Annual Environmental Report for

2009 Operations

Powerstown Landfill

Waste Licence Reg. No. W0025-03

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Prepared by: Pat Connolly SEE

Signed:
Date:

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1. 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 2009 to 31st December 2009.

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

Activity	**Report Section**
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2. 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 licenced 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 the 2009 monitoring period 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 summaries in Table 2.1.

Table 2.1: Waste Received and Disposed to Landfill (2005, 2006, 2007, 2008 and 2009)

Waste type	2005 (Tonnes)	2006 (Tonnes)	2007 (Tonnes)	2008 (Tonnes)	2009 (Tonnes)
Household Waste	25,509	29,990	35,075	28,397	13,839
Commercial Waste	4,237	1,927	2,991	3,956	1,622
Street Cleaning ***	1,142	1,038	1,007	1,101	1,091
Sludge/ Screenings/filter sand	263	629	675	400	377
Garden Park Waste	-	74	364	661	596
Community Clean Up	1,183	2,063	3,018	1,662	2,934
Other	427	-			635
Total	**32,761**	**38,091**	**43,130**	**36,177**	**21,684**

Recovery

The site also incorporates a CAS, which offers a wide range of recovery facilities, including:

- Glass(bottle bank)
- Aluminium Cans
- Papers
- Magazines
- Cardboard
- Plastic bottles
- Plastic film
- Timber
- Mobile phones
- Waste Oil
- Scrap metal
- Flat glass
- Textiles
- Batteries
- Fluorescent light bulbs
- Oil filters
- WEEE(waste electrical and electronic equipment)
- Polystyrene
- Gypsum

This waste material is brought to the landfill by the general public for recovery. See Table 2.2 for the quantities of waste recovered in 2005, 2006, 2007, 2008 and 2009.

Table 2.2: Waste Recovery at the Landfill for Years 2005 to 2009

Material Type	2005 (tonnes)	2006 (tonnes)	2007 (tonnes)	2008 (tonnes)	2009 (tonnes)
Batteries	21.57	19.5	23.07	18.02	16
Paper	62	71.8	52.87	80.54	76
Fluorescent Lights	0.4	3.5	3.5	1.34	3.1
Cardboard	63	89.1	62.94	51.46	55
Textiles	8.2	7.4	14.77	15.84	10
Timber	139	148.6	155.76	213.2	280
Oil	4	1.7	6	4.5	6
Oil filters	1.2	1	0.62	0.86	0.58
Scrap metal	690.6***	357.3	292.16	272.12	268
WEEE	NR	131.6	182.28	172.18	177
Glass					
• Bottle Bank*	9.4 *	24.8 *	29.06 *	44.90 *	51
• Flat Glass	14.7	25.9	12.14	17.16	23
TOTAL	24.1	49.6	41.20	62.06	74
Plastic Bottles	6.8	7.7	6.26	21.18	36
Plastic Film	6.6	9.3	7.02	5.1	in above
Clay**	14,724	11,189	15,366.5	3,101	8,140
Rubble**	426.7	NR	727.02	71.8	1,233
Tyres	NR	NR	2.74	1.62	8.42
Tetra Pac	NR	NR	3.06	3.24	1
Polystyrene	NR	NR	0.98	1.08	1.48
Green waste	NR	NR	184.66	285.5	365
Gypsum	-	-	-	5.10	29
Total	**16,178**	**12,085**	**17,133.43**	**4,387.74**	**10,781**

Note: The figure for tyres in the above table represents the amount of tyres removed from waste loads at the landfill active face.

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 174,153 m^3 (April 2010).

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, waste in the tipping area 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 37 tonnes.

At the end of each day the compacted waste is covered with a layer of granular material (clay / compost). At the end of each week, the compacted waste is covered with an additional 150 mm of granular material (clay / compost).

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. Environmental Monitoring

Ms. Mary Walsh, Environmental Technician and Mr. Fergus Mulhare Landfill Manager for the facility, oversee all matters of an environmental nature including compliance monitoring. While some of the monitoring requirements are completed by Carlow County Council, much of the monitoring and report preparation for 2009 was out-sourced to third parties on behalf of Carlow County Council.

Monitoring locations included in the 2009 monitoring programmes at the facility are presented on the Layout map MON_POW-01 in Attachment 3. A number of monitoring points for landfill gas (TEM 1, TEM2, TP16, TP7, PT8 TP9, TP13, PT14 and PT15) and groundwater (GW3, GW4, GW6 and GW7) listed in the Waste Licence and previously included in monitoring events were not included in the 2009 monitoring programme. These locations have either been decommissioned or damaged due to construction activities (e.g. landfill extension, N9 carriageway upgrading). Approval has been received from the EPA to install new monitoring wells to replace damaged / obsolete landfill gas and groundwater monitoring wells and this work was completed in 2009. Revised monitoring location maps have been prepared for 2010 as shown below.

- MON2008GW: Groundwater monitoring locations.
- MON2008LG1: Landfill gas monitoring locations
- MON2008LG2: Landfill gas, perimeter borehole monitoring locations
- MON2008LG3: Landfill gas, extraction borehole monitoring locations
- MON2008DONSWL: Dust, Odour, Noise, Surface Water, monitoring locations.
- MON2008L: Leachate 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. However, additional dust monitoring locations to those listed in the Waste Licence have been agreed with the EPA and are included in the monitoring programme. A total of six monitoring locations, labelled DM2, DM4-DM8 were included in the 2009 programme (see drawing 3). The Waste Licence stipulates a dust deposition limit of 350 mg/m^2/day for the facility. A dust monitoring summary is presented in Table 3.1

All monitoring results were within the licence limits.

Table 3.1: Summary of Dust Monitoring Data

Monitoring Location	Dust Deposition Limit mg/m^2/day	March -April mg/m^2/day	May -June mg/m^2/day	July-Aug mg/m^2/day
DM1	350			
DM2		198	197	20
DM3				
DM4		142	235	60
DM5		31	78	34
DM6		47	135	96
DM7		82	152	50
DM8		88	59	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.

Chemical Assessment

Samples were collected from ST1 and ST2 quarterly; field measurements were recorded and laboratory analysis completed in compliance Table D.5.1 of the Waste Licence. As water quality limits for surface water are not set out in the Licence; the results were compared to the relevant environmental quality standards (EQSs).

Site specific trigger levels have been set for conductivity (1000µS/cm), chloride (50mg/l) and ammoniacal nitrogen (0.5mg/l) for locations upstream and downstream of the landfill. Results obtained during the 2009 monitoring event show all results below the trigger levels for these three parameters. The relevant trigger levels are shown in Table 3.2.

Table 3.2 Surface Water Trigger Levels

	Upstream	Downstream
Conductivity uS/cm	1000	1000
Chloride mg/l Cl	50	50
Ammoniacal Nitrogen mg/l N	0.5	0.5

For other parameters the standards contained in the European Communities Environmental Objectives (Surface Waters)) Regulations 2009 and , where appropriate, the European Communities (Drinking Water) (No. 2) Regulations 2007 have been used. These standards are shown in Table 3.3. and Table 3.4.

Table 3.3 European Communities Environmental Objectives (Surface Waters)) Regulations 2009

Parameter	Standard
Temperature	Not greater than a rise of 1.5 ^{0} C
BOD	1.5% mean
Dissolved Oxygen Lower Limit	95% > 80% saturation
Dissolved Oxygen Upper Limit	95% < 120% saturation
PH	6.0< PH < 9.0
Ammonia mg/l N	0.065 mean
Orthophosphate mg/l P	0.035 mean
Arsenic ug/l	25 annual average
Copper ug/l	30 annual average
Zinc ug/l	100 annual average
Nickel ug/l	20 annual average

Table 3.4 European Communities (Drinking Water) (No. 2) Regulations 2007

Parameter	Standard
PH	6.5-9.5
Conductivity us/cm	2,500
Ammonia mg/l N	.3
Chloride mg/l	250
Nitrite mg/l N	.5
Total Oxidised Nitrogen mg/l N	11
Sulphate mg/l SO4	250
Sodium mg/l	200
Aluminium ug/l	200
Antimony ug/l	5
Arsenic	10
Boron	1,000
Cadmium	5
Chromium	50
Copper	2,000
Iron	200
Lead	25
Manganese	50
Mercury	1
Nickel	20
Selenium	10

Monitoring results indicate that there is no significant difference in water quality between upstream and downstream stations, with the exception of ammonia which is slightly elevated downstream.

