Ballinasloe Town Council
Comhairle Bhaile Béal Atha na Slua

POLLBOY LANDFILL FACILITY

ANNUAL ENVIRONMENTAL REPORT FOR 2010

January 2011

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1 REPORTING PERIOD

The reporting period is from the 1st January 2010 to the 31st December 2010

The Waste Licence for this site for the period 1st January 2010 to 31st December 2010 was Waste Licence Reg. No. W0027-02. This landfill facility closed for acceptance of waste on 31st December 2005.

2 SITE DEVELOPMENT WORKS

2.1 PROPOSED DEVELOPMENT WORKS

The following works are proposed for 2011:

- Landfill and civic amenity facility landscaping works in accordance with Landscaping Specification to the area along the front boundary fence of the Civic Amenity Site.
- Leachate Storage: Address the recommendations of the "Review and upgrading of Leachate Management Report (October 2008)" with regard to upgrading the leachate telemetry system and the provision of additional leachate storage capacity at the landfill.
- Landfill Gas Management: Install/replace redundant landfill gas boreholes when required.

3 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

Licensed Waste Disposal and Recovery Activities were carried out in accordance with the Third and Fourth Schedules of the Waste Management Act 1996 as per Part 1 Licensed Activities of Waste Licence W0027-02. The facility accepts waste on Tuesdays, Thursdays and Saturdays between 8.30am and 4.30pm.

4 QUANTITY AND COMPOSITION OF WASTE

Tables 4.1 below outlines the categories and quantities which may be accepted for disposal and for recovery under Waste Licence W0027-02.

Table 4.1: Waste Categories and Quantities to be Accepted for Recovery

Waste Type	Maximum Quantity
Waste to be accepted for composting	Maximum Quantity of biodegradable waste which can be processed = 1,000m^3
Waste to be accepted at Civic Waste Facility (Metal, electrical and electronic waste, glass, aluminium and tin cans, waste oils, fabrics, batteries, household hazardous, fluorescent tubes can all be accepted)	Tonnage to be agreed with the Agency.

Table 4.2 provides details on the quantity and composition of waste that was accepted for recovery in 2010 at Pollboy Landfill Civic Amenity Facility.

Table 4.2: Waste Accepted at Civic Waste Facility for Recovery in 2010

EWC Code	Quantity (tonnes)	Description of waste	Hazardous waste. Y/N	Waste Treatment Operation
15 01 07	4.995	Glass Bottles and Jars	N	R13
19 12 05	3.0	Flat Glass	N	R5
20 01 40	32.2	Household Scrap Metal	N	R13
20 01 10	0.95	Clothes	N	R13
15 01 02	0.08	Polystyrene	N	R3
20 01 33	0.448	Small Batteries	Y	R6
16 06 04	0.881	Waste Alkaline Batteries	N	R4
16 06 01	3.806	Lead Acid Batteries	Y	R4
16 01 07	0.3	Oil Filters	Y	R4
20 01 27	11.362	Waste Paint	Y	D10
20 01 23	18	Fridges and Freezers	Y	R4
20 01 36	20	White Goods (Electrical and Electronic)	N	R4

EWC Code	Quantity (tonnes)	Description of waste	Hazardous waste. Y/N	Waste Treatment Operation
20 01 35	21	Televisions and PC Monitors	Y	R4
20 01 21	4	Fluorescent Tubes and Lighting	Y	D10
20 01 99	22	White Goods incl. washing machines, dryers, toasters, radios etc.	N	R4
13 02 08	4.224	Waste Oil	Y	R9
16 05 04	0.461	Waste aerosols/aerosol product	Y	D10

5 SUMMARY OF EMISSIONS AND MONITORING

Quarterly monitoring results for leachate, groundwater and surfacewater are contained in Appendix 5. A summary of emissions and monitoring during 2010 in accordance with the Waste licence is provided in the following sections.

5.1 NOISE

There were no noise surveys carried out during 2010, due to the closure of the landfill on the 31st December 2005. Noise was generated in the most part by compaction and placement machinery which are no longer operational.

5.2 DUST

There were no dust surveys carried out during the course of the year, due to the closure of the landfill on the 31st December 2005.

5.3 LANDFILL GAS

5.3.1 AFS and Hasse Flares

Approval was received from the EPA in July, 2010 that all landfill gas generated by both cells can be flared by the 1,250 m^3/hr. AFS flare and that the 850 m^3/hr. Hasse flare can be retained as a back-up flare. Hence, since October, 2010 all landfill gas generated on the landfill has been flared by the 1,250 m^3/hr. AFS flare.

5.3.2 Off Site Gas Migration

Migratory Boreholes

Appendix 1 (Drawing No. DG0001–04 F07) shows the locations of boreholes used to monitor off-site gas migration as well as the results obtained for gas emissions from these boreholes during 2010.

The emission limit values for off-site gas migration in Waste Licence W0027-02 Schedule C are 20% LEL (1% v/v) for methane and 1.5% v/v for carbon dioxide. Appendix 1 shows that all the results obtained for monitoring of off-site gas migration were within these emission limit values for methane and carbon dioxide.

5.3.3 Buildings

In November 2003 a gas monitor was placed in the main control office of the administration building at the landfill which measures the concentration of methane and carbon dioxide in the air. Neither of these parameters were detected during the reporting period.

5.3.4 Flare Emissions

Flare emissions testing on the AFS flare was carried out by Odour Monitoring Ireland on the 26th November, 2010.

The CO, NOx as NO_2, TOC, HCL/HF in the flare were within the emission limit values as per Waste License 27-2.

5.4 LEACHATE

In 2010, in the first and second quarters, three leachate sampling points were used for monitoring purposes; L14, CH1 and the leachate lagoon. In the second quarter a full suite of parameters was tested for at all three sampling points. A reduction in the number of leachate sample points was agreed with the EPA on the 24th May, 2010 (i.e. after the second quarter). Monitoring henceforth shall only be carried out on the leachate discharge from the site to the sewer i.e. lagoon outlet chamber discharge.

The samples taken at all leachate sample points were within the requirements as set out in Schedule C.5. of the Waste Licence W0027-02.

5.5 SURFACE WATER

Condition 6.6.3 of Waste License W27-2 states that 'the trigger levels for emissions to surface water at (i) outfall to Northern stream (ii) outfall to Southern stream and (iii) outfall from those areas referred to in Condition 3.14.5 are as follows:

(a) BOD: 25 mg/l
(b) Suspended Solids: 60 mg/l

Table 4.3: BOD Surface Water Results 2010

		1st Quarter (15-3-2010)	2nd Quarter (17-5-2010)	28-6-2010 (E.P.A)	3rd Quarter (27-9-2010)	4th Quarter
SW1	**BOD**	2.2	4.8	6.6	8	Note 3
SW3	**BOD**	<1	<1	1.6	<1	Note 3
SW4	**BOD**	<1	<1	<1	<1	Note 3
SW5	**BOD**	<1	<1	Note 4	Note 4	Note 4
SW6	**BOD**	2.2	7.4	Note 1	<1	Note 3
SW7	**BOD**	dry	dry	Note 4	Note 4	Note 4
SW8	**BOD**	1.6	7	7	Note 2	Note 3

Note 1 : In the E.P.A.'s own sampling of the 28-6-2010, sampling was carried out at SW1,SW3,SW4 and SW8 only. Hense, no results are shown for SW6.

Note 2 : No results were received for SW8 for the 3rd quarter. No comments were made as to reason.

Note 3 : No sampling was carried out for the fourth quarter due to the bad weather. (i.e sampler was unable to travel due to frosty road conditions).

Note 4 :The EPA agreed that monitoring henseforth should be carried out at SW1, SW2, SW3, SW4, SW6, SW8. Therefore samples are no longer required at SW5 and SW7.

Table 4.4: Suspended Solids Surface Water Results 2010

		1st Quarter (15-3-2010)	2nd Quarter (17-5-2010)	28-6-2010 (E.P.A)	3rd Quarter (27-9-2010)	4th Quarter
SW1	**Suspended Solids**	<16	18	26	268	Note 3
SW3	**Suspended Solids**	<8	35	10	<8	Note 3
SW4	**Suspended Solids**	<8	<8	<8	<8	Note 3
SW5	**Suspended Solids**	<8	<8	Note 4	Note 4	Note 4
SW6	**Suspended Solids**	<16	<8	Note 1	<8	Note 3
SW7	**Suspended Solids**	dry	dry	Note 4	Note 4	Note 4
SW8	**Suspended Solids**	<8	<16	34	Note 2	Note 3

Note 1 : In the E.P.A.'s own sampling of the 28-6-2010, sampling was carried out at SW1,SW3,SW4 and SW8 only. Hense, no results are shown for SW6.

