Annual Environmental Report 2010

CARLOW
COUNTY COUNCIL
CONTAE CHEATHARLOCHA

Powerstown Landfill

Waste Licence Reg. No. W0025-03

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Table of Contents

TABLES

DRAWINGS

Drawing No 1: Development of 3 phases of Powerstown Landfill

Drawing No 2: Site Layout

APPENDICES

Appendix 1: Map of Monitoring Locations

Appendix 2: Results of Surface Water Monitoring 2010

Appendix 3: Results of Groundwater Monitoring 2010
Groundwater Contour Map

Appendix 4: PRTR

Appendix 5: Topographical Survey

Appendix 6: Bund Integrity Testing

Appendix 7: Water Balance Calculation

1.0 Introduction

This report comprises an Annual Environmental Report (AER) for the Powerstown Landfill Facility, Powerstown, Co. Carlow. The report has been compiled in accordance with Condition 11.5 and Schedule G of the Waste Licence for the facility (Register Number W0025-03) and in accordance with the Environmental Protection Agency's (EPA) Guidance Notes on the preparation of AERs. The report covers the period of 1st January 2010 to 31st December 2010.

The following information is required to be contained in the AER:

Activity	Report Section
Reporting Period	1.0
Waste activities carried out at the facility.	2.2
Quantity and Composition of waste received, disposed of and recovered during the reporting period and each previous year.	2.3
Calculated remaining capacity of the facility and year in which final capacity is expected to be reached.	2.4
Methods of deposition of waste.	2.5
Summary report on emissions (PRTR)	4.4
Summary of results and interpretation of environmental monitoring.	3.0
Resource and energy consumption summary	5.0
Proposed development of the facility and timescale of such development.	6.0
Volume of leachate produced and volume of leachate transported / discharged off-site.	4.2
Report on development works undertaken during the reporting period, and a timescale for those proposed during the coming year.	6.0
Report on restoration of completed cells/ phases.	6.3
Site survey showing existing levels of the facility at the end of the reporting period.	3.10
Estimated annual and cumulative quantities of landfill gas emitted from the facility.	4.1
Estimated annual and cumulative quantity of indirect emissions to groundwater.	4.3
Annual water balance calculation and interpretation	4.2
Report on the progress towards achievement of the Environmental Objectives and Targets contained in previous year's report.	6.2
Schedule of Environmental Objectives and Targets for the forthcoming year.	6.2
Full title and a written summary of any procedures developed by the licensee in the year which relates to the facility operation.	6.4
Tank, pipeline and bund testing and inspection report.	3.12
Reported incidents and Complaints summaries.	8.0
Review of Nuisance Controls.	7.0
Report on the use of a portion of the waste charges for appropriate local environmental improvement projects during the year and details of plans for forthcoming yeas.	9.2
Reports on financial provision made under this licence, management and staffing structure of the facility, and a programme for public information.	9.3 / 9.4
Report on training of staff.	9.3
Statement of compliance of facility with any updates of the relevant Waste Management Plan.	2
Statement on the achievement of the waste acceptance and treatment obligations.	2.3
Updates/Amendments to the Odour Management Plan.	6.4
Waste Recovery Report.	4.4

2.0 Facility Description and Waste Activities

2.1 Facility Description

Powerstown Landfill is located on the N9, approximately 8 kilometres south east of Carlow Town. The facility is located in a rural setting and is bounded to the north and east by farm land, to the west by the N9 road to Carlow/Kilkenny and to the south by a quarry and a third class road. **Drawing No. 1**, illustrates the landfill areas (Phase 1, 2 and 3) and **Drawing 2** shows the layout of the facility. The facility is in compliance with the South-East Waste Management Plan as adopted in 2006.

Phase 1: Old Landfill

Phase 1 of the landfill commenced in 1975 and finished in 1990. The old landfill is located within the southern portion of the site. It is an unlined, capped landfill, located in a spent sand and gravel quarry. It comprises approximately 3.5 hectares (8.6 acres) and contains approximately 130,000 tonnes of municipal waste material. Additional capping works were carried out on the old landfill in 2006.

Phase 2: Former Landfill

Phase 2 of the landfill is located within the northern portion of the site. This area first opened in 1991 and is reputed to be one of the first landfill sites in Ireland that incorporated engineered cells to contain waste that were lined to containment status. This part of the landfill covers approximately 5.7 hectares and has 13 engineered cells and ceased operations in 2006. Cell Capping and flare upgrade works commenced in 2008 and and were completed by October 2008.

Phase 3: Extension – Operating Landfill

The extension to the landfill included the construction of four lined cells, a surface water settlement pond, leachate tank farm, Civic Amenity Site (CAS), a green waste composting area and the conversion of an existing dwelling to a site office. In addition to the above works, a new facility entrance has been provided from a minor road off the N9. Operations commenced in August 2006 and the capacity of the Phase 3 extension will be 240,000 m^3.

2.2 Waste Activities at the Facility

Powerstown Landfill was granted Waste Licence No. W0025-03 by the EPA in December 2009.

The landfill is licensed to carry out the following waste disposal activities in accordance with the Third Schedule of the Waste Management Acts 1996 to 2010:

Class 1: Deposit on, in or under land (including landfill): The activity is limited to the disposal of non-hazardous waste at the facility.

Class 4: Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons: *This activity is limited to the storage of leachate/ collected surface water in lagoon(s)/ retention ponds.*

Class 5: Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment: *This activity is limited to the disposal of non-hazardous waste into lined cells.*

Class 6: Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule: *This activity is limited to the biological treatment of wastewater generated on site.*

Class 7 Physico-chemical treatments not referred to elsewhere in this Schedule (including evaporation, drying and calcination) which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule: *The activity is limited to the removal of grit from leachate in the leachate lagoon(s).*

Class 13: Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced: *This activity is limited to the storage of waste in receptacles and designated areas prior to disposal on or off site.*

In addition to the disposal activities, the landfill is licensed to carry out the following waste recovery activities, in accordance with the Fourth Schedule of the Waste Management Acts 1996 to 2010:

Class 2: Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes): *This activity is limited to the composting of green waste from households and the collection of wastes at the civic waste facility.*

Class 3 Recycling or reclamation of metals and metal compounds: *This activity is limited to the collection of wastes at the civic waste facility.*

Class 4: Recycling or reclamation of other inorganic materials: *This activity is limited to the collection of waste at the civic waste facility and re-use of construction and demolition waste at the facility as capping or on site road material.*

Class 9: Use of any waste principally as a fuel or other means to generate energy: *This activity is limited to the use of landfill gas for the generation of electricity/ energy.*

Class 11: Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule. *This activity is limited to the use of compost generated on site in restoration works.*

Class 13: Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection. on the premises where such waste is produced. *This activity is limited to the storage of waste in receptacles and designated areas prior to recovery on or off site.*

2.3 Quantity and Composition of Waste Disposed and Recovered

Disposal

The waste received for disposal during 2010 included household and commercial waste, local authority clean ups, street cleaning waste, fly tipping, screenings, filter sand and treated sludge. The type and quantity of waste received and disposed to landfill are summarised in Table 2.1. A total of 13,697 tonnes of material was disposed to landfill during 2010.

Table 2.1: Waste Received and Disposed to Landfill (2006 to 2010)

Waste type	2006 (Tonnes)	2007 (Tonnes)	2008 (Tonnes)	2009 (Tonnes)	2010 (Tonnes)
Household Waste	29,990	35,075	28,397	13,839	4,378
Commercial Waste	1,927	2,991	3,956	1,622	339
Street Cleaning Note 1	1,038	1,007	1,101	1,091	2,338
Sludge/ Screenings/filter sand	629	675	400	377	545
Garden Park Waste	74	364	661	596	444
Community Clean Up	2,063	3,018	1,662	2,934	5,040
Other	-			635	613
Total	**38,091**	**43,130**	**36,177**	**21,684**	**13,697**

Note 1: Total includes street cleaning residues, fly tipping, litterbins, road sweeper and drain cleaning

Recovery

The site also incorporates a Civic Amenity Site (CAS) serving the general public. The CAS offers a wide range of recovery facilities. Table 2.2 overleaf details the waste types accepted at Powerstown CAS and the quantities accepted from 2006 to 2010. A total of 1725.55 tonnes of recyclable materials were received at the CAS during 2010. The total number of customers to the CAS during 2010 was approx 19,000.

A total of 10.62 tonnes of biodegradable waste was re-directed from Powerstown landfill to further treatment during 2010.
The BMW reports submitted to the agency during 2010 reported the following results

Q3 2010 % BMW 55.5%
Q4 2010 % BMW 56.4%

Table 2.2: Waste Recovery at the Powerstown CAS from 2006 to 2010

Material Type	2006 (tonnes)	2007 (tonnes)	2008 (tonnes)	2009 (tonnes)	2010 (tonnes)
Batteries	19.5	23.07	18.02***	16***	14.70***
Paper	71.8	52.87	80.54	76	118.40
Fluorescent Lights	3.5	3.5	1.34	3.1	1.07
Cardboard	89.1	62.94	51.46	55	79.24
Textiles	7.4	14.77	15.84	10	12.74
Timber	148.6	155.76	213.2	280	281.91
Oil	1.7	6	4.5	6	
Oil filters	1	0.62	0.86	0.58	0.64
Scrap metal	357.3	292.16	272.12	268	222.66
WEEE	131.6	182.28	172.18	177	231.24
Glass					
• Bottle Bank*	24.8 *	29.06 *	44.90 *	51	74.92
• Flat Glass	25.9	12.14	17.16	23	31.54
TOTAL	49.6	41.20	62.06	74	106.46
Plastic Bottles	7.7	6.26	21.18	36	77.38
Plastic Film	9.3	7.02	5.1	in above	14.78
Tyres Note 1	NR	2.74	1.62	8.42	6.12
Tetra Pac	NR	3.06	3.24	1	14.52
Polystyrene	NR	0.98	1.08	1.48	1.76
Paint Cans	NA	NA	NA	NA	10.52
Green waste	NR	184.66	285.5	365	500.55
Waste Engine Oil	1.7	6	4.5	6	8.98
Waste Cooking Oil	-	-	-	-	0.44
Gypsum	NA	NA	5.10	29	21.44
Biodegradable Food Waste	-	-	-	-	10.62
Clay**	11,189	15,366.5	3,101	8,140	7,038
Rubble**	NR	727.02	71.8	1,233	320 Note 2
Total	**12,085**	**17,133.43**	**4,387.74**	**10,781**	**9,094**

Note 1: The figure for tyres in the above table represents the amount of tyres removed from waste loads at the landfill active face.
Note 2: Figure includes total amount for rubble & soil and stones
NR – None reported
NA – Not Accepted
*Aluminium cans are included in the bottle bank.
**Clay and Rubble were used for site upgrade work
*** Figure represents total amount for lead acid and primary batteries

2.4 Capacity of Landfill

A licence was granted by the EPA on 11th April 2005 for an extension to the landfill that includes a further four cells with a capacity of 240,000 m^3. The remaining capacity of Phase 3 is estimated at 135,524 m^3 (April 2011).

2.5 Methodology of Material Disposal and Recovery

Disposal of Waste

Vehicles such as trucks, tractors with trailers, or cars with trailers containing waste, are initially checked in at the weighbridge and inspected. The weight and description of the waste is recorded. These vehicles then proceed to the tipping area and the waste is tipped under the supervision of site personnel.

Cars and vans are weighed at the weighbridge and these proceed to the waste collection area where the public skips are located. The waste is disposed of into the public skips.

Following tipping of the waste skips within the active area, the waste is levelled and compacted to a layer of no greater than 2 metres in depth on a daily basis. Individual compaction layers are no greater than 600 mm in depth. Compaction of waste is carried out by a purpose built compactor machine weighing approximately 38 tonnes.

At the end of each day the compacted waste is covered with a layer of clay. At the end of each week, the compacted waste is covered with an additional 150 mm of clay.

A number of brown bins are present at the public skips area into which customers can dispose of their biodegradable / food waste. The waste from these bins is collected by an approved contractor and removed off-site for further treatment.

Recovery

Recyclable materials are brought directly to the civic amenity area by the general public where the waste is segregated into groups. Each waste recovery stream has its own designated skip. When the skip is full it is weighed before removal to an appropriate recycling facility.

2.6 Waste Acceptance Procedure

In early 2010 a new Waste Acceptance Procedure was developed in order to comply with the requirements of the revised waste licence. A copy of the procedure was forwarded to the Agency on 11-6-10.

2.7 Enforcement Category

On the basis of international best practices, an Environment-Based Assessment Tool was developed by the Environmental Protection Agency to assist with prioritising enforcement activities. The methodology allocates an enforcement category to licensed facilities on the basis of five environment-based attributes:

1. Complexity;
2. Emissions;
3. Location;
4. Operator Management; and

5. Enforcement Record.

The enforcement category of each IPPC and Waste licensed facility is assessed under each of the above headings, and an overall enforcement category is obtained. This overall enforcement category will then be reviewed by the OEE and either confirmed (in the majority of cases) or adjusted as appropriate. Enforcement categories vary from A1 (extremely high enforcement category) to C2 (very low enforcement category). In line with their enforcement policy, the EPA will use the overall category obtained in developing their annual inspection programme and in guiding the allocation of resources for enforcement activities.
The enforcement category for the landfill has been assigned as A2 (High), as calculated by the Environmental Protection Agency on-line tool.

3.0 Environmental Monitoring

Mr. Fergus Mulhare Landfill Manager and Ms. Mary Walsh, Environmental Technician for the facility, oversee all matters of an environmental nature including compliance monitoring. Some of the monitoring requirements are completed by Carlow County Council, and some are out-sourced to third parties on behalf of Carlow County Council.

Following consultation with the EPA during 2008 monitoring locations at Powerstown Landfill were revised.

Table 3.0 below, details the revised monitoring locations at Powerstown Landfill, in accordance with Waste Licence W0025-03. A map of the monitoring locations is presented in Appendix 1.

Table 3.0 Monitoring Locations

Landfill Gas	Dust Deposition	Noise	Surface Water	Ground Water	Leachate	Odour
G1 – G46 Note 1	D2 D4 D5 D6 D7 D8	S1 S2 N4 N5 N6	ST1 ST2 SWLO SWL1	RCA1 RCA2 GW1 GW2 GW3 GW6 GW7 GW8	LG LT L7 Note 2	OD1 OD2 OD3
TP11 – TP17				Private Wells as per Condition 8.8.1 of Licence	L1, L2, L3, L4, L10, L11, L12, L13 Note 3 Cell 15 Cell 16 Cell 17 Cell 18 Note 4	Nolan residence McDonalds Residence M9 Roundabout NE site boundary Note 5

Note 1: G42 not included
Note 2: Cells to be monitored for Leachate composition (quarterly / annually)
Note 3: Cells to be monitored for leachate levels (weekly)
Note 4: Cells 15-18 levels monitored continuously on SCADA
Note 5: Daily Odour Monitoring Locations

3.1 Dust Monitoring

Dust monitoring was carried out at the facility in compliance with the requirements outlined in Schedule D and Table D.3.1 of the Waste Licence. A total of six monitoring locations as listed in Table 3.0 were monitored during the 2010 monitoring period. The Waste Licence stipulates a dust deposition limit of 350 mg/m^2/day for the facility. A summary of dust deposition monitoring results is presented in Table 3.1
All monitoring results were within the licence limits.

Table 3.1: Summary of Dust Monitoring Data during 2010

Monitoring Location	Dust Deposition Limit mg/m²/day	May/June 2010 (mg/m²/day)	July/Aug 2010 (mg/m²/day)	Sept/Oct 2010 (mg/m²/day)
D2	350	195	23	22
D4		69	57	41
D5		76	31	44
D6		169	66	75
D7		86	37	62
D8		27	51	27

3.2 Surface Water Monitoring

A chemical water quality assessment of the Powerstown Stream was carried out by EPA and a biological water quality assessment was undertaken by Conservation Services Ltd. at two sampling locations, ST1 and ST2 in accordance with Schedule D.6 (Table D.6.1) of the Waste Licence. ST2 is situated upstream of the facility and ST1 is located downstream of the facility. The results of surface water monitoring carried out during 2010 are presented in Appendix 2 of this report.

Chemical Assessment

Samples were collected from ST1 (downstream) and ST2 (upstream) SWLI (inlet to surface water pond) and SWLO (Outlet from surface water pond) on a quarterly basis. Field measurements were recorded and laboratory analysis completed in compliance with Table D.5.1 of the Waste Licence. As water quality limits for surface water are not set out in the Licence; the results for ST1 and ST2 were compared with the surface water trigger levels for the site and with S.I. No 278 of 2007: *European Communities (Drinking Water) (No. 2) Regulations 2007.*

Site specific trigger levels have been set for conductivity (1000µS/cm), chloride (50mg/l) and ammoniacal nitrogen (0.5mg/l) for locations upstream (ST2) and downstream (ST1) of the landfill. Results obtained during the 2010 monitoring event show all results recorded at ST1 were below the trigger levels for these three parameters. The ammonia level recorded during Q4 at ST2 (0.53mg/l) exceeded the trigger level but all other results were below the stipulated limits. The results of monitoring at each location, the relevant trigger levels and the limits set out in S.I. No 278 of 2007 are presented in Appendix 2.

Monitoring results indicate that there is no significant difference in water quality between upstream and downstream monitoring locations. It is considered that operations at Powerstown Landfill do not have an adverse impact on the Powerstown Stream. All results recorded downstream of the landfill are below the stipulated trigger levels set for the site.

The inlet (SWLI) and outlet (SWLO) at the surface water pond are also monitored on a quarterly basis. These locations are not compared to trigger levels or Water Quality Standards. Schedule C.4 of the licence stipulates a limit of 35mg/l suspended solids measured at the outlet from the surface water pond. This limit was exceeded during Q1 2010 but was compliant for all other samples obtained.
Continuous monitoring of pH, conductivity and TOC at the inlet to the surface water pond

is carried out as per Condition 6.5.3 of the waste licence. Results of this monitoring are available on-site.