The quarterly analytical results for each monitoring station are summarised and included in Attachment 4.

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 3.5.

Table 3.5: Habitat Assessment 2008

	ST1	ST2
Trout Adult Habitat	Fair	Fair
Trout Nursery Habitat	Fair – Good	Poor
Trout Spawning Habitat	Fair	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*)*. The results of the biological water quality assessment are compared to previous annual monitoring events dating back to 2005 in Table 3.6.

Table 3.6: Biological Water Quality Assessment

Location	Nov. 2005	Sept. 2006	Sept. 2007	2008	Aug. 2009
ST1 (downstream)	Q3-4 Slightly Polluted	Q3 Moderately Polluted	Q3-4 Slightly Polluted	Q3-4 Slightly Polluted	Q3-4 Slightly Polluted
ST2 (upstream)	Q3-4 Slightly Polluted	Q3 Moderately 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.

In addition to monitoring of the Powerstown Stream, the waste licence requires that the outlet from the Surface Water Retention Pond be monitored. Analysis indicated that the trigger level of 5 mg/l for Total Organic Carbon was not exceeded.

3.3 Groundwater Monitoring

Groundwater monitoring was completed by the EPA at the facility in compliance with Schedule D.4 (Table D.5.1) of the Waste Licence for 2009. 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. There are currently no private wells located within 500m of the facility. The locations of the groundwater monitoring wells labelled GW1-GW8, RCA1 and RCA2 are shown on drawing MON_POW-01.

Water quality limits are not included in the Licence; however specific Groundwater Trigger Levels (GTLs) have been set for each monitoring well for indicator parameters electrical conductivity (EC), chloride and ammoniacal nitrogen. These are shown in Table 3.7. In addition groundwater monitoring data for monitoring wells at the facility were compared to the values in the European Communities Environmental Objectives (Groundwater) Regulations 2010, Schedule 5. The parameters of note are shown in Table 3.8 below. Where parameters are not included in the above regulations standards are taken from the EPA 2003 Interim Guideline Values for Groundwater (Table 3.9).

Table 3.7 Groundwater Trigger Levels

Parameter	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
Conductivity uS/cm	1,000	1,300	1,000	900	900	900	1,000	1,000
Chloride mg/l	50	60	40	40	30	30	50	50
Ammonia mg/l N	2.0	1	0.15	0.15	0.15	0.15	0.8	2.0

Table 3.8 European Communities Environmental Objectives (Groundwater) Regulations 2010

Parameter	Threshold Value
Conductivity uS/cm	1875
Ammonium ug/l N	175
Chloride mg/l Cl	187.5
Sulphate mg/l SO4	187.5
Sodium mg/l Na	150
Boron ug/l B	750
Nickel ug/l Ni	15
Lead ug/l Pb	18.75
Chromium ug/l Cr	37.5
Arsenic ug/l As	7.5
Mercury ug/l Hg	0.75
Cadmium ug/l Cd	3.75
Copper ug/l Cu	1,500
Aluminium ug/l Al	150
Cyanide ug/l Cn	37.5

Table 3.9 Interim Guideline Values, EPA 2003

Parameter	Guideline Value
Aluminium mg/l	0.2
Calcium mg/l	200
Zinc mg/l	0.1
Barium mg/l	0.1
Cyanide mg/l	0.01
Fluoride mg/l	1.0
Uranium mg/l	0.009
Iron mg/l	0.2
Magnesium mg/l	50
Manganese mg/l	0.05
Potassium mg/l	5

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 5. The locations of monitoring locations relative to Phase 2 and Phase 2 landfills are summarised in Table 3.10.

Table 3.10: Position of Groundwater Monitoring Locations Relative to Phase 2 and Phase 3 Landfills

Monitoring Location	Position Relative to Phase 2 and Phase 3
GW1	Down gradient
GW2	Down gradient
GW4	Cross gradient
GW5	Cross gradient
GW6	Cross gradient
GW7	Down gradient
GW8	Down gradient
RCA1	Up gradient
RCA2	Up gradient

Monitoring data for 2009 indicate that samples collected from down gradient monitoring wells GW1, GW2 and GW8 exceeded the groundwater trigger levels for the indicator parameter ammoniacal nitrogen. Monitoring data indicates that the groundwater trigger level chloride has been exceeded at GW1 and GW8. There is no significant difference in metal concentrations at upstream and downstream boreholes, with the exception of sodium and manganese.

Mean values for ammonia and chloride at upstream boreholes are 0.09/26.5 and 0.03/20 respectively. Also of note are the elevated nitrate levels of 11 and 12 respectively.

The quarterly analytical results for each well are summarized and included in Attachment 6.

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.

3.4 Leachate Monitoring

Leachate monitoring is required for compliance with Schedule D.5 of the Waste Licence. Leachate monitoring was conducted by the EPA at seven monitoring locations for a suite of parameters as stipulated in Table D.5.1 of the Waste Licence. The monitoring locations sampled were L1, L2, L3, L4, L7,LT (Leachate Tank) and the Leachate Lagoon. It was agreed with the Agency during 2009 that the following locations would be used for 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.

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)

A copy of the 2009 annual leachate chemical sampling results is included as Attachment 8.

A study of the BOD:COD ratios suggest that the leachate sampled was at degradation Stage IV, the methanogenic stage.

A once-off screening analysis for Dangerous Substances was carried out on leachate samples collected from the leachate lagoon (LG) and the leachate tank (LT) during 2008. These results are presented in Attachment 7.

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 and weekly for Cells 1-13 to ensure that levels remain less than one metre above the liner level.

3.5 Noise Monitoring

Noise monitoring was conducted in accordance with Schedule D of Waste Licence W0025-02 at five locations on 11-11-09. Night-time monitoring was not carried out as the facility only operates during daylight hours. The test locations are described in Table 11 below.

Noise monitoring locations are set out in Schedule D (Table D.1) of Waste Licence; however, following construction of the extension at the facility and N9 carriageway works a number of the monitoring locations in the Licence have been relocated. Noise ELVs are stipulated in Table C.1 of the Licence for day (55 Db (A) L_{Aeq}(15 min) and night (45 Db (A) L_{Aeq}(15 min) for the facility. The noise monitoring results for 2009 are summarised in Table 3.11

The levels recorded at S1 and S2 exceeded the stipulated daytime noise emission value of 55dB(A). However observations recorder during monitoring indicated that passing traffic (on the old N9) and quarry operations, respectively, were the dominant noise sources at these locations.

Locations N5 and N6 are considered to be the locations which best represent noise emissions from the landfill and the stipulated emission was not exceeded at these 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 3.11: Noise Monitoring Results 2009

Location/ Description		**$L(A)_{eq,\ 30\ mins}$ (dB)**	**$L(A)_{10,\ 30\ mins}$ (dB)**	**$L(A)_{90,\ 30\ mins}$ (dB)**	**Predominant Noise Sources**
N4	Western site boundary at old entrance.	54	57	45	Passing traffic on N9
N5	NSL near site office	53	48	37	Passing and distant traffic, passing train, noise from landfill
N6	NSL 300m to the east of the facility	47	45	36	Intermittent and distant passing traffic
S1	NSL 150m north of the old entrance	65	68	54	Passing traffic
S2	NSL south of the facility	63	61	53	Quarry operations, traffic noise.

