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Consulting Engineers

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ANNUAL ENVIRONMENTAL REPORT & ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1.0 INTRODUCTION

1.1 Background

Raffeen Landfill site is operated by Cork County Council under Waste Licence W0023-01. This waste licence register number was assigned by the Agency in July 2006 and replaces the old numbering format (23-1). The landfill is situated approximately 10 km south east of Cork City and approximately 2km south west of Monkstown. (National Grid Reference 1751E 0654N). The site is located adjacent to Monkstown Creek and the southern boundary of the site is located 100m to the north of the edge of the Cork Harbour Estuary. The landfilling of waste at the site took place between 1979 and October, 2001. The civic amenity centre has been open to the public for recycling and disposal since late January 2005. This report covers the period from 1st January, 2008 to 31st of December, 2008.

The site occupies an area of 7.25 hectares and is located in the centre of a narrow, steep sided valley to the west of an active quarry. It is estimated that in the region of 580,300 tonnes of waste has been landfilled at the site. Quarrying was carried out prior to the commencement of landfilling operations at the site. The landfilling of waste has taken place and resulted in the formation of a steep sided valley. The existing contours at the site range in height from 10mOD in the south eastern corner of the site to 72.5mOD in the north western corner. The contract for the final restoration of the site commenced in March 2005. The new civic amenity centre has been open to the public since late January 2005.

The Waste Licence (Register Number W0023-1) for the site was issued on 24th May 2001. The purpose of this Annual Environmental Report (AER) and Environmental Management Programme Report (EMP) is to summarise the interaction of the Raffeen Landfill Facility with the local environment during the monitoring period.

Due to the considerable overlap between the required content of both the AER and the EMP reports, as outlined by the Agency in the “Draft Guidance On Environmental Management Systems & Reporting to the Agency” and the content specified in Schedule A and B of the Waste Licence, the two reports have been combined to form this (one) submission. The guidance notes indicate that the Environmental Management Programme Report is a sub section of the Annual Environmental Report.

1.2 Management and Staffing Structure of the Facility

The site is operated by Cork County Council, County Hall, Cork and is under the overall operational control of Mr. Ted Lucey, Senior Engineer, Cork County Council. Mr. Jerome O' Brien is responsible for landfill operation and aftercare in South Cork, while Mr. Enda Kiernan, Senior Executive Engineer, is responsible for the management of the civic amenity centre.

Ms. Ruth Conroy is Facility Manager for the site and is responsible for the day to day supervision and management of the site. Mr. Stephen Conway and Ms. Sabine Bataille act as the Assistant Facility Manager and provide holiday, sick cover, etc., in Ms. Conroy's absence. Table 1.1 shows the management structure at Raffeen Landfill during 2008.

Table 1.1: Management Structure

Position	Employee Contact Details
Senior Engineer Mr. Ted Lucey Executive Engineer – Civic Amenity Site (Operations) Mr. Enda Kiernan Mr. Kenneth Kingston, Ms. Lisa Collins and Ms. Sabine Bataille – Deputy Managers	Cork County Council, County Hall, Carrigrohane, Cork. Telephone No: 021 4276891 Fax No: 021 4276891
Facility Manager, Ms. Ruth Conroy Resident Engineer & Assistant Facility Manager Mr. Stephen Conway	Cork County Council, Raffeen Recycling Centre & Landfill Site, Raffeen, Kerrycurrihy, Monkstown, Co. Cork Tel No: 021 4842082 / 4859350 Fax No: 021 4859787 Out of Hours Emergency Contact Tel No.: 021 427 1551

Three General Operatives are employed at the civic amenity centre: Mr. John Hallihan, Mr. William McCormack and Mr. Conor Galvin. The General Operatives are responsible for the implementation of the waste acceptance procedures at the site, inspection of all loads arriving at the civic amenity centre and ensuring materials are placed in the correct receptacles. One general operative is based in the reception building/weighbridge adjacent to the site entrance during site opening hours.

The Resident Engineer, Mr. Stephen Conway is responsible for on site supervision of the Main Contractor for the Final Restoration Contract. He ensures all loads of material accepted for restoration purposes at the facility are inspected and recorded.

Table 1.2 shows the operational staff currently employed at Raffeen Civic Amenity Centre. Any changes to this structure will be submitted by the Facility Manager for agreement to the EPA as per Condition 2.6.1 of Waste Licence Reg. No. W0023-01. It is the responsibility of the Facility Manager to organise staff in the absences of the named persons from the facility.

Table 1.2: Operational Staff (Currently on Site)

Employee	Position	Duties and Responsibilities
Mr. John Hallihan	General Operative	Inspect all loads arriving at civic amenity centre. Ensure materials are placed in correct receptacles. One General Operative is based in the reception building/weighbridge adjacent to the site entrance during site opening hours.
Mr. William Mc Cormack	General Operative	
Mr. Conor Galvin	General Operative	

2.0 WASTE MANAGEMENT ACTIVITIES AT THE FACILITY

2.1 Waste Quantities And Composition

The landfilling of waste is reported to have taken place at Raffeen Landfill site since circa 1979. It is estimated that a total of 580,300 tones of waste has been landfilled at the site to date. No municipal waste has been accepted for landfilling at the site since 1st October, 2001.

There was no material imported for capping in 2008 as final capping was completed in 2007.

The civic amenity centre has been open to the public since late January 2005. The civic amenity centre accepts:-

- Paper, newsprint, magazines
- Cardboard and Tetra Paks
- Glass bottles and flat glass
- Food tins
- Beverage/drink cans
- Plastic bottles
- Polystyrene
- Timber
- Green waste
- Scrap metal
- Aerosols
- Paint
- Textiles/reusable clothes
- Waste cooking oil
- Waste engine oil
- Empty gas bottles
- Lead acid, fence, and household batteries
- Fluorescent tubes and energy saving light bulbs and filament bulbs
- Waste electrical and electronic items including fridges and freezers
- Mobile phones
- Household construction and demolition waste (from April 2007 only rubble and ceramics are accepted).
- Printer cartridges
- Stamps, Books, DVDs

The quantities of materials (tonnes) collected for recycling during 2008 are outlined in Table 2.2. A total of 3,831 tonnes of materials were collected for recycling during 2008. Figure 2.1 compares previous years.

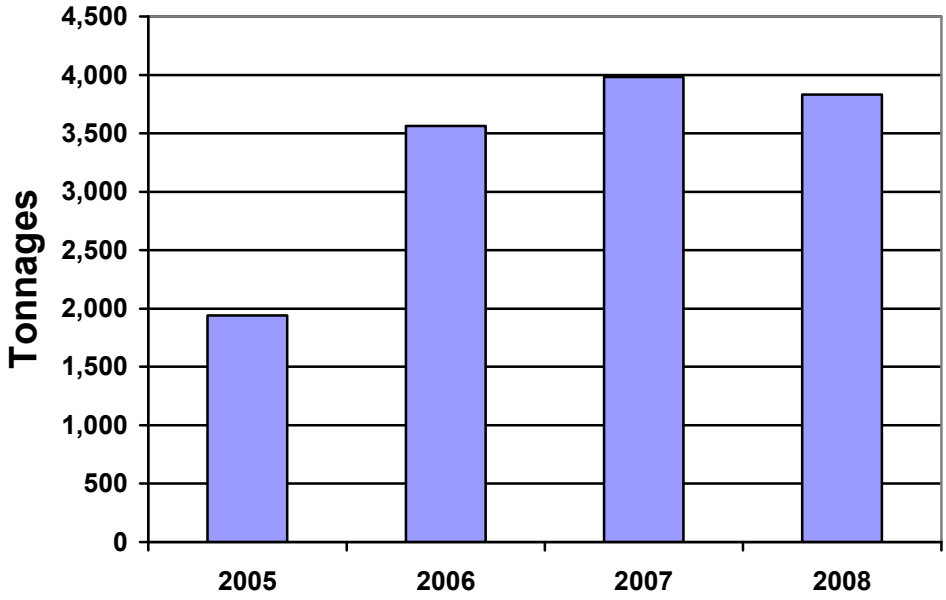


Figure 2.1: Tonnages of Recyclables Accepted at Raffeen CAS

Residual waste from domestic sources is also collected at the Raffeen Civic Amenity Centre. A total of 2,036 tonnes of residual domestic waste was collected and disposed of in 2008. This compares with:

- 2,154 tonnes in 2007
- 1,573 tonnes in 2006
- 1,717 tonnes in 2005

For the majority of the year all this material was disposed of at Youghal Landfill. In October 2008, as part of a new policy Kinsale Road Landfill (operated by Cork City Council) began accepting residual waste from Cork County Council. A total of 441 tonnes of residual waste from domestic sources was landfilled at the Kinsale Road Landfill in 2008. Street sweepings from litter bin collections, fly tipping and other works carried out by the Carrigaline Area Office amounted to 352 tonnes.

Other materials collected at the site for recycling include:

- a total of 90 kg of printer cartridges;
- 536kg of fluorescent tubes and CFL / energy saving bulbs which were recycled by Irish Lamp Recycling Ltd. in 2008 with a further 243kg of ordinary filament bulbs (approximately 7,300).
- approximately 1,000kgs of empty engine oil containers (plastic containers)

Mobile phones are recycled by the Jack and Jill Foundation Charity. Stamps are given to the Guide Dogs for the Blind Charity. Re-saleable books, videos and DVDs are collected by Oxfam. Saint Vincent de Paul continues to collect re-usable items such as furniture, toys, crockery and cutlery.

Table 2.2: Raffeen Civic Amenity Centre Recycling Records, 2008

2008	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Aerosol Containers	0.14	0.36	0.12	0.26	0.32	0.18	0.3	0.22	0.28	0.2	0.26	0.20	2.8
Beverage Cans	0.34	0.34	0.36	0.58	0.28	0.42	0.16	0.26	0.32	0.54	0.56	0.56	4.7
Cardboard	20.98	19.54	15.40	19.24	11.26	12.00	8.26	14.76	9.08	17.64	14.34	18.84	181.3
DIY/Rubble & Ceramics	30.28	31.34	47.7	44.96	47.64	48.30	52.16	26.58	35.28	48.04	32.20	36.18	480.7
Fluorescent Tubes	0.10	0	0.08	0	0.12	0	0	0.08	0	0.1	0	0.06	0.5
Food Tins	1.76	0.68	0.86	0.8	0.96	0.56	0.86	0.5	1.24	0.54	0.64	0.78	10.2
Glass Bottles	20.9	11.76	13.18	12.32	15.92	12.86	18.34	11.32	12.32	13.82	11.84	15.36	169.9
Green Waste	40.34	54.60	57.2	70.34	179.42	179.42	180.22	142.64	161.3	91.82	68.18	30.5	1,256.0
Household Batteries	0	0.16	0	0.2	0	0.24	0.2	0.1	0	0.20	0.28	0	1.4
Lead Acid Batteries	3.02	1.98	0	1.51	0	1.86	1.76	1.77	0	1.70	1.56	0	15.2
Magazines & Paper	23.28	21.82	19.82	18.14	27.88	18.44	46.58	20.18	19.62	23.22	16.6	22.84	278.4
Paint	0.98	1.82	0.34	1.06	1.52	1.12	2.12	1.74	1.64	1.16	1.24	0.68	15.4
Plastic Bottles	4.12	3.52	4.26	4.52	3.48	3.7	3.38	3.34	4.46	3.08	3.74	3.94	45.5
Plate / Flat Glass	3.38	3.34	0	4.42	4.98	3.1	5.92	3.1	4.34	3.24	3.38	2.86	42.1
Polystyrene	1.94	0.86	0.08	0.8	1	0.66	0.66	0.84	0.88	0.9	0.64	0.7	10.0
Scrap Metal	15.5	18.92	15.08	28.06	19.58	20.42	35.72	15.94	21.38	21.58	15.74	16.2	244.1
Textiles	6.96	4.64	5.24	6.64	5.44	6.34	7.34	6.06	6.28	5.5	4.8	4.94	70.2
Timber	35.92	52.90	62.56	72.99	66.6	53.4	72.46	61.42	61.68	54.78	40.62	40.74	676.1
Waste Cooking Oil	0	0.50	0	0	0	0.94	0	0	0.8	0.78	0	0	2.22
Waste Engine Oil	0.92	0	0.98	0.92	0.7	0	0.76	0.74	0	0	1.02	0	6.84
WEEE	32.64	23.3	17.68	27.06	21.96	28.68	44.11	21.3	25.74	24.08	14.98	35.68	317.2
Totals	243.5	252.4	260.9	314.8	409.1	392.6	481.3	332.9	366.6	312.9	232.6	231.1	3,830.76

3.0 SITE DEVELOPMENT WORKS

The following subsections describe the current and proposed future works at the site. The contract for the final restoration of the site commenced in May 2005 and is now complete. This contract involved the installation of the final capping, the gas abstraction system and the leachate abstraction system.

The works completed during 2008 include the completion of the:-

- Leachate abstraction system.
- Gas abstraction system with permanent flare.
- Landscaping planting works
- Access pathways
- Road resurfacing and site traffic markings
- Slides on the compost skip railings
- Stream diversion by Loftus

3.1 Final Capping

The final capping comprises of a five layer composite system as detailed in Table 3.1 and as shown on Drawing No. 03. There are three versions of capping detail placed, two in areas of native tree planting (a version for flat and sloped areas) and one to be used in all other areas. Re grading works were required in most areas prior to the placement of the final capping in order to achieve the required slopes/gradients. The installation of the final capping works commenced in May 2005 and was completed Summer 2007. The final capping levels are shown on Drawing No. 03.

Table 3.1: Final Capping Composition

Component	Flat Areas with Native Tree Planting	Sloping Areas with Native Tree Planting	All Other Areas
1. Topsoil	300 mm	300 mm	150 mm
2. Subsoil	700 mm silty sandy gravel	300 mm silty sandy gravel	300mm silty sandy gravel
3. Drainage Layer	500 mm coarse gravel	300 mm coarse gravel	Geosynthetic
4. Barrier Layer	GCL Geotextile Protection Layer	GCL Geotextile Protection Layer	GCL Geotextile Protection Layer.
5. Gas Collection Layer	Geosynthetic	Geosynthetic	Geosynthetic
Thickness	**1.5m**	**0.90m**	**0.45m**

The progress of this proposed design is discussed in the following sections.

3.2 Leachate Management Infrastructure

The leachate management infrastructure is 100% installed. All the pipe work, level sensors and compressor are installed. The power supply was installed by the ESB in December 2007.

3.3 Landfill Gas Management Infrastructure

The installation of the active gas abstraction system is completed. This is part of the Final Restoration Contract. The system comprises of gas abstraction wells within the waste body, condensate removal traps, gas abstraction wellheads and gas collection pipework. The permanent gas collection pipework is located within the subsoil layer of the final capping. The gas abstraction wells are composed of 300mm diameter boreholes. The installation of the gas abstraction wells was undertaken by a specialist sub contractor.

All gas abstraction boreholes (50 No. in total of which 10 No. are combined leachate and gas abstraction boreholes, and as shown on Drawing No. 02) were in place by late August 2006 with additional boreholes requested by the EPA in the central area of the landfill.