Note 2 : No results were received for SW8 for the 3rd quarter. No comments were made as to reason.

Note 3 : No sampling was carried out for the fourth quarter due to the bad weather. (i.e sampler was unable to travel due to frosty road conditions).

Note 4 : The EPA agreed that monitoring henseforth should be carried out at SW1, SW2, SW3, SW4, SW6, SW8. Therefore samples are no longer required at SW5 and SW7.

The third quarter results show an elevated suspended solids figure of 268mg/l. It is my opinion that the elevated figure for suspended solids at SW1 is due to run-off from a field which is been filled approx. 150 metres upstream from SW1as part of the N6 roadworks. There is ponding occurring in this field and there is temporary drains allowing drainage from this field into a newly constructed drain along the new slip road which flows into sample point SW1.

Table 4.5: Ammonia Surface Water Results 2010

Monitoring Location	1st Quarter (15-3-2010)	2nd Quarter (17-5-2010)	28-6-2010 (E.P.A sampling)	3rd Quarter (27-9-2010)	4th Quarter
SW1	26	15	14	18	Note 3
SW3	0.06	0.10	0.06	0.12	Note 3
SW4	0.08	<0.03	0.05	<0.03	Note 3
SW5	0.05	<0.03	Note 4	Note 4	Note 4
SW6	14	16	Note 1	0.03	Note 3
SW7	dry	dry	Note 4	Note 4	Note 4
SW8	4.3	0.88	1.7	Note 2	Note 3

Note 1 : In the E.P.A.'s own sampling of the 28-6-2010, sampling was carried out at SW1,SW3,SW4 and SW8 only. Hense, no results are shown for SW6.
Note 2 : No results were received for SW8 for the 3rd quarter. No comments were made as to reason.
Note 3 : No sampling was carried out for the fourth quarter due to the bad weather. (i.e sampler was unable to travel due to frosty road conditions).
Note 4 :The EPA agreed that monitoring henseforth should be carried out at SW1, SW2, SW3, SW4, SW6, SW8. Therefore samples are no longer required at SW5 and SW7.

Appendix 3 (Drawing No. DG0001–05 F02) shows the positions of the seven surface water sampling locations (SW1, SW3 – SW7, SW8).

The highest results achieved for ammonia, during 2010, were at SW1 and SW6 which are both located downstream of the landfill. These readings are been investigated by landfill staff at present. However, a sample taken on the sixth of January, 2011 approximately 200 metres downstream of SW1 gave a more improved ammonia reading of 0.134mg/l [for location see Appendix 3 (Drawing No. DG0001–05 F02)]. SW8 showed a slightly elevated reading in the first quarter but this reading had reduced for the remaining sampling periods. A sample taken by Galway County Council staff in December gave a value of 0.225 mg/l at this point. The remaining monitoring locations all showed very low concentrations of ammonia for all sampling periods.

These samples were analysed for metals and volatile organic carbons (voc's) on one sampling occasion. SW1, SW3, SW6 and SW8 exceeded the limit set out for iron in S.I. 278 of 2007. SW1, SW6 and SW8 exceeded the limit set out for manganese in S.I. 278 of 2007. These results can be explained because of the sample points close proximity to the waste mass.

5.6 GROUNDWATER

Appendix 4 (Drawing No. DG0001-01 F08) shows the position of groundwater sampling locations. Sampling and analysis was carried out during the year by the EPA.

During August 2010 Dempsey Drilling replaced four existing damaged groundwater sampling wells with four new wells. The four boreholes replaced are at B8AP, MW3, RC3 and MW6.

The highest concentration of ammonia in 2010 was achieved at borehole B2AP and B8AP which is located in the vicinity of the landfill. Elevated results for ammonia were also reached at MW1, MW3, MW6 and RC3. MW6 and RC3 are also located in the vicinity of the landfill. MW1 and MW3 are located upstream of the landfill and the high result for ammonia may be due to other sources than the closed landfill. The concentrations of ammonia at all remaining boreholes are significantly reduced but are still above that expected of clean drinking water. The results showed highly elevated concentrations of Total Solids at MW6. This is most likely due to roadworks that were carried out adjacent to this sampling point.

These samples were analysed for metals and volatile organic carbons (voc's) on one sampling occasion. The results showed elevated concentrations of iron at all locations. The results show elevated concentrations of cooper at MW6, B2AP and B8A. The results showed elevated concentrations of zinc at MW6, B2AP, B8A and MW1. The results showed elevated concentrations of manganese at all locations except at RC2.

Overall the results show that there is still some level of localised pollution at this landfill.

Table 4.6: Ammonia Groundwater Results 2010

	Ammonia (mg/l N) recorded for groundwater samples taken at Pollboy landfill during 2010			
Monitoring Location	**Date**			
	1st Quarter (15-3-2010)	**2nd Quarter (17-5-2010)**	**28-6-2010 (E.P.A)**	**3rd Quarter (27-9-2010)**
B2AP	19	17	9.7	11
B8A	4.1	2.1	note 2	1
B8AP	note 1	note 3	note 2	23
RC2	1.3	1.2	1.4	1.3
RC3	8.2	note 4	note 2	8.9
MW1	7.3	7.2	note 2	7.4
MW2	1.4	note 5	7.7	0.31
MW3	note 1	note 6	note 2	9.2
MW6	8.2	7.1	note 2	3.6

Note 1 : No sample taken as this borehole was blocked at time of sampling.
Note 2 : In the E.P.A.'s own sampling of the 28-6-2010, sampling was carried out at B2AP, RC2 and MW3 only. Hense, no results are shown for B8A, B8AP, RC3, MW1, MW3 and MW6.
Note 3 : Borehole blocked.
Note 4 : Unable to sample due to damaged borehole.
Note 5 : No flow.
Note 6 : Sampler unable to locate borehole..

5.7 METEOROLOGICAL DATA

Approval was received from the EPA on the 15/07/2010 that the meteorological parameters required could be reduced to include the following parameters only:

- Precipitation Volume
- Temperature (min/max)
- Wind Force Direction
- Humidity

Approval was also received from the EPA on the 15/7/2010 that this weather data can be obtained from N6 Concessions They operate a weather station at Cappataggle, Ballinasloe. Meteorological data from Cappataggle is attached in Appendix 6.

6 RESOURCE AND ENERGY CONSUMPTION SUMMARY

100,050 units of electricity were used at the landfill during 2010.

7 LEACHATE VOLUMES PRODUCED AND TRANSPORTED OFF SITE

The following table shows the quantities of leachate pumped off-site to Ballinasloe Waste Water Treatment Plant during 2010.

Table 4.7: Quantity of Leachate Discharged via Rising Main to WWTP

Month	Quantity of leachate discharged (m^3)
January	930.5
February	876.8
March	1,430.1
April	1,399
May	1,258
June	1,116
July	1,015
August	1,014
September	1,032
October	942
November	1,618
December	90
Total Volume	**12,721 m^3**

8 REPORT ON RESTORATION OF COMPLETED CELLS AND FINAL LEVELS

The Restoration and Aftercare Plan for Pollboy Landfill was submitted to the EPA in February 2003.

9 SITE SURVEY

The most recent topographical survey, which is contained in Appendix 8, was carried out in November 2010.

10 QUANTITY OF LANDFILL GAS

A Gas Utilisation Feasibility Study for Pollboy Landfill was prepared in August 2005. As part of this study the total quantity of landfill gas generated was estimated using the GasSim Model. For comparison purposes, an estimate was also made using the "Rule of Thumb" method contained in the EPA Landfill Site Design Manual. This assumes that a tonne of waste produces 6m3 of landfill gas per year from the time of emplacement. Results are shown in Figures 10.1 and 10.2, for each modelling exercise.