3.6 Meteorological Monitoring

Meteorological monitoring at the facility is required by the Waste Licence, Schedule D (Table D.6) sets out the meteorological parameters and monitoring frequency requirements. Due to the capping project that was undertaken in 2008 to cap cells 6-13 the on-site Meteorological station was removed. Met data for 2009 was obtained from Met Éireann meteorological stations.
Monthly averages of the meteorological data for 2009 are summarised below and daily records are shown in Attachment 9. A Wind Rose for Oak Park Station, contained in Attachment 9, shows the predominant wind directions to be from the west and south directions.

Table 3.12 Meteorological Data 2009

	Temperature Mean	Rainfall Total	Windspeed Mean	Humidity Mean	Pressure Mean
January	3.96	113.4	4.26	91.46	998.20
February	5.03	24.5	3.04	87.89	1009.35
March	6.88	32.8	4.48	83.97	1007.59
April	8.94	101.9	3.78	84.34	1003.41
May	11.23	77.1	4.27	80.21	1008.34
June	14.31	66.40	3.07	79.90	1010.11
July	15.09	159.3	3.85	85.56	1002.06
August	15.53	104	3.78	87.06	1004.93
September	13.08	41.80	3.21	85.82	1015.24
October	11.46	130	3.39	05.24	1006.38
November	7.37	220.2	5.34	98.93	989.36
December	2.95	73.7	3.51	89.85	997.60
		1145.1			

Temperature: ^{0}C
Rainfall: mm
Windspeed: knots
Humidity: relative humidity %
Pressure: hPa

The total annual rainfall during 2009 was approximately 1145 mm. This result indicates an increase of approximately 126 mm in comparison to rainfall figures reported in 2008.

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 shown on Drawing 3.

Gas monitoring locations are:

- Main office area and weighbridge

- Perimeter boreholes G1-G46

- 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 2008. All reported monitoring results for carbon dioxide and methane were below the relevant ELVs and in compliance with the Licence requirements throughout 2009.

Gas Borehole Monitoring Quarter 1
Monitoring was carried out at the above locations with the exception of TP13, TP14, TP15, TP16, G9, G10, G42. These locations are not available due to damaged infrastructure. Exceedances of the methane limit were found at G11 and G13 and G17. Exceedances of the carbon dioxide limit were found at TP17, G5, G7, G8, G43 and G44.

Gas Borehole Monitoring Quarter 2
Monitoring was carried out at the above locations with the exception of TP14, TP15, TP16, G9, G10, G42. These locations are not available due to damaged infrastructure. Exceedances of the methane limit were found at G13. Exceedances of the carbon dioxide limit were found at G1, G5, G7, G8, G27, G28, G29, G44.

Gas Borehole Monitoring Quarter 3
Monitoring was carried out at the above locations with the exception of TP14, TP15, TP16, G9, G10, G42. These locations are not available due to damaged infrastructure. Exceedances of the methane limit were no found. Exceedances of the carbon dioxide limit were found at TP13, G1, G4, G5, G6, G8, G24 , G28, G29 and G44.

Gas Borehole Monitoring Quarter 4
Monitoring was carried out at the above locations with the exception of TP14, TP15, TP16, G9, G10, G42. These locations are not available due to damaged infrastructure. Exceedances of the methane limit were found at G13, G17 and G18. Exceedances of the carbon dioxide limit were found at TP11, TP12, TP13, G1, G4, G5, G6, G7, G8, G12, G13, G14, G15, G17, G18, G27 and G28.

The elevated methane levels are found at perimeter boreholes, which either enter the waste body or are located very close to the waste, at the unlined landfill. In these cases methane would be expected to migrate from the waste body to the borehole.

Elevated carbon dioxide levels which are not in the vicinity of the unlined landfill will be investigated further in 2010, these are at TP13, TP17, G1, G4, G5, G6, G7, G8, G43, G44. In these cases migration of carbon dioxide from the waste body would not be expected.

3.8 Landfill Gas Plant Flare Monitoring

Compliance with Schedule D7 of the Waste Licence requires annual monitoring of the landfill gas plant flare. Daily measurements of methane, carbon monoxide and oxygen

concentrations at the flare were recorded and annual monitoring for additional parameters listed in the Licence were completed. The annual flare monitoring was completed in March 2008 (RPS Ltd., 2008). The results obtained are considered to be indicative of flare gas for 2008.

These results are compared with the 2006 monitoring results. ELVs for the landfill gas plant are stipulated in the Licence (Table C.5). The results of the annual landfill gas flare monitoring are summarised in Table 3.13.

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

Table 3.13: Annual Landfill Gas Plant Flare Monitoring Results 2008

Parameter	Units	Flare (enclosed) Emission Limit*	Utilisation Plant ELVs*	November 2006	March 2008	March 2009
Temperature	˚C	–	–	1028.4	974	1023
Oxygen	%	–	–	2.55	10.19	9.12
Oxides of Nitrogen (as NO2)	mg/m^3 N	150	500	24	64	71.65
Carbon Monoxide	mg/ m^3	50	650	23	35	5.70
Sulphur Dioxide (SO2)	mg/ m^3	–	–	26	85	21.65
Hydrogen Chloride	mg/ m^3	50 (at mass flows > 0.3 kg/h)	50 (at mass flows > 0.3 kg/h)	<1.99	29.27	6.48
Hydrogen Fluoride	mg/ m^3	5 (at mass flows > 0.05 kg/h)	5 (at mass flows > 0.05 kg/h)	<0.09	0.08	1.14
Total organic carbon (TOC)	mg/ m^3	10	–	<0.86	9.96	6.32

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

In addition to annual flare monitoring, servicing of the flare is carried out at quarterly intervals.

3.9 Odour Monitoring

Odour monitoring was performed by Odour Monitoring Ireland three times during 2009 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 14-7-10
Ten zones of surface emissions were identified. These were associated with inadequate landfill gas extraction from the active cells (Cells 15 and 16) and were located at flanked and open areas. Some of the emissions occurred as a result of insufficient sealing at wellheads.

Monitoring carried out on 10-8-10
Ten zones of surface emissions were identified that exceeded recommended limits. These were associated with inadequate landfill gas extraction from the active cells (Cells 15 and 16). Comparision with the 2008 surveys demonstrated improvements in the control of fugitive landfill gas to atmosphere (as a result of capping works carried out in 2008).

Monitoring carried out on 9-11-10
Nine zones of surface emissions were identified from flanked and open areas and a number of wellheads. VOC levels had reduced from the July survey as shown on the site map. The report recommended an extension of the mitigation measures in place, which are as follows:

- Partial permanent capping on the northern and eastern flanks of Cells 15 and 16.
- Extension of the temporary capping on some flanks.
- Vertical extraction wells and pipework.

3.10 Topographical Site Survey

A topographical survey of the Phase 2 landfill was completed in March 2009. A copy of the survey drawing is included in Attachment 11 and was used to calculate remaining void capacity.

3.11 Slope Stability Assessment

An assessment of the stability of the waste sideslopes was carried out in December 2009 at three critical slopes:

- The northern slope of Cell 16
- The eastern slope of Cell 16
- The southern slope of Cell 10.

The stability analysis was performed using TALREN software and assumed a factor of safety of 1.3 to 1.4. was required. It was found that the in-situ factors of safety were 1.55, 1.56 and 2.15 respectively and that the slopes had an acceptable factor of safety.

3.12 Other Testing

Schedule E of the waste licence requires that bund, tank and container integrity testing is carried out at three year intervals. This work is next scheduled for 2010.