The flare compound was completed in June 2007 and is located in the area to the north of the Civic Amenity Centre west of the Loftus Quarry. This location was selected in order to locate the flare compound as far as possible from existing houses in the area and in as low-lying an area of the site as possible to facilitate condensate removal. Within the Flare Compound, a partial vacuum induces a pressure gradient towards the abstraction wells and controls the lateral movement of gas. An electrically driven centrifugal blower induces this vacuum. The extracted gas is flared to control emissions to the atmosphere of methane and volatile organic compounds.

Gas pumping trials were carried out during the summer of 2007. The outcome of the trials determined that a 150cum/hr enclosed flare would be required for the site. The flare was delivered to site in April 2008 and commissioned by July 1st 2008. AFS serviced the flare during October 2008 and carried out maintenance on the flare during November 2008.

New gas migration wells have been installed towards the southern end of the landfill. These are discussed in Section 3.6.

3.4 Landscaping

The Final Restoration Contract included a programme of landscaping. The planting includes the development of areas of native woodland (30,935m^2), native scrub (27,125m^2), wildflower meadow (1,345m^2) and native hedgerow (1,000 m^2) planting. Existing hedgerows were maintained where possible. The planting of trees took place on the flatter portions of the site to create areas of native woodland. On the sloping sections of the site scrub areas were developed. A wildflower meadow was created on the existing haul road, along the eastern side of the site north of the existing site entrance. It is considered that the planting scheme will re-establish native woodlands and scrub habitats that reflect the character of existing habitats and provide a wildlife corridor between existing fragmented habitats. The planting has taken into account the provision of a diverse range of habitats, which include aquatic, marsh, meadow, hedgerow, scrub and woodland. The landscaping provides an attractive

backdrop to the civic amenity centre. The landscaping works commenced following the completion of the final capping, and installation of pipework for the leachate abstraction system and gas abstraction system. The landscaping contract was completed by mid April 2008.

3.5 Access Roads And Paths

The gas flare compound is located on the northern boundary of the civic amenity centre. Access to the gas flare compound will be from the civic amenity centre. As part of the Final Restoration Contract, pedestrian pathways have been incorporated to provide access around the site to the environmental monitoring points.

3.6 Road Resurfacing

The road outside the facility was resurfaced during mid May 2008. Site traffic markings were re-lined in August 2008.

3.7 Slides on the Compost Skip Railings

'Slides' were installed on the compost skip railings to facilitate easier emptying of green waste bags into the skip for the public. A new barrier counter was also installed during 2008.

3.8 Stream Diversions

Surface water from a quarry immediately to the east of the landfill had been entering the site. The quarry owner diverted this discharge to prevent it entering the landfill site during January 2008. Within the site the upper end of the stream diversion was relined to prevent surface water entering the body of the landfill.

3.9 Environmental Monitoring Locations

Drawing 01 shows an updated environmental monitoring locations map. Due to access difficulties SW1 has always been and continues to be monitored downstream of the Kennels while GW1 is located within the Kennels boundary.

For clarity, all monitoring results labelled as SW2 submitted to the EPA as part of quarterly monitoring requirements since early 2004, when the stream diversion was completed, have been taken at SW2A. SW2A is located at the discharge point from the 'new culvert' that was constructed to pipe the stream through the site. SW2 is located at the discharge point from the 'old culvert'. Both SW2 and SW2A continue to be monitored (as requested by the EPA since 2006). In addition to these monitoring points at the estuary, a further monitoring point, also in the estuary, SW2B was added at the request of the EPA during 2007. SW2A and

SW2B also take runoff from the surface water drain from Loftus and discharges from a number of houses close by.

SW5 collects surface water runoff from the capping, which is discharged into the new culvert (SW2A), which in turn discharges into the estuary. SW5 has been monitored since 13th December 2006.

Groundwater monitoring location GW7 to the north of the existing landfill was covered during September 2005. However GW1 to the north of the site is a good indication of groundwater quality up-gradient of the site.

GW8 was installed on 11 May 2007 to provide a groundwater monitoring location down gradient of the landfill and monitoring of this groundwater well has been carried out since June 2007.

G & L11 (GW4) and G & L12 (GW6) have replaced G & L2 and G & L5 as leachate monitoring boreholes. G & L 8 will be replaced by one of the many gas extraction boreholes installed in 2006.

The gas collection system with permanent flare has been commissioned since July 2008.

Three temporary modified boreholes (GM11, GM12 and GM13) were installed early in June 2006 at the closest location to the nearest private dwelling to the south of the landfill. They were placed at a depth of 1.8 m from the surface in a private field between the landfill and the dwelling. This is located in the same enclosure as GM10 but along the opposite fence. Due to the fact that GM10 is at a depth of 6.66 m it was deemed necessary to install deeper permanent gas migration monitoring boreholes. These were drilled in July 2006 within 1.5 m of the temporary modified boreholes. Approximate depths are given in the table below:

Table 3.2: Approximate Depth of Permanent Gas Migration Monitoring Boreholes

Gas Migration Borehole	Location	Depth (m)
GM11(A)	Top of field, furthest from road	9.0
GM12(A)	Middle of field	9.0
GM13(A)	Bottom of field, closest to road	4.5

These permanent gas migration monitoring boreholes were installed to replace the temporary modified boreholes GM11, GM12 and GM13. The new wells are labelled GM11A, GM12A, and GM13A and were placed within 1.5 m of the temporary boreholes. Caps and valves were fitted and monitoring of these boreholes has been carried out on a weekly basis since the end of April 2007 and on a daily basis since July 2007. Monitoring continued on a daily basis at GM10 until October 2007 when it was necessary to replace the monitoring of this borehole with the three other permanent wells in the same enclosure.

4.0 EMISSIONS

4.1 Management Of Emissions

Cork County Council is committed to ensuring that any emissions from the previous deposition of waste at Raffeen Landfill Site, and related activities will not result in the contravention of any relevant standard, including any standard for an environmental medium or any relevant emission limit value, prescribed under any other enactment.

Cork County Council is committed that the restoration of Raffeen Landfill and the operation of the civic amenity centre shall be carried on in accordance with such conditions as may be attached to the licence and will not cause environmental pollution.

Cork County Council shall use the best available technology to prevent or eliminate or, where that is not practicable, to limit, abate or reduce an emission from the activity concerned.

The environmental monitoring programme at the facility during the reporting period included monitoring of landfill gas, leachate levels and composition, groundwater and surface water. The monitoring frequencies required by the Waste Licence and subsequent correspondence with the EPA, are outlined in Table 4.1. The potential emissions from the site include dust, leachate and landfill gas are discussed in the following sections.

Table 4.1: Summary of Required Monitoring Frequencies

Parameter	No. of Locations	Monitoring Frequency
Groundwater Quality	6	Monthly, Quarterly & Annual
Surface Water Quality	5	Quarterly & Annual
Surface Water Inspection	4	Weekly
Leachate Composition	5	Quarterly & Annual
Landfill Gas Composition	6	Monthly
Landfill Gas Site Office Gas Monitoring Points	1 4	Continuously Weekly
Leachate Levels	5	Weekly
Groundwater Levels	7	Monthly
Dust Monitoring	3	3 times a year
Noise Monitoring	7	Annual

An Oliver IGD Tocsin 700 Gas Monitor was installed in the offices to continually monitor levels of methane, carbon dioxide and oxygen.

4.1.1 Dust

Raffeen Landfill site is no longer accepting waste for landfilling. Landfilling ceased in October, 2001.

Potential dust generating activities at Raffeen are:-

- Vehicle movements on the un-surfaced haul roads within the landfill site.

The dust deposition limit is 350 mg/m^2/day for a 30 day composite sample. Dust monitoring was carried out at three locations points (D1 – D3) at the site boundaries of the landfill site between May 2008 and January 2009. The monitoring results were well within the emission limit value of 350 mg/m^2/day permitted in the Waste Licence for the facility.

Dust control measures employed during the final restoration contract have included the use of a mobile sprayer or bowser to control fugitive dust emissions from the movement of vehicles during dry and windy weather. This has been achieved through the spraying with water of site roads and any other areas trafficked by vehicles. Speed restrictions also apply to construction vehicles within the landfill. A wheelwash was installed in the civic amenity centre to reduce the quantity of mud and debris taken off site and therefore reduce the generation of dust emissions on the adjacent public road.

The Contract for the Final Restoration of the landfill site is complete. The Contractor was required to clean roadways of any dirt, mud or other materials being dropped or spread by traffic associated with this contract. During 2008 the Facility Manager organised for road sweeping to be undertaken as necessary by Cork County Council personnel from the local area office. Due to the final capping being completed, it is not anticipated that there will be any further movement of heavy vehicles.

4.1.2 Odour and Aerosols

Odour

Potential for odour emissions has significantly reduced since municipal waste is no longer landfilled at the site. It is still accepted but placed in either a closed container (hopper with compactor attached), or in an open skip. There is potential for odours arising from this open skip, but this has not occurred as the open skips containing municipal waste are removed for landfilling almost every day.

The installation of an active gas abstraction system and flare controls the volume of gas being produced at the site and reduces the potential for malodours occurring from gas venting. The gas flare was installed in April 2008and commissioned by July 2008.

A weekly inspection of the Civic Amenity Centre is conducted. Odours were not found to be a nuisance during any of the site inspections of the civic amenity centre during the reporting period. Collection bins and skips in the civic amenity centre will be washed to prevent the generation of malodours should it be required.

Aerosols

Aerosols are defined as fine particulate material water droplets and microbial emissions from activities carried out at the landfill. Within landfill sites sources typically include re-suspension of fine material by wheel action of vehicles and fugitive emissions from tipping and distribution of waste. Monitoring for the presence of aerosols has not been undertaken at the site as it is not required by the Waste Licence and landfilling activities have ceased at the site. There is very little potential for aerosol generation from tipping of waste within the civic amenity centre.

4.1.3 Landfill Gas

Landfill Gas Monitoring-

Monitoring of the composition of landfill gas was undertaken at eleven gas monitoring locations within and in the vicinity of the landfill site during the reporting period. The current monitoring points are G & L1, G & L3, G & L4, GM 6, GM 7, GM 9, G & L11, G & L12, GM11A, GM12A and GM13A and the site office. Temporary monitoring points GM11, GM12 and GM13 were replaced by monitoring points GM11A, GM12A and GM13A, respectively in April 2007. Monitoring points GM11A, GM12A and GM13A comply with EPA requirements for monitoring well construction specifications.

During 2008 it is has not been possible to access all of the monitoring points as monitoring points G & L2, G & L5 and G & L8 were damaged as a result of construction activities taking place at the site in 2005. It should not be necessary to replace G& L2 or G& L5 as monitoring locations G & L11 (GW4) and G & L12 (GW6) will monitor the gas composition within the waste body. G & L8 is replaced by the newly installed gas extraction boreholes. Monitoring was discontinued at GM10 on the 22nd of October 2007 as the three monitoring points GM11A, GM12A and GM13A installed in April 2007 are sufficient to monitor gas migration to the south of the landfill. The results from the 2008 monitoring have been compared to the results for 2000, 2001, 2002, 2003, 2004, 2005, 2006 and 2007 to determine if there are any trends.

Monitoring is undertaking on a monthly frequency at six of the monitoring boreholes; G & L1, G & L3, G & L4, GM6 (G & L6), G & L11 (GW4) and G & L12 (GW6). At the request of the EPA monitoring is undertaken on a weekly frequency at the site office and at monitoring locations GM7 (G & L7), GM9, (G & L9), GM 11A, GM12A and GM13A.

The locations of the monitoring boreholes are shown on Drawing No. 01. An Oliver IGD Tocsin 700 Gas Monitor has been installed in the offices to continually monitor levels of methane, carbon dioxide and oxygen. There was no methane detected in 2008.

During 2008 methane has been detected at seven boreholes G & L1, G & L3, G & L4, GM6, GM7, GM9 (G & L9) and G & L11 (GW4). It should be noted that only occasional trace levels of methane were detected at monitoring locations GM6 and GM7 during 2008. Methane was detected in monitoring location GM6 on occasion at a concentration of 0.1%v/v in October. Low levels of methane were detected in GM7 during August (0.1% v/v) and on three occasions in October (0.1, 0.6 and 1% v/v). GM6 and GM7 are located outside the landfill boundary.

Significant methane concentrations have only been detected in monitoring location G & L4. Monitoring location G & L4 tends to have the highest methane levels seen at the site. The concentration of methane (G & L4) was greater than 40% on 1 of the monitoring dates during 2008 with a range in methane concentration of 0.0% v/v to 40.7% v/v. This is a decrease on 2007 and is a significant reduction compared to methane levels seen prior to 2006 at the site as outlined in Table 4.2.

Table 4.2: Summary of Methane Concentrations at G & L4

Monitoring Period	Methane Concentration Range	Sampling Dates Methane > 40% v/v
2008	0.0% v/v to 40.4% v/v	1 out of 11 samples
2007	0.5% v/v to 48.1% v/v	2 out of 12 samples
2006	6.7% v/v to 37.3% v/v	0 out of 12 samples
2005	10.2% v/v to 61.4% v/v	6 out of 12 samples
2004	18.7% v/v to 60.0% v/v	9 out of 12 samples
2003	2.3 to 61.9% v/v	8 out of 12 samples
2002	18.3% v/v to 60.9% v/v	4 out of 12 samples
2001	9.8 % v/v to 51.6% v/v	6 out of 12 samples

There has been no access to monitoring location GM8 (G & L8) since February 2005 due to construction activities at the site. During January and February 2005 methane levels of up to 24.4% v/v were measured at G & L8. G & L8 is replaced by the newly installed gas extraction boreholes. The newly installed gas extraction boreholes are shown on Drawing No. 02. Considerable variation is seen in the gas concentrations at monitoring location GM9 (G & L9). The variability can be seen in the 2008 methane results. During 2008 methane was not detected on 7 out of 51 sampling occasions, an increase from the previous year where on 20 out of 50 sampling occasions the methane concentration was 0 % v/v. A similar result was seen in 2006 when the methane concentration ranged from 0 to 38.2% v/v with a methane concentration of 0% v/v on 24 out of 51 sample dates. However, the methane concentration range (0 to 35 % v/v) during 2008 is similar to the 2007 range of 0.0 to 35.4% v/v. There appears to be no seasonal trend or relationship between atmospheric pressure and higher methane levels at any of the monitoring locations.

An Oliver IGD Tocsin 700 Gas Monitor continually monitors gas levels in the site office. In the event of monitoring indicating that the concentration of methane exceeds 1% v/v or the concentration of carbon dioxide exceeds 1.5%. The Facility Manager will inform the licensing authority immediately. No methane has been detected within the site office to date and carbon dioxide levels are well within acceptable levels.

Gas Emissions

A gas model was prepared for the site during 2003 to estimate the quantity of landfill gas potentially being generated at the site and to determine if an active gas system would be viable at the site. Based on the gas model results an active gas abstraction system with flare was installed and commissioned at the site by July 2008.

A revised gas model was prepared for the site during 2005, using GasSim, at the request of the EPA to estimate the quantity of landfill gas potentially being generated. A number of assumptions were made in order to carry out the modelling. These were as follows:

Breakdown of the waste between 1979-2001 was as follows:-

1979-1995	75% Domestic / 25% Commercial
1996-1999	50% Domestic / 50% Commercial
2000-2001	25% Domestic / 25% Commercial / 50% Inert Waste

A square area of 7.25 Ha was assumed. Rainfall data was taken from Cork Airport. The "wet" setting was used with regard to the waste type. The density of methane gas at International Standard Atmosphere (1 atmosphere pressure and 15 degrees Celsius) is 0.68kg/m^3. All other settings used were default settings. For 2005, the following results were obtained:-

- Total Bulk Landfill Gas Emission - 209 kg/hr which equates to 1,830,840 kg/yr approx.
- Methane Emission – 104 kg/hr which equates to 910,040 kg/yr approx.