Biological Assessment

A biological assessment was completed in accordance with Schedule D (Table D.5.1) of the Waste Licence. The biological assessment contained two facets; habitat assessment and biological water quality assessment.

A habitat assessment was carried out at ST1 and ST2. These monitoring locations were assessed in terms of characteristics of the habitat and rated as a habitat for trout in the adult, nursery and spawning stages. The results of the habitat assessment are shown in Table 3.2.

Table 3.2: Habitat Assessment 2010

	ST1	ST2
Trout Adult Habitat	Fair	Poor
Trout Nursery Habitat	Fair	Poor
Trout Spawning Habitat	Fair - Poor	Poor

A biological water quality assessment was also completed at locations ST1 and ST2. Based on the relative abundance of indicator species, a biotic index (Q-rating) was determined for each location in accordance with the biological assessment procedure used by the EPA (McGarrigle, M.L. *et al.*; 1998). Table 3.3 presents the results of the biological water quality assessment. Results are compared to previous annual monitoring events dating back to 2006. A full copy of the report for this survey was submitted to the agency.

Table 3.3: Biological Water Quality Assessment

Location	Sept. 2006	Sept. 2007	2008	Aug. 2009	Sept 2010
ST1 (Downstream)	Q3 Moderately Polluted	Q3-4 Slightly Polluted	Q3-4 Slightly Polluted	Q3-4 Slightly Polluted	Q3-4 Slightly Polluted
ST2 (Upstream)	Q3 Moderately Polluted	Q3-4 Slightly Polluted	Q3-4 Slightly Polluted	Q3-4 Slightly Polluted	Q3-4 Slightly Polluted

The biological assessment shows that the water quality remains the same relative to the 2007 assessment. Historically the biological water quality of the stream has fluctuated between moderately and slightly polluted. The cause of historical deteriorations and recovery of biological water quality is unlikely to result from activities at the site as the assessment shows as similar conditions both upstream and downstream.

3.3 Groundwater Monitoring

Groundwater monitoring for 2010 was completed by the EPA at the facility in compliance with Schedule D.4 (Table D.5.1) of the Waste Licence. In addition Condition 8.7 Licence stipulated a requirement to include private wells (e.g. domestic, agriculture etc) within 500m of the facility to be included in the monitoring programme, subject to agreement with the owner. 2 private wells were sampled during the 2010 monitoring period. The quarterly analytical results for each well are summarized and included in Appendix 2. A groundwater contour map is also presented in Appendix 2.

Water quality limits are not stipulated in the licence; however specific Groundwater Trigger Levels (GTLs) have been set for individual monitoring wells for indicator parameters electrical conductivity (EC), chloride and ammoniacal nitrogen. In addition groundwater monitoring data for monitoring wells at the facility were assessed relative to EPA Interim Guideline values (IGV's) (EPA 2003).

The results of groundwater level monitoring indicate that the local groundwater flow direction is generally to the north-west, a groundwater flow direction map is presented in Attachment 2. The locations of groundwater monitoring locations relative to Phase 2 and Phase 3 landfills are summarised in Table 3.4 below.

Table 3.4: Position of Groundwater Monitoring Locations Relative to Phase 2 and Phase 3 Landfills

Location	Comment	Position Relative to Phase 2 and Phase 3
GW1	As Existing	Down gradient
GW2	As Existing	Down gradient
GW3	New Borehole Installed	Background
GW6	New Borehole Installed	Background
GW7	New Borehole Installed	Down gradient
GW8	As Existing	Down gradient
RCA1	As Existing	Up gradient
RCA2	As Existing	Up gradient

Monitoring data for 2010 indicate that samples collected from down gradient monitoring wells GW1, GW2 and GW8 exceeded the groundwater trigger levels for the following parameters: GW1; Ammonia, Conductivity, GW2: Conductivity, Chloride, GW8: Ammonia. Annual analysis for the presence of metals indicated that ortho-phosphate was detected at levels in excess of the IGV at all groundwater monitoring locations during 2010. Potassium was detected at levels in excess of the IGV at GW1, GW2 and GW8. Iron and Nickel levels detected at GW2 exceeded their respective IGV's and Calcium at GW8 also exceeded the IGV. Uranium was detected at GW8 in excess of the IGV. Uranium is naturally present in soils and due to the bedrock in certain areas of Carlow, Uranium is present in groundwater due to the types of rock it passes through. All other metals detected were below the IGV's.
Boron, Calcium and Magnesium were detected at all groundwater monitoring wells. Sodium was also detected at all wells with the exception of GW7. Aluminium was detected at GW6, GW7, RCA1 and RCA2.

For the purpose of this AER groundwater monitoring data was also compared to S.I. No 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010. Ammonia Levels at GW1. GW2 and GW8 exceed the upper threshold values set out in S.I. No. 9 and Nickel at GW2 also exceeds the upper threshold value. All other results reported are within the relevant threshold values.

Groundwater monitoring data indicates that the quality of groundwater downgradient of the facility has been impacted. It is considered that leachate percolating from the unlined landfill may be contributing to the deterioration of groundwater quality. In January 2011 Carlow County Council commissioned Malone O' Regan to prepare a Tier 1 Qualitative Risk Assessment of the Powerstown Landfill, including an investigation into the groundwater quality of the local aquifer, the Powerstown Stream and the River Barrow.

3.4 Leachate Monitoring

Leachate monitoring is required for compliance with Schedule D.5 of the Waste Licence. Leachate Monitoring locations were revised during 2008 / 2009 and the locations are presented in Table 3.0 (pg. 12 of this report). It was agreed with the Agency during 2009 that the following locations would be used for leachate quality reporting purposes:

- L7: this collects leachate from Cells 7 and 8.
- LG: the Leachate Lagoon which collects leachate from Cells 1-6 and 8-13.
- LT: the Leachate Tank which collects leachate from Cells 15 and 16.

Annual leachate monitoring was conducted by the EPA on 19th October 2010 at Powerstown Landfill. Samples were not obtained from LT and L7 listed above. Samples were obtained from LG and also from L2, L3 and L4. The results of the sample obtained from LG are presented overleaf in table 3.5. The results are compared to previous results received during 2009, 2008 and 2007.

The Phase 2 and Phase 3 landfills have been constructed to an engineered specification which includes a leachate collection system. The levels are monitored to ensure that a leachate level of less than 1m is maintained by the pumping and collection system.

The quality of municipal landfill leachate changes with time as the degradation of waste progresses inside the landfill as a result of internal bio-reactions within the landfill that leads to the formation of leachate. The process of leachate generation occurs in a series of stages and the quality of the leachate in any given generation stage has particular characteristics. The stages of decomposition and leachate characteristics include:

- Stage I Aerobic Processes (degradation)
- Stage II Anaerobic Acid Formation
  (hydrolysis and fermentation)
- Stage III Unstable Anaerobic Methane Formation/Acetogenesis
  (low pH, BOD:COD >0.4)
- Stage IV Stable Anaerobic Methane Formation/Methanogenesis
  (higher pH, BOD:COD <0.25)
- Stage V Air Penetration (Oxidation)

In addition to annual chemical testing, quarterly leachate monitoring is carried out for temperature, odour and a visual description. This data is reported to the Agency in the form of Leachate Quarterly Reports.

Leachate levels are monitored on a continuous basis for Cells 15 and 16. Leachate levels are monitored weekly for Cells 1-13 to ensure that levels remain less than one metre above the liner level. These results are submitted to the agency on a quarterly basis.

Table 3.5: Results of leachate monitoring at Leachate Lagoon (LG)

Parameter/ Date	Aug-07	21/07/2008	13/05/2009	19/10/2010
Visual	Amber brown colour	-	-	Brown
Ammonia mg/l N	620	1100	1300	1200
Conductivity µS/cm	10580	15200	17900	17900
pH	7.9	7.8	7.7	7.8
Temperature °c	20	23	13.2	12.2
Orthophosphate mg/l P	1.5	4.4	6.3	5.7
Total Oxidised Nitrogen mg/l N	2.2	0.1	nm	142.11
BOD mg/l O_2	30.8	65	104	nm
COD mg/l O_2	1337	1336	1375	1480
Chloride mg/l Cl	1248	1928	2338	2282
Fluoride mg/l F	0.6	2.9	2.5	nm
Sulphate mg/lSO4	39.9	57.4	110	nm
Aluminium ug/l	102	<250	<250	170
Antimony ug/l	<5	<10	<5	<5
Arsenic ug/l	139	152	20.3	110
Barium ug/l	280	121	46.7	160
Beryllium ug/l	<5	<10	<5	<5
Boron ug/l	2950	4350	510	3500
Cadmium ug/l	<5	<10	<5	<5
Calcium mg/l	62.7	80.6	10.9	54
Chromium ug/l	81.5	<10	23.4	69
Cobalt ug/l	25.4	32.6	7.04	41
Copper ug/l	31.5	<10	<30	35
Iron ug/l	5330	5320	1020	5100
Lead ug/l	9.06	<10	<5	<5
Magnesium mg/l	80.4	116	14.6	76
Manganese ug/l	337	721	<250	360
Mercury ug/l	<5	<5	<5	<5
Molybdenum ug/l	<5	<10	<5	5.7
Nickel ug/l	142	70.5	31.6	220
Potassium mg/l	<5	728	102	690
Selenium ug/l	17.4	23	<5	35
Sodium mg/l	<5	1450	190	1400
Thallium ug/l	<5	<10	<5	<5
Tin ug/l	13.1	22	<10	<10
Total Cyanide mg/l	<0.05	<0.05	<0.05	0.211
Uranium ug/l	<5	<10	<5	<5
Vanadium ug/l	49.5	74.5	12.2	61
Zinc ug/l	136	<60	<100	10

nm = not measured

3.5 Noise Monitoring

Noise monitoring was conducted in accordance with Schedule D of Waste Licence W0025-02 at five locations on 22nd of December 2010. Night-time monitoring was not carried out as the facility only operates during daylight hours. The revised noise monitoring locations for Powerstown Landfill are presented in Table 3.0 (pg. 12).

Noise limits stipulated in Schedule C.1 of the Licence are as follows: Daytime noise limit; (55 dB (A) L_{Aeq}(15 min) and night-time (45 Db (A) L_{Aeq}(15 min) for the facility. The noise monitoring results for 2010 are summarised in Table 3.6 overleaf.

The L_{Aeq} levels recorded at locations outside the boundary of Powerstown Landfill ranged from 49dB(A) to 68dB(A). The levels recorded at locations S1 (68dB(A)) and S2 (61dB(A)) exceed the stipulated daytime noise emission value of 55dB(A). However, observations recorded at the time of the survey indicate that landfill operations were not audible during the survey at locations S1 and S2. Passing traffic was the dominant noise source at these locations and it is therefore considered that operations at Powerstown Landfill did not contribute to the exceedances recorded at S1 and S2.

Landfill operations were audible intermittently at locations N5 and N6. The L_{Aeq} recorded at N5 was 53dB(A) and N6 was 49dB(A). Both results are below the stipulated daytime noise emission limit.

Monitoring Location N4 is the only location that is situated inside the boundary of Powerstown Landfill. The L_{Aeq} recorded at this location was 50dB(A)and is below the noise emission limit value of 55dB(A) set out in Waste Licence W0025-03. .

In summary operations at Powerstown Landfill were audible at two locations; N5 and N6. The L_{Aeq} recorded at these locations did not exceed the stipulated daytime noise emission limit value of 55dB(A). The limit was exceeded at locations S1 and S2 and it is considered that the exceedances were due to high levels of passing traffic at both locations. It is therefore considered that, based on the local ambient noise environment in the vicinity of Powerstown Landfill and the results recorder during the noise survey, activities at the facility do not have an adverse effect on the receiving environment.

Table 3.6: Noise Monitoring Results 2010 (& *2009*)

Location	Description	Monitoring Event	$L_{Aeq, 30min}$	$L_{A10, 30min}$	$L_{A90, 30min}$	Pre-dominant Noise Sources 2010
N4	Inside Western Site Boundary, at old entrance to landfill	2010 *2009*	50 *54*	53 *57*	44 *45*	Traffic along N9 roadway
N5	NSL outside southern site boundary	2010 *2009*	53 *53*	50 *48*	42 *37*	Passing and distant traffic, passing train, intermittent noise form landfill
N6	NSL approx 310m to the east of the facility	2010 *2009*	49 *47*	49 *45*	43 *36*	Distant traffic noise
S1	NSL outside north western boundary of facility	2010 *2009*	68 *65*	73 *68*	49 *54*	Passing traffic
S2	NSL outside south western boundary of facility	2010 *2009*	61 *63*	61 *61*	37 *53*	Passing traffic

3.6 Meteorological Monitoring

Waste Licence W0025-03 for Powerstown Landfill requires meteorological monitoring at the facility. Schedule D (Table D.6) sets out the meteorological parameters and monitoring frequency requirements. During 2010 Carlow County Council were in the process of re-instating the Met. Station on-site at Powerstown Landfill. The met data reported for 2010 was obtained from Meteorological Stations at Ashford, Co. Wicklow and Casement Aerodrome. Table 3.7 overleaf presents the results for 2010 meteorological data.

Table 3.7 Meteorological Data 2010

	Precipitation Volume (mm)	Temperature Max (°C)	Temperature Min (°C)	Windspeed (Knots)	Wind Direction (Degrees from North)	Evapo-transpiration (mm)	Relative Humidity (%)	Atmospheric Pressure (hPa)
January	3.99	6.9	0.3	8.44	209	0.21	92	1016
February	2.06	7.8	0.4	6.51	176	0.42	91	1004
March	2.66	10.2	1.3	8.03	195	1.15	80	1015
April	1.12	13.3	3.6	7.58	172	1.93	76	1019
May	2.15	15.5	6.3	6.20	164	2.46	77	1019
June	1.37	18.8	9.1	6.36	182	3.00	78	1018
July	2.89	20.5	12.0	10.03	220	2.54	83	1012
August	1.19	19.5	10.3	8.51	223	2.19	83	1015
September	3.73	18.0	9.9	8.86	208	1.50	85	1013
October	2.62	14.8	6.7	10.01	189	0.89	87	1011
November	5.48	9.9	2.7	9.60	195	0.36	91	1005
December	2.85	5.7	-0.6	6.28	208	0.14	95	1016

The total annual rainfall during 2010 was approximately 978mm. This result indicates a decrease of approximately 167 mm in comparison to rainfall figures reported in 2009.

3.7 Landfill Gas

Landfill gas monitoring was completed by Carlow County Council personnel at the facility in compliance with the requirements outlined in Schedule D (Table D.2.1) of the Waste Licence. Landfill gas monitoring must be completed monthly at all gas boreholes/vents/wells and weekly at the site office. Landfill gas emission limit values (ELVs) are stipulated in the Licence for landfill gas measured in any building on or adjacent to the landfill. The ELVs are 20% LEL (1% v/v) for methane, and 1.5% v/v carbon dioxide. In the absence of ELVs for gas boreholes/vents/wells the ELVs for buildings are used for evaluation purposes. Landfill gas monitoring locations are illustrated on the map contained in Appendix 1.

Gas monitoring locations are detailed in table 3.0 (pg 12) and are also outlined below:

- Main office area and weighbridge
- Perimeter boreholes G1-G46 (with the exception of G42)
- Landfill Gas boreholes TP11-TP17

Landfill Gas Monitoring in Buildings on or Adjacent to the Landfill

Landfill gas monitoring was carried out within the main office area and within the weighbridge office at Powerstown landfill during 2010. All reported monitoring results for carbon dioxide and methane were below the relevant ELVs and in compliance with the Licence requirements throughout 2010.

Gas Borehole Monitoring Quarter 1
Monitoring was carried out at the above locations with the exception of TP14, TP15, TP16, G9 and G10. There were no exceedances in relation to methane concentrations detected during Q1 2010. Elevated CO_2 levels were detected at 5 locations during Q1 2010 (TP17, G31, G32, G29, G33).

Gas Borehole Monitoring Quarter 2
Monitoring was carried out at the above locations with the exception of TP14, TP15, TP16, G9 and G10. There were no exceedances in relation to methane concentrations detected during Q2 2010. Elevated CO_2 levels were detected at 11 locations during Q2 2010 (G5, G6, G7, G8, G12, G14, G27, G28, G29, G43, G44).

Gas Borehole Monitoring Quarter 3
Monitoring was carried out at the above locations with the exception of G9, G10. There were no exceedances in relation to methane concentrations detected during Q3 2010. Elevated CO_2 levels were detected at 11 locations during Q3 2010 (G5, G6, G7, G8, G14, G17, G27, G28, G29, G43, G44).

Gas Borehole Monitoring Quarter 4
Monitoring was carried out at the above locations with the exception of G9 and G10. Methane concentrations in excess of the ELV were detected at G41 during October, November and December 2010. Elevated CO_2 levels were detected at 11 locations during Q3 2010 (TP13, TP15, TP16, TP17, G5, G8, G27, G28, G29, G41, G44).

3.8 Landfill Gas Plant Flare Monitoring

Compliance with Schedule D7 of the Waste Licence requires annual monitoring of the landfill gas plant flare (LFGF1). Continuous monitoring of methane, carbon monoxide, carbon dioxide, oxygen, temperature, flow and pressure is recorded at the flare.

Annual analysis of the composition of gas emissions from the flare at Powerstown Landfill was carried out on the 30th of September 2010 by Odour Monitoring Ireland on behalf of Carlow County Council. The parameters analysed were those listed in table D.7.1 of Waste Licence W0025-03 at the inlet and outlet from the flare.

These results are presented below in tables 3.8 and 3.9. Results for the emissions from the flare are compared with results recorded during 2008, 2009 and are also compared to ELVs stipulated in the table C.5 of the licence. There are no stipulated limits for gas concentrations at the inlet to the flare.

All reported landfill gas flare measurements were in full compliance with the Licence requirements and methane removal efficiency was calculated to be >99%.