4. 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 emissions or pollutant release and transfer from the Powerstown Landfill facility have been compiled and submitted to the EPA in electronic form as part of the AER submission for 2009 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 1,887,365 kg. for 2009.. The amount of methane flared in 2009 is considered to be 764,164 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 2009 at Powerstown Landfill is 1,123,367 kg/year. This exceeds the specified threshold limit value. The predicted volume of carbon dioxide released to atmosphere in 2009 at Powerstown Landfill is 748,913 kg/year. This is below the specified threshold limit value. The following table summarises the emissions to air in 2009

Table 4.1 Emissions to Air in 2009

Emission Type	**Kg/year**
Carbon Monoxide	29
Nitrogen Oxides	368
Sulphur Oxides	111
Methane	1,123,367
Carbon Dioxide	748,913
Flourine and Inorganic Compounds (as Fl)	6
Chlorine and Inorganic Compounds (as HCl)	32
Total Organic Carbon (as C)	32

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
- 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 2009 based on the water balance calculation is 16,089 m^3. The actual quantity of leachate tankered off site was 13,274 m^3 (at a conversion rate of 1 m^3 = 1 tonne). The difference between the theoretical quantity and the measured quantity is thus 2,815 m^3. Leachate generated at the unlined cell cannot be captured as this cell was based on the dilute and disperse principle. According to the water balance calculation, the total volume of leachate generated at the unlined cell was 1,364 m^3; therefore the total calculated volume of recoverable leachate was (16,089 – 1,364=) 14,725 m^3. When this quantity is compared with the measured quantity, the difference is 1,451 m^3, or 9.8 %. Thus the water balance calculation is considered to be validated by site data as the balance is absorbed by the waste body.

The water balance calculation is contained in Attachment 8 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. The leachate tankered off-site is measured; total volume of leachate tankered off-site in 2009 was 13,274 m^3. The monthly and annual volumes of leachate tankered off-site in 2009 and preceding years are summarised in Table 4.2 below.

Table 4.2: Leachate Collected and Transferred Off-Site

Month	Leachate 2005 (m^3)	Leachate 2006 (m^3)	Leachate 2007 (m^3)	Leachate 2008 (m^3)	Leachate 2009 (m^3)
January	1340	817	3018.26	1722.2	969
February	717	587	1434.56	1261.72	1,069
March	555	770	2425	1136.56	1,201
April	610	869	1068.82	435.02	822
May	517	751	663.92	815.52	1,141
June	225	619	831.36	511.7	762
July	91	566	1430.74	2055.94	1,214
August	272	522	1539.46	1304.4	528
September	181	473	864.32	1406.26	910
October	335	973	722.98	1570.10	923
November	493	2193	355.68	1493.70	782
December	1015	2327	895.76	1041.18	2,953
Total	**6,351**	**11,467**	**15,251**	**14,754.3**	**13,274**

The volume of leachate generated within the landfill decreased from 2007 to 2009. This reduction in volume is likely to be due to the final capping that was installed on cells 6-13 during 2008. The placement of the final cap on these cells prevents rainfall infiltration into the waste. As leachate production is directly proportional to rainfall infiltration and waste organic content, variation in leachate generation is associated with variation in these parameters.

4.3 Emissions to Groundwater

Monitoring data for 2009 indicate that samples collected from down gradient monitoring wells (GW1, GW2) exceeded the groundwater trigger levels (GTL) and Interim guideline values (IGV) levels for indicator parameters chloride and ammoniacal nitrogen. The quarterly analytical results for each well are summarized in Attachment 7 and a summary of non-compliance with groundwater trigger levels is presented in Section 3. In addition elevated concentrations of metals were reported for samples from GW2 (barium, boron, calcium, iron, manganese, nickel, potassium, sodium and uranium) and GW1 (barium, manganese, sodium and potassium).

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 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.

4.4 Pollutant Release and Transfer 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 2009 at Powerstown Landfill is 1,123,367 kg/year. This exceeds the specified threshold limit value. The predicted volume of carbon dioxide released to atmosphere in 2009 at Powerstown Landfill is 748,913 kg/year. This is below 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 56,000 litres of water per day was discharged to the Powerstown Stream during 2009. Table 4.3 summarises the releases to water in 2009.

Table 4.3 Releases to Water in 2009

Emission Type	Kg/annum
Total Organic Carbon	4,036
Ammonia	6
BOD	151
COD	3,027
Calcium	2,194,905
Sulphate	4,919
Antimony	946

Releases to Wastewater or Sewer

13,274 m^3 of leachate was transferred off-site to Mortarstown, Tullow and Muinebheag Wastewater Treatment Plants. Table 4.4 summarises the releases to sewer in 2009.

Table 4.4 Releases to Sewer in 2009

Emission Type	Kg/annum
Ammonia	17,254
BOD	1,380
COD	18,250
Calcium	144
Sodium	2,521
Orthophosphate	83
Chlorides (as Cl)	31,032
Flourides (as Total F)	33

Releases to Land

There were no releases to land reported for the Powerstown facility during 2009.

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 2009 a total of 1, 409 tonnes of material was transferred off-site for recovery.

5. Energy and Resource Consumption

The following section summarises energy and resource usage at the facility in 2009.

5.1 Diesel

Overall, diesel usage at the landfill for 2009 was approximately 68,215 litres. The reduction from the 2008 figure (81,067) is due to the reduction in the opening hours in 2009.

5.2 Electricity

Electricity usage at the landfill was estimated at 70,000 KWH for 2009. The decrease from 2008 was due to the reduction in opening hours in 2009.

5.3 Resource consumption

Table 5.1 contains quantities of material used for landfill maintenance from 2006 to 2009.

- The covering material used at the landfill during 2009 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.
- Water bowsers are used to dampen down dust and its usage is dependent on weather conditions, i.e. usage increases on dry windy days.

Table 5.1: Resource Consumption for Landfill Maintenance

Material	2006	2007	2008	2009
Covering material, road making material / clay	11,189 tonnes	6113.4	6277.11 tonnes	8,140
Road making material e.g. broken stone	1,200 tonnes	528.9 tonnes	2212.5 tonnes	262
Hessian cover void saver	36,000 m^2	NR	17.828 m^2	4,500 m^2
Water	500 m^3	438 m^3	111 m^3	400 m^3
Woodchip	NR	108.74 tonnes	41.78 tonnes	23
Compost	NR	2,276.9 tonnes	5727.62 tonnes	1,419

6. Development Activities & Plans

6.1 Development Works

Development works conducted at Powerstown Landfill during 2009 included the following:

- **Installation of landfill gas management infrastructure.**
  Additional temporary gas wells and collection pipework was installed in 2009 at the active cells in order to increase the collection rates in Cells 15 and 16 and to reduce landfill odours.

- **Capping Works**
  Partial capping of Cells 15 and 16 (on the northern and eastern boundaries) was carried out from the anchor trench, upwards along the side slopes, for a distance of five metres. This increased the collection rates of landfill gas from the side slopes and anchor trench drainage layer.

- **Installation of leachate management infrastructure.**
  Additional monitoring boreholes were installed in order to comply with licence requirements and to replace damaged infrastructure. This consisted of three groundwater boreholes and three landfill gas boreholes.

6.2 Environmental Objectives and Targets for 2008 and 2009

The Environmental Objectives and Targets (EOTs) for 2009 were included in the AER that was submitted in 2008. These are outlined in Table 6.1 -6.4 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 2010 are listed below in table 6.5. The information presented includes EOTs for promoting continual environmental improvement, maximisation the amount of material recycled at the CAS and the site development and plans for 2010.