Gas pumping trials have been undertaken since August 2006 following the completion of the installation of the gas abstraction system. The trials provide an estimate of the volume of gas being produced at the site. This will allow a comparison to be made against the GasSim predictions.

A revised gas model was prepared for the site during 2008, using GasSim, for PRTR purposes. The same assumptions as above were applied. In order to tie in the Carbon Dioxide and Methane figures to the results of the landfill gas pumping trial, the percentage methane (30%) and percentage carbon dioxide (25%) measured in the pumping trial has been taken and applied to the estimated Total Bulk Landfill Gas Emissions for 2008 from GasSim.

For 2008, the following GasSim predictions were obtained:-

- Total Bulk Landfill Gas Emission (allowing for collection, flaring and flare downtime) - 135m^3/hr for 2008.
- Methane Emission – 27 kg/hr which equates to 238,272 kg/yr approx.

4.1.4 Surface Water

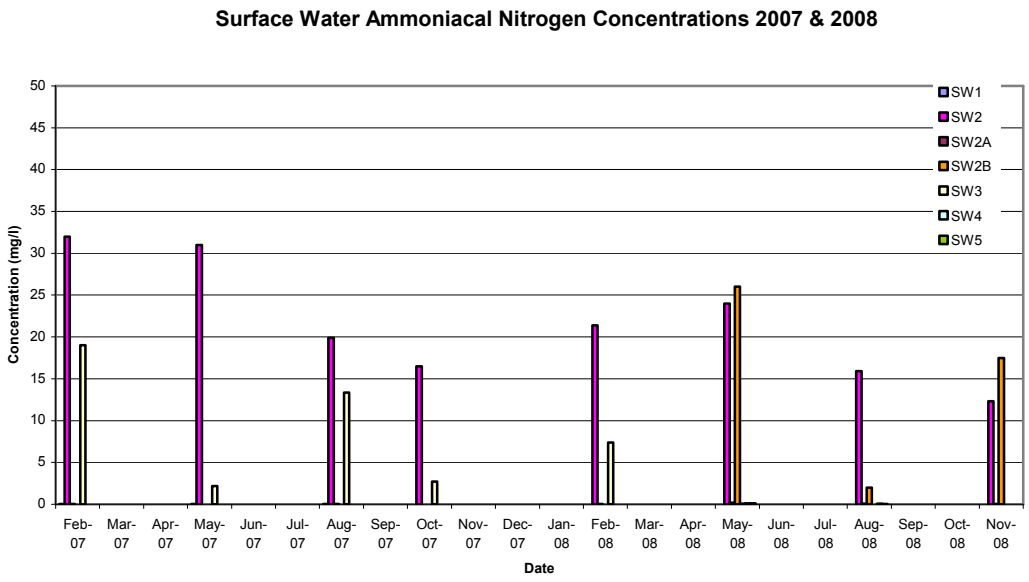
Monitoring of the surface water quality was carried out at seven locations in the vicinity of Raffeen Landfill Site during 2008. Monitoring point SW1 is located up gradient of the site, while monitoring locations SW2, SW2A, SW2B and SW3 are located down gradient of the site (Drawing No. 01). Monitoring point SW4 is located upstream of the present site, at a point before the stream enters the diversion culvert. SW5 (New Culvert) collects surface water runoff from the capping. Monitoring of the surface water quality is undertaken on a quarterly basis in SW1, SW2, SW2A, SW3, SW4 and SW5 with a more comprehensive analysis undertaken on an annual basis. Weekly ammoniacal nitrogen analysis, visual and odour monitoring is undertaken at each of the locations. The results of the monitoring for 2008 have been compared to the results for 2007 and 2006 to determine if any trends are apparent. The results have also been compared to the environmental quality standards (EQS) set for surface water by the EPA in the publication “Towards Setting Guideline Values For The Protection of Groundwater in Ireland”. The monitoring to date indicates that the landfill site is

not significantly impacting on the surface water quality in the vicinity of the site. The water quality data for 2008 is similar to that recorded previously, with some exceptions outlined below.

Monitoring point SW1, which is located upstream of the site, is considered to represent the background water quality of the catchment. There was no change in the water quality at this location during 2008. The results of monitoring at this location are within the levels set for EQS where limits have been specified for surface water parameters.

Monitoring point SW2 is located at the discharge point from the 'old culvert'. The results are only comparable to pre 2004 analysis before the stream was diverted to the new culvert. Monitoring points SW2A, SW2B and SW3 are located down gradient of the site within the tidal portion of Monkstown Creek. The estuarine location and influence of the tides significantly influence the water chemistry at these locations with the highest concentrations typically being encountered at monitoring locations SW2B and SW3 (see attached figures). There has been an increase in the concentrations of COD, electrical conductivity and chloride at monitoring location SW2B compared to previous ranges. The concentrations exceed the EQS set for surface waters at SW2B.

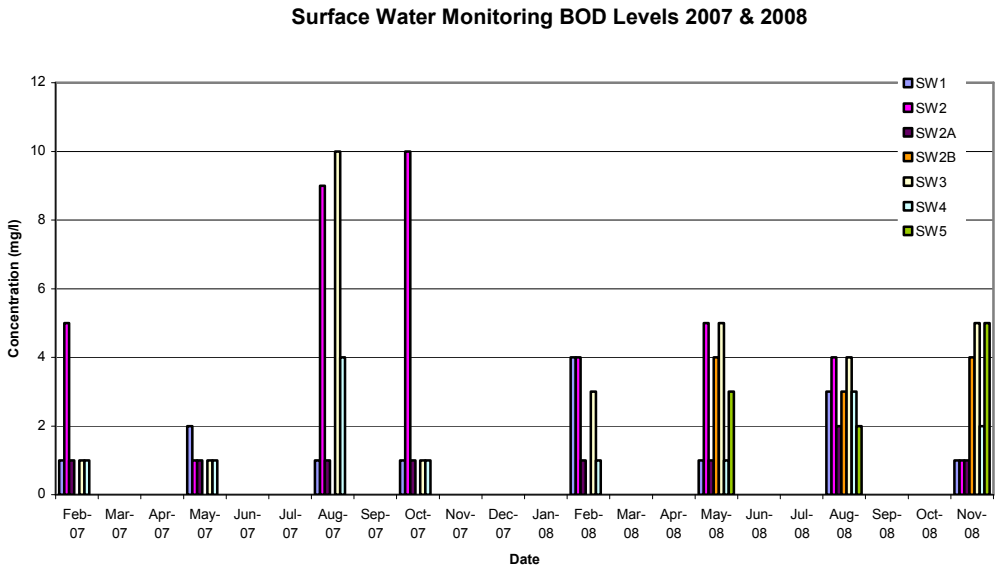
Figure 4.2: Surface Water Ammoniacal Nitrogen Concentrations 2007 & 2008



Note: Quarterly monitoring did not commence in SW2B and SW5 until Quarter 2, 2008

The ammoniacal nitrogen concentration is within the levels seen previously at the site. Monitoring point SW3 is located down gradient of the site within the tidal portion of Monkstown Creek. The concentration of ammoniacal nitrogen (NH_3) during 2008 at SW3 (range 0.01 to 7.4 mg/l) was a decrease from levels detected during 2006 and 2007. There was also a reduction in the ammoniacal nitrogen concentration during 2008 at monitoring locations SW1and SW2.

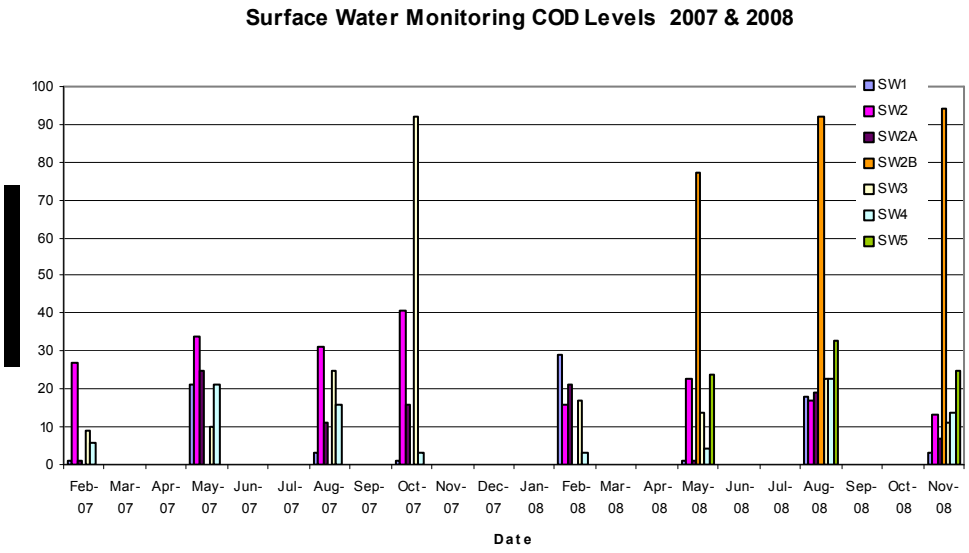
Figure 4.3: Surface Water Monitoring BOD Levels 2007 & 2008



Note: Quarterly monitoring did not commence in SW2B and SW5 until Quarter 2, 2008

Monitoring of the BOD levels in 2008 indicated similar levels to those seen previously in SW1 SW2A and SW2B. Levels at SW3 and SW4 have increased slightly since 2007 but are below peak levels recorded during Quarter 3 of 2007.

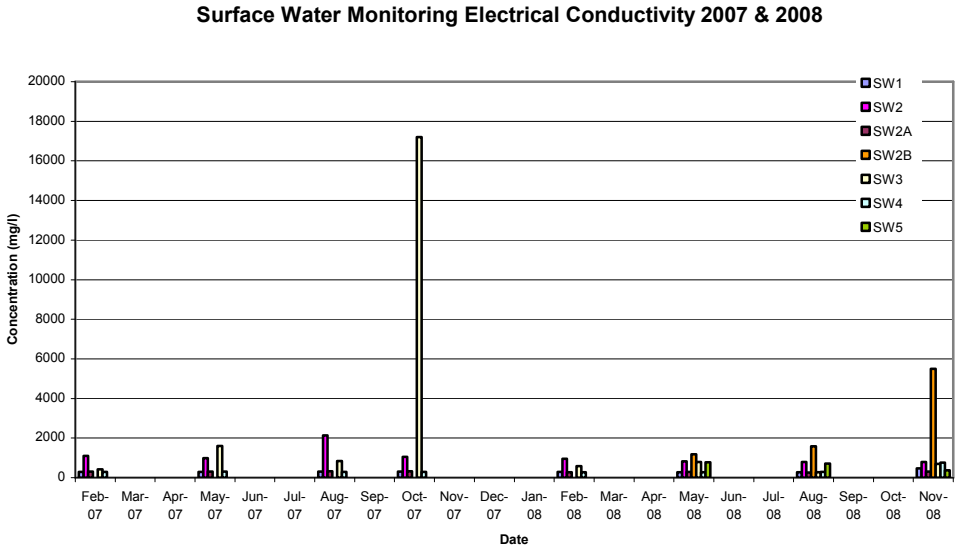
Figure 4.4: Surface Water Monitoring COD Levels 2007 & 2008



Note: Quarterly monitoring did not commence in SW2B and SW5 until Quarter 2, 2008.

Monitoring of COD levels in 2008 indicated either decreases or similar concentrations than those of 2007 with the exception of SW2B where values increased slightly during 2008.

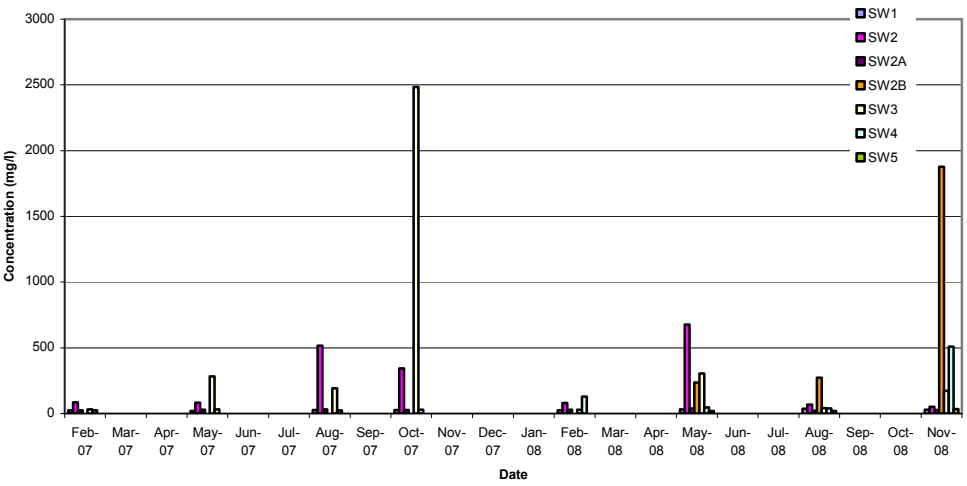
Figure 4.5 : Surface Water Monitoring Electrical Conductivity 2007 & 2008



Note: Quarterly monitoring did not commence in SW2B and SW5 until Quarter 2, 2008.

Monitoring of the electrical conductivity indicates similar or reduced concentrations during 2007 and 2008 at SW1, SW2, SW2A, SW3, SW4 and SW5. The concentration at monitoring location SW2B increased during 2008. However, levels are within weekly monitoring concentration ranges from 2007 and early 2008. The estuarine location and influence of the tides significantly influence the water chemistry at this location with the highest concentrations typically being encountered at monitoring locations SW2A and SW3.

Figure 4.6: Surface Water Monitoring Chloride Concentrations 2007 & 2008



Note: Quarterly monitoring did not commence in SW2B and SW5 until Quarter 2, 2008.

Monitoring of the chloride concentration indicates similar concentrations during 2007 and 2008, with the exception of increases at SW2B and SW4 during Quarter 4, 2008.

Most of the differences in the surface water composition up gradient of the site and down gradient of the site are considered to be a result of change in flow conditions from more fast flowing conditions up gradient of the site to slower moving or stagnant conditions in the estuary combined with the effect of tides and presence of more saline water at SW2B and SW3. The change to more estuarine conditions is seen in the increase in electrical conductivity, chloride, magnesium, potassium and sodium.