Table 3.8: Annual Emissions Monitoring Results at LFGF1 (2008 to 2010)

Parameter	Units	Flare (enclosed) Emission Limit*	March 2008	March 2009	September 2010 **
Temperature	°C	–	974	1023	1021
Oxygen	%	–	10.19	9.12	7.17
Oxides of Nitrogen (as NO_2)	mg/Nm^3	150	64	71.65	69.61
Carbon Monoxide	mg/Nm^3	50	35	5.70	3.26
Sulphur Dioxide (SO_2)	mg/Nm^3	–	85	21.65	115
Hydrogen Chloride	mg/Nm^3	50 (at mass flows > 0.3 kg/h)	29.27	6.48	5.09
Hydrogen Fluoride	mg/Nm^3	5 (at mass flows > 0.05 kg/h)	0.08	1.14	0.45
Total organic carbon (TOC)	mg/Nm^3	10	9.96	6.32	2.19

NOTES:
- Denotes no ELV for that parameter
*Dry gas referenced to 5% oxygen by volume for utilization plants and 3% oxygen volume for flares.
** Normalised gas results, oxygen corrected to 3% O_2.

Table 3.9: Annual Monitoring Results at LFGF1 (Inlet) 2010

Parameter	Units	September 2010
CH_4	%	36.50
CO_2	%	35.21
O_2	%	1.50
Total Sulphur	mg/Nm^3	21.56
Total Chlorine	mg/Nm^3	1.94
Total Fluorine	mg/Nm^3	<0.65
Total Landfill gas volumetric airflow rate	m^3/hr	240

In addition to annual flare monitoring, servicing of the flare is carried out at quarterly intervals by Automatic Flare Systems Ltd.

3.9 Odour Monitoring

Odour monitoring was performed by Odour Monitoring Ireland twice during 2010 in compliance with Schedule D (Table D.3.1) of the Waste Licence. The independent assessments involved the use of a continuous kinematic VOC/GPS to detect areas of potential landfill gas leakage from the site. Condition 8.14.6 of the waste licence stipulates the following limits:

- Open surfaces: <100ppmv
- Vertical wells/collection sumps etc: <500ppmv

Monitoring carried out on 17/06/10
Seven zones of surface emissions were identified during this survey. Five of these areas were at sloped / flanked areas within the active area of the landfill. One area was due to insufficient sealing around a well head while another was a diffuse source in an open area.

Monitoring carried out on 30/09/10
Eight zones of surface emissions were identified during this survey. Seven of these were as a result of landfill gas surface emissions from flanked areas within the landfill. One source was due to insufficient sealing around a vertical well head.

Mitigation measures carried out as a result of these surveys included:

- Additional capping material as required
- Extension of the temporary capping on some flanks.
- Maintenance of vertical extraction wells and pipe-work.

3.10 Topographical Site Survey

A topographical survey of the Phase 3 landfill was completed in March 2010. A copy of the survey drawing is included in Appendix 5.

3.11 Slope Stability Assessment

An assessment of the stability of the waste sideslopes was carried out in October 2010 at three critical slopes:

- The southern slope of phase II
- The northern slope of phase III
- The eastern slope of phase III

The slope stability test of Powerstown Landfill concluded that based on visual inspection and appropriate analysis carried out, landfill slopes have an acceptable factor of safety with respect to slope stability. The factor of safety for the critical slopes analysed was in excess of the required minimum of 1:3.

3.12 Other Testing

Bund Integrity Testing was completed during 2010 at the following locations:

- Leachate Tank (LT)
- Leachate Lagoon (LG)

A copy of these reports is presented in Appendix 6.

4.0 Generation and Emission of Landfill Products

This summary of emissions from the facility is based on a review of monitoring data, disposal and recovery records and emissions calculation, modeling and estimation. The discussed emissions from the facility include both estimated and calculated emissions of landfill gas, emissions to groundwater and volumes of leachate produced and transported off-site.

Releases and off-site transfers of landfill products, contaminants from all deliberate, accidental, routine and non-routine activities at the facility must be reported to the EPA. The pollutant release and transfer report (PRTR) for Powerstown Landfill facility have been compiled and submitted to the EPA in electronic form as part of the AER submission for 2010 and the results are summarized in Section 4.4.

4.1 Landfill Gas and Emissions to Air

Landfill gas is produced by the breakdown of organic material by micro-organisms under anaerobic conditions. Typically, the major constituents of landfill gas are methane (CH_4) and carbon dioxide (CO_2), and lower concentrations of other components, for example mercaptans, organic acids, aldehydes, ketones and alcohols, give landfill gas its typical characteristic odour.

Methane makes up 60% volume/volume (v/v) of landfill gas and is flammable (at concentrations in the range 5-15%) and can be an asphyxiant. Carbon dioxide makes up 40% v/v and is also asphyxiating in enclosed areas (at concentrations greater than 1.5% v/v). Over time, the concentrations of both gases change, depending on the type and age of waste, method of fill and moisture content. Methane and carbon dioxide generation and emissions are discussed below.

Landfill Gas Generation

Landfill gas generation at the site was predicted using LandGEM (Landfill Gas Emissions Model) based on site specific data, relative assumptions and standard calculations applicable to landfill sites.

The estimated methane generation for the entire site, as per the site model was predicted to be 1,898,561 m^3 for 2010. The amount of methane flared in 2010 is considered to be 583,518 kg.

Landfill Gas Emissions

Landfill gas is emitted from the landfill through two areas: through direct emissions of uncaptured landfill gas from the waste body to atmosphere and through the capture of gas in the landfill gas collection system which is directed to the landfill gas flare.

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills.

The software provides a relatively simple approach to estimating landfill gas emissions. The model allows users to provide landfill characteristics, determine model parameters,

select up to four gases/pollutants (total landfill gas, methane, carbon dioxide, NMOC, and 46 air pollutants), and enter waste acceptance rates. The model then calculates methane emission estimates using the first-order decomposition rate equation

The threshold value for methane emitted or released to air, as outlined in E-PRTR Regulations (2006) is 100,000 kg/year and that for carbon dioxide is 100,000,000 kg/year. The predicted volume of methane released to atmosphere in 2010 at Powerstown Landfill is 777,750 kg/year. This exceeds the specified threshold limit value. The following table summarises the emissions to air in 2010

Table 4.1 Summary of Emissions to Air in 2010

Emission Type	Kg/year
Carbon Monoxide	17
Nitrogen Oxides	356
Sulphur Oxides	588
Methane	777,750
Flourine and Inorganic Compounds (as Fl)	2.3
Chlorine and Inorganic Compounds (as HCl)	26
Total Organic Carbon (as C)	11.2

Figures have been rounded off, refer to the electronic PRTR for the original figures.

4.2 Leachate Generation

Leachate generation occurs within the landfill waste body as a result of rainfall infiltration through the capping layers. The Phase 2 and Phase 3 landfills contain engineered landfill cells. The cell design incorporates a landfill capping layer and a cell liner comprising a geotextile and clay liner overlain by a leachate collection system. Landfill cells 1 – 13 have been permanently capped therefore water infiltration to these cells is minimised. Leaks in landfill liners and collection systems can occur. Therefore, the water balance calculation is conducted to determine the predicted volume of leachate generated which can be compared with the measured volume of leachate collected (i.e. volume generated).

Water Balance

The water balance is calculated using the following formula (EPA, 2000):

$$Lo = [ER (A) + LW + IRCA + ER (l)] - [aW]$$

Lo = leachate produced (m^3)
ER = effective rainfall (m)
A = area of cell (m^2)
LW = liquid industrial waste (also includes excess water from sludges) (m^3)
IRCA = infiltration through restored and capped areas (m)
l = surface area of lagoon (m^2)
a = absorptive capacity of waste (m^3/t)
W = weight of waste deposited (t/a)

Data used for the water balance calculation includes site specific data (e.g. landfill design, quantity of waste landfilled), regional data (e.g. published rainfall data, potential evapotranspiration) and empirical data (waste absorptive capacity). The empirical data used was selected based on known landfill and waste characteristics.

Infiltration figures are generally taken at mid range for those given in the EPA Landfill Design Manual.

No liquid industrial waste was landfilled.

Lagoon areas are not applicable at Powerstown landfill as the lagoon at the old reception area has a sealed floating cover and leachate from the Phase 3 area is stored in a sealed storage tank.

The waste bearing areas at Powerstown Landfill are presented in zones as follows:

- Unlined cell
- Cells 1-5
- Cells 6-13
- Cells 15 & 16
- Cell 17 (does not contain waste but did contain run-off from cells 15/16 which was treated as leachate.)
- There are 'dirty' paved areas at Powerstown landfill also draining to the leachate collection system. These are also included in the water balance calculation at a run-off coefficient of 0.95.

The estimated volume of leachate generated for 2010 based on the water balance calculation is 16,073 m^3. The actual quantity of leachate tankered off site was 25,194 m^3 (at a conversion rate of $1m^3$ = 1 tonne). The difference between the theoretical quantity and the measured quantity is thus 9,121 m^3. It is considered that this large difference is due to the amount of surface water run-off captured at cell 17. Surface water / leachate run-off was held in cell 17 for a period of time to allow for analysis of samples in order to determine a suitable treatment process for this run-off. Rainfall / run-off collected following heavy rain during late 2009 and early 2010 was held for a period within Cell 17. Therefore, due to the large amount of captured run-off it took a significant period of time to empty cell 17. The figures presented in the water balance calculation calculate a much smaller amount of leachate from April to August 2010 in comparison to what was actually removed off-site. This run-off would previously have been directed to the surface water retention pond and it is considered that this is the cause of the significant increase in leachate volumes at Powerstown Landfill during 2010.

The water balance calculation is contained in Appendix 7 of this report.

Leachate Abstraction and Removal

Leachate generated within the landfill cells is directed to a leachate collection system and pumped to either the leachate storage tank at the east of the facility or the leachate storage lagoon to the west of the facility. Leachate is transferred off-site by tanker. Given that the operating landfill is lined with no leaks, it is assumed that the quantity of leachate tankered off site is the same as the quantity of leachate produced within the landfill. The leachate is tankered off-site for treatment at either the Mortarstown, Tullow or Muine Beag waste water treatment plants (WWTP). The leachate tankered off-site is measured: total volume of leachate tankered off-site in 2010 was 25,194 m^3. The monthly and annual volumes of leachate tankered off-site in 2010 and preceding years are summarised in Table 4.2 below.

Table 4.2: Leachate Collected and Transferred Off-Site

Month	Leachate 2006 (m^3)	Leachate 2007 (m^3)	Leachate 2008 (m^3)	Leachate 2009 (m^3)	Leachate 2010 (m^3)
January	817	3018.26	1722.2	969	2320.04
February	587	1434.56	1261.72	1,069	4374.92
March	770	2425	1136.56	1,201	2836.90
April	869	1068.82	435.02	822	2213.44
May	751	663.92	815.52	1,141	2110.88
June	619	831.36	911.7	762	1802.54
July	566	1430.74	2055.94	1,214	2143.52
August	522	1539.46	1304.4	528	1990.52
September	473	864.32	1406.26	910	1958.50
October	973	722.98	1570.10	923	727.10
November	2193	955.68	1493.70	782	1822.70
December	2327	895.76	1041.18	2,953	892.96
Total	**11,467**	**15,251**	**14,754.3**	**13,274**	**25,194**

The volume of leachate generated within the landfill decreased from 2007 to 2009. A significant increase in the volume of leachate produced was noted during 2010. It is considered that this increase was due to leachate percolating from active cells 15 and 16 into two unused cells (17 & 18). Rainwater previously captured in cells 17 & 18 was uncontaminated and treated as surface water run off at the site. However, as the height of cells 15/16 increased during 2010, leachate migrated down side slopes from the active area into cells 17 & 18 thus contaminating the water contained within. This resulted in additional leachate to be tankered off site for treatment at WWTP. This problem has since been alleviated by the installation of a new barrier along the southern slope of cells 15 and 16.

4.3 Emissions to Groundwater

Monitoring data for 2010 indicate that samples collected from down gradient monitoring wells GW1, GW2 and GW8 exceeded the groundwater trigger levels for the following parameters: GW1; Ammonia, Conductivity, GW2: Conductivity, Chloride, GW8: Ammonia. The quarterly analytical results for each well are summarized in Appendix 2.

Groundwater monitoring data indicates that the quality of groundwater downgradient of the facility, and in particular downgradient of the Phase 1 landfill, has been impacted. Elevated levels of chloride, ammoniacal nitrogen, barium, boron, calcium, iron, manganese, nickel, potassium, sodium and uranium have historically been detected at monitoring wells downgradient of the facility. It is considered that leachate percolating from the unlined landfill may be contributing to the deterioration of groundwater quality.

It has been estimated that 1,469 m^3 of recharge passes through the waste in Phase 1 every year and that a leachate plume is present beneath this area (Geotechnical and Environmental Services Ltd. (GESL), 2001). As this landfill area is unlined and without a leachate collection system a conservative assumption is that the majority of recharge discharges from the waste to groundwater as leachate.

Previous assessment (GESL, 2001) concluded that significant attenuation of any contaminants leaving the landfill structure, this attenuation is attributed to an estimated annual through flow of 4000m^3 in the bedrock aquifer beneath the landfill. An ELRA is currently being compiled by Malone O Regan for Carlow County Council which will investigate this matter further.

4.4 Pollutant Release and Transfer Report

The PRTR for Powerstown Landfill was electronically submitted to the EPA on the 6th May 2011. The report was prepared in accordance with AER/PRTR Reporting requirements and EPA Guidance Note No. 4. The results of the "Landfill Gas Survey 2010" were also incorporated into the PRTR. A copy of the submitted report is contained in Appendix 3 of this report.

Releases to Air
The threshold value for methane emitted or released to air, as outlined in E-PRTR Regulations (2006) is 100,000 kg/year and that for carbon dioxide is 100,000,000 kg/year. The predicted volume of methane released to atmosphere in 2010 at Powerstown Landfill is 1,361,268 kg/year. This exceeds the specified threshold limit value.

Releases to Waters
Surface water run-off at Powerstown landfill is collected by a series of engineered channels and drains. All surface water run off is directed to a surface water retention pond, whereby suspended solids present in the water are allowed to settle before the water is discharged to the nearby Powerstown Stream. Approximately 432,000 litres of water per day was discharged to the Powerstown Stream during 2010.

Releases to Wastewater or Sewer
There are no releases to wastewater to report for the 2010 survey.

Releases to Land
There are no releases to land to report for Powerstown Landfill during 2010.

Treatment and Transfer of Waste
The Powerstown facility is permitted to accept waste for disposal to landfill and recovery, recoverable materials are transferred off-site for recycling or re-use.
In 2010 a total of 1, 736 tonnes of material was transferred off-site for recovery.

5.0 Energy and Resource Consumption

The following section summarises energy and resource usage at the facility in 2010.

5.1 Diesel

Overall, diesel usage at the landfill for 2010 was approximately 45,533 litres. This information was supplied by the machinery contractors invoice records.

5.2 Electricity / Water

The Energy Suppliers to the site are ESB Independent Energy. Records were obtained for energy usage at the site for the period January – December 2010. The total amount of energy used was 91,932kWh.

A water meter is installed at the site. Water usage at the site between 11/11/09 to 12/11/10 was 172m^3.

5.3 Resource consumption

Table 5.1 contains quantities of material used for landfill maintenance from 2006 to 2010.

- The covering material used at the landfill during 2010 was a combination of clay, compost and Hessian material.
- Road making material is used for the road network in the landfill and for access to the active area in cells 15 / 16.
- The hessian void saver is the biodegradable material used to cover the waste.

Table 5.1: Resource Consumption for Landfill Maintenance

Material	2006	2007	2008	2009	2010
Covering material / clay / broken stone / rubble (tonnes)	12,389	6642.3	8489.61	8,402	7,408
Hessian cover void saver (m^2)	36,000	NR	17,828	4,500	9,288
Woodchip (tonnes)	NR	108.74	41.78	23	24.06
Compost (tonnes)	NR	2,276.9	5727.62	1,419	27.46

6.0 Development Activities & Plans

6.1 Development Works

In addition to meeting the targets and objectives set out for the 2010 period, further development works conducted at Powerstown Landfill during 2010 included the following:

- Landscaping of green areas and provision of new shrubbery (December 2010)
- Planting of trees along northern site boundary to improve aesthetics and provide shelter (December 2010)
- Re-location of toilet facilities for public use (November 2010)
- Re-wiring of weighbridge to improve the efficiency of the system (September 2010).
- Installation of additional litter nets to minimise effects of wind blown litter (December 2010)
- Installation of new gates at waste quarantine area and scrap metal storage area for health and safety reasons and to improve aesthetics (July 2010)
- Provision of a gale breaker at the domestic waste intake area to provide shelter to staff and customers (November 2010)

6.2 Environmental Objectives and Targets for 2010 and 2011

The Environmental Objectives and Targets (EOTs) for 2010 were included in the AER that was submitted in 2010. These are outlined in Table 6.1 below along with a progress summary.

Schedule G of the Waste Licence requires the inclusion of a Schedule of Environmental Objectives and Targets for the forthcoming year. The Schedules for Environmental Objectives and Targets for 2011 are listed below in table 6.2. The information presented includes EOTs for promoting continual environmental improvement, maximising the amount of material accepted at the site and site development plans for 2011.

Table 6.1 Summary of Site Development Plans and Objectives for 2010

	Item	Target / Objective	Progress
1	Capping	Ongoing as required	Additional temporary capping completed during 2010 Note1
2	Monitoring	Complete the re-location of the weather station	Completed Feb 2011 Note 2
3	Staff Training	Continue training in the gas collection system	Completed (March 2010)
4	Civic Amenity Site	Revise arrangements for timber acceptance	Completed; new timber bay constructed for temporary storage of timber in August 2010
5	Gas collection	Extend gas collection system within active area	Completed and on-going
6	Site Procedures	Revise Odour Control and Waste Acceptance procedures	Completed
7	Site Infrastructure	Extend waste quarantine area	Completed July 2010
8	Surface Water Monitoring	Repair / replace continuous monitoring equipment at surface water pond	Completed and on-going
9	Waste Acceptance	Make arrangements for the new pre-treatment requirements	Completed

Note 1: Cell 15: 30% temporary capped at final finished contour level, cell 16 temporary cap below final contour level.
Note 2: The weather station was acquired during 2010. The final location of the weather station was under review at the end of 2010 as there were issues with the line of sight from the weather station to the interfacing p.c.