Figure 5.1: Total Bulk Landfill Gas 1998 to 2035 at the 50th Percentile

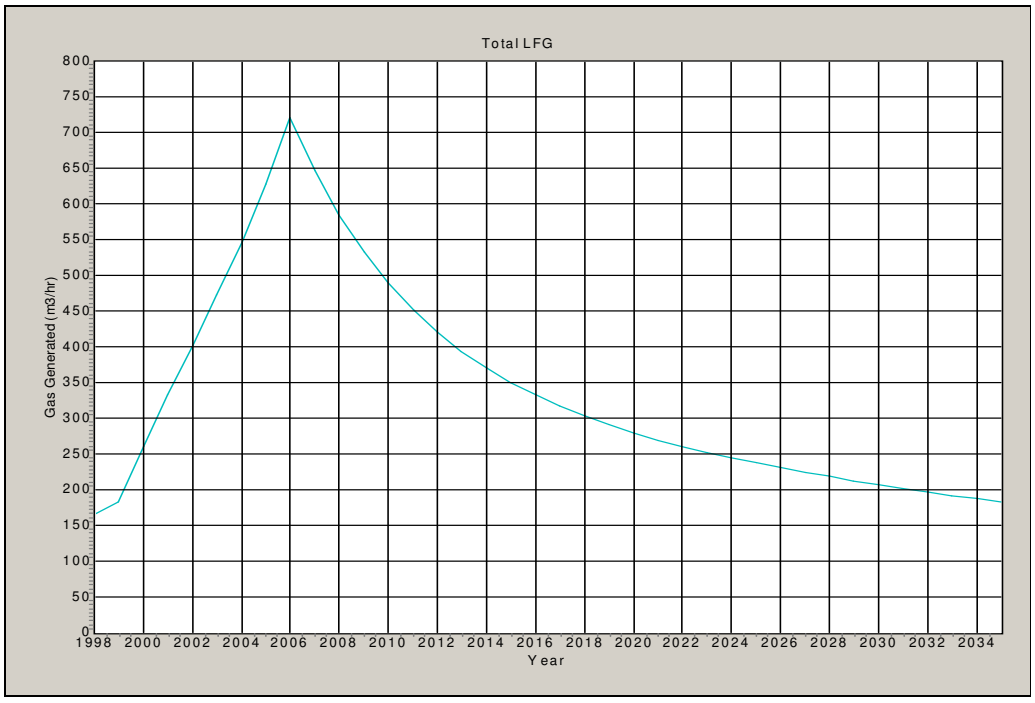
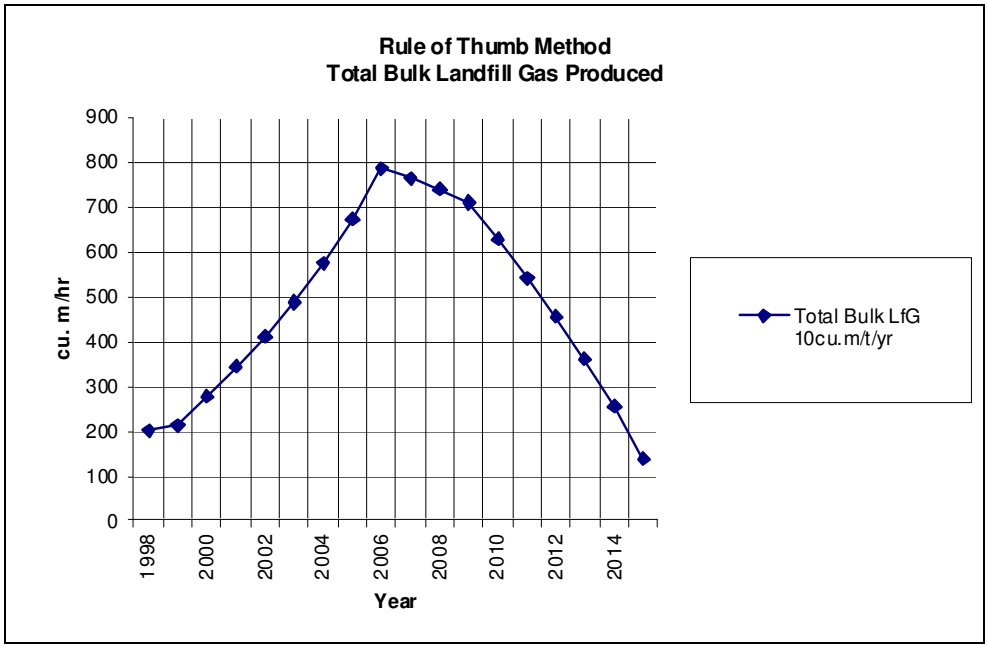


Figure 5.2: Estimation of Landfill Gas Potential using Rule of Thumb Method, 1998-2015



For 2010, a generation rate of 485 m^3/hr of landfill gas was estimated using the GasSim Model and 640 m^3/hr was estimated using the Rule of Thumb method.

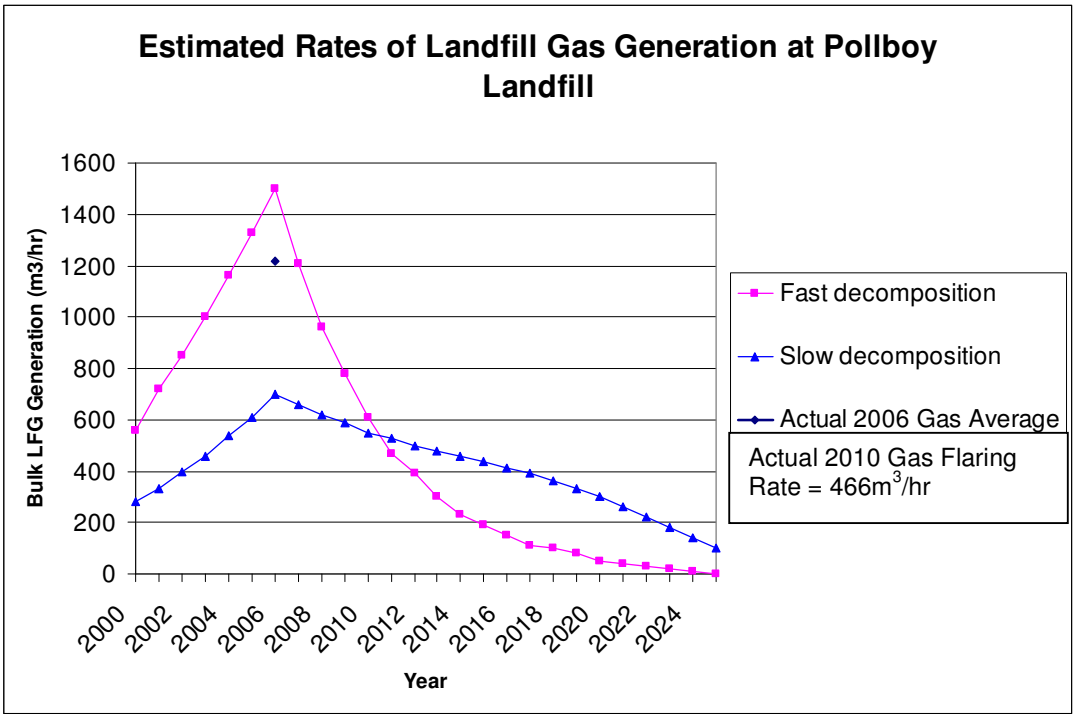
The above results are theoretical rates of landfill gas production and should be viewed with caution. Some models can over predict the quantities of gas to be generated while others can underestimate.

A landfill gas pumping trial was carried out in 2005 to demonstrate the extracted landfill gas quantity and quality that could be obtained through active gas extraction from the existing wells using the available flare on site. This trial was carried out as part of the study into the feasibility of power generation at the landfill. Estimates of future landfill gas generation rates were made by the pumping trial contractor, based on waste input data, the results of monitoring carried out during the trial and using his own in-house model. Estimates were made based on fast decomposition and slow decomposition of the waste as down in Figure 10.3. This figure demonstrates the possible variation in generation rates. Based on this model, the landfill gas generation rate at the facility in 2010 could vary between 580 and 780 m^3/hr. It is intended that we formally initialise the format for this data to investigate the purposes of the financial figures.