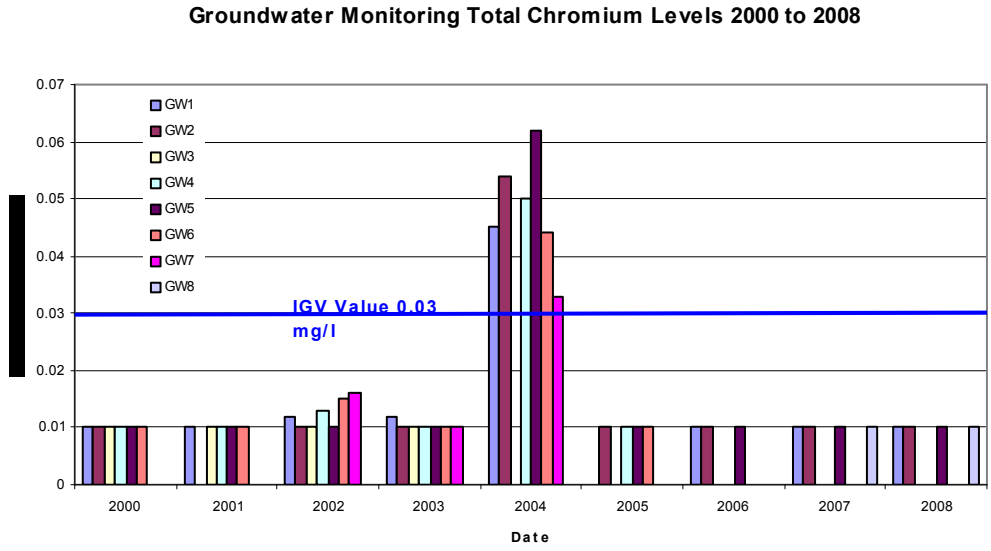
4.1.5 Groundwater

During 2005 the EPA requested that any groundwater monitoring locations within the waste body (GW4-now G & L11 and GW6- now G & L12) be classed as leachate monitoring locations. As a result there are now six groundwater monitoring boreholes at Raffeen Landfill Site (GW1, GW2, GW3, GW5, GW7 and GW8) of which two are damaged and no longer in use (GW3 and GW7). Monitoring boreholes GW1, GW2 and GW5 are located outside the landfill boundary. Monitoring boreholes GW3 and GW7 were located within the landfill boundary. GW8 was installed in May 2007 in order to monitor the groundwater downgradient of the site, outside of the waste body. During 2008 groundwater quality was monitored as per the EPA monitoring requirements at monitoring locations GW1, GW2, GW5 and GW8. Groundwater quality within and in the vicinity of the landfill site is monitored for various parameters on a monthly, quarterly and annual basis. Groundwater levels are monitored on a monthly basis.

The monitoring results indicate that there has been no significant change in the quality of the groundwater monitored within and in the vicinity of the landfill site during 2008. The concentration of ammoniacal nitrogen has been low in all groundwater monitoring locations.

Several charts are presented in the following section to graphically illustrate the groundwater monitoring results. It should be noted that frequently the concentration is less than the detection limit where this occurs the concentration is illustrated as the detection limit on the graph.

Figure 4.7: Groundwater Monitoring Total Chromium Levels (detection limit <0.01 mg/l)



Monitoring of the groundwater quality in the vicinity of the site indicates that the concentration of heavy metals tends to be within the interim guideline values for groundwater with the exception of iron and manganese. However it should be noted that iron and manganese concentrations above the IGV value occur naturally in groundwater in areas underlain by Old Red Sandstones and muddy limestones where reducing conditions results in solution of iron and manganese from geological material. As illustrated on Figure 4.7 the concentration of chromium during the 2005, 2006 and 2007 monitoring period was less than the detection limit of <0.01mg/l and the IGV value of 0.03 mg/l at all monitoring locations.

Figure No. 4.8: Groundwater Monitoring Cadmium Levels (detection limit <0.0035 mg/l)

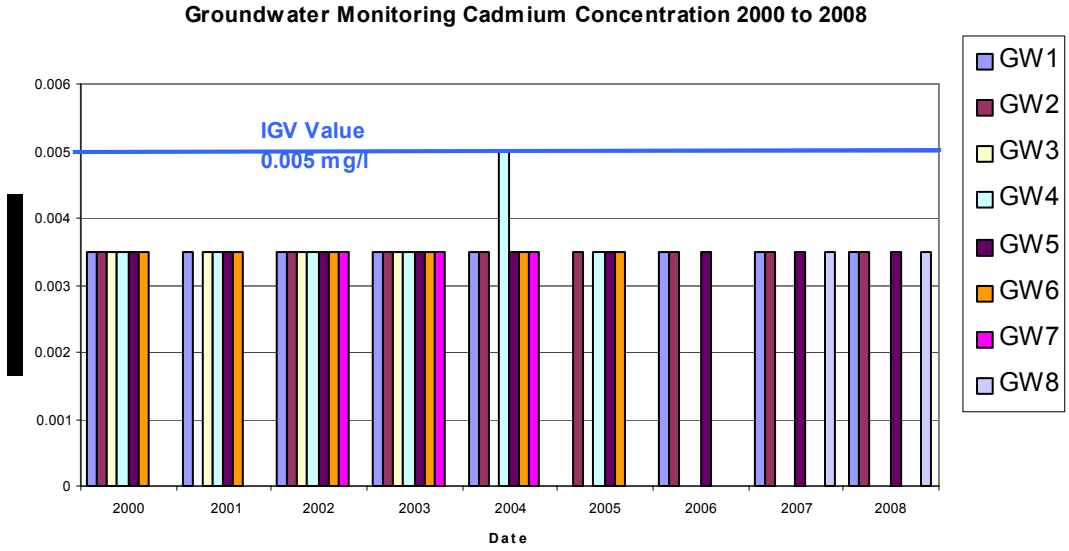


Figure 4.8 illustrates the concentration of cadmium is less than the IGV value of 0.005 mg/l. It should be noted that on most monitoring dates the concentration has been less than the detection limit of < 0.0035 mg/l.

Figure 4.9: Groundwater Monitoring Cyanide Levels (detection limit <0.001 mg/l)

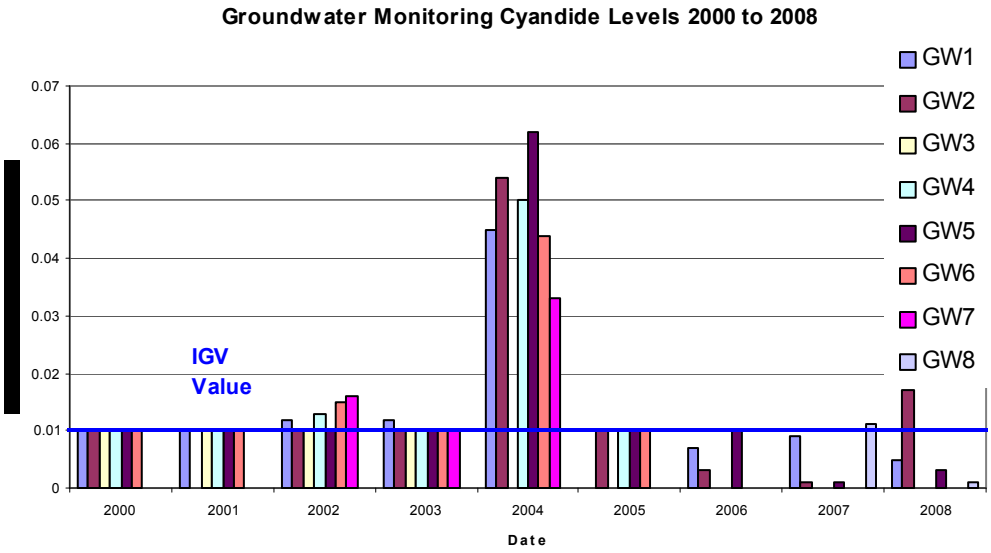


Figure No. 4.9 illustrates the concentration of cyanide is less than the IGV value of 0.01 mg/l during 2005, 2006 and 2007, with the exception of GW8 (0.011mg/l) in 2007 and GW2 (0.017mg/l) in 2008 which slightly exceeded the IGV (0.01mg/l). It should be noted that on many of the monitoring dates the concentration has been less than the detection limit of < 0.001 mg/l.

Figure 4.10: Groundwater Monitoring Mercury Levels (detection limit <0.0005mg/l)

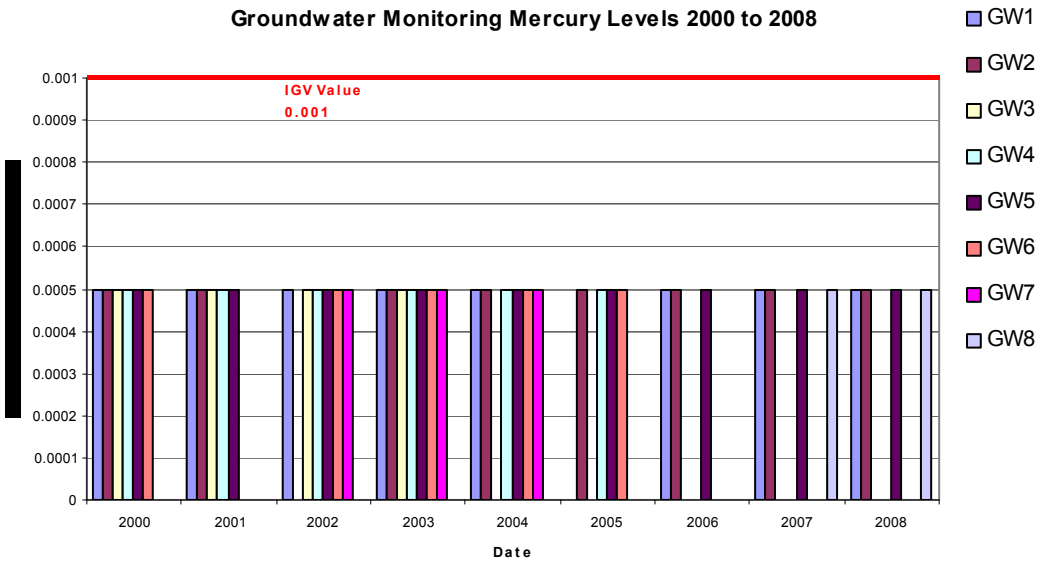
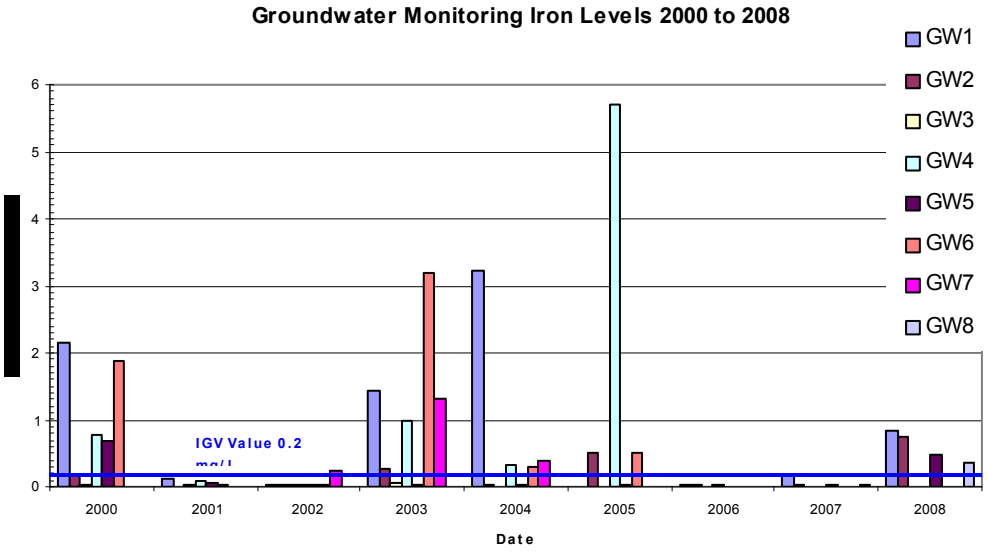


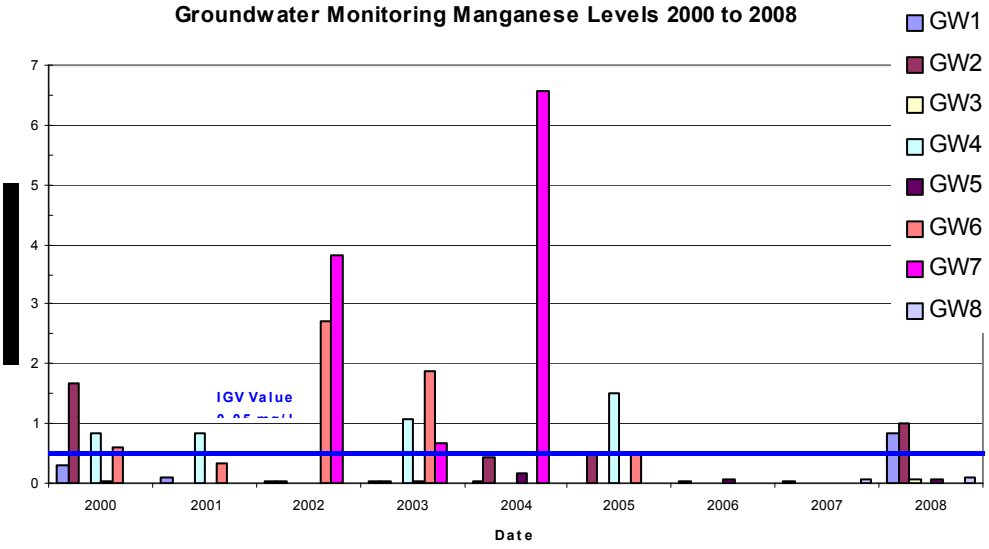
Figure No 4.10 illustrates the concentration of mercury is less than the IGV value of 0.001 mg/l. It should be noted that on many of the monitoring dates the concentration has been less than the detection limit of < 0.0005 mg/l.

Figure 4.11: Groundwater Monitoring Iron Levels (detection limit <0.03 mg/l)



The iron and manganese concentrations during 2007 in the groundwater exceed the IGV values for groundwater (Figure 4.11 & 4.12). However it should be noted that high iron and manganese concentrations occur naturally in groundwater in areas underlain by muddy limestones and old red sandstones where reducing conditions results in solution of iron and manganese from geological material.

Figure 4.12: Groundwater Monitoring Manganese Levels (detection limit < 0.014)



The concentration of lead has not been presented graphically as the IGV values for lead in groundwater is 0.01 mg/l it should be noted that the detection limit of the analysis method used up to end of 2004 was 0.049 mg/l. On all occasions up to end of 2004 the concentration of lead was less than the detection limit. During 2005 the detection limit of analysis method was increased with a detection limit of 0.002 mg/l being possible. The results for 2005 indicate concentrations above the IGV value of 0.019 mg/l at GW2 and GW6. The concentrations at GW4 (0.002 mg/l) and GW5 (< 0.002) were less than the IGV value. The detection limit of the analysis method used in 2006 and 2008 was again 0.049 mg/l, the concentration of lead was less than the detection limit during 2008 on all occasions.

4.1.6 Leachate Monitoring

Leachate Composition Monitoring

There are three combined leachate monitoring boreholes located within the site these being; G & L1, G & L3 and G & L4. In 2006 the existing monitoring locations G & L11 (GW4) and G & L12 (GW6) were included as leachate monitoring locations (Drawing No. 01). There was no access to monitoring location G & L2 or G & L5 during the reporting period as these monitoring installations were damaged by construction activities taking place at the site during 2005. It will not be necessary to replace these two leachate monitoring boreholes as monitoring locations G & L11 (GW4) and G & L12 (GW6) monitor the leachate composition within the waste body. Monitoring of the leachate composition is undertaken on a quarterly and annual basis with weekly monitoring of the leachate levels. There was no significant change in the composition of the leachate at the site during 2008.