Table 6.2 Summary of Targets and Objectives for 2011

	Item	Target / Objective
1	Capping	Provide temporary capping as required
2	Monitoring	Complete the re-location of the weather station
3	Staff Training	Continue to provide training to staff in relevant fields
4	Site Infrastructure	Inspect all gas collection well heads and seal as required
5	Site Infrastructure	Extend liner at surface water pond overflow discharge & anchor in place above overflow pipes
6	Gas collection	Extend gas collection system within active area, Install new pipe-work
7	Monitoring	Install suitable sampling pump at GW3 to enable sampling
8	Waste Activities	Contact Waste Operators with a view to increasing the amount of waste currently accepted at the landfill
9	Provision of Services	Review tender for bird control
10	Provision of Services	Review tender for pest control
11	Monitoring	Complete all monitoring as required as per W0025-03
12	Site Infrastructure	Re-grading of side slopes to prevent leachate run-off to clean cells

6.3 Restoration

There was no final capping or restoration works carried out in 2010. Intermediate temporary capping was carried out at cells 15 and 16 as detailed in table 6.1. It is not expected that any final capping works will take place in 2011.

6.4 Procedures

New procedures put in place since 1-1-2010 are as follows:

- Odour Management Plan: this was submitted to the Agency in early 2010.
- Waste Acceptance Procedures: this was submitted to the Agency in early 2010 and takes account of the new pre-treatment requirements contained in the revised waste licence W0025-03, which apply from 1-7-10.

7.0 Environmental Nuisances

7.1 Litter

Litter netting is erected on site along the perimeter of the active cells and is located in such a manner so as to capture the maximum amount of wind blown litter. The placement of daily cover material also helps in controlling litter. In addition, litter patrols/ inspections are carried out on a weekly basis to establish if any incidents are arising. Powerstown Landfill is closed to the public on Tuesdays of every week however staff are present on-site to carry out maintenance etc as required. At least 1 staff member is assigned to litter picking duties every Tuesday at Powerstown Landfill.

7.2 Noise

Site roads are constructed between the fill areas, so that the completed cells provide shelter against noise from site plant and equipment, thereby minimising the risk of noise nuisance to nearby noise sensitive receptors.

7.3 Dust

Dust generated on site is kept to a minimum by use of a wheel wash system and the procedure of water sprinkling as necessary. Dust is monitored at least 3 times per to assess whether or dust is causing a nuisance at the site.

7.4 Bird and Pest Control

The bird species that scavenge at Powerstown facility are mainly the crow family, which include rooks and occasionally hooded crows and jackdaws. Bird Control Ireland Ltd. is contracted to visit the site twice per week at varying times both during and outside operating hours. Only trained birds of prey are used which include the Harris hawk and peregrine falcon. There are also visual & acoustic deterrents used on site such as an automated bird scarer, use of a hand pistol and the use of kites.

In general, scavenger birds numbers in the area are low and do not present many problems. This is due to the success of the falconry method of control, operational practices and restricting the size of the tipping area.

Pest control contractors, Pestguard Ltd, are employed to control rodent and flying insect infestations. The site is visited on a monthly basis. There are approximately 50 rodent bait stations located around the site, all clearly identifiable. Each box is monitored and re-baited during monthly site inspections. The risk of fly infestations are kept to a minimum by good operating practices which include efficient compaction of waste, restricting the size of the tipping area and covering of waste at the end of each day. As an additional precautionary measure, the tipping area, plant, machinery and landfill are sprayed as required with appropriate insect repellent.

7.5 Landfill Gas Management and Odour Control

Improvements in this area during 2010 include the following:

- Extra wells have been installed in active area.
- Flare in operation continuously.
- Odour patrols carried out twice a day at three off-site locations and daily at two on site locations.
- Temporary capping works carried out at the active cells.
- Implementation of odour management plan

8.0 Incidents and Complaints for the Reporting Period 2010

8.1 Reported Incidents

There were 15 incidents reported to the EPA during 2010. Of these, 10 incidents were in relation to the flare shutting down due to power failures, extreme cold weather, problems with the gas sampling line, compressor and thermocouples.
There were 2 incidents reported for breakdown of the TOC analyser at the surface water pond.
3 notifications were in relation to landfill gas exceedances of CH4 and CO2 in boundary gas monitoring wells.

8.2 Complaints

A file is maintained at the Powerstown Landfill which records all complaints either by telephone, letter, e-mail, in person or via the EPA. The file also contains a record of the responses to these complaints. In total 4 complaints were received between January to December 2010. The complaints can be summarised as follows.

Odour
A total of 3 complaints were received during 2010 in relation to odour. This is a significant decrease in comparison to those received during 2009 (19 complaints). The number of odour related complaints has decreased steadily over recent years.
The completed final capping of cells 6-13, the installation of a new gas collection system and the continuous operation of the new 1000m^3 capacity flare have led to improved odour control and reduced odours emanating from the landfill. Upgrading of the gas collection system in the active area of the landfill has also helped to eliminate odour related complaints.

Litter
1 complaint was received in relation to litter during 2010. However, it was noted that this complaint was not directly in relation to litter at Powerstown Landfill but was in relation to illegal fly tipping in the environs and surrounding areas. The issue was forwarded to the Environment section of Carlow County Council and the fly tipped material was removed.

No other complaints were received at Powerstown Landfill during 2010. The 4 complaints outlined above were received during January – March 2010 with no further complaints received throughout the remainder of the year.

9.0 Financial Provisions, Staffing, Training and Programme for Public Information

9.1 Financial Provisions

The gate fee changed a number of times during 2010 due to increases in the landfill levy. The changes in pricing are detailed below:

Date	Landfill Levy/tonne	Gate fee (incl. levy)/tonne
31/12/2009	€20	€125
01/01/2010	€25	€130
01/02/2010	€30	€135

Gate fees, including the levy, for 2010 amounted to: €579,643

The landfill levy paid for 2010 was: €166,104.81

The budget allocated to Powerstown Landfill for 2010 was:

- Landfill: €810,000
- Civic Amenity Site: €168,000

Condition 12.2 of the waste licence requires that the licensee shall maintain a fund, or provide a written guarantee, that is adequate to assure the Agency that it is, at all times, financially capable of implementing the Restoration and Aftercare Plan. The above budget does not include financial provision for future capping works and aftercare programs. This is incorporated into a separate fund.

9.2 Community Fund

Condition 12.5 of the waste licence requires that a Community Fund be set up, consisting of one euro for every tonne of waste accepted for disposal. The current fund stands at €130,000. Carlow County Council in conjunction with local residents and elected members are currently attempting to establish a community fund committee to manage and discharge this fund for the benefit of the social and physical environment of the local community.

9.3 Staffing

The landfill has a total of 7 employees in addition to outside contractors.

- Landfill Manager - Fergus Mulhare.
- Deputy Manager / Environmental Technician – Mary Walsh.
- Site Foreman – John Nolan, Pat Doyle
- Weighbridge Operators - 2
- Ground staff – 1

Training Completed during 2010

Training completed by Carlow County Council landfill staff members during 2010 includes the following:

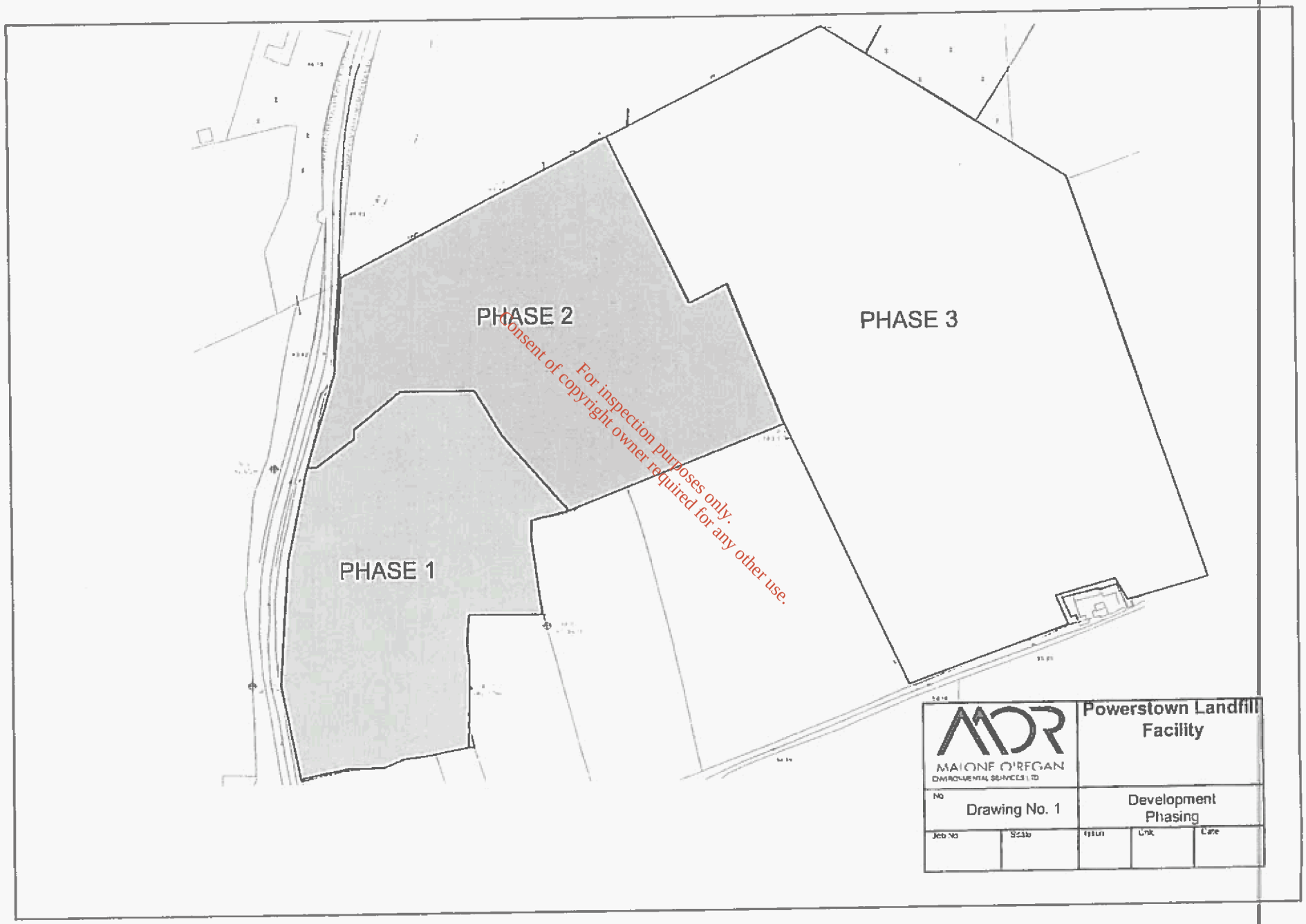
- Landfill Gas Balancing (2 staff members)
- Manual Handling (2 staff members)
- FAS Safe Pass (2 staff members)
- Fire Warden training (1 staff member)

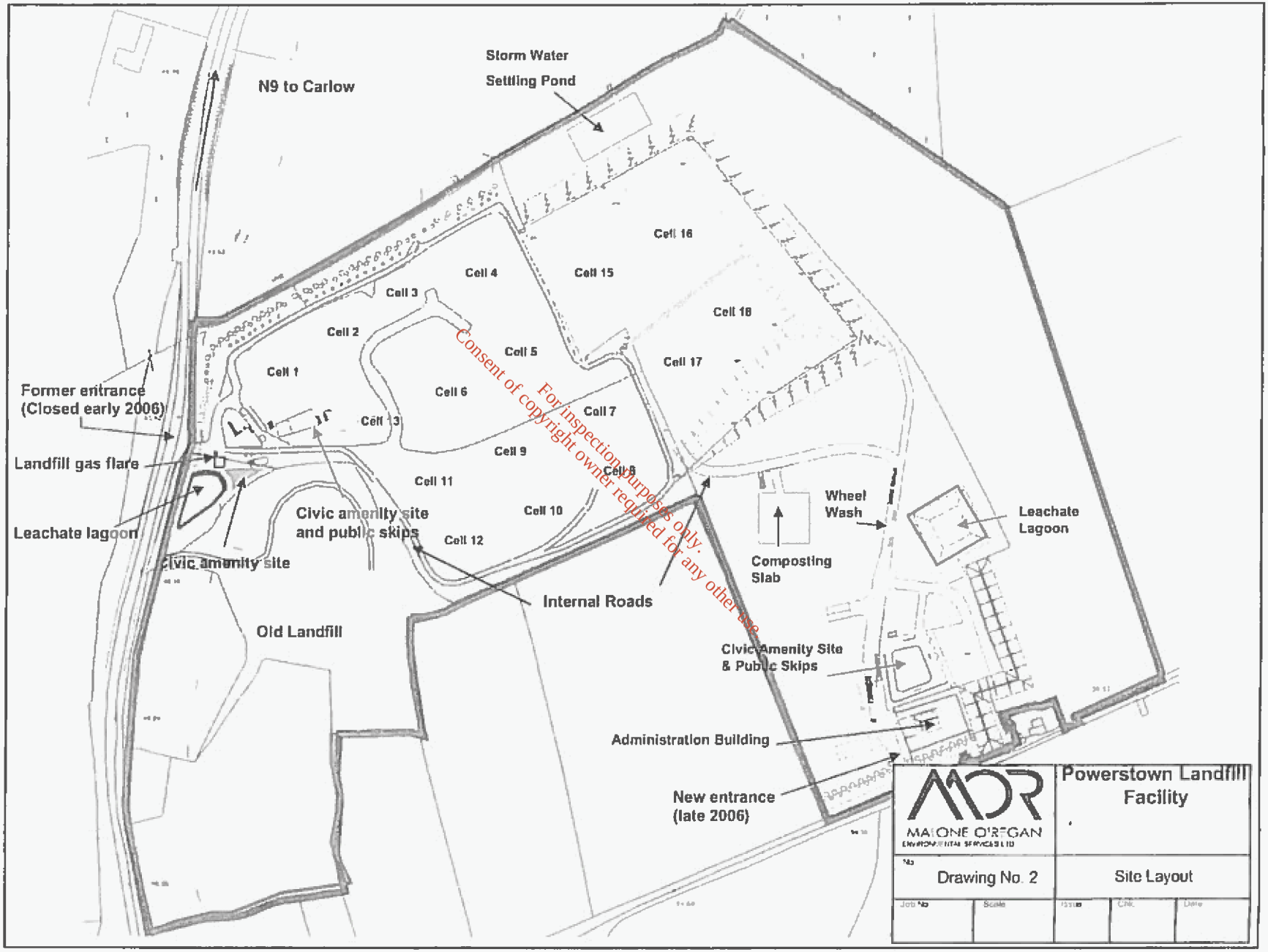
9.4 Public Information

Carlow County Council subscribe to a full page advertisement in the Carlow Nationalist on a fortnightly basis or more often if required. All relevant public notices in relation to Powerstown Landfill are included in this advertisement. The information pack on Carlow County Council's website was updated during 2010 to include more recent relevant information in relation to the site. Information leaflets are available at the weighbridge office, civic amenity site and skip area detailing types of waste accepted, current charges and opening hours. An electronic notice board is in operation at the site detailing opening hours and charges.

A meeting with local residents was held on 19-5-10. Following a number of requests from Carlow County Council, the local residents group declined to form an official committee. Following this meeting, there were no complaints received from the general public and no further meetings were arranged. It is anticipated that a committee might be formed during 2011 which will incorporate the local residents and the community fund group.