Table 6.1: EOTs for 2009: Promote continual environmental improvement

	Target	**Progress**
1	Revise and implement the environmental management system for the site	Completed
2	Promote energy conservation within the site	Ongoing
3	Provide training to personnel in the operation and maintenance of the gas flare and the balancing of the gas fields	Completed
4	Continue to provide training to staff in relation to good environmental practices and health and safety measures.	Completed
5	Prepare and implement an odour management plan	Completed

Table 6.2: EOTs for 2009: Maximize recycling at the civic amenity site

	Target	Date for achievement of target
1	Increase the annual recycling rate at the civic amenity site	Ongoing
2	Increase the scope and types of wastes accepted for recycling at the facility	Completed
3	Obtain competitive prices and value for money for servicing of recycling centre	South-east contract under preparation

Table 6.3: EOTs for 2009: Improve communications and minimization complaint

	Target	Date for achievement of target
1	Effectively deal with and minimise complaints.	As complaints arise
2	Improve communications towards customers and local residents	Ongoing

Table 6.5 Summary of Site Development Plans and Objectives for 2010

	Item	Target / Objective
1	Capping	Ongoing as required
2	Monitoring	Complete the re-location of the weather station
3	Staff Training	Continue training in the gas collection system
4	Civic Amenity Site	Revise arrangements for timber acceptance
5	Gas collection	Extend gas collection system within active area
6	Site Procedures	Revise Odour Control and Waste Acceptance procedures
7	Site Infrastructure	Extend waste quarantine area
8	Surface Water Monitoring	Repair / replace continuous monitoring equipment at surface water pond
9	Waste Acceptance	Make arrangements for the new pre-treatment requirements

6.3 Restoration

There were no final capping or restoration works carried out in 2009. It is not expected that any final capping works will take place in 2010 due to the reduced waste intake. It is therefore not possible to estimate the dates of final capping and restoration works at this time.

6.4 Procedures

New procedures put in place since 1-1-09 are as follows:

- Communications Programme
- Awareness, Training and Corrective Action Procedure
- Leachate Handling Procedures

- Procedure for Windy Conditions

- Odour Management Plan: this was submitted to the Agency in early 2010 and takes account of the requirements of the revised waste licence W0025-03 (issued in December 2009).

- 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. 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.

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.

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 offices were sprayed with insecticide twice during 2009.

7.5 Landfill Gas Management and Odour Control

Improvements in this area, over 2008-2009, include the following:

- Old unlined site and active site are connected.
- Extra wells have been installed in active area.
- New gas collection system in Phase I and II.

- Capping works completed at Cells 6-13.
- Flare in operation continuously.
- Odour control carried out twice a day at four perimeter residential locations and daily at various locations on site.
- Leachate extraction pipes have been connected to the active flare.
- Capping works carried out at the active cells.

8.0 Incidents and Complaints for the Reporting Period 2009

8.1 Reported Incidents

There were 14 incidents reported to the EPA during 2009. All incidents related to power failures on the site and in the local area which resulted in the flare shutting down, and the EPA were duly informed. One notification was simply to inform the Agency of the new opening hours of the landfill.

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 22 complaints were received between January to December 2009. The complaints can be summarised as follows.

Odour
A total of 19 complaints were received during 2009 in relation to odour. This is a decrease in comparison to those received during 2008 (29 complaints) and is far less than the amount received in 2006 (over three hundred).
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 all helped to improve odour control and reduce odour emanating from the landfill.

Litter
No complaints were received in relation to litter during the 2009 reporting period. Additional netting was purchased, older netting was replaced and regular litter patrols were carried out around the boundary of the site.

Birds
No complaints were received in relation to bird nuisance at the landfill during 2009. The falconry method of bird control is recognised as a suitable way of reducing the risk of bird nuisance. This control will continue at the landfill in 2010.

Vermin / Flies
3 complaints were received in relation to flies during 2009, all from the same individual. Investigation showed that the landfill could not be solely responsible for any fly nuisance, as the surrounding land is intensively farmed.

Traffic
No complaints was received in relation to traffic during 2009.

Noise
No complaints was received in relation to noise during 2009.

9. Financial Provisions, Staffing and Programme for Public Information

9.1 Financial Provisions

The gate fee between 1st of January 2009 to the 31st of December 2009 was €125.00 per tonne which included the landfill levy of €20.

Gate fees, excluding the levy, for 2009 were: 1,667,896

The landfill levy paid for 2009 was: 317,694

The budget allocated to Powerstown Landfill for 2009 was:

- Landfill: €1,074,500
- Recycling: €160,000

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. A detailed response will be submitted in a separate report which will consider current financial issues and the present competitive market.

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 120,000 and it is proposed to seek submissions in 2010 for suitable projects.

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 2008-2009-2010

Training was completed by all Carlow County Council staff members during 2008-2009-2010. Courses undertaken include:

- FAS Waste Management Course (2 staff members)
- FAS Safe Pass Course (4 staff members)
- Occupational First Aid and use of defibrillators (1 staff member)
- Working at Heights (5 staff members)

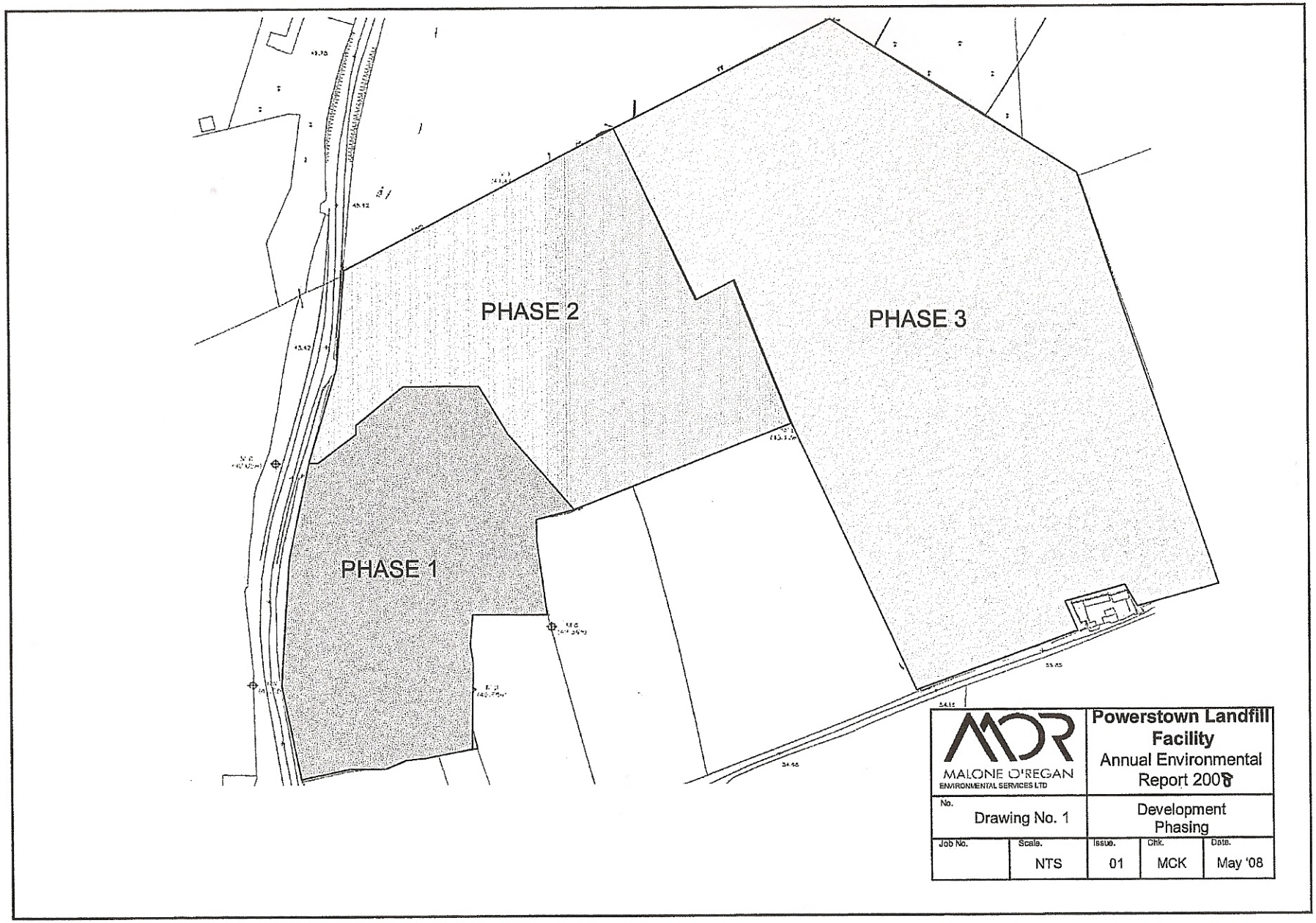
- Training in bird control and safe use of pistol (3 staff members)
- Safety Management for Construction (1 staff member)
- Training in the operation of the landfill gas collection system (2 members)

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 2008 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 and current charges. An electronic notice board is in operation at the site detailing opening hours and charges. Quarterly meetings with local residents commenced in early 2009, three meetings were held, on 16-1-09, 4-2-09 and 19-5-09. Copies of the agenda and minutes of the most recent meeting, held on 19-5-10, are shown in Attachment 10.