Based on monitoring results, the mean volume of gas flared at the facility for 2010 is as follows:

- 245 m^3/hr in the old landfill cell
- 221 m^3/hr in Cell 1

Figure 5.3: Estimated Rates of Landfill Gas Generation at Pollboy Landfill



11 WATER BALANCE CALCULATION

Factors which affect the rate of generation of leachate include precipitation, surface run-off, evapotranspiration, moisture released and absorbed in waste, moisture used during decomposition and vapour contained in gas. Of these, precipitation, surface run-off and evapotranspiration are the major contributors.

The model of the water balance for leachate generation can be represented mathematically as follows:

L_o =[(ER.A)+LIW+IR]-[aW+MCW]

where:

L_o	=	Free leachate produced
ER	=	Effective rainfall i.e. actual rainfall minus [potential evapotranspiration plus soil moisture deficit]
A	=	Area of cell
LIW	=	Liquid Industrial Waste (e.g. sludge)
IR	=	Infiltration (from restored areas only)
aW	=	Absorption capacity of waste
MCW	=	Moisture Consumption of Waste

For the purposes of this estimation, the contributions due to Liquid Industrial Waste, Absorption Capacity of Waste and the Moisture Consumption of Waste have been ignored.

Capping of a landfill typically reduces rainwater infiltration into the waste by up to 90%. For the purposes of this estimation, a reduction of 85% has been assumed. Based on an annual precipitation of 923mm/year and an annual evapotranspiration of 454mm/year, leachate generation from the landfill was estimated for the current landfill scenario of old landfill (unlined) and Phase 1(lined) cells – both are capped.

The Water Balance Calculation is contained in Appendix 7.

12 ENVIRONMENTAL MANAGEMENT

12.1 REVIEW OF OBJECTIVES AND TARGETS SET OUT FOR 2010

Objective 1: Restoration and Aftercare of the Landfill (Landscaping)

Reason for Undertaking Project: To protect the surrounding environment and integrate the site with the surrounding landscape.

Target: To complete landscaping works in accordance with Restoration Plan

Responsibility: The Landfill Facility Manager is responsible for the implementation of this project.

Progress: A landscaping specification was prepared in October 2008. Landscaping/planting is proposed to be carried out in Spring 2011.

Objective 2: Landfill Gas Management

Reason for undertaking project: To further improve landfill gas and odour control at the facility.

Target: To install / replace redundant landfill gas boreholes where required

Summary: Wells providing low/no gas to the system will be disconnected and new wells will be installed.

Responsibility: The Landfill Facility Manager is responsible for the implementation of this project.

Progress: No new gas wells were installed during the year.

12.2 SCHEDULE OF OBJECTIVES AND TARGETS FOR 2011

Objective 1: Restoration and Aftercare of the Landfill

Reason for Undertaking Project: To protect the surrounding environment and integrate the site with the surrounding landscape.

Target: To ensure completion of topsoiling and landscaping works

Responsibility: The Landfill Facility Manager is responsible for the implementation of this project.

Timescale: The topsoiling and landscaping works will be carried out in Spring to coincide with the best season for planting

Objective 2: Landfill Gas Management

Reason for undertaking project: To further improve landfill gas and odour control at the facility.

Target: To install / replace redundant landfill gas boreholes where required

Summary: Wells providing low/no gas to the system will be disconnected and new wells will be installed.

Responsibility: The Landfill Facility Manager is responsible for the implementation of this project.

Timescale: The installation of new gas wells will be carried out during the year as the need for additional wells is identified.

Objective 3: Leachate Management Upgrade

Reason for undertaking project: To improve the efficiency of leachate management

Target: Explore additional storage capacity options and upgrade telemetry system to reduce pumping, operational and staff overtime costs

Summary:

1) **Leachate Sampling**

Extensive sampling of leachate from CH1, CH2, CH6, the leachate lagoon and WWTP influent and effluent has been carried out. This sampling was required for the treatment process modelling at the WWTP. Preliminary treatment process modelling for the Waste Water Treatment Plant has also been completed. This process is necessary to determine the optimum treatment regime and to allow recommendations to be made with regard to additional storage and pre-treatment options.

2) **Additional Leachate Storage**

Additional leachate storage is required for the contaminated groundwater currently being collected and pumped from the leachate interceptor drain around the perimeter of the old landfill cell.

Options for providing additional leachate storage capacity at the landfill to be explored.

3) **Telemetry**

Existing telemetry system to be upgraded to reduce pumping, operational and staff overtime costs.

Responsibility: The Landfill Facility Manager is responsible for the implementation of this project.

Timescale: Meeting to be held between Galway County Council and RPS Consultants to discuss results and how best to progress the above items.

13 SUMMARIES OF REPORTED INCIDENTS & COMPLAINTS

There were no complaints registered with the landfill in 2010. All incidents at the landfill concerned emission limit exceedences which are summarised in Section 5.

14 REVIEW OF NUISANCE CONTROLS

14.1 ODOUR

Odour management at the facility has significantly improved since 2005, as a result of the following works being carried out:

- Installation of temporary clay capping immediately following cessation of filling.
- Installation of permanent capping system incorporating, inter alia, an LLDPE membrane and landfill gas drainage geocomposite layer.
- Installation of additional landfill gas collection wells in Cell 1.
- Use of two flares for gas management and control.
- Reinstatement of gas management system on old landfill.

14.2 VERMIN

ISS (Pest Control), Letterkenny were contracted to control the vermin on the site for the first half of 2010. Pestguard took over from ISS in the Summer of 2010 to carry out a program of monitoring and control at the facility. External bait boxes are located around the facility and internal bait boxes are located in the office buildings. The bait boxes are checked on a four weekly basis and more frequently when required.

14.3 FIRES

An Emergency Response Procedure has been prepared in consultation with the Assistant Chief Fire Officer and approved by the EPA. A risk assessment of environmental pollution caused by contaminated firewater has been carried out. Any fires will be treated as an incident and will be reported to the fire station immediately.

15 REPORT ON FINANCIAL PROVISIONS

A total of €18 million (ex. VAT) has been set aside for the 30 year restoration and aftercare of Pollboy Landfill from 2005 onwards.

Landfill Expenditure in 2010 was €317,869.97. Operating Costs for the Civic Amenity Facility in 2010 were €73,680.

16 MANAGEMENT STRUCTURE

The management structure at Pollboy Landfill is as follows:

Mr. Tony McInerney: Senior Executive Engineer, Environment Section, Galway County Council, with overall responsibility for management of the Pollboy Landfill Facility.

Mr. Kevin Mulrennan:. Kevin Mulrennan, Environment Section, Galway County Council manages operations at Pollboy landfill.

17 PROGRAMME FOR PUBLIC INFORMATION

The Communication Procedure outlines the programme for public information.

All details of the Community Liaison Committee will be provided and kept on file and will include details of meetings (dates of meetings, actions arising etc.) between the licensee and representatives of local residents.

The Council will also ensure that access to environmental information on the landfill facility will be readily available in accordance with Council Directive 90/313/EEC on Freedom of Access to Information on the Environment, which came into effect in Ireland in May 1993.

Appendix 1

Drawing of Location of Gas Migration Boreholes and Landfill Gas Emissions from Boreholes

Appendix 2
Drawing of Leachate Monitoring Points

Appendix 3
Drawing of Surface Water Monitoring Points

Appendix 4
Drawing of Groundwater Monitoring Points

Appendix 5

Quarterly Monitoring Results for Leachate, Surface water and Groundwater

First Quarter Results (Q1)

Second Quarter Results (Q2)

Third Quarter Results (Q3)