The highest strength leachate is seen at monitoring location G & L3 as reflected in the elevated electrical conductivity, ammoniacal nitrogen, biochemical oxygen demand, chemical oxygen demand and iron values. Previously the lowest strength leachate was found at monitoring locations G & L11 and G & L12, however the leachate has strengthened in G& L11 during 2008. This trend is similar to the 2007 trend.

The monitoring of the composition of the leachate at the site indicates that the leachate is of a lower strength than the values typically quoted in the literature. Many of the parameters are within the standards set for drinking water. This is considered to be due to the high proportion of construction and demolition waste which has been landfilled at the site. The leachate composition is not considered to be significantly impacting on the environment in the vicinity of the site. The surface water and groundwater are naturally discharging to the estuary where significant dilution is available. Monitoring of the surface water quality in the vicinity of the site indicates that significant pollution is not occurring at the site.

Leachate Level Monitoring

Leachate levels are monitored on a weekly frequency at the site. From January 2007 EPA have requested that leachate levels be reported as the height of leachate above the base of the borehole. The variation in height of leachate above the base of the boreholes for 2008are summarised in Table 4.3. The depths of the wells are also included; there have been no changes in the depths of the wells during 2008.

It is important to note that this site is unlined and landfilling took place within a former worked out quarry. There are no records of the exact base profile of the site. However it is known to change based on available borehole logs. Significant quantities of construction and demolition waste have been landfilled at the site in the past, together with domestic refuse. This creates a difficulty in having an exact picture of leachate levels across the site as it results in perched leachate levels.

The highest leachate level during 2008 was recorded in G & L12. This monitoring location is located within the landfill site, in the south corner of the site. This monitoring location was formerly a groundwater monitoring location (GW6). It is located at an elevation of approx 16.5mOD in a low lying area of the landfill.

Table 4.3: Summary of Variation In Leachate Levels During 2008

Location	Maximum Leachate Level (m above the base of the borehole)	Minimum Leachate level (m above the base of the borehole)	Depth of Well (mbgl)
G & L1	4.95m Jan-08 and Sep-08	3.42m Jun-08	7.27
G & L2	Damaged		
G & L3	6.55m Jan-08	0.55m May-08 & Jun-08	11.55
G & L4	0.57m Feb-08	Dry for the most of Mar-Aug 08. 0.02m Feb-08, Oct-08 & Dec-08	7.00
G & L5	Damaged		
G & L11 (GW4)	13m Jan-08	10.09m Oct-08	20.70
G & L12 (GW6)	21.77m Sep-08	18.90 Jun-08	27.60

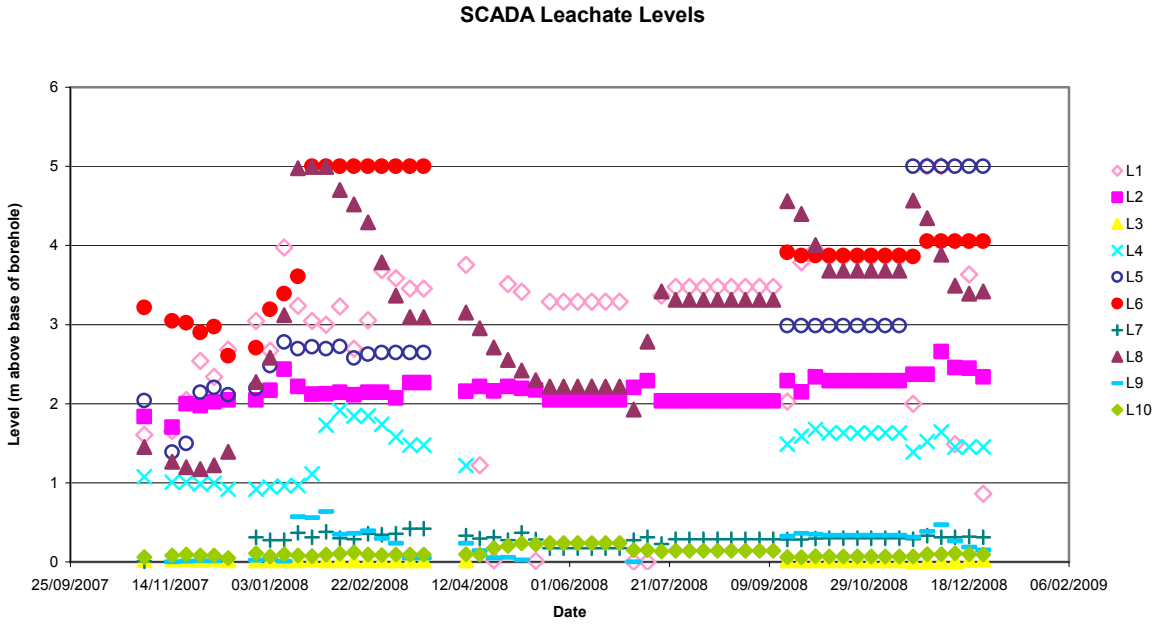
A topographical survey was carried out in April 2006. This survey measures the top of the standpipe for G&L12 at 13.9 mOD and G&L11 at 21.83 mOD. Calculating from this, the bottom of the standpipe for G&L12 (GW6) is over 14m below sea level and G&L11 (GW4) borders on sea level. The topographical survey from 2006 has not changed significantly. This indicates that there is a possibility for tidal influence at these particular boreholes. A preliminary investigation was carried out by BHP Laboratories Ltd. by viewing previous data and carrying out an ionic balance over a tidal period. The report concludes that there appears to be a minor tidal influence at these locations but the levels of chloride detected does not suggest actual seawater penetration.

Daily SCADA leachate level data from leachate abstraction points (L1 to L10 as shown on Drawing No. 02) since November 2007 to December 2008 has been examined. The lowest leachate levels are seen at leachate abstraction points L3, L7, L9 and L10. Levels at L3 are stable and lowest at 0.02m - 0.032m. The nearest leachate monitoring borehole to L3 is G & L4 where the lowest levels of each of the leachate monitoring boreholes was also recorded. No major fluctuation in levels are seen at L7, levels range from 0.172m to 0.422m. Only minor fluctuation in level is seen at L9 and levels range from 0.001m to 0.636m. The lowest levels in L9 are seen between November 2007 and January 2008 and between April and May 2008. Levels at L10 have remained relatively stable since November 2007 to December 2008 and lie between 0.05m and 0.239m. Leachate abstraction points L7, L9 and L10 are located at the south of the site.

The highest leachate levels are seen at leachate abstraction points L1, L6, L8. The greatest fluctuation in leachate levels is seen at L1 and L8. A large fluctuation in level is seen at L1 from 0.02m to 3.975m. Levels increase gradually from November 2007 to April 2008. From April 2008 levels even out at approximately 3m before decreasing again in November 2008. Levels at L8 fluctuate between 1.173m and 4.994m, peaking in January, September and November 2008. Leachate abstraction point L8 is located along the southwest boundary of the site as is G & L12 where the highest leachate levels of each of the leachate monitoring boreholes was recorded also. Levels readings at L6 fluctuated between 2.607m – 3.608m during November 2007 to January 2008. However, levels stabilised between September and December 2008 at approximately 4.0m.

Only minor fluctuation in level are seen at L2 (1.704m - 2.656m) and levels generally lie at approximately 2.0m. Levels at L4 varied from 0.917m - 1.912m over the period of November 2007 to December 2008. The highest leachate levels were measured during January and February of 2008 (1.729 – 1.912m). Towards the end of 2008 levels were generally approximately 1.631m. Levels at L5 ranged from 1.387m to 2.986m between November 2007 and December 2008. However, levels were stable at 2.986m during September and November 2008.

Figure 4.13 SCADA Leachate Level Data



Leachate Generation

Raffeen Landfill is an unlined site. The leachate abstraction system has been installed as part of the Final Restoration Contract. The discharge of leachate from the waste body is taking place to the groundwater and / or the surface water in the vicinity of the site. Both the surface water and groundwater are discharging to the Cork Harbour estuary immediately down gradient of the landfill where significant dilution is available.

The water balance method has been used to predict the likely annual leachate generation rates at the landfill site in order to estimate the potential leachate emissions from the facility.

This method is based on the use of a mathematical equation which provides a conservative estimate which caters for worst case scenarios. The method used for the Raffeen Landfill Site is based on the equation developed by Ehrig (Quality and Quantity of Sanitary Landfill Leachate, 1983).

The equation is as follows; $L_0 = [(ER.a) + LW + IR] – [aW]$

Where:-

L_0 : Free Leachate Produced
ER: Effective Rainfall (net precipitation after loss by evaporation).
a: Area of Cell(s)
LW: Liquid Waste
IR: Infiltration from restored areas
aW: Absorptive capacity of waste
a_R: Restored Area

The results of the leachate generation estimates are summarised in Table 4.4. Data from Cork Airport in 2008 has been used in the estimates as this is the closest meteorological station to the site. Effective rainfall corresponds to the amount of total rainfall minus evapotranspiration. Monthly rainfall figures for Cork Airport for 2008 are shown in Table 4.4. Potential evapotranspiration data from Cork Airport for 2008 has been obtained (Table 4.4).

The water balance method assumes that the infiltration on an uncapped cell which is open for a full year is taken as being 100% of the effective rainfall on the site. As outlined in the EPA Landfill Site Design Manual in areas that have been temporarily capped / restored an infiltration rate of 25 – 30% of the annual rainfall is recommended while in restored areas infiltration would be between 2 – 10%. The installation of the final capping commenced in March 2005. By July 2007 100% of the landfill has been capped. Since 100% of the final capping has been installed at the site, calculations that have been previously carried out on an upper and lower bound basis of 25% to 30% for the interim capped area no longer apply for 2008. An infiltration rate of 2% was used for the restored area to provide a realistic range in which the actual leachate production would lie. This method does not take into account the steep nature of the site (up to 1:2.5) in the leachate generation calculations.

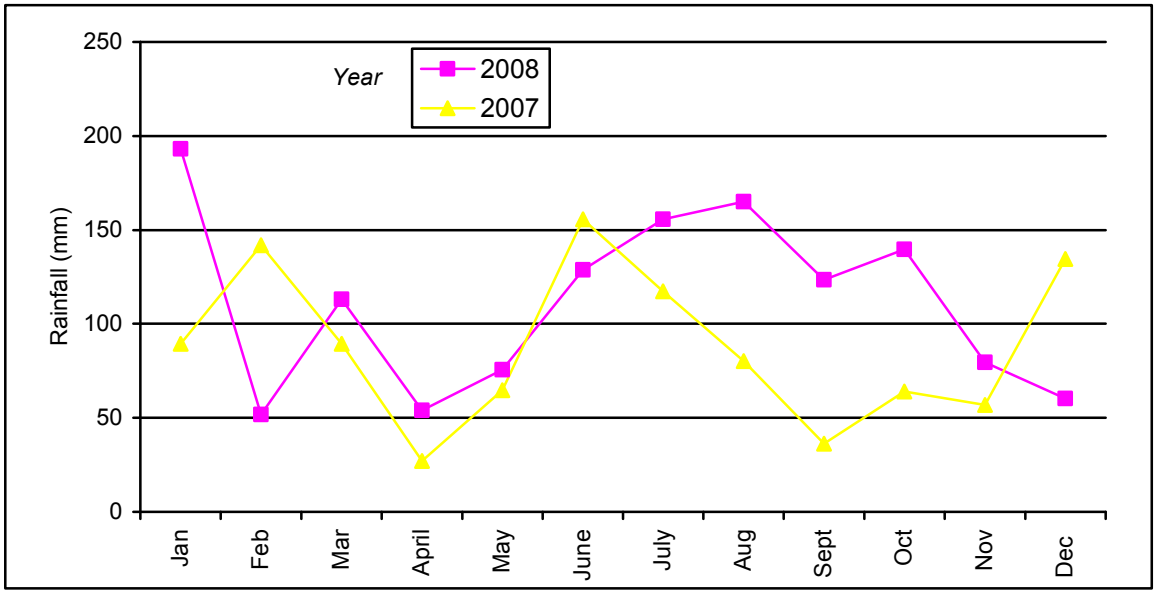
The landfilling of municipal refuse at Raffeen Landfill ceased in October 2001. 122,609m³ of inert construction and demolition waste, including 1,000m³/day of topsoil in 2007, has been accepted since this time for restoration purposes. Since final capping has been placed over 100% of the whole site no additional material has been required for restoration purposes in 2008. The water balance for the site has been calculated based on the assumptions outlined below.

Table 4.4: Water Balance Data 2008

Month	Average Rainfall Cork Airport (mm)	2008 Rainfall Cork Airport (mm)	Cork Airport Potential Evapo Transpiration Data 2008 (mm)	Effective Rainfall (mm)	Leachate Generation (m^3) 2% Final Capped Area
Jan	148.3	193.1	9.8	183.3	266
Feb	115.9	51.8	15.1	36.7	53
Mar	97.1	113.2	33.1	80.1	116
April	70.2	54	53.0	1	1
May	84.1	75.6	73.0	2.6	4
June	67.7	128.9	85.6	43.3	63
July	65.4	155.8	71.2	84.6	123
Aug	89.9	165.1	57.7	107.4	156
Sept	97.4	123.6	41.0	82.6	120
Oct	125.8	139.8	22.6	117.2	170
Nov	108.7	79.4	13.1	66.3	96
Dec	136.5	60.2	9.4	50.8	74
Total	**1206.9**	**1340.5**	**484.5**	**856**	**1,241**

In the Water Balance Calculation the figures for 2008 have been adjusted for January to December at 100% as restoration was completed at this time. The potential leachate generation from the area with interim capping no longer applies. During 2008 it is estimated that the leachate generation at the site was the order of 1,241 m^3/annum.

Figure 4.14: Rainfall in 2007 and 2008



The rainfall data during the reporting period has been compared to the monthly average rainfall figures for the period 1961 to 1990. The monthly rainfall figures for Cork Airport for 2008 have been compared to these monthly average figures. The rainfall figures were lower than average during February, April, May, November and December. The monthly rainfall figures were significantly higher for June, July and August 2008. Figure 4.14 shows rainfall over 2007 and 2008. The highest rainfall for 2008 occurred in January.

The highest leachate levels at the site are seen at monitoring location G&L12 in September. Monitoring locations G & L2 and G & L5 were damaged during 2005 therefore a full data set is not available for these locations since 2005.

Leachate Emissions

Leachate generation for 2008 is estimated at 1,241m3/annum. The maximum monthly leachate generation is estimated to have occurred during January 2008. The completion of 100% of the installation of the final capping since July 2007 has had a significant reduction in the volume of leachate being produced at the site. Leachate generation has reduced by approx 3,779 – 5,166m^3/annum.

As indicated by the monitoring of the leachate composition since 2000 the leachate at Raffeen is of low strength when compared to the values typically quoted for leachate composition.

The environmental monitoring programme at the site indicates no impact of leachate in the groundwater quality in the vicinity of the landfill. The concentration of ammoniacal nitrogen has been low in all groundwater monitoring locations.

As discussed in Section 4.1.5 most of the groundwater parameters are within the interim guideline values for groundwater set by the EPA. This indicates that the landfill is not having a significant impact on the groundwater quality in the vicinity of the site. As discussed in Section 4.1.4 no significant impact has been seen in the surface water quality in the vicinity of the site.