ATTACHMENT 1

DRAWING 1: DEVELOPMENT PHASING



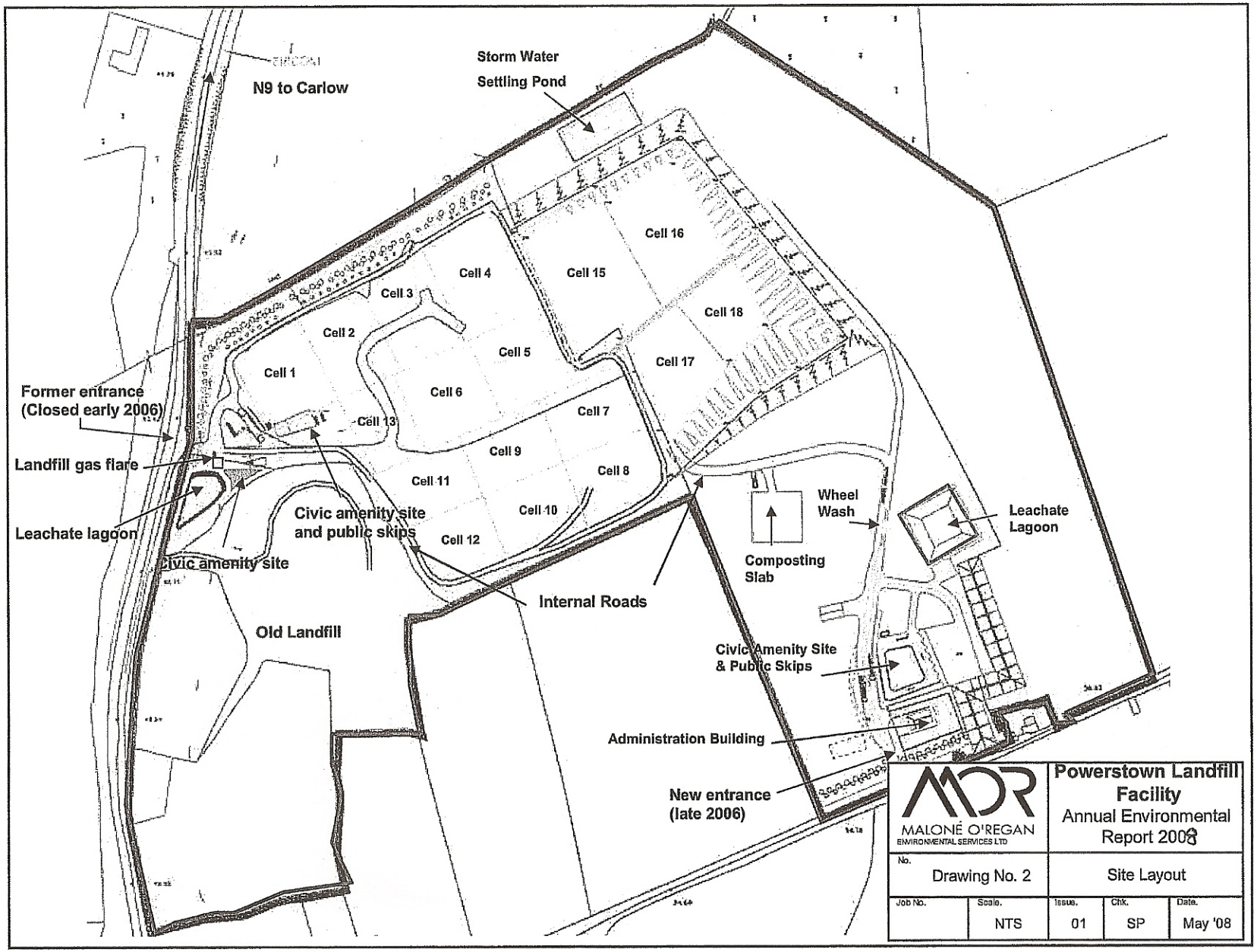
MALONE O'REGAN ENVIRONMENTAL SERVICES LTD

Powerstown Landfill Facility
Annual Environmental Report 2008

No.				
Drawing No. 1		Development Phasing		
Job No.	Scale.	Issue.	Chk.	Date.
	NTS	01	MCK	May '08

ATTACHMENT 2

DRAWING 2: SITE LAYOUT PLAN


N9 to Carlow
Storm Water
Settling Pond
Cell 16
Cell 4
Cell 15
Cell 3
Cell 18
Cell 2
Cell 5
Cell 17
Cell 1
Cell 6
Former entrance
(Closed early 2006)
Cell 13
Cell 7
Landfill gas flare
Cell 9
Cell 11
Cell 8
Leachate lagoon
Civic amenity site
and public skips
Cell 10
Cell 12
Civic amenity site
Wheel
Wash
Leachate
Lagoon
Composting
Slab
Internal Roads
Old Landfill
Civic Amenity Site
& Public Skips
Administration Building
New entrance
(late 2006)
MALONÉ O'REGAN
ENVIRONMENTAL SERVICES LTD
Powerstown Landfill
Facility
Annual Environmental
Report 2008
No.
Drawing No. 2
Site Layout
Job No.
Scale.
NTS
Issue.
01
Chk.
SP
Date.
May '08

ATTACHMENT 3

DRAWING 3:MONITORING LOCATIONS

GB1 Building Gas
G1 Perimeter Gas
TP1 Trial Pit
GW1 Ground Water
upstream Stream/Surface Water
TEM1 Telecom Eireann (Eircom) Manhole
DMP1 Dust
N1 Noise
RCA1 Rotary Core Wells

Upstream
Downstream
SW OUTLET
SW INLET
Pond
10kv
UND
FF
CS

49.78 45.62 43.42 46.16 48.04 48.96 50.95 48.79 54.68 55.13 54.16 55.85 56.93 54.34 54.33 56.71 56.49 54.87

NOTES:

1. This Drawing is the property of Carlow Co. Council, it is a confidential document and must not be copied, used or it's contents divulged without prior written consent.

2. Use figured dimensions only, if in doubt ask.

CARLOW COUNTY COUNCIL
COUNTY OFFICES, ATHY ROAD, CARLOW
JOHN MULHOLLAND DIRECTOR OF SERVICES, INFRASTRUCTURE/WATER SERVICES
ph: 059-9170300, fax: 059-9141503.