Appendix 6
2010 Meteorological Data

Weather Data 2010

Date	Mean Wind Speed (m/s)	Mean Relative Humidity (%)	Max Air Temp (°C)	Min Air Temp (°C)	Mean Air Temp (°C)	Mean Wind Direction (°)	Rain Intensity Daily Total (mm)	Precipitation Amount (mm)
01/01/2010	1	90.43	1.4	-4.7	-1.58	294.62	0	0
02/01/2010	2.21	86.88	4	-2.2	0.49	260.96	0	0
03/01/2010	2.94	82.47	3	-2.7	0.07	111.2	0	0
04/01/2010	1.78	90.08	1.5	-5.6	-1.3	261.29	0	0
05/01/2010	1.52	92.14	1.8	-1.9	-0.03	276.1	0.23	0.3
06/01/2010	1.39	79.94	2.3	-4.5	-1.16	98.95	0	0
07/01/2010	0.87	91.47	2.9	-5.7	-2.39	220.08	0	0
08/01/2010	0.63	97.48	-3.6	-6	-4.92	147.02	0	0
09/01/2010	0.26	97.15	-1.1	-9.7	-4.88	162.54	0.1	0.1
10/01/2010	2.1	95.08	1.2	-6	-1.19	74.17	0	0.1
11/01/2010	1.83	96.28	2	-0.8	0.8	102.52	0.54	0.5
12/01/2010	5.11	91.13	3.7	0.1	1.85	114.21	4.92	4.5
13/01/2010	1.15	98.72	3.4	0.1	1.28	123.3	0.68	5.2
14/01/2010	0.98	96.64	5.6	0.3	2.22	163.97	0	0.5
15/01/2010	2.69	90.36	10.5	6.1	8.06	175.48	2.56	3.3
16/01/2010	2.35	87.44	9.9	3	5.68	226.83	0.17	3.8
17/01/2010	2.29	87.2	9.2	2.9	6.15	242.07	0	0.5
18/01/2010	1.74	91.3	10.5	2.1	6.39	198.52	0	0
19/01/2010	3.81	86.68	7.4	4	6.09	131.4	2.67	1.8
20/01/2010	1.12	91.03	9.7	0.6	4.91	212.33	0.7	2.6
21/01/2010	3.16	92.2	10.5	0.4	7.04	160.25	1.41	2.2
22/01/2010	0.99	91.59	9	0	4.29	240.81	0	2.2
23/01/2010	0.58	99.21	1.8	-2.6	-0.3	222.17	0	0
24/01/2010	0.65	99.76	1.8	-3.4	-0.4	182.43	0	0
25/01/2010	0.63	98.32	4.5	-2.3	0.79	150.51	0	0
26/01/2010	0.51	95.64	6.1	-3.5	0.28	203.24	0	0
27/01/2010	2.96	92.84	9.9	1.5	6.07	270.27	0	0.1
28/01/2010	3.49	87.57	8.6	4.9	6.52	275.21	0.03	0.1
29/01/2010	2.17	89.67	7.9	1.3	4.41	267.55	1.17	1.3
30/01/2010	1.29	89.17	4.6	-0.6	1.17	289.26	0	1.3
31/01/2010	1.86	90.01	4.7	-0.7	1.39	288.78	0.21	0.1
01/02/2010	2.63	88.63	7.1	-0.4	3.87	256.19	0	0.1
02/02/2010	2.95	92.16	8.9	5.6	7	249.8	2.16	1.3
03/02/2010	2.32	92.37	9.5	3	5.2	176.85	2.98	2.7
04/02/2010	2.08	93.82	9.5	1	5.23	135.55	4.77	8.2
05/02/2010	2.11	89.18	8.4	2.4	5.12	99.22	0	8.2
06/02/2010	1.07	97.32	4.7	-0.2	2.46	184.54	0	0
07/02/2010	2.71	92.22	7.3	2.7	4.42	110.83	0	0
08/02/2010	2.66	83.78	4.8	1	3.31	83.11	0	0
09/02/2010	2.08	74.17	5	-1.9	2.35	71.39	0	0
10/02/2010	0.83	78.43	4.7	-3.7	-0.29	192.96	0	0
11/02/2010	0.71	82.8	5.4	-4.7	0.05	234.76	0	0
12/02/2010	1.05	84.94	6.6	-1.8	2.56	145.53	0	0

13/02/2010	0.67	88.72	5.2	-1.6	1.55	188.66	0	0
14/02/2010	1.6	90.04	7.1	-2.1	2.4	273.43	0	0
15/02/2010	3.48	88.33	8.2	1.6	4.88	266.86	0.1	0.4
16/02/2010	1.9	89.13	6.2	-0.9	2.35	211.33	0.27	0.4
17/02/2010	1.41	89.9	5.4	-2.1	1.26	94.86	0	0.3
18/02/2010	1.18	87.88	5.9	-3	0.88	247	0	0
19/02/2010	1.9	87.57	5.9	-1.7	1.47	275.1	0	0
20/02/2010	1.05	93.51	4.8	-3.9	0	215.14	0.07	0.1
21/02/2010	1.05	96.17	3	-2.2	-0.3	155.13	0	0.1
22/02/2010	1.73	91	4.3	-3.7	-0.62	69.77	0.03	0
23/02/2010	3.37	87.22	3.1	-1.7	0.56	81.68	3.36	3.1
24/02/2010	1.56	93.68	3.7	0.4	1.96	88.54	1.33	3.8
25/02/2010	1.27	87.86	5.7	-1	2.41	288.2	0.03	0.7
26/02/2010	3.41	87.44	7	2.3	3.76	257.54	1.47	0.7
27/02/2010	1.12	79.33	8.2	-1	3.83	139.82	0	1.2
28/02/2010	1.77	84.65	8.3	-1.8	2.92	269.28	2.1	2.5
01/03/2010	0.68	78.1	9.2	-2.8	2.5	231.03	0	2.5
02/03/2010	1.48	81.85	8.1	-1.9	2.83	151.33	0	0
03/03/2010	1.32	88.6	5.4	0.7	4.07	129.67	15.99	15.6
04/03/2010	1.45	83.25	8.1	-2.1	2.21	105.1	0	15.6
05/03/2010	0.67	80.97	9.9	-2.4	3.03	230.77	0	0
06/03/2010	0.88	81.82	8.5	-1.5	3.62	151.71	0	0
07/03/2010	1.57	77.24	6.8	-1.7	2.43	141.54	0	0
08/03/2010	1.5	67.66	7.5	-5.1	1.15	108.36	0	0
09/03/2010	0.72	65.5	9.2	-4.5	1.92	219.15	0	0
10/03/2010	1.12	75.17	8.6	-3.8	2.32	206.58	0	0
11/03/2010	1.34	74.18	8.9	-2.5	3.47	234.83	0	0.3
12/03/2010	1.77	79.92	9.9	4	6.89	186.49	0	0.4
13/03/2010	1.21	76.9	9.9	4.6	6.68	279.14	0	0
14/03/2010	2.15	77.5	11.4	0.9	6.21	277.01	0.03	0.2
15/03/2010	1.52	73.05	10.3	2.7	6.19	257.66	0	0.2
16/03/2010	2.2	78	9.8	0.4	5.93	150.76	0.2	0.2
17/03/2010	2.67	79.13	14.4	7.3	10.53	217.13	0.03	0.2
18/03/2010	5.35	78.82	14.1	8.8	10.89	217.65	1.53	1
19/03/2010	2.22	81.02	10.4	5	7.53	168.13	11.83	6.5
20/03/2010	1.21	75.41	12.4	4.6	7.54	150.85	0	10.2
21/03/2010	2.22	75.44	12.7	3.7	8.13	226.45	6.37	0.2
22/03/2010	4.51	76.82	10.8	3.2	7.6	234.89	1.4	7.6
23/03/2010	1.96	82.75	9.8	2.2	7.01	166.45	20.14	2.8
24/03/2010	2.75	76.67	11.8	6	8.82	176.67	12.77	17
25/03/2010	2.85	83.04	12.7	6	9	112.19	14.78	15.2
26/03/2010	0.88	83.72	13.3	4.3	8.43	185.81	0	17.8
27/03/2010	2.83	78.28	10.9	4.6	7.85	275.68	0.73	0.7
28/03/2010	1.55	73.35	10.9	4.3	7.32	224.26	6.66	0.7
29/03/2010	3.19	89.85	5.3	0.5	3.69	82.41	49.22	43.9
30/03/2010	3.63	90.28	4.2	0.6	2.87	245.49	14.12	49.6
31/03/2010	3.01	77.78	6.8	1.1	3.46	236.99	2.43	16.4
01/04/2010	2.45	74.26	9.5	1.2	5.12	237	0	1.3
02/04/2010	2.43	84.76	9.9	2.5	5.55	117.15	10.1	7.8
03/04/2010	1.74	83.36	9.6	2.3	5.34	148.42	2	7.8