Table 4.5: Water Balance Calculation 2008

Period	Active Cell m^2	Effective Rainfall (m)	Volume of Waste (t)	Effective Rainfall x Active Area	Absorptive Capacity (m^3)	Volume of Free Leachate (m^3)	Interim Capped Area (m^2)	Final Capped Area (m^2)	Effective Rainfall (m)	Volume of Leachate Interim Capped Area (m^3)	Volume of Leachate Final Capped Area (m^3)	Total Leachate Produced (m^3)
January	0	0.1833	0	0.00	0	0.00	0	72,510	0.1833	0.00	265.82	266
February	0	0.0367	0	0.00	0	0.00	0	72,510	0.0367	0.00	53.22	53
March	0	0.0801	0	0.00	0	0.00	0	72,510	0.0801	0.00	116.16	116
April	0	0.001	0	0.00	0	0.00	0	72,510	0.001	0.00	1.45	1
May	0	0.0026	0	0.00	0	0.00	0	72,510	0.0026	0.00	3.77	4
June	0	0.0433	0	0.00	0	0.00	0	72,510	0.0433	0.00	62.79	63
July	0	0.0846	0	0.00	0	0.00	0	72,510	0.0846	0.00	122.69	123
Aug	0	0.1074	0	0.00	0	0.00	0	72,510	0.1074	0.00	155.75	156
Sept	0	0.0826	0	0.00	0	0.00	0	72,510	0.0826	0.00	119.79	120
Oct	0	0.1172	0	0.00	0	0.00	0	72,510	0.1172	0.00	169.96	170
Nov	0	0.0663	0	0.00	0	0.00	0	72,510	0.0663	0.00	96.15	96
Dec	0	0.0508	0	0.00	0	0.00	0	72,510	0.0508	0.00	73.67	74
Total		**0.856**				**0.00**				**0.00**		**1241**

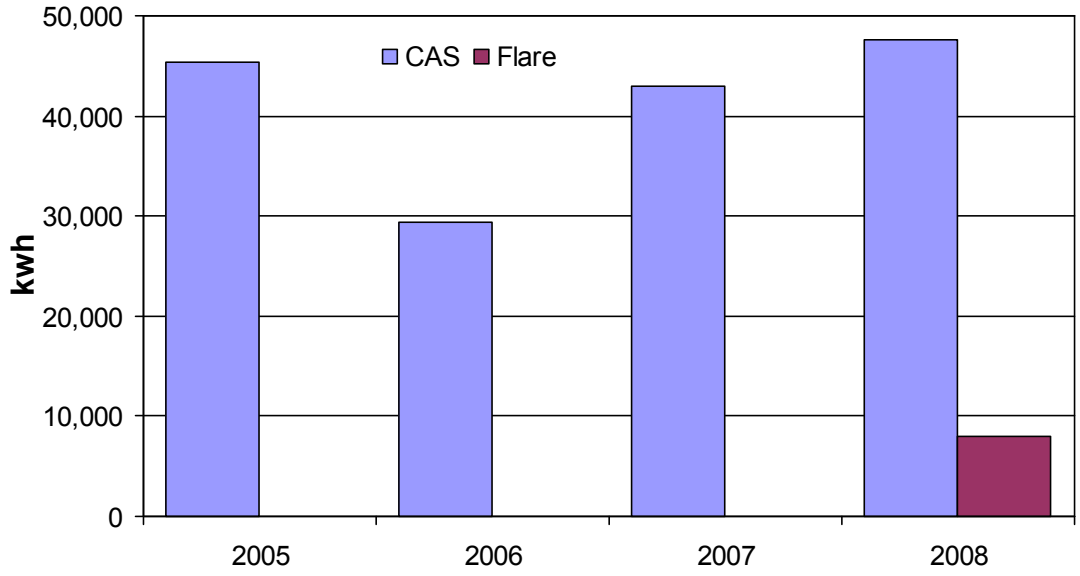
Note 2% Infiltration On Final Capped Area

5.0 ENERGY CONSUMPTION/GENERATION

5.1 Resource and Energy Consumption Summary

The landfilling of waste has ceased at the site and therefore fuel is no longer used by site machinery. Records indicate that the ESB usage at the landfill site office during the year amounted to 47,609 kW hours in 2008. Usage trends are shown in Figure 5.1 below.

Figure 5.1: Energy Usage at Raffeen Landfill & Civic Amenity Site



The drop in usage from 2005 to 2006 may be due to the compacter for light plastic packaging being in disuse, with the increase from 2006 to 2007 being attributed to the installation of the temporary flare. In April 2008 a paper compactor was installed at the site and this has contributed to the increase in energy usage between 2007 – 2008.

A permanent flare was also installed in 2008 and was commissioned at the end of June. The energy usage for this is accounted for on a separate connection. In total just under 8,000 kWhrs were used to run this flare in 2008.

The Contractor had no major works to carry out on site in 2008 and did not use any significant amount of fuel. There was no usage of electricity by the Contractor. Packing of skips carried out by JCB used a total of 8,300 litres per year in 2008.

All electricity at Raffeen is provided by Energia and is “green” electricity i.e. it is carbon free and there is no carbon tax is payable.

6.0 ENVIRONMENTAL INCIDENTS AND COMPLAINTS

Condition 3 of the Waste Licence requires that the licensee shall make written records of environmental incidents and complaints.

Incidents & Complaints

There were no complaints and no incidents in 2008.

6.1 Review of Nuisance Controls

6.2.1 Litter Abatement Measures

As the landfilling of municipal waste has ceased at the site the potential for the generation of litter has been significantly reduced. The civic amenity centre has been operational since late January 2005. Routine litter patrols are carried out on the instruction of the Facility Manager to ensure that any loose litter is collected. Litter patrols include the area of the civic amenity centre as well as all fences and the public road along the site boundary. The effectiveness of the litter control techniques are assessed weekly and documented in the weekly site inspection record sheet.

All contractors transporting materials offsite for recycling from the civic amenity centre are required to ensure that when transporting and discharging these loads that litter generation is kept to an absolute minimum. All vehicles are required to be totally sealed or covered with a net or tarpaulin to ensure that materials are not blown from the vehicles.

6.2.2 Birds

Municipal waste is no longer accepted for landfilling at the Raffeen waste facility. However, it is accepted in skips at the Civic Amenity Centre for transport to an alternative landfill. Prior to February 2007 this waste was brought to East Cork Landfill. Since their closure, waste is now being transported to Youghal Landfill or the Kinsale Road Landfill. This has led to an increase in the volume of municipal waste being accepted at Raffeen, as it appears that some customers previously using the East Cork Landfill are now using Raffeen for disposal of their household municipal waste. Waste accepted from street sweepings has also increased.

This appears to have resulted in an increase in the number of birds perching on skips holding municipal waste when there is no human activity around the area. To mitigate this impact, these skips were retrofitted with a roll-over tarpaulin cover in April/May 2008. They are easily used and can be operated by one person. They are opened by Council workers when depositing residual waste and closed immediately afterwards.

6.2.3 Vermin and Flying Insects

As municipal refuse is no longer accepted for landfilling at the site and full cover has been placed over the whole site there is currently no food source for vermin. The situation is continuously monitored by the Facility Manager and preventative baiting is undertaken by a specialist contractor on a regular basis. A comprehensive pest control programme is in place on site and on occasions, particularly coming into the winter, when vermin tend to migrate to warmer locations the pest control company lay extra bait where needed. The completion of the installation of the final capping during 2007 has reduced the potential for vermin.

However, extra rat poison put down on occasions in March and October 2008 when rats were spotted around the residual waste bin.

Flies do not pose a problem at the Raffeen Civic Amenity Centre. Residual (municipal) waste bins are emptied frequently at Youghal and Kinsale Road Landfills. Wasps however, do cause problems during the summer. During August 2008 there was the seasonal increase in wasps. Wasp 'catchers' and spray were purchased to minimise the impact on visitors to the site.

6.2.4 Fires

The burning of waste or other material is not permitted at the facility. Municipal refuse is no longer landfilled. In the event that a fire breaks out on the site, it will be treated as an emergency and dealt with immediately, in accordance with the Emergency Response Procedure for dealing with fires.

6.2.5 Odour Control

Municipal waste is no longer landfilled at the site and the final capping of the landfill was completed during Summer 2007. The landfilling of waste no longer presents a potential to generate occurs.

Other potential odours include odours from gas production from the waste body of the landfill. However, the gas management system and permanent flaring has been installed and commissioned since July 2008, and odours have not been a problem from the waste body.

The operation of the civic amenity centre also has the potential to generate odours. Odours may occur from putresible waste in skips, however residual (municipal) waste bins are emptied frequently at Youghal and Kinsale Road Landfills. Should it be required collection bins and skips in the civic amenity centre shall be washed to prevent the generation of malodours. Weekly inspections of the site have shown odour has not been a nuisance. Odour, where detected has been from farming activities in the area.

6.2.6 Dust Control

The Contract for the Final Restoration of the landfill site is complete. The Contractor was required to clean roadways of any dirt, mud or other materials being dropped or spread by traffic associated with this contract. During 2008 the Facility Manager organised for road sweeping to be undertaken as necessary. The Facility Manager ensures that effective dust control measures are implemented on site.

6.2 Programme for Public Information

The Communications Programme has remained unchanged from the previous year's AER. Public information at Raffeen in 2008 has involved laminated signage with updates on:

- Free Household Hazardous Waste Collections by Chemcar (laminated signage)

- A free waste recycling website: wastematchers.com (laminated signage and leaflets)
- Leaflets on Raffeen, the materials accepted and how to present it
- Composting Information Packs (see Section 7 for more information)

A display for leaflets was ordered in November 2008 and will be used to provide easy assessable information for staff to hand to customers.

Objective 1 in Section 7 gives further details on the public information programme at Raffeen CAS.

7.0 ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

In accordance with Condition 2 (Management of the Facility) of the Waste Licence (68-2), Cork County Council (CCC) is required to establish and maintain a documented Environmental Management System (EMS) for the facility.

7.1 Objectives And Targets

The purpose of this section is to determine what progress has been made towards achieving the objectives and targets proposed during the previous year, and how the objectives will continue to be met and improved upon in the forthcoming year. It also outlines any new objectives proposed for the forthcoming year.

Objective 1: Establish an environmental awareness programme on site targeting the further development of recycling.

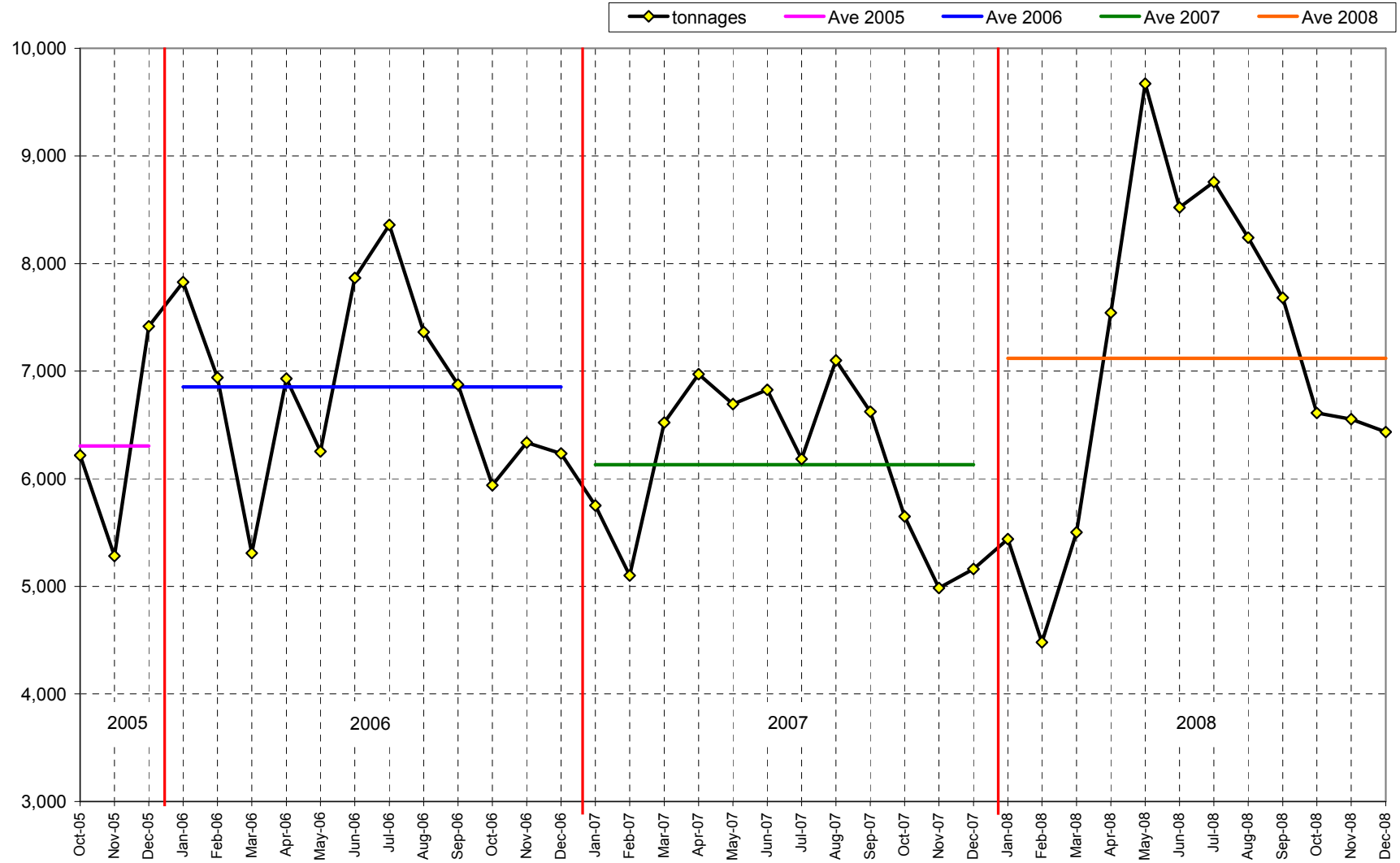
The civic amenity centre opened in late January 2005 and since then has increased recycling awareness in the area to the extent that the number of users at the site has been increasing steadily over the years. While user numbers (or vehicles counted entering the site) dropped slightly in 2007 compared to 2006, in 2008 these were back up and above 2006 levels. See Figure 7.1 which shows monthly usage.

In 2008 over 85,400 vehicles were logged as entering the facility with the intention to recycle or dispose of material. This is a 16% increase on the numbers for 2007 (73,566 vehicles). Usage has mainly increase during the week from Monday to Friday. Saturdays do not show any huge increase in numbers (based on averages), but have stayed steadily at the 2007 figure. This shows that while more people are visiting the Civic Amenity Site in 2008 they opt to come in during the week when it is considerably quieter than on Saturdays. Saturdays tend to have double the number of vehicles compared to week days and the waiting time for customers can be frustrating.

Statistics for 2008 give approximately 280 vehicles per day. However it is more realistic to take Saturday out of this calculation. This gives an average of 240 vehicles excluding Saturdays and an average of 480 vehicles for Saturdays only.