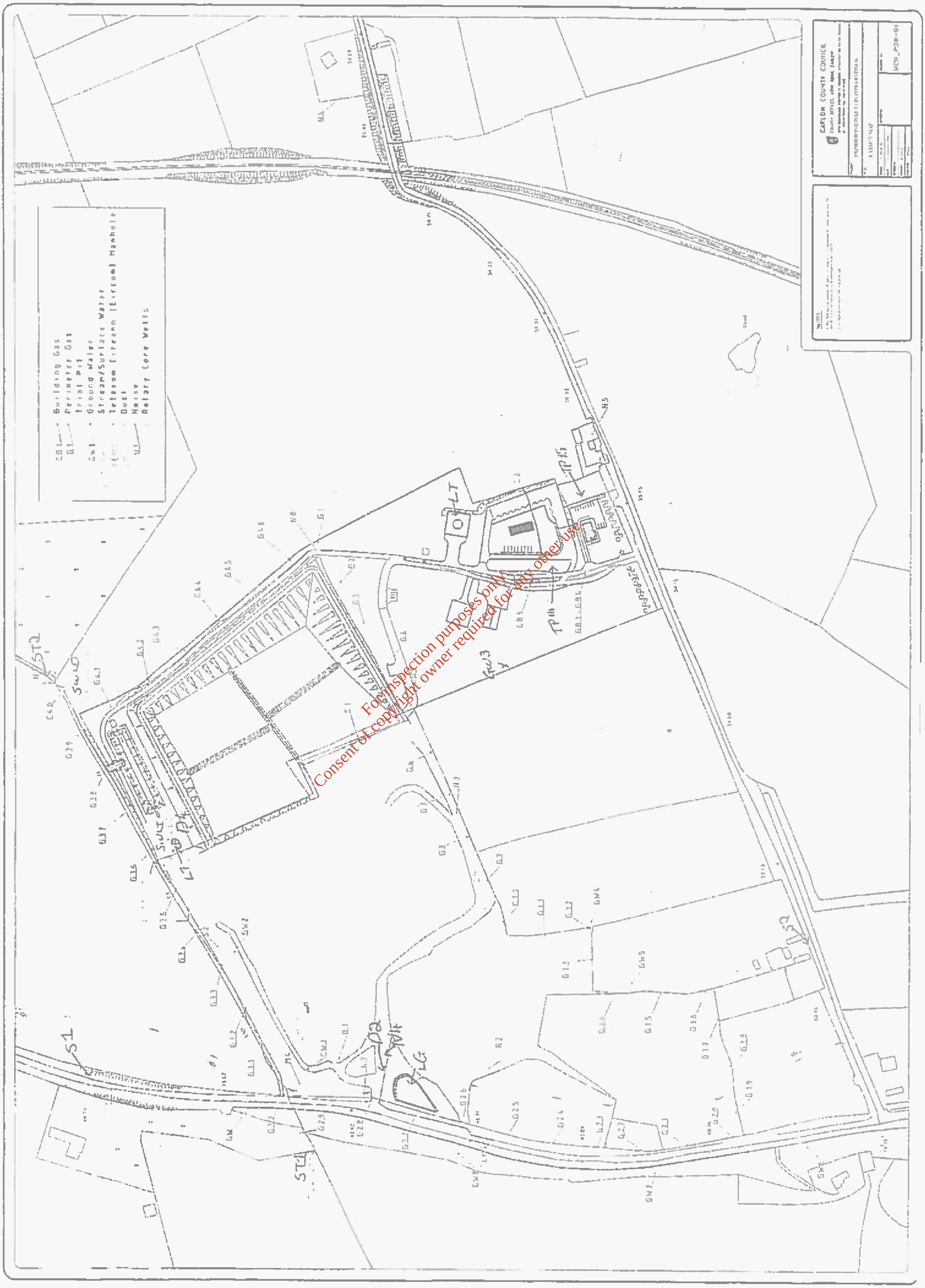
DRAWINGS





APPENDIX 1

MAP OF MONITORING LOCATIONS



APPENDIX 2

RESULTS OF SURFACE WATER MONITORING DURING 2010

Monitoring Results at ST1 - Downstream

Test Parameter	Q1 2010	Q2 2010	Q3 2010	Q4 / Annual 2010	Drinking Water Regulations (S.I 278 2007)	Trigger Levels
Visual	Brown colour (in flood)	Clear	Clear	Clear	-	-
Ammonia mg/l N	0.29	0.26	0.1	0.34	0.23	0.5
Dissolved Oxygen % Sat	86.0	120	87	74	-	-
Conductivity µS/cm	716	769	803	820	2,500	1000
COD mg/l O_2	21	<20	34	<20	-	-
Chloride mg/l Cl	27	26	22	24	250	50
pH	7.6	7.8	7.6	7.6	6.5 – 9.5	-
Suspended Solids mg/l	35	<5	<5	<5	-	-
Temperature °c	5.8	12.7	15.1	11.5	25	-
Orthophosphate mg/l P	NR	NR	NR	0.04	-	-
Total Oxidised Nitrogen mg/l N	NR	NR	NR	4.62	-	-
BOD mg/O_2	1.4	0.8	0.5	NM	-	-

NM = Not Measured
NR = Not Required

Monitoring Results at ST2 – Upstream

Test Parameter	Q1 2010	Q2 2010	Q3 2010	Q4 / Annual 2010	Drinking Water Regulations (S.I 278 2007)	Trigger Levels
Visual	Muddy brown colour	Clear	Clear	Clear	-	-
Ammonia mg/l N	0.11	0.03	0.02	0.53	0.23	0.5
Dissolved Oxygen % Sat	89.0	114	86.3	83.0	-	-
Conductivity µS/cm	704	757	818	826	2,500	1000
COD mg/l O_2	<20	<20	<20	<20	-	-
Chloride mg/l Cl	25	22	21	23	250	50
pH	7.7	7.9	7.9	7.9	6.5 – 9.5	-
Suspended Solids mg/l	33	11	<5	6	-	-
Temperature °c	5.8	12.1	15.4	12.1	25	-
Orthophosphate mg/l P	NR	NR	NR	0.05	-	-
Total Oxidised Nitrogen mg/l N	NR	NR	NR	2.84	-	-
BOD mg/O_2	0.8	0.6	0.5	NM	-	-

NM = Not Measured
NR = Not Required

Results of sampling at inlet to surface water pond (SWLI)

Test Parameter	Q1 2010	Q2 2010	Q3 2010	Q4 / Annual 2010
Visual	Clear Sample	Clear Sample	Clear Sample	Clear
Odour	Strong odour	Strong odour	-	-
Ammonia mg/l N	0.11	<0.01	0.02	0.33
Dissolved Oxygen % Sat	90.0	93	90	96.0
Conductivity µS/cm	733	724	733	342
COD mg/l O_2	<20	<20	<20	<20
Chloride	21	18	17	7
pH	7.5	7.6	7.5	7.9
Suspended Solids mg/l	97	<5	<5	<5
Temperature °c	10.4	11.1	11.7	11.3
BOD mg/O_2	<0.5	<0.5	<0.5	NM

Results of sampling at outlet from surface water pond (SWLO).

Test Parameter	Q1 2010	Q2 2010	Q3 2010	Q4 / Annual 2010
Visual	Clear Sample	Clear Sample	Clear Sample	Clear
Ammonia mg/l N	<0.06	<0.01	<0.01	0.4
Dissolved Oxygen % Sat	91.0	93	84	95.0
Conductivity µS/cm	747	726	722	712
COD mg/l O_2	<20	<20	<20	<20
Chloride	21	19	17	16
pH	7.4	7.3	7.3	7.6
Suspended Solids mg/l Note 1	96	<5	<5	<5
Temperature °c	10.5	11	11.5	11.4
BOD mg/O_2	<0.5	<0.5	<0.5	NM

Note 1: Discharge Limit of 35mg/l suspended solids set out in Schedule C.4 of Waste Licence W0025-03 for outlet from pond
NM = Not Measured

Results of analysis of Surface Water for the presence of Heavy Metals

Test Parameter	ST1 Downstream	ST2 Upstream	Inlet SWLI	Outlet SWLO
Sulphate mg/l SO_4	NM	NM	NM	NM
Alkalinity mg/l $CaCO_3$	284	264	144	324
Aluminium mg/l	<250	<250	<250	<250
Antimony mg/l	<5	<5	<5	<5
Arsenic ug/l	<5	<5	<5	<5
Barium ug/l	<30	<30	<30	<30
Beryilium ug/l	<5	<5	<5	<5
Boron ug/l	<50	<50	<50	<50
Cadmium ug/l	<5	<5	<5	<5
Calcium mg/l	87	83	42	97
Chromium ug/l	<5	<5	<5	<5
Cobalt ug/l	<5	<5	<5	<5
Copper ug/l	<5	<5	<5	<5
Iron ug/l	<250	<250	<250	<250
Lead ug/l	<5	<5	<5	<5
Magnesium mg/l	22	24	24	12
Manganese ug/l	<250	<250	<250	<250
Mercury ug/l	<0.5	<0.5	<0.5	<0.5
Molybdenum ug/l	<5	<5	<5	<5
Nickel ug/l	<5	<5	<5	<5
Potassium mg/l	<5	<5	8.8	<5
Selenium mg/l	<5	<5	<5	<5
Sodium mg/l	8.8	7.4	6.2	7.3
Thallium ug/l	<5	<5	<5	<5
Tin ug/l	<10	<10	<10	<10
Uranium ug/l	6.3	7.3	<5	<5
Vanadium ug/l	<5	<5	<5	<5
Zinc ug/l	<30	<30	<30	<30

APPENDIX 3

RESULTS OF GROUND WATER MONITORING DURING 2010

GROUNDWATER CONTOUR MAP

Parameter	Monitoring Location: GW1						
	Units	IGVs/GTLs	S.I. No 9 of 2010	Jan-10	May-10	Jul-10	Oct-10
Visual Inspection	-	-	-	Clear	Clear	Clear	Clear
Water Level	mAOD	-	-	10.2	10.2	10.1	10
Temperature	oC	25	-	11.5	11.8	12.1	12.2
Dissolved Oxygen	%	NAC	-	24	28	25	37
pH	pH units	≥6.5≤9.5	-	7	7.1	7	7.1
Conductivity	µS/cm	1,000 / 1,000	800-1875	*1167*	995	*1073*	879
Ammonia	mg/l N	0.12 / 1.56	0.065-0.175	*8.3*	*7.1*	*11*	*2.5*
Chloride	mg/l Cl	30 / 50	24-187.5	*47*	*34*	*45*	*36*
Ortho-Phosphate	mg/l P	0.01	-	NR	NR	NR	*0.04*
Total Oxidised Nitrogen	mg/l N	NAC	-	NR	NR	NR	12.53
Fluoride	mg/l F	1	-	NR	NR	NR	NM
Sulphate	mg/l SO4	200	187.5	NR	NR	NR	NM
Alkalinity	mg/l $CaCO_3$	NAC	-	NR	NR	NR	338
Total Organic Carbon	mg/l C	NAC	-	1.3	NM	NM	NM
Aluminium	µg/l	200	150	NR	NR	NR	<250
Antimony	µg/l	-	-	NR	NR	NR	<5
Arsenic	µg/l	10	7.5	NR	NR	NR	<5
Barium	µg/l	100	-	NR	NR	NR	<30
Beryllium	µg/l	-	-	NR	NR	NR	<5
Boron	µg/l	1000	750	NR	NR	NR	31
Cadmium	µg/l	5	3.75	NR	NR	NR	<5
Calcium	mg/l	200	-	NR	NR	NR	120
Chromium	µg/l	30	37.5	NR	NR	NR	<5
Cobalt	µg/l	-	-	NR	NR	NR	<5
Copper	µg/l	30	1500	NR	NR	NR	<5
Iron	µg/l	200	-	NR	NR	NR	<250
Lead	µg/l	10	18.75	NR	NR	NR	<5
Magnesium	mg/l	50	-	NR	NR	NR	16
Manganese	µg/l	50	-	NR	NR	NR	<250
Mercury	µg/l	-	0.75	NR	NR	NR	<0.5
Molybdenum	µg/l	-	-	NR	NR	NR	<5
Nickel	µg/l	20	15	NR	NR	NR	<5
Potassium	mg/l	5	-	NR	NR	NR	*6.8*
Selenium	µg/l	-	-	NR	NR	NR	<5
Sodium	mg/l	150	150	NR	NR	NR	18
Thallium	µg/l	-	-	NR	NR	NR	<5
Tin	µg/l	-	-	NR	NR	NR	<10
Uranium	µg/l	9	-	NR	NR	NR	<5
Vanadium	µg/l	-	-	NR	NR	NR	<5
Zinc	µg/l	100	-	NR	NR	NR	<30
Total Cyanide	mg/l	0.01	-	NR	NR	NR	<0.05
VOC's	µg/l	-	-	NR	NR	NR	
m,p xylene	µg/l	10	-	NR	NR	NR	0.8
Toluene	µg/l	10	-	NR	NR	NR	1.8

mbpl = metres below pipe level
NM = Not Measured
NR = Not Required
ND = None Detected
NAC = No Abnormal Change

Parameter	Monitoring Location: GW2						
	Units	IGVs/GTLs	S.I. No 9 of 2010	Jan-10	May-10	Jul-10	Oct-10
Visual Inspection	-	-	-	Brown colour	-	Rusty Brown Colour	Slightly Brown
Water Level	mAOD	-	-	2	1.6	1.5	1.5
Temperature	oC	25	-	8.3	11	14.5	13.6
Dissolved Oxygen	%	NAC	-	32	28	19	24
pH	pH units	≥6.5≤9.5	-	7.1	7.1	7	7
Conductivity	uS/cm	1,000 / 1,300	800-1875	1025	1444	1170	1340
Ammonia	mg/l N	0.12 / 0.78	0.065-0.175	0.06	0.1	0 02	0.26
Chloride	mg/l Cl	30 / 60	24-187.5	46	105	57	112
Nitrite	mg/l N	-	-	NR	NR	NR	-
Ortho-Phosphate	mg/l P	0.01	-	NR	NR	NR	0.04
Total Oxidised Nitrogen	mg/l N	NAC	-	NR	NR	NR	40.37
Fluoride	mg/l F	1	-	NR	NR	NR	NM
Sulphate	mg/l SO4	200	187.5	NR	NR	NR	NM
Alkalinity	mg/l CaCO3	NAC	-	NR	NR	NR	356
Total Organic Carbon	mg/l C	NAC	-	4.8	NM	NM	NM
Aluminium	µg/l	200	150	NR	NR	NR	<250
Antimony	µg/l	-	-	NR	NR	NR	<5
Arsenic	µg/l	10	7.5	NR	NR	NR	<5
Barium	µg/l	100	-	NR	NR	NR	47
Beryllium	µg/l	-	-	NR	NR	NR	<5
Boron	µg/l	1000	750	NR	NR	NR	110
Cadmium	µg/l	5	3.75	NR	NR	NR	<5
Calcium	mg/l	200	-	NR	NR	NR	160
Chromium	µg/l	30	22.5	NR	NR	NR	<5
Cobalt	µg/l	-	-	NR	NR	NR	<5
Copper	µg/l	30	1500	NR	NR	NR	23
Iron	µg/l	200	-	NR	NR	NR	270
Lead	µg/l	10	18.75	NR	NR	NR	<5
Magnesium	mg/l	50	-	NR	NR	NR	22
Manganese	µg/l	50	-	NR	NR	NR	<250
Mercury	µg/l	1	0.75	NR	NR	NR	<0.5
Molybdenum	µg/l	-	-	NR	NR	NR	<5
Nickel	µg/l	20	15	NR	NR	NR	50
Potassium	mg/l	5	-	NR	NR	NR	18
Selenium	µg/l	-	-	NR	NR	NR	<5
Sodium	mg/l	150	150	NR	NR	NR	60
Thallium	µg/l	-	-	NR	NR	NR	<5
Tin	µg/l	-	-	NR	NR	NR	<10
Uranium	µg/l	9	-	NR	NR	NR	8.2
Vanadium	µg/l	-	-	NR	NR	NR	<5
Zinc	µg/l	100	-	NR	NR	NR	<30
Total Cyanide	mg/l	10	-	NR	NR	NR	<0.05
VOC's	µg/l	-	-	NR	NR	NR	ND

mbpl = metres below pipe level
NM = Not Measured
NR = Not Required
ND = None Detected
NAC = No Abnormal Change

Parameter	Monitoring Location: GW3					
	Units	IGVs/GTLs	S.I. No 9 of 2010	May-10	Jul-10	Oct-10
Visual Inspection	-	-	-	Clear	Borehole	Borehole
Water Level	mAOD	-	-	26.2	Not	Not
Temperature	oC	25	-	11.6	Sampled	Sampled
Dissolved Oxygen	%	NAC	-	66		
pH	pH units	≥6.5≤9.5	-	7.6		
Conductivity	µS/cm	1,000 / 1,000	800-1875	724		
Ammonia	mg/l N	0.12 / 1.56	0.065-0.175	0.02		
Chloride	mg/l Cl	30 / 40	24-187.5	23		
Total Organic Carbon	mg/l C	NAC	-	NM		
Ortho-Phosphate	mg/l P	0.01	-	NR		
Total Oxidised Nitrogen	mg/l N	NAC	-	NR		
Fluoride	mg/l F	1	-	NR		
Sulphate	mg/l SO4	200	- 187.5	NR		
Alkalinity	mg/l $CaCO_3$	NAC	-	NR		
Aluminium	µg/l	200	150	NR		
Antimony	µg/l	-	-	NR		
Arsenic	µg/l	10	7.5	NR		
Barium	µg/l	100	-	NR		
Beryllium	µg/l	-	-	NR		
Boron	µg/l	1000	750	NR		
Cadmium	µg/l	5	3.75	NR		
Calcium	mg/l	200	-	NR		
Chromium	µg/l	30	37.5	NR		
Cobalt	µg/l	-	-	NR		
Copper	µg/l	2000	1500	NR		
Iron	µg/l	200	-	NR		
Lead	µg/l	10	18.75	NR		
Magnesium	mg/l	50	-	NR		
Manganese	µg/l	50	-	NR		
Mercury	µg/l	1	0.75	NR		
Molybdenum	µg/l	-	-	NR		
Nickel	µg/l	20	15	NR		
Potassium	mg/l	5	-	NR		
Selenium	µg/l	-	-	NR		
Sodium	mg/l	150	150	NR		
Thallium	µg/l	-	-	NR		
Tin	µg/l	-	-	NR		
Uranium	µg/l	9	-	NR		
Vanadium	µg/l	-	-	NR		
Zinc	µg/l	100	-	NR		
Total Cyanide	mg/l	10	-	NR		
VOC's	µg/l	-	-	NR		

mbpl = metres below pipe level
NM = Not Measured
NR = Not Required
ND = None Detected
NAC = No Abnormal Change

Parameter	Monitoring Location: GW6				
	Units	IGVs/GTLs	S.I. No 9 of 2010	Jul-10	Oct-10
Visual Inspection	-	-	-	Brown Colour	-
Water Level	mAOD	-	-	12.2	12.1
Temperature	oC	25	-	11.8	10.8
Dissolved Oxygen	%	NAC	-	62	70
pH	pH units	≥6.5≤9.5	-	7.3	7.4
Conductivity	µS/cm	1,000 / 900	800-1875	730	718
Ammonia	mg/l N	0.12 / 0.12	0.065-0.175	<0.01	0.02
Chloride	mg/l Cl	30 / 30	24-187.5	23	22
Total Organic Carbon	mg/l C	NAC	-	NM	NM
Ortho-Phosphate	mg/l P	0.01	-	NR	*0.04*
Total Oxidised Nitrogen	mg/l N	NAC	-	NR	8.53
Fluoride	mg/l F	1	-	NR	NM
Sulphate	mg/l SO4	200	- 187.5	NR	NM
Alkalinity	mg/l $CaCO_3$	NAC	-	NR	306
Aluminium	µg/l	200	150	NR	69
Antimony	µg/l	-	-	NR	<5
Arsenic	µg/l	10	7.5	NR	<5
Barium	µg/l	100	-	NR	<30
Beryllium	µg/l	-	-	NR	<5
Boron	µg/l	1000	750	NR	27
Cadmium	µg/l	5	3.75	NR	<5
Calcium	mg/l	200	-	NR	120
Chromium	µg/l	30	37.5	NR	<5
Cobalt	µg/l	-	-	NR	<5
Copper	µg/l	30	1500	NR	<5
Iron	µg/l	200	-	NR	<250
Lead	µg/l	10	18.75	NR	<5
Magnesium	mg/l	50	-	NR	14
Manganese	µg/l	50	-	NR	<250
Mercury	µg/l	1	0.75	NR	<0.5
Molybdenum	µg/l	-	-	NR	<5
Nickel	µg/l	20	15	NR	<5
Potassium	mg/l	5	-	NR	<5
Selenium	µg/l	-	-	NR	<5
Sodium	mg/l	150	150	NR	7.3
Thallium	µg/l	-	-	NR	<5
Tin	µg/l	-	-	NR	<10
Uranium	µg/l	9	-	NR	<5
Vanadium	µg/l	-	-	NR	1.3
Zinc	µg/l	100	-	NR	<30
Total Cyanide	mg/l	10	-	NR	<0.05
VOC's	µg/l	-	-	NR	ND