04/04/2010	3.17	76.94	9.2	0.6	5.25	247.14	15.86	7.9
05/04/2010	4.83	84.85	13.1	7.8	10.32	227.75	36.77	15.1
06/04/2010	1.57	87.17	11.6	6.3	8.01	247.34	10.74	32.4
07/04/2010	3.27	77.08	11.6	3.9	7.66	266.42	0	11.3
08/04/2010	1.86	79.38	13.2	4	8.8	238.06	0.2	0
09/04/2010	1.31	73.72	14.9	4.5	9.38	166.83	0	0
10/04/2010	1.41	69.29	17.6	4.7	10.36	136.9	0	0
11/04/2010	0.87	67.17	18.7	2.5	11.97	119.81	0	0
12/04/2010	1.56	65.25	17	4	11.18	92.64	0	0
13/04/2010	1.98	70.93	15.4	3.7	10.21	121.21	0	0
14/04/2010	2.3	68.07	12.5	5.2	8.95	86.18	0	0
15/04/2010	2.17	76.11	14	2	8.29	110.69	0	0
16/04/2010	1.11	70.42	15.6	2.7	9.34	141.26	0	0
17/04/2010	0.95	75.35	13.7	2.7	8.52	266.71	0	0
18/04/2010	0.9	75.18	12.7	3.6	8.51	244.31	2.2	0.9
19/04/2010	1.61	66.79	12.1	4.4	8.03	153.51	0	2.6
20/04/2010	1.52	66.33	11.5	2.1	7.05	201.73	0	0
21/04/2010	1.34	57.75	12.4	-0.4	6.88	134.81	0	0
22/04/2010	1.01	60.56	13.5	3.4	8.7	154.4	0	0
23/04/2010	1.42	61.9	16.1	6.1	10.94	196.63	0	0
24/04/2010	2.18	79.51	15.6	4.9	9.96	139.17	2.78	1.7
25/04/2010	3.65	81.9	15.7	10.1	12.36	245.82	0.53	3.1
26/04/2010	1.86	77.38	17.1	9	12.76	234.01	0	1.7
27/04/2010	2.44	81.4	16.1	9.3	12	186.85	12.62	5.5
28/04/2010	3.58	81.33	17.1	10.6	12.99	228	2.29	10.8
29/04/2010	3.48	77.39	13.3	7.4	10.44	259.47	1.83	1.1
30/04/2010	2.08	82.21	13.9	7.7	10.19	260.03	2.53	7
01/05/2010	1.65	81.75	12.7	6.8	9.14	197.67	6.24	8.6
02/05/2010	1.71	76.51	12	5.1	8.18	127.53	1.8	8.6
03/05/2010	1.52	70.11	12.8	2.5	7.9	177.61	0	2.4
04/05/2010	1.3	74.21	12.7	3.2	8.45	241.33	0.43	0
05/05/2010	2.11	83.4	16.3	8.4	11.66	265.68	1.03	1.3
06/05/2010	2.08	78.38	14.6	9.7	12.16	87.74	0	1.5
07/05/2010	2.84	69.93	11.8	4.8	8.91	58.32	0	0
08/05/2010	2.98	56.53	15.1	2.5	9.25	72.86	0	0
09/05/2010	1.59	68	14	1.7	8.86	123.99	0	0
10/05/2010	2.17	63.89	11.3	2.8	7.54	97	0	0
11/05/2010	1.39	72.56	11.5	1	6.44	249.03	4.22	3.1
12/05/2010	1.41	65.67	11.6	0.5	7.21	157.22	0	3.1
13/05/2010	2.59	78.21	12.2	5.8	8.84	246.9	2.93	0.5
14/05/2010	2.12	72.25	14.7	4.4	9.6	272.63	0	0.9
15/05/2010	3.86	69.31	14	6.4	10.22	267.9	1.72	2.4
16/05/2010	2.64	72.15	14.3	3.8	9.28	269.68	0	2.4
17/05/2010	1.92	71.93	15.3	5.8	11	246.78	0.1	0
18/05/2010	1.8	86.53	13.9	8	11.66	182.28	7.36	7.2
19/05/2010	2.04	87.66	19	11.5	14.49	244.73	0	7.3
20/05/2010	1.01	78.79	23	13.6	17.86	211.23	10.97	9
21/05/2010	0.93	80.26	22	13.4	17.6	200.3	0	9.2
22/05/2010	1.04	70.13	25	10	17.99	149.89	0	0
23/05/2010	0.89	65.96	24.7	2	17.62	198.52	0	0

24/05/2010	2.04	72.32	19.6	10.8	14.46	85.76	0	0
25/05/2010	2.52	63.96	17.1	6.1	11.8	56.53	0	0
26/05/2010	2.11	63.51	15.8	4.9	10.22	78.01	0	0
27/05/2010	2.99	70.48	14	4.3	9.5	275.45	0.36	0.5
28/05/2010	1.46	72.5	15.2	4.4	10.8	222.22	15.73	3.6
29/05/2010	1.68	88	13.9	2	11.37	151.86	2.93	11.8
30/05/2010	1.42	71.07	16.2	6.5	11.58	284.25	0	5.5
31/05/2010	1.78	74.86	17.1	10.7	13.46	157.82	20.63	15.3
01/06/2010	3.09	80.13	17.5	11.2	14.01	261.26	0	20.6
02/06/2010	1.19	71.01	20.6	9.2	14.91	208.09	0	0
03/06/2010	2.19	66.01	20.2	10.6	15.69	140.46	4.74	0
04/06/2010	2.01	70.48	20.4	12.4	15.82	210.26	0	1
05/06/2010	1.85	75.32	19.3	9.8	14.7	261.75	7.9	0
06/06/2010	1.89	74.57	19.7	11.3	14.52	276.74	0.33	10.3
07/06/2010	2.33	86.72	15.6	10.9	12.91	134.32	18.05	15.3
08/06/2010	2.36	93	14.4	12.1	13.19	60.21	17.2	15.4
09/06/2010	2.75	89.15	15.4	11.5	12.86	66.73	1.33	13.4
10/06/2010	2.22	74.27	19.6	8.3	13.83	87.66	0	7.4
11/06/2010	1.9	77.9	18.6	8.7	12.95	233.83	0	0
12/06/2010	1.93	68.1	17.7	11	13.64	283.6	0.57	0.1
13/06/2010	2.52	79.89	15.4	10.1	12.76	275.5	11.73	7.4
14/06/2010	1.51	75.49	19.4	10	14.11	201.59	0	7.4
15/06/2010	1.08	68.23	22	8.4	15.08	181.77	0	1.6
16/06/2010	1.33	75.43	20.9	9.9	15.48	278.33	0	0
17/06/2010	1.08	68.45	22.2	13.1	17.39	154.72	0	0
18/06/2010	1.28	75.65	19.2	11.3	15.14	263.78	0	0
19/06/2010	1.7	66.66	20.3	7.5	13.74	146.93	0	0
20/06/2010	1.18	61.11	22.7	5.9	14.86	247.47	0	0
21/06/2010	1.7	66.73	23.8	8.4	16.14	250.66	0	0
22/06/2010	1.57	71.07	20.9	11.3	16.43	222.66	0	0
23/06/2010	2.62	77.54	19.5	13.7	16.55	247.32	1.8	1.5
24/06/2010	2.13	72.75	20.3	13.4	16.04	263.12	0	1.5
25/06/2010	1.2	73.06	20.8	11.4	16.69	189.83	0.1	0.4
26/06/2010	2.13	68.03	21.8	13.6	17.65	216.22	0	0.7
27/06/2010	3.71	69.51	20.3	13.7	16.66	241.49	7.56	0.8
28/06/2010	1.58	89.17	19.8	12.1	15.9	223.34	10.94	21.5
29/06/2010	1.05	68.93	21	12	16.79	257	0	1
30/06/2010	1.96	78.51	21.5	13.4	16.65	202.76	32.99	14
01/07/2010	3.48	73.83	20.3	14.4	17.39	215.71	0	29.4
02/07/2010	4.14	74.18	18.8	12.5	15.27	241.71	0.4	1.8
03/07/2010	3.52	73.14	18.3	12.2	14.96	246.88	3.17	2
04/07/2010	5.85	74.42	18.5	12.9	15.92	252.24	0	2.1
05/07/2010	3.17	70.83	18.6	10.8	14.23	269.29	0.8	2.1
06/07/2010	2.61	84.28	19.3	10	14.19	229.97	1.64	2.3
07/07/2010	5.29	70.37	18.3	12.5	15.26	251.35	0	2.9
08/07/2010	2.5	82.28	17.5	11.1	13.98	218.93	3.94	3.8
09/07/2010	1.93	86.44	16.9	12.8	14.59	178.66	35.2	28.5
10/07/2010	1.99	92.22	18.3	12.5	15.19	120.37	15.57	31.9
11/07/2010	2.88	77.49	17.1	10.5	13.69	248.87	6.65	15.6
12/07/2010	0.88	70.66	19.7	10.7	15.55	162.94	0	5.9