Weekends were busiest from April to September with Saturday 7th June being the busiest day of the year (over 700 vehicles registered as entering the facility). These numbers may have been influenced by the June bank holiday the previous Monday. People who would normally visit the site on a Saturday may have postponed it until the following week if they went away for the bank holiday weekend. Saturday 10th and 17th May were the next busiest of the year. January and February were the quietest months in 2008, with Thursday 31st January being the quietest of the year, and the second quietest day of the year on Wednesday 23rd January (both just under 80 vehicles).

Figure 7.1: Monthly User Numbers at Raffeen CAS



General Operatives are updated continuously on recycling information relative to the operation of the site. Leaflets on the facility, what it accepts and how to present it at the site and on other recycling and environmental matters are available upon request at the site office. Numerous telephone queries are responded to on a daily basis advising people on the best way to present their materials at the site or sometimes a more suitable location.

The Facility Manager is on site to provide information on recycling and has completed the FÁS Waste Management Training Course. Any deputy/assistant Facility manger will also undergo this training. All general operatives have completed the FÁS Waste Operator Training Course.

A new method of distributing information was to prepare **"Compost Packs"** which are given out when compost bins were purchased. These packs contain:

- a book on *Backyard Composting* by John Rouac,
- a CD-Rom on *The Complete Guide to Home Composting*
- information on WasteMatcher.com a re-use website for Cork City and County
- list of Chemcar Free Household Hazardous Waste Collections
- and other helpful information on waste and recycling including information on materials accepted at the recycling centre

As in previous years, in the forthcoming year it is proposed to continue to expand the range of information leaflets on various recycling and environmental issues available at the site office. A method of distributing these leaflets to the public was investigated in 2008, as there is no "reception area" as such where a display can be placed. A stand for leaflets was ordered in November 2008 and will be used to provide easy assessable information for staff to hand to customers.

The responsibility of achieving these targets lie with the Facility Manager, Deputies/ Assistants and the General Operatives employed at the site.

Objective 2: Cork County Council propose to continue investigating new materials and markets for collected recyclable material at the civic amenity centre.

Cork County Council provide collection facilities for the recycling of a wide range of goods. Materials currently collected at the civic amenity/ recycling centre are listed in Section 2.1 Waste Quantities and Composition. This includes polystyrene, paint, aerosol cans, and batteries.

This range was expanded in 2008 to include waste oil containers. This was to help prevent containers being emptied of the waste oil from going into the residual waste. The waste oil containers are shredded and recycled.

During 2008 an arrangement was made to collect bicycles that the public are discarding at the Raffeen Recycling Centre and give them to a not-for-profit community group that is run by a group of volunteers called Cork Community Bikes.

Cork Community Bikes work with local schools and youth groups promoting the use of bicycles and sustainable transport. They have developed a do-it-yourself bike workshop for the community to use and have made it a centre of training and a social focus for anybody with an interest in bicycles in Cork City.

This is beneficial on a number of levels:

- it removes unwanted bicycles from the waste stream
- it supports the principles of reduce, re-use, recycle
- it provides support to the local community and in particular the youth

Due to the current economic circumstances in 2009 this objective will have the added caveat that acceptance of all materials will depend on the economic viability of recycling certain materials. All aspects including costs of recycling versus landfilling and the impacts of certain materials in landfill (e.g. paints, aerosols, engine oil containers, polystyrene) must be carefully considered for the future operations of the site.

Objective 3: Cork County Council to examine the viability of inviting local school groups or other interested parties to the site.

A number of groups and individuals interested in recycling visited the site in 2008. A visit from approximately twenty first year students from St. Bernadettes School took place in October.

It is intended to continue these informative site visits as there has been very good feedback from students and teachers. It is the responsibility of the Facility Manager to ensure this occurs.

Objective 4: Cork County Council to investigate the possibility of providing nesting boxes and the establishment of bird hides.

Due to delays with the commencement of the contract for the Final Capping and Gas Abstraction System the landscaping did not commence until September 2007. Grass seeding operations took place between September and October 2007 and tree and shrub planting commenced on February 8th 2008. Landscaping planting works were completed by mid April 2008. A sufficient period of time must be allowed for the establishment of the vegetation, after which a suitable programme for the provision of nesting boxes and the establishment of bird hides will be investigated.

Objective 5: Implementation of Landscape Proposal

The target of final restoration was achieved during 2008. The installation of the final capping was completed during Summer 2007. Grass seeding operations took place between September and October 2007 and tree and shrub planting commenced February 2008. Landscaping works were completed by mid April 2008.

The implementation of the landscape proposals satisfies the following objectives:-

- Re-establishes native woodlands and scrub habitats that reflect the character of existing habitats and provides a wildlife corridor between existing fragmented habitats.
- Creates a diverse range of habitats including aquatic, marsh, meadow, hedgerow, scrub and woodland.
- Ensures that all adverse visual impacts affecting local properties and the landscape in general are effectively mitigated against.
- Provides an attractive setting to the recycling facility.
- Provides a planting specification that shall minimize long-term maintenance.

Objective 6: Maintain monitoring programme

The environmental monitoring programme has been in operation at the site since before the waste licence was issued. The programme meets the requirements of the waste licence and has been expanded over 2006 in response to requests by the Agency. The monitoring programme continued at current frequencies during 2008 as the final restoration works were not completed until mid 2008. During 2009 it proposed that a submission shall be made to the Agency outlining the proposed revised monitoring frequencies during the aftercare period.

Objective 7: Full review of all procedures and forms

All procedures at the site will be thoroughly reviewed and new ones developed where required, with updates completed by the end of the year for submission in next year's AER. This is the responsibility of the Facility Manager and General Operatives.

7.2 Summary of Procedures Associated with the Facility

There have been no new procedures developed at the site during the reporting period. A review of all procedures will be carried out in 2009.

7.3 Financial Provisions

Cork County Council is committed to protecting the environment and will ensure the provision of the necessary funds to meet any financial commitments or liabilities incurred by the carrying out of the disposal activities relating to the Raffeen Landfill. These commitments include compliance with the waste management licence (No. W0023-01) and restoration and aftercare of the site as specified in Condition 8 of the licence.

In 2008 budget funding in the order of €150,000 for operational / maintenance costs for the landfill and €0.96 million capital costs for the Raffeen Restoration and Capping Contract was made available. Finances of approximately €760,000 were made available for operation of the Civic Amenity site.

Funding for 2009 has decreased significantly for the landfill operation as the capping on site is complete. €220,000 has been made available for operational / maintenance costs of the landfill, and €828,950 for the operation and maintenance of the Civic Amenity Site.

Under Section 38 of the Waste Management Act, 1996, Cork County Council "shall provide and operate, or arrange of, such facilities as may be necessary for the recovery and disposal of household waste arsing within the functional area". Compliance with section 38 and all other relevant sections of the waste management act, 1996 is a statutory obligation of Cork County Council. Cork County Council annually in the preparation of the "Book of Estimates" and the passing of these estimates shall make provision for any capital works and maintenance works required to fulfil conditions of the waste licence for the Raffeen Landfill.

8.0 ENERGY AUDIT

In October 2007 an energy audit was carried out by the Energy Section of Cork County Council. A data logger recorded energy usage over a number of weeks. This identified lighting of the site as being the main usage of electricity on site contributing to 73% of energy costs. The audit identified an approximate daytime usage of 1.5 kW/hr compared to 8kW/hr at night. A night meter was installed in early November at Raffeen to bring costs down, however, the Energy Section recommended that motion sensors be installed to further reduce energy usage. This is currently under investigation and it is envisaged that in conjunction with some other civil works required this will be implemented in 2009.

(A) GAS & LEACHATE

PT_CD	NAME	LIC_TYPE	ACTIVITY	PT_TYPE	EASTING	NORTHING	VERIFIED	STATUS
G & L1	RAFFEEN	W	LANDFILL	M	174,932	065,751	Y	EXISTING
G & L2	RAFFEEN	W	LANDFILL	M	175,048	065,582	Y	✱ DAMAGED
G & L3	RAFFEEN	W	LANDFILL	M	175,151	065,462	Y	EXISTING
G & L4	RAFFEEN	W	LANDFILL	M	175,194	065,399	Y	EXISTING
G & L5	RAFFEEN	W	LANDFILL	M	175,246	065,301	Y	✱ DAMAGED
G & L11 (GW4)	RAFFEEN	W	LANDFILL	M	175,196	065,376	Y	EXISTING
G & L12 (GW6)	RAFFEEN	W	LANDFILL	M	175,325	065,201	Y	EXISTING

(B) SURFACE WATER

PT_CD	NAME	LIC_TYPE	ACTIVITY	PT_TYPE	EASTING	NORTHING	VERIFIED	STATUS
SW 1	RAFFEEN	W	LANDFILL	M	174,893	065,958	Y	EXISTING
SW 2	RAFFEEN	W	LANDFILL	M	175,414	065,158	Y	EXISTING
SW 2A	RAFFEEN	W	LANDFILL	M	175,401	065,142	Y	EXISTING
SW 2B	RAFFEEN	W	LANDFILL	M	175,423	065,149	N	EXISTING
SW 3	RAFFEEN	W	LANDFILL	M	175,432	065,114	Y	EXISTING
SW 4	RAFFEEN	W	LANDFILL	M	174,929	065,748	Y	EXISTING
SW 5	RAFFEEN	W	LANDFILL	M	175,333	065,211	Y	EXISTING

(C) NOISE

PT_CD	NAME	LIC_TYPE	ACTIVITY	PT_TYPE	EASTING	NORTHING	VERIFIED	STATUS
N 1	RAFFEEN	W	LANDFILL	M	174,948	065,759	Y	EXISTING
N 2	RAFFEEN	W	LANDFILL	M	175,092	065,598	Y	EXISTING
N 3	RAFFEEN	W	LANDFILL	M	175,336	065,222	Y	EXISTING
N 4	RAFFEEN	W	LANDFILL	M	175,419	065,279	Y	EXISTING
N 5	RAFFEEN	W	LANDFILL	M	175,354	065,111	Y	EXISTING
N 6	RAFFEEN	W	LANDFILL	M	175,161	065,057	Y	EXISTING
N 7	RAFFEEN	W	LANDFILL	M	175,395	065,177	Y	EXISTING

(D) DUST

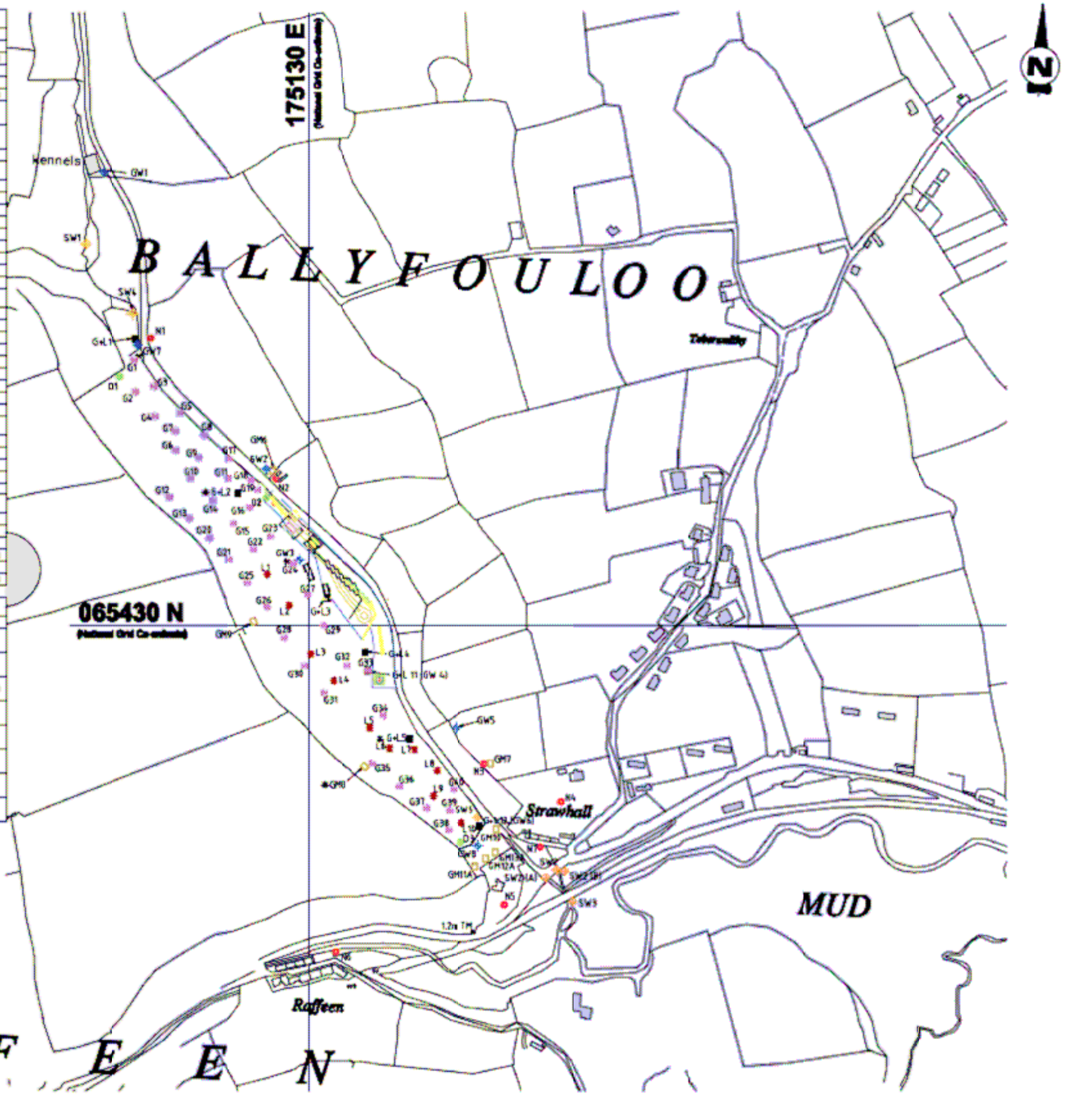
PT_CD	NAME	LIC_TYPE	ACTIVITY	PT_TYPE	EASTING	NORTHING	VERIFIED	STATUS
D 1	RAFFEEN	W	LANDFILL	M	174,912	065,715	Y	EXISTING
D 2	RAFFEEN	W	LANDFILL	M	175,081	065,577	Y	EXISTING
D 3	RAFFEEN	W	LANDFILL	M	175,384	065,182	Y	EXISTING

(E) GROUNDWATER

PT_CD	NAME	LIC_TYPE	ACTIVITY	PT_TYPE	EASTING	NORTHING	VERIFIED	STATUS
GW 1	RAFFEEN	W	LANDFILL	M	174,889	065,998	Y	EXISTING
GW 2	RAFFEEN	W	LANDFILL	M	175,081	065,609	Y	EXISTING
GW 3	RAFFEEN	W	LANDFILL	M	175,119	065,546	Y	✱ DAMAGED
GW 5	RAFFEEN	W	LANDFILL	M	175,276	065,306	Y	EXISTING
GW 7	RAFFEEN	W	LANDFILL	M	174,924	065,756	Y	✱ DAMAGED
GW 8	RAFFEEN	W	LANDFILL	M	175,323	065,176	N	EXISTING