NAC = No Abnormal Change
NM = Not Measured
NR = Not Required
ND = None detected

Parameter	Monitoring Location: GW7				
	Units	IGVs/GTLs	S.I. No 9 of 2010	Jul-10	Oct-10
Visual Inspection	-	-	-	Brown Colour	-
Water Level	mAOD	-	-	11	7.8
Temperature	oC	25	-	11.9	10.8
Dissolved Oxygen	%	NAC	-	30	25
pH	pH units	≥6.5≤9.5	-	7.3	7.2
Conductivity	µS/cm	1,000 / 1,000	800-1875	710	720
Ammonia	mg/l N	0.12 / 0.62	0.065-0.175	<0.01	0.01
Chloride	mg/l Cl	30 / 50	24-187.5	21	21
Total Organic Carbon	mg/l C	NAC	-	NM	NM
Ortho-Phosphate	mg/l P	0.01	-	NR	*0.04*
Total Oxidised Nitrogen	mg/l N	NAC	-	NR	9.35
Fluoride	mg/l F	1	-	NR	NM
Sulphate	mg/l SO4	200	- 187.5	NR	NM
Alkalinity	mg/l $CaCO_3$	NAC	-	NR	285
Aluminium	µg/l	200	150	NR	87
Antimony	µg/l	-	-	NR	<5
Arsenic	µg/l	10	7.5	NR	<5
Barium	µg/l	100	-	NR	<30
Beryllium	µg/l	-	-	NR	<5
Boron	µg/l	1000	750	NR	38
Cadmium	µg/l	5	3.75	NR	<5
Calcium	mg/l	200	-	NR	93
Chromium	µg/l	30	37.5	NR	<5
Cobalt	µg/l		-	NR	<5
Copper	µg/l		1500	NR	<5
Iron	µg/l	200	-	NR	<250
Lead	µg/l	10	18.75	NR	<5
Magnesium	mg/l	50	-	NR	11
Manganese	µg/l	50	-	NR	<250
Mercury	µg/l	1	0.75	NR	<0.5
Molybdenum	µg/l	-	-	NR	<5
Nickel	µg/l	20	15	NR	<5
Potassium	mg/l	5	-	NR	<5
Selenium	µg/l	-	-	NR	<5
Sodium	mg/l	150	150	NR	<5
Thallium	µg/l	-	-	NR	<5
Tin	µg/l	-	-	NR	<10
Uranium	µg/l	9	-	NR	<5
Vanadium	µg/l	-	-	NR	<5
Zinc	µg/l	100	-	NR	<30
Total Cyanide	mg/l	10	-	NR	<0.05
VOC's	µg/l	-	-	NR	ND

NAC = No Abnormal Change
NM = Not Measured
NR = Not Required
ND = None detected

Parameter	Monitoring Location: GW8						
	Units	IGVs/GTLs	S.I. No 9 of 2010	Jan-10	May-10	Jul-10	Oct-10
Visual Inspection	-	-	-	Clear	-	Clear	-
Water Level	mAOD	-	-	8.7	8.2	8.1	8.1
Temperature	oC	25	-	11.1	11.8	12.1	11.1
Dissolved Oxygen	%	NAC	-	21	27	18	23
pH	pH units	≥6.5≤9.5	-	7.2	7.3	7.2	7.2
Conductivity	µS/cm	1,000 / 1,000	800-1875	778	748	767	827
Ammonia	mg/l N	0.12 / 1.56	0.065-0.175	2	1.1	0.85	0.64
Chloride	mg/l Cl	30 / 50	24-187.5	24	24	24	28
Ortho-Phosphate	mg/l P	0.01	-	NR	NR	NR	0.04
Total Oxidised Nitrogen	mg/l N	NAC	-	NR	NR	NR	10.11
Fluoride	mg/l F	1	-	NR	NR	NR	NM
Sulphate	mg/l SO4	200	187.5	NR	NR	NR	NM
Alkalinity	mg/l $CaCO_3$	NAC	-	NR	NR	NR	338
Total Organic Carbon	mg/l C	NAC	-	0.7	NM	NM	NM
Aluminium	µg/l	200	150	NR	NR	NR	<250
Antimony	µg/l	-	-	NR	NR	NR	<5
Arsenic	µg/l	10	7.5	NR	NR	NR	<5
Barium	µg/l	100	-	NR	NR	NR	100
Beryllium	µg/l	-	-	NR	NR	NR	<5
Boron	µg/l	1000	750	NR	NR	NR	180
Cadmium	µg/l	5	3.75	NR	NR	NR	<5
Calcium	mg/l	200	-	NR	NR	NR	390
Chromium	µg/l	30	37.5	NR	NR	NR	<5
Cobalt	µg/l	-	-	NR	NR	NR	<5
Copper	µg/l	30	1500	NR	NR	NR	<5
Iron	µg/l	200	-	NR	NR	NR	<250
Lead	µg/l	10	18.75	NR	NR	NR	<5
Magnesium	mg/l	50	-	NR	NR	NR	46
Manganese	µg/l	50	-	NR	NR	NR	<250
Mercury	µg/l	1	0.75	NR	NR	NR	<0.5
Molybdenum	µg/l	-	-	NR	NR	NR	<5
Nickel	µg/l	20	15	NR	NR	NR	<5
Potassium	mg/l	5	-	NR	NR	NR	6.4
Selenium	µg/l	-	-	NR	NR	NR	<5
Sodium	mg/l	150	150	NR	NR	NR	41
Thallium	µg/l	-	-	NR	NR	NR	<5
Tin	µg/l	-	-	NR	NR	NR	<10
Uranium	µg/l	9	-	NR	NR	NR	11
Vanadium	µg/l	-	-	NR	NR	NR	<5
Zinc	µg/l	100	-	NR	NR	NR	90
Total Cyanide	mg/l	10	-	NR	NR	NR	<0.05
VOC's	µg/l	-	-	NR	NR	NR	ND

NM = Not Measured
NR = Not Required
ND = None Detected
NAC = No Abnormal Change

Parameter	Monitoring Location: RCA1						
	Units	IGVs	S.I. No 9 of 2010	Jan-10	May-10	Jul-10	Oct-10
Visual Inspection	-	-	-	Brown Colour	-	Clear with Mud	-
Water Level	mbpl	-	-	5.6	13	5.2	3.7
Temperature	oC	25	-	10.4	11.3	11.3	10.4
Dissolved Oxygen	%	NAC	-	91	84	75	70
pH	pH units	≥6.5≤9.5	-	7.3	7.3	7.2	7.3
Conductivity	µS/cm	1000	800-1875	731	732	761	780
Ammonia	mg/l N	0.12	0.065-0.175	0.02	0.01	0.01	0.02
Chloride	mg/l Cl	30	24-187.5	19	18	18	18
Ortho-Phosphate	mg/l P	0.01	-	NR	NR	NR	*0.05*
Total Oxidised Nitrogen	mg/l N	NAC	-	NR	NR	NR	9.52
Fluoride	mg/l F	1	-	NR	NR	NR	NM
Sulphate	mg/l SO4	200	187.5	NR	NR	NR	NM
Alkalinity	mg/l $CaCO_3$	NAC	-	NR	NR	NR	315
Total Organic Carbon	mg/l C	NAC	-	0.7	NM	NM	NM
Aluminium	µg/l	200	150	NR	NR	NR	140
Antimony	µg/l	-	-	NR	NR	NR	<5
Arsenic	µg/l	10	7.5	NR	NR	NR	<5
Barium	µg/l	100	-	NR	NR	NR	<30
Beryllium	µg/l	-	-	NR	NR	NR	<5
Boron	µg/l	1000	750	NR	NR	NR	63
Cadmium	µg/l	5	3.75	NR	NR	NR	<5
Calcium	mg/l	200	-	NR	NR	NR	110
Chromium	µg/l	30	37.5	NR	NR	NR	<5
Cobalt	µg/l	-	-	NR	NR	NR	<5
Copper	µg/l	30	1500	NR	NR	NR	<5
Iron	µg/l	200	-	NR	NR	NR	<250
Lead	µg/l	10	18.75	NR	NR	NR	<5
Magnesium	mg/l	50	-	NR	NR	NR	11
Manganese	µg/l	50	-	NR	NR	NR	<250
Mercury	µg/l	1	0.75	NR	NR	NR	<0.5
Molybdenum	µg/l	-	-	NR	NR	NR	<5
Nickel	µg/l	20	15	NR	NR	NR	<5
Potassium	mg/l	5	-	NR	NR	NR	<5
Selenium	µg/l	-	-	NR	NR	NR	<5
Sodium	mg/l	150	150	NR	NR	NR	3.3
Thallium	µg/l	-	-	NR	NR	NR	<5
Tin	µg/l	-	-	NR	NR	NR	<30
Uranium	µg/l	9	-	NR	NR	NR	<5
Vanadium	µg/l	-	-	NR	NR	NR	<5
Zinc	µg/l	100	-	NR	NR	NR	<30
Total Cyanide	mg/l	10	-	NR	NR	NR	<0.05
VOC's	µg/l	-	-	NR	NR	NR	ND

mbpl = metres below pipe level
NM = Not Measured
NR = Not Required
ND = None Detected
NAC = No Abnormal Change

Parameter	Monitoring Location: RCA2						
	Units	IGVs	S.I. No 9 of 2010	Jan-10	May-10	Jul-10	Oct-10
Visual Inspection	-	-	-	Muddy brown	-	Clear with Mud	-
Water Level	mbpl	-	-	5.4	4.6	4.8	3.4
Temperature	oC	25	-	10.4	11	11.3	10.4
Dissolved Oxygen	%	NAC	-	95	84	81	71
pH	pH units	≥6.5≤9.5	-	7.4	7.3	7.3	7.3
Conductivity	µS/cm	1000	800-1875	733	724	754	776
Ammonia	mg/l N	0.12	0.065-0.175	0.03	0.01	0.01	0.01
Chloride	mg/l Cl	30	24-187.5	19	17	17	18
Ortho-Phosphate	mg/l P	0.01	-	NR	NR	NR	*0.05*
Total Oxidised Nitrogen	mg/l N	NAC	-	NR	NR	NR	9.43
Fluoride	mg/l F	1	-	NR	NR	NR	NM
Sulphate	mg/l SO4	200	187.5	NR	NR	NR	NM
Alkalinity	mg/l $CaCO_3$	NAC	-	NR	NR	NR	310
Total Organic Carbon	mg/l C	NAC	-	0.5	NM	NM	NM
Aluminium	µg/l	200	150	NR	NR	NR	37
Antimony	µg/l	-	-	NR	NR	NR	<5
Arsenic	µg/l	10	7.5	NR	NR	NR	<5
Barium	µg/l	100	-	NR	NR	NR	<30
Beryllium	µg/l	-	-	NR	NR	NR	<5
Boron	µg/l	1000	750	NR	NR	NR	82
Cadmium	µg/l	5	3.75	NR	NR	NR	<5
Calcium	mg/l	200	-	NR	NR	NR	150
Chromium	µg/l	30	37.5	NR	NR	NR	<5
Cobalt	µg/l	-	-	NR	NR	NR	<5
Copper	µg/l	30	150	NR	NR	NR	<5
Iron	µg/l	200	-	NR	NR	NR	<250
Lead	µg/l	10	18.75	NR	NR	NR	<5
Magnesium	mg/l	50	-	NR	NR	NR	16
Manganese	µg/l	50	-	NR	NR	NR	<250
Mercury	µg/l	1	0.75	NR	NR	NR	<0.5
Molybdenum	µg/l	-	-	NR	NR	NR	<5
Nickel	µg/l	20	15	NR	NR	NR	<5
Potassium	mg/l	5	-	NR	NR	NR	<5
Selenium	µg/l	-	-	NR	NR	NR	<5
Sodium	mg/l	150	150	NR	NR	NR	6.6
Thallium	µg/l	-		NR	NR	NR	<5
Tin	µg/l	-		NR	NR	NR	<10
Uranium	µg/l	9		NR	NR	NR	7.2
Vanadium	µg/l	-		NR	NR	NR	<5
Zinc	µg/l	100		NR	NR	NR	<30
Total Cyanide	mg/l	10		NR	NR	NR	<0.05
VOC's	µg/l	-		NR	NR	NR	
Toluene	µg/l	10					0.6

mbpl = metres below pipe level
NM = Not Measured
NR = Not Required
ND = None Detected
NAC = No Abnormal Change

Parameter	Units	IGVs	S.I. No. 278 of 2007	Doyle	Purcell
Temperature	oC	25	-	11.2	12.6
Dissolved Oxygen	%	NAC	-	57	69
pH	pH units	-	≥6.5≤9.5	7.1	7.4
Conductivity	µS/cm	1,000	2,500	853	577
Ammonia	mg/l N	0.12	0.23	0.01	<0.01
Chloride	mg/l Cl	30	250	25	*31*
Total Organic Carbon	mg/l C	NAC	NAC	NM	NM
Ortho-Phosphate	mg/l P	0.01	-	*0.04*	*0.03*
Total Oxidised Nitrogen	mg/l N	NAC	-	16.43	2.54
Fluoride	mg/l F	1	0.8	NM	NM
Sulphate	mg/l SO4	200	250	NM	NM
Alkalinity	mg/l $CaCO_3$	NAC	-	331	236
Aluminium	µg/l	200	200	<250	<25
Antimony	µg/l	-	5	<5	<0.5
Arsenic	µg/l	10	10	<5	1.4
Barium	µg/l	100	-	<30	<3
Beryllium	µg/l	-	-	<5	<0.5
Boron	µg/l	1000	1000	34	<5
Cadmium	µg/l	5	5	<5	<0.5
Calcium	mg/l	200	-	130	66
Chromium	µg/l	30	50	<5	0.7
Cobalt	µg/l	-	-	<5	0.5
Copper	µg/l	30	2000	<5	<0.5
Iron	µg/l	200	200	<250	<25
Lead	µg/l	10	25	<5	<0.5
Magnesium	mg/l	50	-	8.2	16
Manganese	µg/l	50	50	<250	<25
Mercury	µg/l	1	1	<0.5	<0.5
Molybdenum	µg/l	-	-	<5	0.8
Nickel	µg/l	20	20	<5	<0.5
Potassium	mg/l	5	-	<5	<0.5
Selenium	µg/l	-	10	<5	1.1
Sodium	mg/l	150	200	5.4	12
Thallium	µg/l	-	-	<5	<0.5
Tin	µg/l	-	-	<10	2
Uranium	µg/l	9	-	<5	<0.5
Vanadium	µg/l	-	-	<5	0.7
Zinc	µg/l	100	-	<30	<3
Total Cyanide	mg/l	10	0.05	<0.05	<0.05
Bromoform	µg/l	-	100 Note 1	ND	2.6
Dichloromethane	µg/l	10	-	ND	0.9
m.p xylene	µg/l	10	-	0.7	0.6
Toluene	µg/l	10	-	1.4	1.1
Total Coliforms	per 100ml	0	0	0	0
E-Coli	per 100ml	0	0	0	0

Note 1: Limit refers to sum of bromoform, chloroform, dibromochloromethane and bromodichloromethane
NAC ◘No Abnormal Change
NM = Not Measured

APPENDIX 4

PRTR

Environmental Protection Agency

Guidance to completing the PRTR workbook

AER Returns Workbook

REFERENCE YEAR	2010

1. FACILITY IDENTIFICATION

Parent Company Name	Carlow County Council
Facility Name	Powerstown Landfill Site
PRTR Identification Number	W0025
Licence Number	W0025-03

Waste or IPPC Classes of Activity

No.	class_name
3.5	Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
3.1	Deposit on, in or under land (including landfill)
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
3.4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
3.6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.
3.7	##########
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.3	Recycling or reclamation of metals and metal compounds.
4.4	Recycling or reclamation of other inorganic materials.
4.9	Use of any waste principally as a fuel or other means to generate energy.