13/07/2010	2.47	84.59	17.6	12.7	14.8	116.39	10.52	5
14/07/2010	2.28	86.79	19.4	14	15.9	110.79	20.81	8.6
15/07/2010	3.09	85.83	18.4	13.5	15.31	249.08	9.31	6.4
16/07/2010	3.26	75.6	16	11.4	13.88	281.08	0.47	14.9
17/07/2010	3.69	74.18	17.8	11.5	14.36	249.61	9.23	4.6
18/07/2010	2.48	87.58	19.6	13.7	16.9	241.18	6.17	7.8
19/07/2010	2.46	79.81	20.4	13.8	17.5	239.72	2.33	7.8
20/07/2010	1.37	78.23	18.3	10.8	15.28	224.9	28.23	8.3
21/07/2010	1.51	92.19	16.7	12.4	13.38	234.28	21.43	24.9
22/07/2010	1.92	75.08	19.5	11.2	14.62	103.61	0	23.9
23/07/2010	1.37	76.15	18.2	8.3	13.9	250.96	1.17	0.5
24/07/2010	2.77	86	18.9	13.5	15.7	238.31	0	1
25/07/2010	3.75	87.56	20.6	14.6	17.2	264.94	0	0
26/07/2010	4.16	88.51	21.6	15.3	17.4	264.2	1.1	0
27/07/2010	3.73	80.54	18.1	13.7	15.41	265.43	0.36	0.7
28/07/2010	2.57	80.73	17.7	12.8	14.94	276.93	0	2.1
29/07/2010	1.49	79.77	17.5	13.2	15.13	270.82	4.54	2.2
30/07/2010	2.67	86.97	18.9	13.5	16.41	255.41	0.83	3.7
31/07/2010	3.13	81.89	17.4	13.1	14.95	268.83	1.4	3.7
01/08/2010	1.41	80.28	18	12.8	15.01	276.17	0	1.4
02/08/2010	1.41	82.78	16.4	10.2	13.88	264.07	1.73	1.2
03/08/2010	2.6	84.13	16.4	11.6	14.23	262.36	9.4	4.6
04/08/2010	2.47	79.66	18.3	11.2	14.24	267.74	0.2	11.6
05/08/2010	2.87	79.03	17.6	12.9	14.75	256.37	7.52	1.5
06/08/2010	4.11	89.32	16.6	13.4	14.78	252.58	4.46	4.7
07/08/2010	1.92	78.42	18.1	13.1	15.32	270.54	0	1.6
08/08/2010	1.75	78.47	18.5	8.5	14.38	245.24	2.5	0.6
09/08/2010	3.22	77.89	17.3	11.4	14.83	262.06	0.2	1.6
10/08/2010	2.63	72.41	19.5	11.7	15.14	274.77	0	0.9
11/08/2010	1.84	82.72	17.2	10.4	13.92	280.28	4.13	1.6
12/08/2010	2.04	81.92	17	12	14.01	289.08	5.76	3.4
13/08/2010	1.59	80.24	16.9	11.6	13.82	251.07	2.33	3.6
14/08/2010	0.84	84.35	16.5	11.8	13.52	281.15	0	1.8
15/08/2010	1.06	76.51	22.9	7.5	15.29	247.31	0.4	1.8
16/08/2010	1.35	89.39	16.1	10.3	14.25	228.54	4.34	4.9
17/08/2010	2.49	78.26	17.1	10.5	14.46	277.88	2.23	4.9
18/08/2010	4.18	82.04	17	11.4	14.05	255.69	10.94	4.1
19/08/2010	1.96	87.3	18	11.2	14.21	180	3.9	6.6
20/08/2010	4.28	77.99	19.1	13	17.15	237.94	0.03	3
21/08/2010	2.95	82.67	19.4	12.4	14.91	247.32	0.2	3.1
22/08/2010	1.63	84.24	19.3	9.2	14.18	228.28	18.6	3.4
23/08/2010	2.87	79.43	16.6	11.3	13.69	252.35	0	5.3
24/08/2010	3.61	77.06	16.5	9	13.18	274.75	0.63	5.3
25/08/2010	1.57	80.49	17.4	4.7	11.22	124.76	0	0.7
26/08/2010	1.55	77.32	18.9	5.7	12.31	142.57	0.2	0
27/08/2010	1.51	74.13	18.5	8.1	13.3	282.01	0	0
28/08/2010	2.87	75.53	18.1	9	13.42	276.5	0.77	0.1
29/08/2010	2.4	71.44	17.5	7.3	13.79	212.15	0	0.4
30/08/2010	1.05	69.15	18.4	4.3	11.41	196.39	0	0.4
31/08/2010	1.1	74.23	19.5	4.8	12.42	149.59	0	0

01/09/2010	1.38	74.96	20.6	9.2	14.6	141.54	0	0
02/09/2010	1.53	72.01	22.4	8.9	15.21	140.76	0	0
03/09/2010	1.92	76.35	22	9.3	15.13	142.54	2.43	0
04/09/2010	1.78	82.1	21.3	13.5	17.22	187.79	2.96	4.9
05/09/2010	2.46	85.65	19.5	12.4	15.95	141.47	33.72	7.9
06/09/2010	2.14	92.5	17.3	13.3	15.4	173.47	52.2	32.9
07/09/2010	1.79	88.96	16.5	12.1	13.49	225.58	1.29	42.4
08/09/2010	2.77	85.49	17.9	11.9	14.42	220.49	0	18.5
09/09/2010	2.57	87.38	18.2	12	14.66	237.18	31.46	24.5
10/09/2010	2.47	88.25	18.5	14	16.57	253.27	2.3	35.9
11/09/2010	2.68	83.62	17.3	10.6	13.9	265.23	0	3.8
12/09/2010	3.27	82.65	16.1	9.1	13.35	258.25	9.23	3.8
13/09/2010	5.98	91.22	18.1	14	16.04	251.37	7.33	8.6
14/09/2010	4.37	70.48	16.3	10.2	13.6	274.73	0.1	0.7
15/09/2010	3.84	79.83	16.7	10.1	12.68	277.55	0	0.7
16/09/2010	1.97	81.21	17.1	10	12.35	282.23	0.8	1.3
17/09/2010	1.14	78.76	15	7.1	10.78	267.03	6.32	1.3
18/09/2010	2.77	89.21	15	6.6	11.27	233.23	3.7	2.9
19/09/2010	3.57	87.67	17.2	13.6	14.77	248.36	0	4
20/09/2010	3.57	80.84	19	13.4	16.08	241.65	0	0.7
21/09/2010	1.9	83.49	19.5	12.8	15.58	158.37	21.61	0.8
22/09/2010	1.86	88.9	18.6	12.7	15.41	214.83	6.26	17.2
23/09/2010	2.03	86.6	15.7	11.4	13.04	254.46	0.5	9.8
24/09/2010	1.59	75.11	13.4	8.4	10.83	96.1	0	0.7
25/09/2010	1	67.56	12.7	7.8	9.71	157.11	0	0
26/09/2010	0.96	71.4	11.8	7.7	9.54	152.33	0	0
27/09/2010	1.73	77.66	15.4	6.3	10.72	128.77	2.04	0
28/09/2010	1.6	86.63	13.9	8.5	11.71	199.83	0.23	3
29/09/2010	1.63	81.64	16.6	5.5	10.61	233.63	1.3	3
30/09/2010	1.43	84.81	15.3	7.8	11.37	170.67	5.98	1.5
01/10/2010	3.76	77.15	14.2	9	12.43	218.17	0.83	5.4
02/10/2010	1.97	78.78	14.9	9.3	11.54	194	0	3.9
03/10/2010	1.98	81.71	16.4	6.6	11.33	232.48	3.63	0.6
04/10/2010	2.94	81.85	15	7.5	11.29	232.56	1.87	2.7
05/10/2010	3.09	71.86	14.8	9	11.37	232.61	6.33	4.2
06/10/2010	2.54	77.49	14.9	6.8	10.63	223.44	0	1.4
07/10/2010	2.63	75.96	17.3	8.8	12.95	135.19	0.56	1.4
08/10/2010	3.78	81.1	19.5	13.8	16.71	112.92	0	1.5
09/10/2010	4.27	80.31	16.9	13.1	15.39	93.77	0	0
10/10/2010	2.93	82.07	13.8	9.5	12.62	91.61	0	0
11/10/2010	1.61	82.36	18	6.6	10.97	101.64	0	0
12/10/2010	1.05	88.51	15.6	4.1	9.02	141.6	0	0
13/10/2010	0.68	93.88	8.6	4.1	6.58	153.64	0	0
14/10/2010	0.65	81.16	11.3	8.1	9.72	174.22	0	0
15/10/2010	1.35	84.61	14.9	8.4	11.15	238.49	1.5	3.2
16/10/2010	0.84	80.24	13.4	3.3	8.4	212.13	0	3.2
17/10/2010	2.04	85.94	14.2	0.7	8.35	231.85	0	0.2
18/10/2010	3.19	80.14	13.6	9.5	11.15	269.68	4.27	1
19/10/2010	2.23	80.58	13.1	4.5	8.5	280.13	2.83	3
20/10/2010	1.53	75.28	10.3	1.6	6.16	264.32	0.37	3.6