(F) GAS MIGRATION

PT_CD	NAME	LIC_TYPE	ACTIVITY	PT_TYPE	EASTING	NORTHING	VERIFIED	STATUS
GM6 (G+L 6)	RAFFEEN	W	LANDFILL	M	175,088	065,608	Y	EXISTING
GM7 (G+L 7)	RAFFEEN	W	LANDFILL	M	175,332	065,273	Y	EXISTING
GM8 (G+L 8)	RAFFEEN	W	LANDFILL	M	175,107	065,361	N	✱ DAMAGED
GM9 (G+L 9)	RAFFEEN	W	LANDFILL	M	175,066	065,435	Y	EXISTING
GM10 (G+L 10)	RAFFEEN	W	LANDFILL	M	175,345	065,197	Y	EXISTING
GM11A (G+L 11)	RAFFEEN	W	LANDFILL	M	175,337	065,171	Y	EXISTING
GM12A (G+L 12)	RAFFEEN	W	LANDFILL	M	175,349	065,188	Y	EXISTING
GM13A (G+L 13)	RAFFEEN	W	LANDFILL	M	175,361	065,187	Y	EXISTING



NOTES

- Gas / Leachate Level & Leachate Composition Monitoring (G + L)
- Gas Migration Monitoring Only (GM)
- Noise Monitoring (N)
- Dust Monitoring (D)
- Groundwater Monitoring (GW)
- Surface Water (SW)
- Damaged Borehole (No Longer in Existence)

No.	Date		Amendment / Issue	App.
			ISSUE FOR APPROVAL	
			ISSUE FOR APPROVAL	
			ISSUE TO EPA	

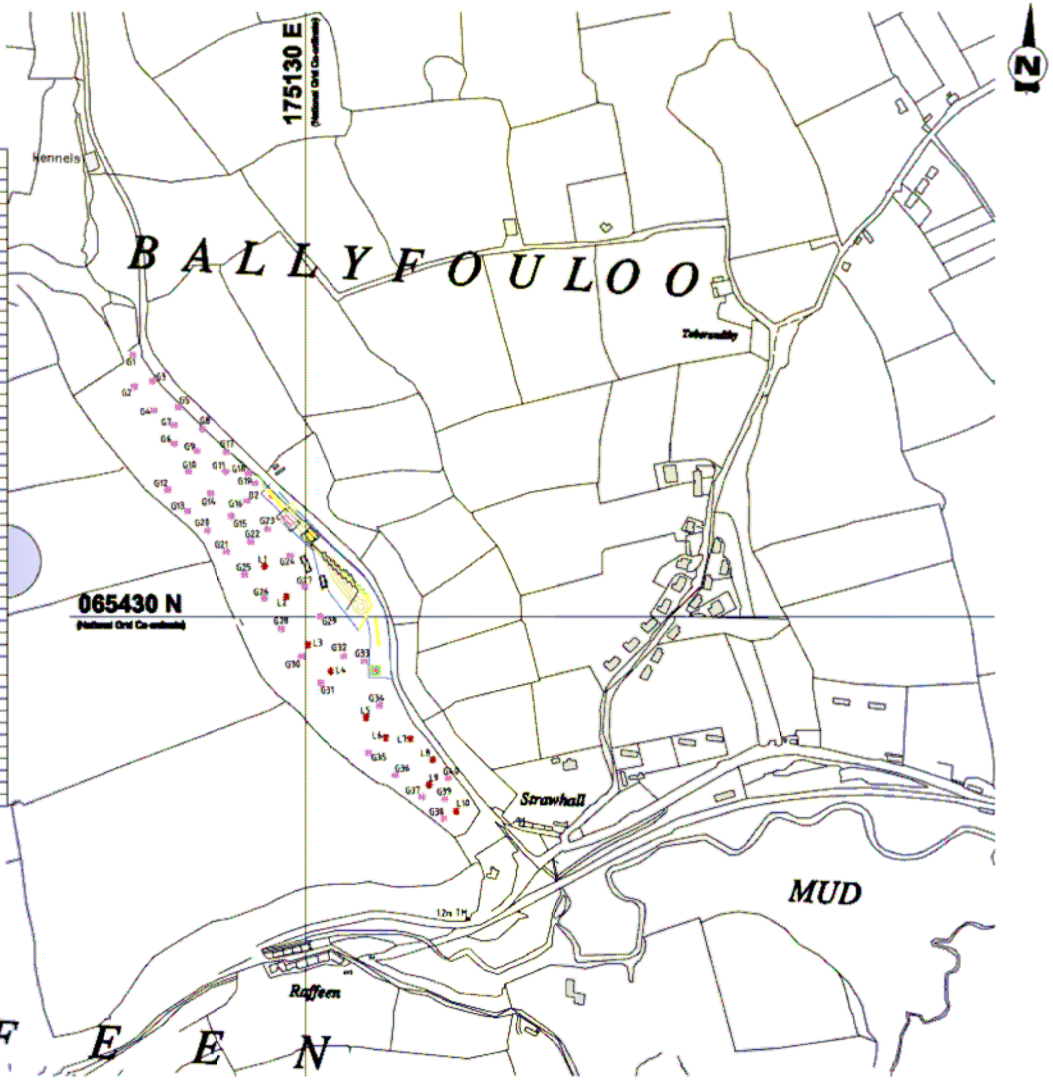
Client:
Cork County Council

Consulting Engineers

Project:
RAFFEEN LANDFILL
ANNUAL ENVIRONMENT
REPORT 2008

Title:
1/2500 LOCATION PLAN
SHOWING
ENVIRONMENTAL
MONITORING POINTS.

Dwg. No: 01
Rev: A01



(S) GAS ABSTRACTION

PT_ID	NAME	LE_TYPE	ACTIVITY	PT_TYPE	EASTING	NORTHING	VERIFIED	STATUS
G1	RAFFEEN	W	LANDFILL	A	174,929	065,734	Y	EXISTING
G2	RAFFEEN	W	LANDFILL	A	174,930	065,698	Y	EXISTING
G3	RAFFEEN	W	LANDFILL	A	174,952	065,704	Y	EXISTING
G4	RAFFEEN	W	LANDFILL	A	174,953	065,678	Y	EXISTING
G5	RAFFEEN	W	LANDFILL	A	174,982	065,674	Y	EXISTING
G6	RAFFEEN	W	LANDFILL	A	174,977	065,632	Y	EXISTING
G7	RAFFEEN	W	LANDFILL	A	174,977	065,653	Y	EXISTING
G8	RAFFEEN	W	LANDFILL	A	175,010	065,649	Y	EXISTING
G9	RAFFEEN	W	LANDFILL	A	175,004	065,623	Y	EXISTING
G10	RAFFEEN	W	LANDFILL	A	174,996	065,599	Y	EXISTING
G11	RAFFEEN	W	LANDFILL	A	175,037	065,599	Y	EXISTING
G12	RAFFEEN	W	LANDFILL	A	174,970	065,578	Y	EXISTING
G13	RAFFEEN	W	LANDFILL	A	174,992	065,553	Y	EXISTING
G14	RAFFEEN	W	LANDFILL	A	175,019	065,574	Y	EXISTING
G15	RAFFEEN	W	LANDFILL	A	175,044	065,548	Y	EXISTING
G16	RAFFEEN	W	LANDFILL	A	175,061	065,566	Y	EXISTING
G17	RAFFEEN	W	LANDFILL	A	175,038	065,622	Y	EXISTING
G18	RAFFEEN	W	LANDFILL	A	175,063	065,597	Y	EXISTING
G19	RAFFEEN	W	LANDFILL	A	175,071	065,586	Y	EXISTING
G20	RAFFEEN	W	LANDFILL	A	175,016	065,531	Y	EXISTING
G21	RAFFEEN	W	LANDFILL	A	175,038	065,507	Y	EXISTING
G22	RAFFEEN	W	LANDFILL	A	175,066	065,517	Y	EXISTING
G23	RAFFEEN	W	LANDFILL	A	175,086	065,532	Y	EXISTING
G24	RAFFEEN	W	LANDFILL	A	175,112	065,502	Y	EXISTING
G25	RAFFEEN	W	LANDFILL	A	175,059	065,479	Y	EXISTING
G26	RAFFEEN	W	LANDFILL	A	175,082	065,451	Y	EXISTING
G27	RAFFEEN	W	LANDFILL	A	175,128	065,466	Y	EXISTING
G28	RAFFEEN	W	LANDFILL	A	175,181	065,416	Y	EXISTING
G29	RAFFEEN	W	LANDFILL	A	175,146	065,431	Y	EXISTING
G30	RAFFEEN	W	LANDFILL	A	175,125	065,385	Y	EXISTING
G31	RAFFEEN	W	LANDFILL	A	175,167	065,356	Y	EXISTING
G32	RAFFEEN	W	LANDFILL	A	175,174	065,385	Y	EXISTING
G33	RAFFEEN	W	LANDFILL	A	175,198	065,379	Y	EXISTING
G34	RAFFEEN	W	LANDFILL	A	175,215	065,328	Y	EXISTING
G35	RAFFEEN	W	LANDFILL	A	175,203	065,273	Y	EXISTING
G36	RAFFEEN	W	LANDFILL	A	175,234	065,263	Y	EXISTING
G37	RAFFEEN	W	LANDFILL	A	175,265	065,221	Y	EXISTING
G38	RAFFEEN	W	LANDFILL	A	175,290	065,196	Y	EXISTING
G39	RAFFEEN	W	LANDFILL	A	175,291	065,229	Y	EXISTING
G40	RAFFEEN	W	LANDFILL	A	175,296	065,243	Y	EXISTING

(S) DUAL GAS AND LEACHATE

PT_ID	NAME	LE_TYPE	ACTIVITY	PT_TYPE	EASTING	NORTHING	VERIFIED	STATUS
L1	RAFFEEN	W	LANDFILL	A	175,062	065,489	Y	EXISTING
L2	RAFFEEN	W	LANDFILL	A	175,107	065,414	Y	EXISTING
L3	RAFFEEN	W	LANDFILL	A	175,137	065,398	Y	EXISTING
L4	RAFFEEN	W	LANDFILL	A	175,154	065,368	Y	EXISTING
L5	RAFFEEN	W	LANDFILL	A	175,198	065,315	Y	EXISTING
L6	RAFFEEN	W	LANDFILL	A	175,222	065,298	Y	EXISTING
L7	RAFFEEN	W	LANDFILL	A	175,251	065,288	Y	EXISTING
L8	RAFFEEN	W	LANDFILL	A	175,277	065,265	Y	EXISTING
L9	RAFFEEN	W	LANDFILL	A	175,273	065,235	Y	EXISTING
L10	RAFFEEN	W	LANDFILL	A	175,305	065,205	Y	EXISTING

NOTES

- Gas Abstraction (G)
- Dual Gas & Leachate Abstraction (L)

Client: Cork County Council

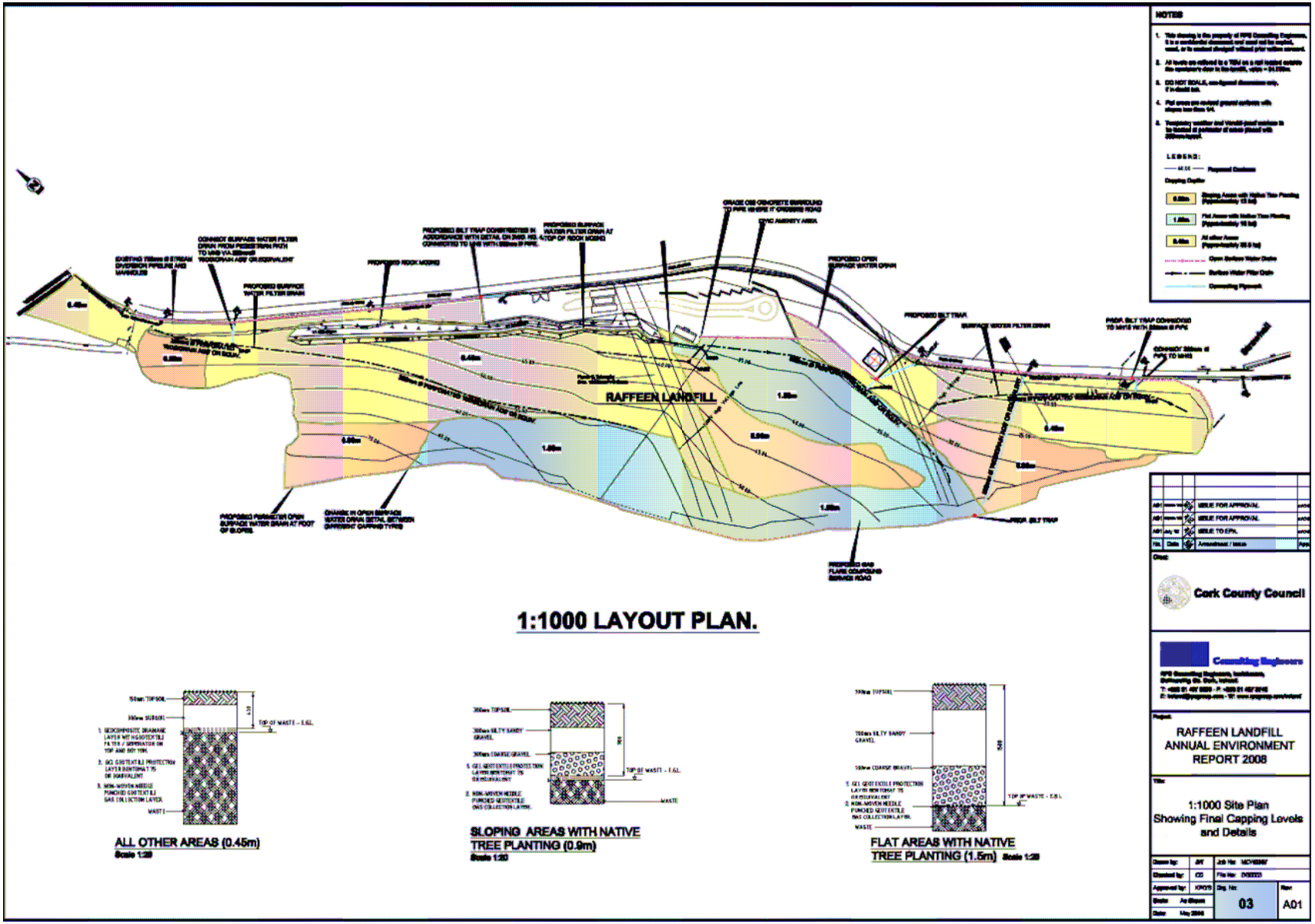
Consulting Engineers

Project: RAFFEEN LANDFILL ANNUAL ENVIRONMENT REPORT 2008

Title: 1/2500 LOCATION PLAN SHOWING GAS & LEACHATE EXTRACTION POINTS

Drg. No: 02

Rev: A01


NOTES
LEGEND:
RAFFEEN LANDFILL
1:1000 LAYOUT PLAN.
ALL OTHER AREAS (0.45m)
Scale 1:20
SLOPING AREAS WITH NATIVE TREE PLANTING (0.9m)
Scale 1:20
FLAT AREAS WITH NATIVE TREE PLANTING (1.5m)
Scale 1:20
ISSUE FOR APPROVAL
ISSUE TO EPA
Cork County Council
Consulting Engineers
RAFFEEN LANDFILL ANNUAL ENVIRONMENT REPORT 2008
1:1000 Site Plan Showing Final Capping Levels and Details
03
A01