PROJECT: MONITORING POINTS IN POWERSTOWN

TITLE: LAYOUT MAP

SCALE: 1:1000 @ A0	REVISIONS:	DRAWING NO.:
DATE: 17 November 2006		MON_POW-01
DESIGNED:		
DRAWN: B. Griffin		
CHECKED: G. Whelan		

ATTACHMENT 4

SUMMARY OF SURFACE WATER QUARTERLY RESULTS

Surface Water Monitoring Summary 2009
Location ST1 Downstream

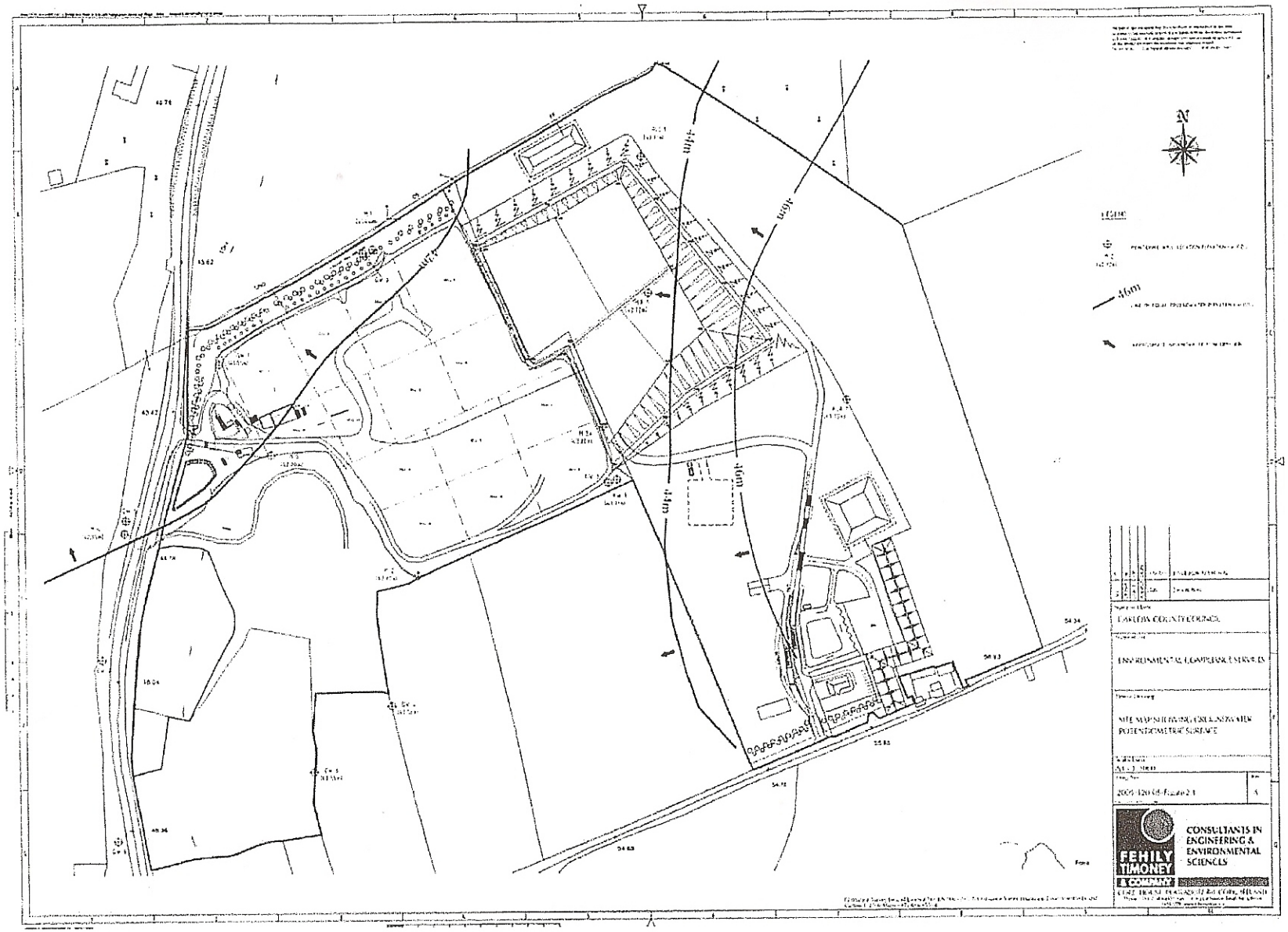
Parameter	Units	10-2-10	13-5-09	25-8-09	25-11-09	Trigger Level	Surface Water Regs	Drinking Water Regs.
Visual Inspection								
Temperature	Deg. C	7.3	10.9	14	8.7		$< 1.5^0$ rise	
Dissolved Oxygen	%	98	101	91	85		80%-120% at 95% percentile values	
PH	PH Units	7.9	7.8	7.6	7.8		6-9	6.5-9.5
Conductivity	uS/cm	843	813	871	819	1,000		2,500
Ammonia	mg/l N	.13	.17	.11	.14	.5	.065 mean value	.3
Chloride	mg/l	30	26	23	20	50		250
Suspended Solids	mg/l	16	---	---	15			
BOD	mg/l O2	.8	1.0	.6	.7		1.5 mean value	
COD	mg/l O2	8	8	20	20			
Ortho-Phosphate	mg/l P		.014				.035 mean value	
Total Oxidised Nitrogen	mg/l N		7.6					11
Sulphate	mg/l SO4		100					250
Alkalinity	mg/l CaCO3		273					
Potassium	mg/l		5					
Sodium	mg/l		5					200
Calcium	mg/l		11.6					
Aluminium	ug/l		250					200
Antimony	ug/l		5					5
Arsenic	ug/l		5				25 annual average	10
Barium	ug/l		30					
Beryllium	ug/l		5					
Boron	ug/l		50					1000
Cadmium	ug/l		5					5
Chromium	ug/l		5					50
Cobalt	ug/l		5					
Copper	ug/l		30				30 annual average	2,000
Iron	ug/l		250					200
Lead	ug/l		5					25
Magnesium	ug/l		5					
Manganese	ug/l		250					50
Mercury	ug/l		5					1
Molybdenum	ug/l		5					
Nickel	ug/l		5				20 annual average	20
Selenium	ug/l		5					10
Silver	ug/l		5					
Thallium	ug/l		5					
Thorium	ug/l							
Tin	ug/l		10					
Uranium	ug/l		5					
Vanadium	ug/l		5					
Zinc	ug/l		100				100 annual average	

Surface Water Monitoring Summary 2009
Location ST2 Upstream

Parameter	Units	10-2-10	13-5-09	25-8-09	25-11-09	Trigger Level	Surface Water Regs	Drinking Water Regs.
Visual Inspection								
Temperature	Deg. C	6.2	10.9	14	8.7		$< 1.5^0$ rise	
Dissolved Oxygen	%	91	103	94	84		80%-120% at 95% percentile values	
PH	PH Units	8	8.1	7.7	7.7		6-9	6.5-9.5
Conductivity	uS/cm	848	821	890	827	1,000		2,500
Ammonia	mg/l N	.017	.009	.04	.06	.5	.065 mean value	.3
Chloride	mg/l	27	24	21	19	50		250
Suspended Solids	mg/l	8	24	---	21			
BOD	mg/l O2	.8	.7	1.4	1.9		1.5 mean value	
COD	mg/l O2	8	8	20	20			
Nitrite	mg/l N							.5
Ortho-Phosphate	mg/l P		.02				.035 mean value	
Total Oxidised Nitrogen	mg/l N		6.1					11
Sulphate	mg/l SO4		130					250
Alkalinity	mg/l CaCO3		261					
Potassium	mg/l		5					
Sodium	mg/l		5					200
Calcium	mg/l		11.1					
Aluminium	ug/l		250					200
Antimony	ug/l		5					5
Arsenic	ug/l		5				25 annual average	10
Barium	ug/l		30					
Beryllium	ug/l		5					
Boron	ug/l		50					1000
Cadmium	ug/l		5					5
Chromium	ug/l		5					50
Cobalt	ug/l		5					
Copper	ug/l		30				30 annual average	2,000
Iron	ug/l		250					200
Lead	ug/l		5					25
Magnesium	ug/l		5					
Manganese	ug/l		250					50
Mercury	ug/l		5					1
Molybdenum	ug/l		5					
Nickel	ug/l		5				20 annual average	20
Selenium	ug/l		5					10
Silver	ug/l		5					
Thallium	ug/l		5					
Thorium	ug/l							
Tin	ug/l		10					
Uranium	ug/l		5					
Vanadium	ug/l		5					
Zinc	ug/l		100				100 annual average	

ATTACHMENT 5

GROUNDWATER CONTOUR MAP


N
LEGEND
460m
CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
FEHILY TIMONEY & COMPANY

