M				18401.4	18401.4	0.0	0.0
321	Manganese (as Mn)	M				89.9624	89.9624	0.0	0.0
327	Nitrate (as N)	M				515648.12	515648.12	0.0	0.0
372	Nitrite (as N)	M				310.7792	310.7792	0.0	0.0
387	Ortho-phosphate (as P)	M				5315.96	5315.96	0.0	0.0
370	Selenium	M				0.61338	0.61338	0.0	0.0
343	Sulphate	M				26579.8	26579.8	0.0	0.0
240	Suspended Solids	M				73605.6	73605.6	0.0	0.0
351	Total Organic Carbon (as C)	M				179924.8	179924.8	0.0	0.0
301	Acetate	M				0.0	0.0	0.0	0.0
						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

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

[PRTR# : W0004 | Facility Name : Arthurstown Landfill | Filename : PRTR 2011 draft_W0004_2011.xls | Return Year : 2011]

16/04/2012 10:22

Please enter all quantities on this sheet in Tonnes

5

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility	Non	Haz Waste : Address of Next Destination Facility	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)
						Haz Waste : Name and Licence/Permit No of Recoverer/Disposer	Non Haz Waste: Address of Recoverer/Disposer						
					M/C/E	Method Used							
Within the Country	20 03 01	No	77777.58	mixed municipal waste	M	Weighed	Offsite in Ireland	Ringsend Wastewater Treatment plant,**			Dublin City Council,Ringsend Wastewater Treatment plant,Ringsend,Dublin,Ireland		

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

[Link to previous years waste data](#)

[Link to previous years waste summary data & percentage change](#)