Address 1	Kilkenny Rd.
Address 2	Co Carlow
Address 3	
Address 4	
Country	Ireland
Coordinates of Location	-6.15456 53.5062
River Basin District	IEEA
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Mary Walsh
AER Returns Contact Email Address	mwalsh@carlowcoco.ie
AER Returns Contact Position	Environmental Technician
AER Returns Contact Telephone Number	059 9172402
AER Returns Contact Mobile Phone Number	

AER Returns Contact Fax Number	059 91 46356
Production Volume	15433.29
Production Volume Units	tonnes
Number of Installations	1
Number of Operating Hours in Year	1378
Number of Employees	8
User Feedback/Comments	Releases to air results in sections A, B and C were all calculated using oxygen corrected results (3%). Discharges to surface water were calculated using a flow rate of 5L/sec for discharge from the SW pond to receiving waters.
Web Address	

2. PRTR CLASS ACTIVITIES

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

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

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

4.1 RELEASES TO AIR

Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR		METHOD			Please enter all quantities in this section in KGs	QUANTITY		
POLLUTANT			Method Used		Flare Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
No. Annex II	Name	M/C/E	Method Code	Designation or Description				
02	Carbon monoxide (CO)	M	PER	Flue Gas Analyser, Testo 350/454 MXL	16.66788	16.66788	0.0	0.0
08	Nitrogen oxides (NO/NO2)	M	PER	Flue Gas Analyser, Testo 350/454 MXL	355.9052	355.9052	0.0	0.0
11	Sulphur oxides (SO3/SO2)	M	PER	Flue Gas Analyser, Testo 350/454 MXL	587.9773	587.9773	0.0	0.0
81	Methane (CH4)	C	MAB	Gas Sim / Landgem, Calculation	0.0	777750.0	0.0	777750.0

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

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR		METHOD			Please enter all quantities in this section in KGs	QUANTITY		
POLLUTANT			Method Used		Flare Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
No. Annex II	Name	M/C/E	Method Code	Designation or Description				
60	Chlorine and inorganic compounds (as HCl)	M	PER	Impinger train containing 0.10 molar sodium hydroxide and deionised water solution in accordance EN1911 EN15713 and EPA 26A	26.02439	26.02439	0.0	0.0
64	Fluorine and inorganic compounds (as HF)	M	PER	Impinger train containing 0.10 molar sodium hydroxide and deionised water solution in accordance EN1911 EN15713 and EPA 26A	2.300781	2.300781	0.0	0.0

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

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

RELEASES TO AIR		METHOD			Please enter all quantities in this section in KGs	QUANTITY		
POLLUTANT			Method Used		Flare Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
Pollutant No	Name	M/C/E	Method Code	Designation or Description				
351	Total Organic Carbon (as C)	M	FER	FID in accordance with EN12619:2002	11.19713	11.19713	0.0	0.0

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

Additional Data Requested from Landfill operators

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

Landfill: Powerstown Landfill Site

Please enter summary data on the quantities of methane flared and / or utilised

	T (Total) kg/Year	M/C/E	Method Used: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	1361288.24	C	Gas Sim / Landgem	Model Calculation	N/A	
Methane flared	583518.0	M	Flare	Measured at Flare	0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	777750.0	C	Calculation	Calculated based on result	N/A	

4.2 RELEASES TO WATERS

Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of stormsurface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as thi

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
No.	Name	Method Used: M/C/E	Method Code	Description or Description	SWLO Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
[illegible]	[illegible]	M	ALT	EPA Laboratory Kilkenny	2877.66	2877.66	0.0	0.0

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

SECTION B : REMAINING PRTR POLLUTANTS

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

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

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

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
No.	Name	Method Used: M/C/E	Method Code	Description or Description	SWLO Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
[illegible]	[illegible]	M	ALT	EPA Laboratory Kilkenny	18.13	18.13	0.0	0.0
[illegible]	[illegible]	M	ALT	EPA Laboratory Kilkenny	3784.32	3784.32	0.0	0.0
[illegible]	[illegible]	M	ALT	EPA Laboratory Kilkenny	2.9	2.9	0.0	0.0
[illegible]	[illegible]	M	ALT	EPA Laboratory Kilkenny	15294.96	15294.96	0.0	0.0
[illegible]	[illegible]	M	ALT	EPA Laboratory Kilkenny	1892.16	1892.16	0.0	0.0
[illegible]	[illegible]	M	ALT	EPA Laboratory Kilkenny	1151.06	1151.06	0.0	0.0
[illegible]	[illegible]	M	ALT	Heated Persulfate Oxidation SM5310C	409.97	409.97	0.0	0.0

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

4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

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

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

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

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

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

4.4 RELEASES TO LAND Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

RELEASES TO LAND				Please enter all quantities in this section in KGs		
POLLUTANT		METHOD		QUANTITY		
No. Annex II	Name	Code	Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
				0.0	0.0	0.0

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

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

RELEASES TO LAND				Please enter all quantities in this section in KGs		
POLLUTANT		METHOD		QUANTITY		
Pollutant No	Name	Code	Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
				0.0	0.0	0.0

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

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

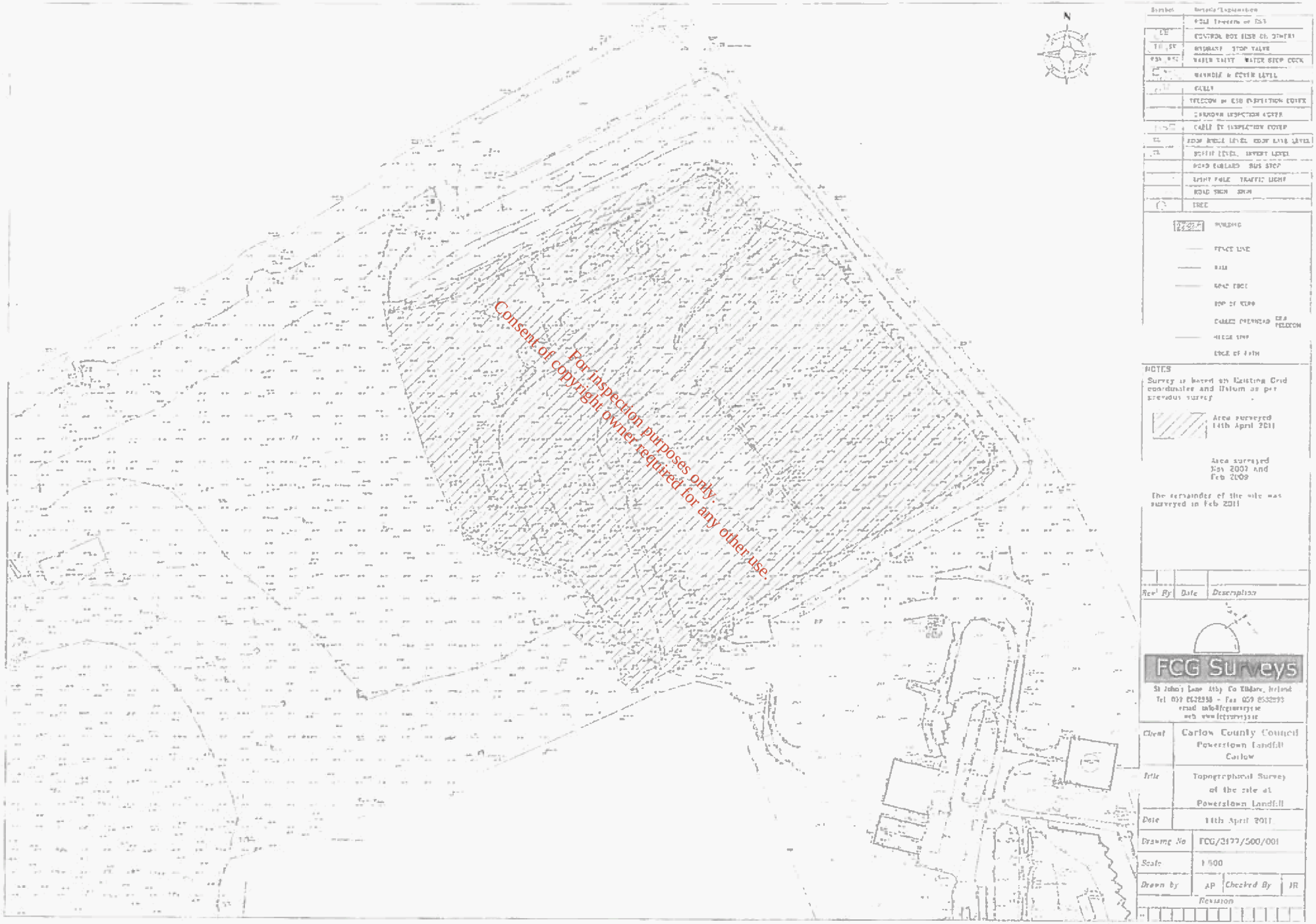
Please enter all quantities on this sheet in Tonnes

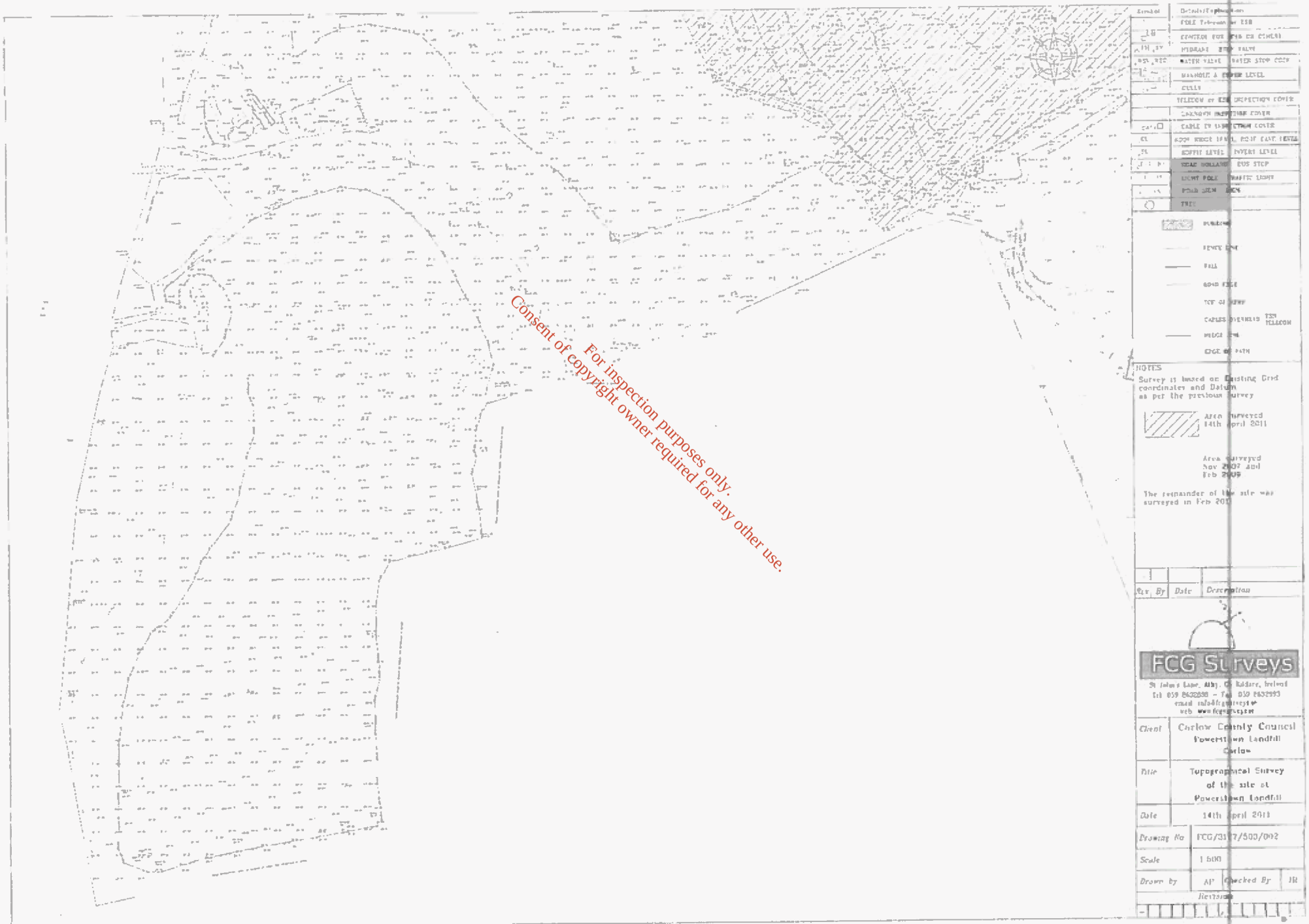
Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste Name and Licensed/Permit No of Next Destination Facility / Non Haz Waste Name and Licensed/Permit No of Recovery/Disposer	Haz Waste Address of Next Destination Facility / Non Haz Waste Address of Recovery/Disposer	Name and Licence / Permit No and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination as Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
Within the Country	19 07 03	No	25194 02 m	landfill leachate other than those mentioned in 19 07 02	D15	M	Weighed	Onsite in Ireland	Mortarstown Waste Water Treatment Plant,D-0028	Mortarstown Waste Water Treatment Plant,Mortarstown Waste Water Treatment Plant,Carlow, ,Ireland		
Within the Country	15 01 05	No	1 76	composite packaging / polystyrene	D15	M	Weighed	Onsite in Ireland	Daniella Recycling Ltd,WP01/08	Tinypark,Quinagh,Carlow, ,Ireland		
Within the Country	15 01 05	No	14 52	composite packaging / tetrapac	D15	M	Weighed	Onsite in Ireland	AES Ltd,W0194-02	Kyletalsha,Portlaoise,Laois. , Ireland		
Within the Country	15 01 01	No	60 56	paper and cardboard packaging	D15	M	Weighed	Onsite in Ireland	AES Ltd,W0194-02	Kyletalsha,Portlaoise,Laois. , Ireland		
Within the Country	20 01 21	Yes	1 07	fluorescent tubes and other mercury-containing waste	D15	M	Weighed	Onsite in Ireland	KMK Metals Recycling,W0113-03	Capercuir Ind Estate,Daingean Road,Tullamore,Co Offaly,Ireland	Alba Services Gmbh & Co KG,E55657020,Kanalstrasse 64,48432 Rheine, , ,Germany	Kanalstrasse 64,48432 Rheine, , ,Germany
Within the Country	16 01 03	No	6 12	end-of-life tyres	D15	M	Weighed	Onsite in Ireland	Laois Tyre Recycling,WFP-LS-10-0002-01	Unit 20 ,Bay Road Business Park,Mountmellick,Co Laois,Ireland		
Within the Country	20 01 01	No	118 4	paper and cardboard	D15	M	Weighed	Onsite in Ireland	Ray Whelan,WC156-01	Ballyhannon, ,Co Carlow, ,Ireland		
Within the Country	20 01 11	No	12 74	textiles	D15	M	Weighed	Onsite in Ireland	Mrs Quins Charity Shop,Mrs Quins Charity Shop	Toughers Business Park,Newhall,Naas,Co Kildare,Ireland		
Within the Country	15 01 02	No	14 78	plastic packaging / wrapping	D15	M	Weighed	Onsite in Ireland	AES Ltd,W0194-02	Kyletalsha,Portlaoise,Laois. , Ireland		
Within the Country	15 01 02	No	77 38	plastic packaging / bottles	D15	M	Weighed	Onsite in Ireland	AES Ltd,W0194-02	Kyletalsha,Portlaoise,Laois. , Ireland		
Within the Country	20 01 38	No	215 89	wood other than that mentioned in 20 01 37	D15	M	Weighed	Onsite in Ireland	AES Ltd,W0194-02	Kyletalsha,Portlaoise,Laois. , Ireland		
Within the Country	15 01 01	No	18 68	paper and cardboard packaging	D15	M	Weighed	Onsite in Ireland	O Toole Composting Ltd,WFP-CW-10-003-01	Ballintrane,Carlow, ,,Ireland		
Within the Country	20 01 38	No	66 02	wood other than that mentioned in 20 01 37	D15	M	Weighed	Onsite in Ireland	O Toole Composting Ltd,WFP-CW-10-003-01	Ballintrane,Carlow, ,,Ireland		
Within the Country	20 01 33	Yes	14 7	batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries	D15	M	Weighed	Onsite in Ireland	Enva Ireland Ltd,W0184-01	Clonminam Ind. Est ,Portlaoise,Co Laois, ,Ireland	Campine Recycling,MLAV/05 173/GVDA,Beerse,Belgium, , ,Belgium	Beerse,Belgium, , ,Belgium
Within the Country	08 01 11	Yes	10 52	waste paint and varnish containing organic solvents or other dangerous substances	D15	M	Weighed	Onsite in Ireland	Enva Ireland Ltd,W0184-01	Clonminam Ind. Est ,Portlaoise,Co Laois,,Ireland	Geocycle 38 125 BP,Seneffe,,,,,,Belgium	Seneffe, ,,,Belgium
Within the Country	13 02 08	Yes	8 98	other engine, gear and lubricating oils	D15	M	Weighed	Onsite in Ireland	Enva Ireland Ltd,W0184-01	Clonminam Ind Est ,Portlaoise,Co Laois, ,Ireland	Enva Ireland Ltd,W0184-01,Clonminam Ind. Est ,Portlaoise,Co Laois,,Ireland	Clonminam Ind. Est ,Portlaoise,Co Laois, ,Ireland
Within the Country	20 01 25	No	0 44	edible oil and fat / Waste Cooking oil	D15	M	Weighed	Onsite in Ireland	Pure Oil Ltd,KK/288/05	Bamtown,Co Wexford, , ,Ireland		
Within the Country	16 01 07	Yes	0 64	oil filters	D15	M	Weighed	Onsite in Ireland	Enva Ireland Ltd,W0184-01	Clonminam Ind Est ,Portlaoise,Co Laois, ,Ireland	R.D Recycling,51727/1/KD,Houthalen, , , ,Belgium	Houthalen, , , ,Belgium
Within the Country	20 01 40	No	217 6	metals	D15	M	Weighed	Onsite in Ireland	A1 Metal Recycling,ATFWMP007D	Acragaar,Mountmellick,Co Laois, ,Ireland		
Within the Country	20 01 40	No	5 06	metals / steel cans	D15	M	Weighed	Onsite in Ireland	Daniella Recycling Ltd,WP01/08	Tinypark,Quinagh,Carlow, ,Ireland		
Within the Country	20 01 02	No	74 92	glass jars	D15	M	Weighed	Onsite in Ireland	Irishaul Ltd,WCP/KK/412/07	Olivers Cross,Mallow,Co Cork, ,Ireland		
Within the Country	20 01 02	No	31 54	flat glass	D15	M	Weighed	Onsite in Ireland	AES Ltd,W0184-02	Kyletalsha,Portlaoise,Laois. , Ireland		