21/10/2010	2.65	81.23	12.7	3.7	8.39	259.79	6.3	0.9
22/10/2010	2.27	86.79	12.1	5.9	8.6	244.75	7.7	9.1
23/10/2010	1.77	84.47	12	3.9	7.84	250.01	4.6	11.7
24/10/2010	0.74	81.3	11	0.1	4.49	222.72	0	3.2
25/10/2010	1.27	82.76	11	-2.3	4.93	170.8	9.45	5.8
26/10/2010	3.9	87.37	16.4	10.6	14.12	238.09	12.96	11
27/10/2010	3.46	81.7	13	7.8	10.66	241.03	3.37	8.2
28/10/2010	2.98	84.58	15.4	6.4	11.18	218.52	16.86	4.7
29/10/2010	2.88	85.33	12.9	6.1	9.6	248.18	2.29	15.2
30/10/2010	1.24	86.98	12.5	3.7	7.03	213.8	0.74	16.5
31/10/2010	1.15	86.15	11.4	4.1	7.47	129.79	2.1	0.4
01/11/2010	2.78	88.08	14.2	1.5	8.66	213.19	15.98	4.2
02/11/2010	7.03	82.54	13.7	10.2	11.63	259.96	1.3	14.6
03/11/2010	2.69	87.87	15	7.9	10.88	235.2	17.24	14.6
04/11/2010	9.25	88.46	15.1	14.7	14.88	258.15	0	10
05/11/2010	2.22	87.67	10.4	7.4	9.07	255.17	7.67	12
06/11/2010	2.05	87.62	8.5	2.9	5.48	273.41	4.17	12
07/11/2010	2.55	85.17	8.6	1.7	5.17	253.33	29.3	20
08/11/2010	2.25	85.31	10.7	4.7	7.02	187.61	0.7	20
09/11/2010	2.92	77.89	9.6	1.7	6.44	111	0	13.3
10/11/2010	1.58	84.06	8.8	-1.4	4.42	237.85	11.9	5.4
11/11/2010	9.4	73.55	11.8	7.8	9.8	258.73	0.63	9
12/11/2010	4	79.01	10	4.6	7.66	260.43	10.95	3.5
13/11/2010	1.39	88.12	6.3	2.2	4.65	236.86	0	9.3
14/11/2010	0.58	87.41	7.9	-2.3	2.51	217.51	3.8	8.8
15/11/2010	1.29	84.92	9	1	4.12	228.03	4.24	1
16/11/2010	3.51	82.43	9.5	3.5	7.06	165	24.16	16
17/11/2010	3.13	83.31	10	5.1	8.34	154.54	32.04	21.5
18/11/2010	3.72	84.64	9.9	5.1	8.28	242.57	1.9	29.6
19/11/2010	1.17	85.96	10.4	2.7	6.44	133.17	0.2	3.9
20/11/2010	1.72	87.1	9.1	4.7	6.45	55.61	0	0.1
21/11/2010	1.42	85.1	6.6	0.3	3.48	121.22	0	0
22/11/2010	0.8	88.07	6.7	-1	2.09	216.89	0	0
23/11/2010	1.16	89.99	7.7	-0.3	2.95	259.66	0.13	0
24/11/2010	0.95	88.49	6.3	-0.2	2.76	260.66	0.03	0.3
25/11/2010	1.83	84.41	5.7	-0.8	2.41	288.73	0.9	1.8
26/11/2010	1.7	86.49	5.2	-0.1	2.15	288.15	0	1.8
27/11/2010	1.58	84.03	3.3	-2.1	0.24	169.67	0.46	0.5
28/11/2010	0.58	88.9	1.1	-4.9	-2.09	180.44	0	1.1
29/11/2010	0.89	93.33	-0.9	-4.9	-2.77	99.69	9.23	0
30/11/2010	2.4	86.29	1.8	-4.4	-1	49.56	0	7.9
01/12/2010	1.36	80.75	-0.2	-7	-3.86	101.08	0	7.9
02/12/2010	0.96	83.37	0.8	-6.9	-3.77	239.06	0.5	0
03/12/2010	1.65	85.74	3.6	-7.4	-0.03	235.41	4.47	0.5
04/12/2010	0.75	93.66	2.2	-2.6	0.2	236.43	0	4.8
05/12/2010	0.99	90.73	2.9	-4.7	-0.93	261.36	3.97	4.8
06/12/2010	0.91	92.53	2.6	-4.7	-0.93	160.56	0	3.2
07/12/2010	1.09	84.85	1.9	-4.4	-2.16	128.51	0	3.2
08/12/2010	1.06	88.86	1.9	-6.2	-1.25	283.14	0	0
09/12/2010	2.54	85.32	5.7	-0.6	3.34	264.68	0	0

10/12/2010	1.87	87.5	7.8	4.1	5.85	264.09	0.2	0
11/12/2010	1.06	92.54	6	0	4.21	242.56	0	6
12/12/2010	1.15	93.87	3.7	-1.3	0.92	117.66	0	0.2
13/12/2010	0.69	88.26	4.2	-2.8	0.82	136.52	0	0
14/12/2010	0.6	82.78	5.1	0.3	2.63	254.95	0.37	0
15/12/2010	1.44	87.78	5.8	3.9	4.97	266.06	2.86	0.2
16/12/2010	3.18	84.42	8.4	-0.8	4.22	259.28	0.4	3.1
17/12/2010	2.74	90.57	1	-1.8	-0.43	275.03	0	3.4
18/12/2010	0.94	90.44	-0.2	-6.6	-3.19	199.85	0	0.1
19/12/2010	0.61	88.63	-0.9	-8	-4.9	138.41	0	0
20/12/2010	0.51	89.67	-4.5	-11.3	-8.66	214.1	0	0
21/12/2010	0.22	88.81	-6.9	-13.4	-10.64	204.75	0	0
22/12/2010	0.28	90.5	-3.8	-11.1	-8.06	234.77	0	0
23/12/2010	0.39	91.76	-2.3	-9.4	-6.36	221.66	0	0
24/12/2010	0.22	89.31	-2.5	-12.7	-9.36	214.76	0	0
25/12/2010	0.19	88.41	-5	-14.3	-10.32	188.9	7.53	0
26/12/2010	2.1	86.23	6.1	-7.1	2.48	153.35	13.18	11.8
27/12/2010	2.33	89.73	8.8	6.1	7.69	149.2	2.03	14.2
28/12/2010	1.27	90.2	12	5.5	8.66	155.97	5.69	8.6
29/12/2010	1.41	90.49	9.9	5.7	8.56	173.36	0	4.7
30/12/2010	1.41	93.81	9	6	7.6	87.74	0	4.7
31/12/2010	0.47	91.1	7.4	5.5	6.51	201.39	0	0
01/01/2011	0.3	85	5.6	5.6	5.6	302		0

Appendix 7
Water Balance Calculation

Appendix 8
Topographical Survey