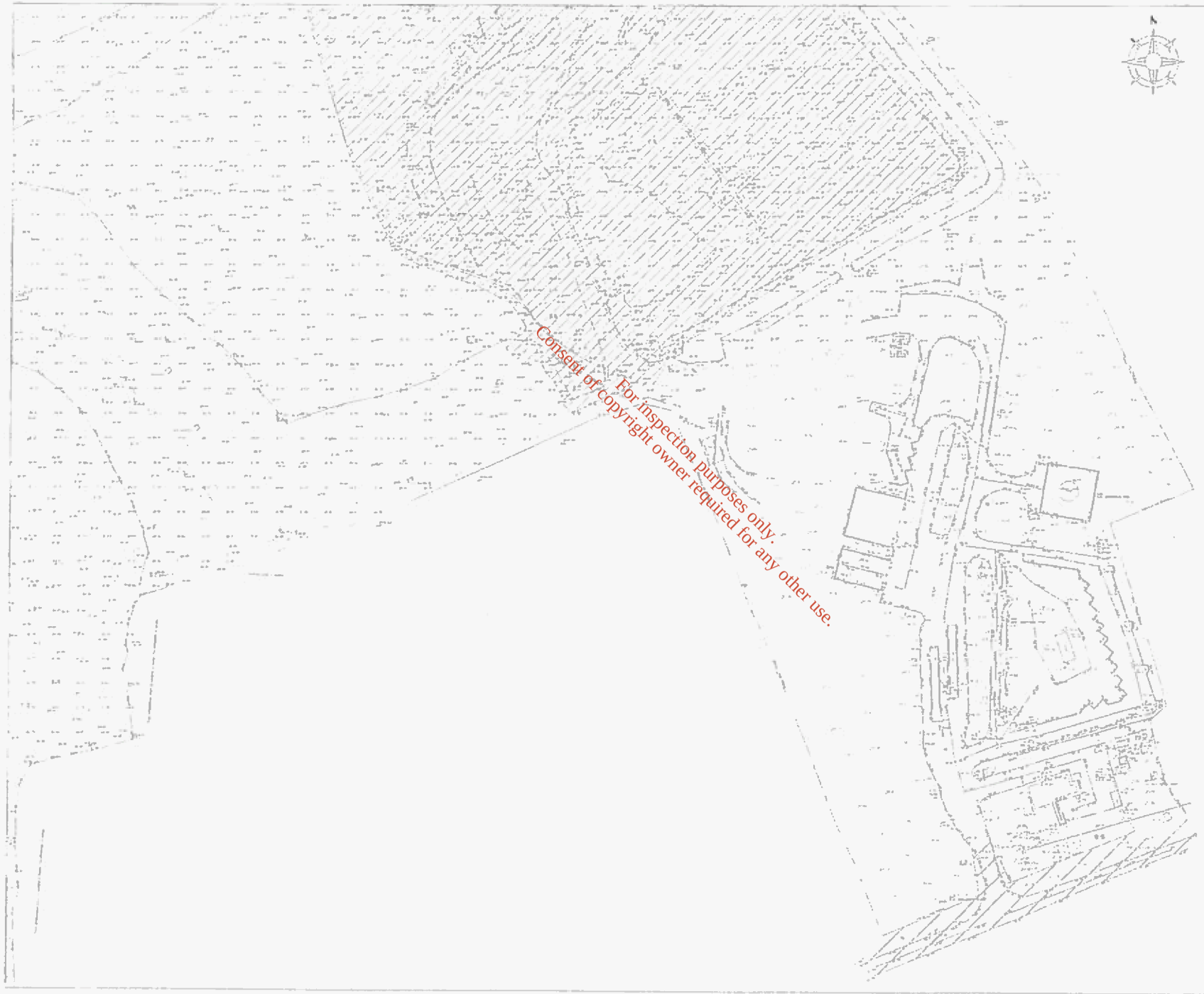
Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste: Name and Licence/Permit No of Next Destination Facility. Non Haz Waste: Name and Licence/Permit No of Recoverer/Disposer	Haz Waste: Address of Next Destination Facility. Non Haz Waste: Address of Recoverer/Disposer	Name and Licence / Permit No and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	20 01 35	Yes	231 24	discarded electrical and electronic equipment other than those mentioned in 20 01 21 and and 20 01 23 containing hazardous components	D15	M	Weighed	Onsite in Ireland	Ratcliffe Recycling Ltd,WCP-DC-08-1130-01	Ballystahan,St Margarets,Dublin, ,Ireland	Ratcliffe Recycling Ltd,WCP-DC-08-1130-01,Ballystahan,St Margarets,Dublin, ,Ireland	Ballystahan,St Margarets,Dublin, ,Ireland
Within the Country	20 02 01	No	10 82	biodegradable waste / food waste	D15	M	Weighed	Onsite in Ireland	O Tools Composting Ltd,WFP-CW-10-003-01	Ballintrane,Carlow, , ,Ireland		
Within the Country	20 02 01	No	103 86	biodegradable waste / green waste	D15	M	Weighed	Onsite in Ireland	O Tools Composting Ltd,WFP-CW-10-003-01	Ballintrane,Carlow, , ,Ireland		
Within the Country	20 02 01	No	226 76	biodegradable waste / green waste	D15	M	Weighed	Onsite in Ireland	Cleary Compost and Shredding Ltd,228/2006	Monasterevin,Co Kildare, , ,Ireland		
Within the Country	17 08 02	No	21 44	gypsum-based construction materials other than those mentioned in 17 08 01	D15	M	Weighed	Onsite in Ireland	Gypsum Recycling Ireland Ltd,O Hagan Waste Disposal	Bawnogues,Straffen,Co Kildare, ,Ireland		

APPENDIX 5

TOPOGRAPHICAL SURVEY







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NOTES

Survey is based on Existing Grid coordinates and Datum as per the previous survey

Area surveyed 14th April 2011

Area surveyed Nov 2007 and Feb 2009

The remainder of the site was surveyed in Feb 2011

No.	By	Date	Description

FCG Surveys

St John's Lane Athy Co Kildare Ireland
Tel 059 8632588 – Fax 059 8632393
email info@fcgsurveys.ie
web www.fcgsurveys.ie

Client	Carlow County Council Powerstown Landfill Carlow
Title	Topographical Survey of the site of Powerstown Landfill
Date	14th April 2011
Drawing No	FCG/3177/500/001
Scale	1:500
Drawn by	AP Checked By JR
Revision	

APPENDIX 6

BUND INTEGRITY TESTING

REPORT ON

LEACHATE TANK BUND INTEGRITY ASSESSMENT

FOR POWERSTOWN LANDFILL SITE,

COUNTY CARLOW

Prepared for:

Carlow County Council

October 2010

AGEC Ltd
The Grainstore
Singletons Lane
Bagenalstown
Co. Carlow
Ireland

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DOCUMENT APPROVAL FORM

Document title:	Report on Leachate Tank Bund Integrity at Powerstown Landfill Site, County Carlow		
File reference Number:	1056_005	Document Revision No.	0
Note: Amendments marked with line in right-hand margin			

File Reference Number	Document Revision No.	Amendment/Comment

Task	Nominated authority	Approved (signature)
Prepared by	Author: Ian Higgins	Ian Higgins
Checked by	Geotechnical Project Manager: Paul Jennings	Paul Jennings
Approved by	Geotechnical Project Director: Turlough Johnston	T. Johnston
Quality check	Quality Manager: Marion English	Marion English

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TABLE OF CONTENTS

1 INTRODUCTION

Applied Ground Engineering Consultants Ltd (AGEC) was engaged in October 2010 by Carlow County Council to undertake a slope stability assessment at the Powerstown Landfill in Carlow. In addition to the slope stability assessment a visual inspection was carried out on the Leachate holding tank bund.

2 SITE DESCRIPTION

Powerstown landfill is located in Powerstown townland just to the east of the N9 National Primary Route (Carlow – Waterford), and approximately 6km south of Carlow town.

The Powerstown Landfill site comprises three phases as follows:

(1) Phase I (1975 – 1990). Southwest of site. No cell numbers. This phase includes the older part of the landfill that is unlined.

(2) Phase II (1990 – 2006). Cells 1 to 13. This is capped but the capping is temporary on some cells. The underside of the landfill is lined.

(3) Phase III (2006 – present). Cells 15 to 18. Currently being filled. The underside of the landfill is lined.

3 SITE RECONNAISSANCE

A site reconnaissance was carried out on Tuesday 19 October 2010. The purpose of the reconnaissance was to visually inspect the landfill site and to identify any signs of ground deformation or movements.

The reconnaissance included a walkover and visual inspection of Phases II and III of the landfill, as well as a visual inspection of the leachate tank bund. At the time of the walkover the weather was overcast with occasional showers.

4 SITE CONDITIONS

On the north boundary of the site is the Powerstown Stream, which is a tributary of the River Barrow. To the west the site is bounded by the N9. There are agricultural lands and a gravel pit adjoining part of the southern boundary. To the east there are agricultural lands.

The site is essentially underlain by sand and gravel deposits, and part of the site was formerly used for extraction of granular soils. There is currently a working sand and gravel quarry on the southern boundary of the site.

5 INTEGRITY OF LEACHATE HOLDING TANK BUND

A large Leachate tank is located close to the eastern boundary of the landfill site. A reinforced concrete bund surrounds the tank. The tank is 8.53m in diameter and 7.25m in height. The bund is 1.2m in height and 300mm in thickness.

In terms of volume, the Tank can hold a total of 400m^3 of material, with the bund capable of retaining 420m^3 of material.

No obvious structural defects were noted during the inspection. Small cracks were noted at four locations around the wall of the bund, at the location of the induced joints shown on drawing 2005-120-04-601 produced by Fehily Timony. Minor longitudinal cracks were notes in the floor of the bund, again at the locations indicated on the Fehily Timony drawing.

6 CONCLUSION AND RECOMMENDATIONS

The conclusions of the leachate tank bund integrity assessment for the Powerstown Landfill site are as follows:

(1) A visual inspection of the leachate holding tank bund showed no signs of loss of integrity.

7 REFERENCES

British Standards Institute (1981). Code of practice for earthworks. BS 6031:1981.

Charles, J.A. & Watts, K.S. (2001). Building on fill: geotechnical aspects 2nd ed. Building Research Establishment, London.

Sarsby, R.W. (2000). Environmental Geotechnics. Thomas Telford Ltd., London.

PHOTOGRAPHS

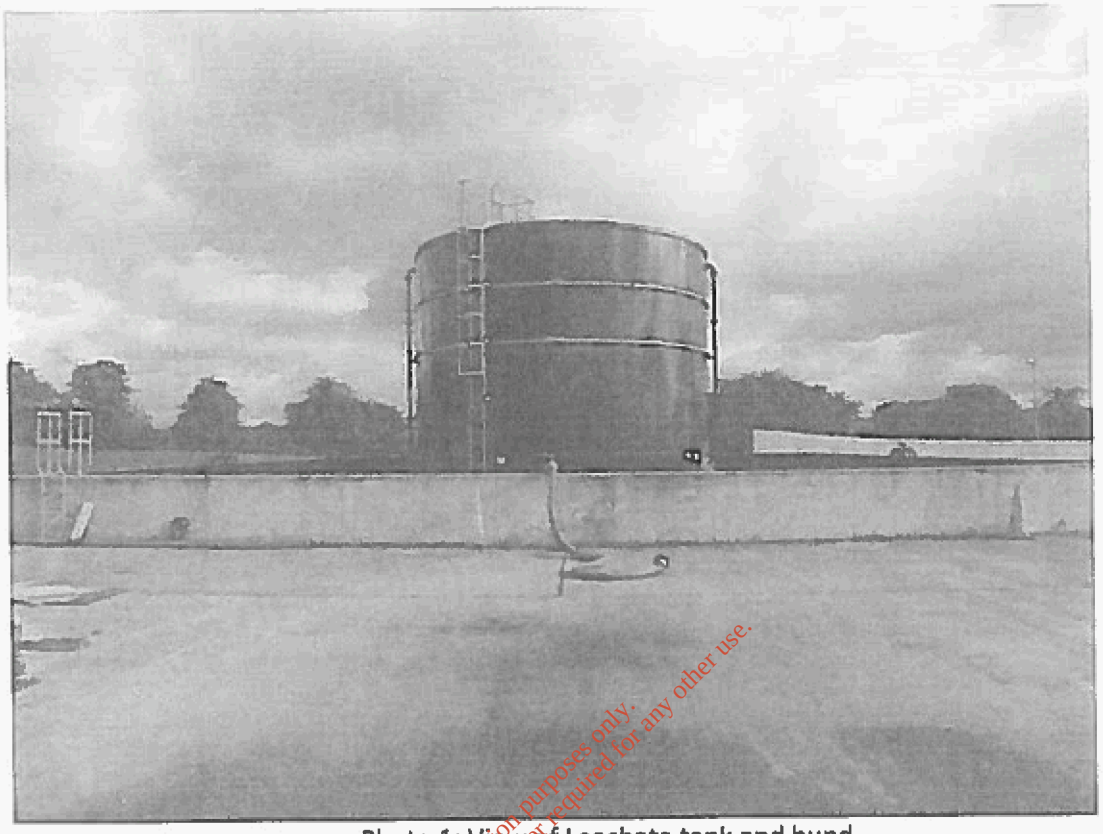

Photo 1: View of Leachate tank and bund

GTS

Geomembrane Testing Services Limited

Client: Carlow County Council

REPORT ON:

COVERED LEACHATE LAGOON
at
POWERSTOWN LANDFILL DEVELOPMENT
KILKENNY ROAD
POWERSTOWN
CO CARLOW

Inspection Date November 2010

Prepared by:

Geomembrane Testing Services Limited
Thornback Road, Troyswood, Co Kilkenny, Ireland
Tel/Fax: (056) 7770953 Mobile: (086 8323113)
Email: gts@o2.ie

APPENDIX 7

WATER BALANCE CALCULATION

Water Balance Calculation
Powerstown Landfill AER 2010

2010			LEACHATE VOLUMES (m³)																
Month	Rainfall (mm)	ER (mm)	Unlined Cell Active	Unlined Cell Temp Cap	Unlined Cell Perm Cap	Cells 1-5 Active	Cells 1-5 Temp Cap	Cells 1-5 Perm Cap	Cells 6-13 Active	Cells 6-13 Temp Cap	Cells 6-13 Perm Cap	Cells 15-16 Active	Cells 15-16 Temp Cap	Cells 15-16 Perm Cap	Total Infiltration	Total Absorption by Waste	Paved Areas	Cell 17	Total Leachate
January	123 6	117 0	0	0	247	0	0	58	0	71	133	2,234	0	0	2 740	229	370	0	2 884
February	57 8	46 1	0	0	97	0	0	22	0	29	53	881	0	0	1 080	117	173	0	1 136
March	82 5	46 8	0	0	99	0	0	22	0	29	53	894	0	0	1 095	57	247	0	1 288
April	33 5	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	100
May	66 8	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	200
June	41	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123	0	123
July	89 6	10 8	0	0	23	0	0	5	0	7	12	206	0	0	253	85	268	0	458
August	37 1	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111	185	296
September	111 9	68 9	0	0	143	0	0	32	0	40	76	1 278	0	0	1,587	51	335	559	2 409
October	81 1	53 6	0	0	113	0	0	25	0	32	61	1 024	0	0	1,256	61	243	404	1 842
November	164 4	153 6	0	0	324	0	0	73	0	93	175	2 567	92	0	3 323	57	492	820	4 579
December	88 2	4 2	0	0	9	0	0	2	0	3	5	70	3	0	91	34	264	440	761
Totals	977 5	499 0	0	0	1,053	0	0	237	0	301	569	9,153	94	0	11,406	687	2,926	2,407	18,073

Rainfall	Evapotranspiration	Effective Rainfall
123 6	6 7	117 0
57 8	11 7	46 1
82 5	35 7	46 8
33 5	58 0	-24 5
65 8	78 1	-8 3
41	90 0	-49 0
89 6	78 8	10 8
37 1	68 0	-30 9
111 9	45 0	66 9
81 1	27 5	53 6
164 4	10 8	153 6
88 2	4 2	84 0

Waste Deposition	
Month	Tonnes
Jan-10	3 228
Feb-10	1 668
Mar-10	819
Apr-10	914
May-10	890
Jun-10	1 638
Jul-10	926
Aug-10	726
Sep-10	728
Oct-10	872
Nov-10	808
Dec-10	481

Infiltration Coefficient	
Active	1
Temp Cap	0 25
Perm Cap	0 05

Run-off Coefficient	
Paved Areas	0 95

Absorptive Capacity of waste 0.87 m³/t

Summary of Waste Bearing Zones at Powerstown Landfill

Zone	Total Area (m²)	Description	Zone Areas (m²) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Unlined Cell	42200	Active	0	0	0	0	0	0	0	0		0	0	0
		Temp Cap	0	0	0	0	0	0	0	0		0	0	0
		Perm Cap	42200	42200	42200	42200	42200	42200	42200	42200	42200	42200	42200	42200
Cells 1-5	9500	Active	0	0	0	0	0	0	0	0	0	0	0	0
		Temp Cap	0	0	0	0	0	0	0	0	0	0	0	0
		Perm Cap	9500	9500	9500	9500	9500	9500	9500	9500	9500	9500	9500	9500
Cells 6 - 13	25200	Active	0	0	0	0	0	0	0	0	0	0	0	0
		Temp Cap	2412	2412	2412	2412	2412	2412	2412	2412	2412	2412	2412	2412
		Perm Cap	22788	22788	22788	22788	22788	22788	22788	22788	22788	22788	22788	22788
Cells 15 - 16	19100	Active	19100	19100	19100	19100	19100	19100	19100	19100	19100	16712	16712	16712
		Temp Cap	0	0	0	0	0	0	0	0	0	0	2388	2388
		Perm Cap	0	0	0	0	0	0	0	0	0	0	0	0
Paved Area	3151	CA lower level	1405	1405	1405	1405	1405	1405	1405	1405	1405	1405	1405	1405
		LT delivery bay	145	145	145	145	145	145	145	145	145	145	145	145
		LT bund	420	420	420	420	420	420	420	420	420	420	420	420
		Green waste quarantine	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021	1021
		Domestic waste	160	160	160	160	160	160	160	160	160	160	160	160
Cell 17	5250	Unused cell (contaminated run-off form active areas)	0	0	0	0	0	0	0	5250	5250	5250	5250	5250

Notes:
1 Rainfall data from Ashford weather station
2 Potential Evapotranspiration from Casement weather station