ATTACHMENT 6

SUMMARY OF GROUNDWATER WATER QUARTERLY RESULTS

Groundwater Monitoring Summary 2009
Borehole GW1 Downgradient

Parameter	Units	Average	10-2-10	13-5-09	25-8-09	25-11-09	Trigger	Standard
Visual Inspection			Clear	Clear	Clear	Clear		
Water Level	mAOD		10.6	10.1	10	10.5		
Temperature	Deg. C		11.5	11.5	12.4	11.6		
Dissolved Oxygen	%		27	31	26.7	26		
PH	PH Units		7.2	7.1	6.9	7.0		
Conductivity	uS/cm		1205	1262	2140	1309		1875
Ammonia	mg/l N		7.7	10	45	11	2.0	0.175
Chloride	mg/l		60	63	170	69	50	187.5
Total Organic Carbon	mg/l C		3.0		12.1	2.2		
Nitrite	mg/l N							
Ortho-Phosphate	mg/l P			.006				
Total Oxidised Nitrogen	mg/l N			6.7				
Fluoride	mg/l							1.0
Sulphate	mg/l SO4							187.5
Alkalinity	mg/l CaCO3			488				
Alminium	ug/l			250				150
Antimony	ug/l			5				
Arsenic	ug/l			5				7.5
Barium	ug/l			30				100
Beryllium	ug/l			5				
Boron	ug/l			50				750
Cadmium	mg/l			5				3.75
Calcium	mg/l			15.1				200
Chromium	ug/l			5				37.5
Cobalt	ug/l			5				
Copper	ug/l			30				1,500
Iron	ug/l			250				200
Lead	ug/l			5				18.75
Magnesium	mg/l			5				50
Manganese	ug/l			250				50
Mercury	ug/l			5				0.75
Molybdenum	ug/l			5				
Nickel	ug/l			5				15
Potassium	mg/l			5				5
Selenium	ug/l			5				
Silver	ug/l							
Sodium	mg/l			5.08				150
Thallium	ug/l			5				
Thorium	ug/l							
Tin	ug/l			10				
Uranium	ug/l			5				9
Vanadium	ug/l			5				
Zinc	ug/l			5				100
Total Cyanide	mg/l							37.5

Groundwater Monitoring Summary 2009

Borehole GW2 Downgradient

Parameter	Units	Average	10-2-09	13-5-09	25-8-09	25-11-09	Trigger	Standard
Visual Inspection			Clear	Rusty	Clear	Clear		
Water Level	mAOD		---	1.7	1.2	2		
Temperature	Deg. C		8.2	11.0	15.2	11.8		
Dissolved Oxygen	%		55	34	25	24		
PH	PH Units		7.3	7.1	6.9	7.0		
Conductivity	uS/cm		1025	1897	1984	1149		1875
Ammonia	mg/l N		.02	0.14	.05	0.02	1.0	0.175
Chloride	mg/l		31	172	125	50	60	187.5
Total Organic Carbon	mg/l C		0.5		9.6	4.6		
Nitrite	mg/l N							
Ortho-Phosphate	mg/l P				.006			
Total Oxidised Nitrogen	mg/l N				35			
Fluoride	mg/l							1.0
Sulphate	mg/l SO4							187.5
Alkalinity	mg/l CaCO3				35			
Aluminium	ug/l				250			150
Antimony	ug/l				5			
Arsenic	ug/l				5			7.5
Barium	ug/l				30			100
Beryllium	ug/l				5			
Boron	ug/l				50			750
Cadmium	mg/l				5			3.75
Calcium	mg/l				19.3			200
Chromium	ug/l				5			37.5
Cobalt	ug/l				5			
Copper	ug/l				30			1,500
Iron	ug/l				250			200
Lead	ug/l				5			18.75
Magnesium	mg/l				5			50
Manganese	ug/l				382			50
Mercury	ug/l				5			0.75
Molybdenum	ug/l				5			
Nickel	ug/l				5			15
Potassium	mg/l				5			5
Selenium	ug/l				5			
Silver	ug/l							
Sodium	mg/l				11.2			150
Thallium	ug/l				5			
Thorium	ug/l							
Tin	ug/l				10			
Uranium	ug/l				5			9
Vanadium	ug/l				5			
Zinc	ug/l				5			100
Total Cyanide	ug/l							37.5

Groundwater Monitoring Summary 2009

Borehole GW8 Downgradient

Parameter	Units	Average	10-2-09	13-5-09	25-8-09	25-11-09	Trigger	Standard
Visual Inspection			Clear	Clear	Light Brown	Clear		
Water Level	mAOD		7.4	8.3	8.3	9.2		
Temperature	Deg. C		11.3	11.5	12.0	11.2		
Dissolved Oxygen	%		25	24	20	19		
PH	PH Units		7.3	7.2	7.3	7.2		
Conductivity	uS/cm		842	798	832	778		1875
Ammonia	mg/l N		2.7	1.4	1.8	1.7	2.0	0.175
Chloride	mg/l		30	26	170	26	50	187.5
Total Organic Carbon	mg/l C		.5		3.4	.8		
Nitrite	mg/l N							
Ortho-Phosphate	mg/l P			.006				
Total Oxidised Nitrogen	mg/l N			11				
Fluoride	mg/l							1.0
Sulphate	mg/l SO4							187.5
Alkalinity	mg/l CaCO3			332				
Aluminium	ug/l			250				150
Antimony	ug/l			5				
Arsenic	ug/l			5				7.5
Barium	ug/l			30				100
Beryllium	ug/l			5				
Boron	ug/l			50				750
Cadmium	mg/l			5				3.75
Calcium	mg/l			11.8				200
Chromium	ug/l			5				37.5
Cobalt	ug/l			5				
Copper	ug/l			30				1,500
Iron	ug/l			250				200
Lead	ug/l			5				18.75
Magnesium	mg/l			5				50
Manganese	ug/l			250				50
Mercury	ug/l			5				0.75
Molybdenum	ug/l			5				
Nickel	ug/l			5				15
Potassium	mg/l			5				5
Selenium	ug/l			5				
Silver	ug/l							
Sodium	mg/l			5				150
Thallium	ug/l			5				
Thorium	ug/l							
Tin	ug/l			10				
Uranium	ug/l			5				9
Vanadium	ug/l			5				
Zinc	ug/l			100				100
Total Cyanide	ug/l							37.5

Groundwater Monitoring Summary 2009

Borehole RCA1 Upgradient

Parameter	Units	Average	10-2-09	13-5-09	25-8-09	25-11-09	Trigger	Standard
Visual Inspection								
Water Level	mAOD		5.3	4.9	4.2	5.9		
Temperature	Deg. C		10.7	10.9	11.3	10.9		
Dissolved Oxygen	%		68	85	72.8	73		
PH	PH Units		7.4	7.4	7.2	7.2		
Conductivity	uS/cm		803	744	784	890		1875
Ammonia	mg/l N		.25	.014	.08	.01		0.175
Chloride	mg/l		31	21	20	34		187.5
Total Organic Carbon	mg/l C		.05		3.0	2.0		
Nitrite	mg/l N							
Ortho-Phosphate	mg/l P			.009				
Total Oxidised Nitrogen	mg/l N			12				
Fluoride	mg/l							1.0
Sulphate	mg/l SO4							187.5
Alkalinity	mg/l CaCO3			309				
Aluminium	ug/l			250				150
Antimony	ug/l			5				
Arsenic	ug/l			5				7.5
Barium	ug/l			30				100
Beryllium	ug/l			5				
Boron	ug/l			50				750
Cadmium	mg/l			5				3.75
Calcium	mg/l			13.8				200
Chromium	ug/l			5				37.5
Cobalt	ug/l			5				
Copper	ug/l			30				1,500
Iron	ug/l			250				200
Lead	ug/l			5				18.75
Magnesium	mg/l			5				50
Manganese	ug/l			250				50
Mercury	ug/l			5				0.75
Molybdenum	ug/l			5				
Nickel	ug/l			5				15
Potassium	mg/l			5				5
Selenium	ug/l			5				
Silver	ug/l			5				
Sodium	mg/l			5				150
Thallium	ug/l			5				
Thorium	ug/l							
Tin	ug/l			10				
Uranium	ug/l			5				9
Vanadium	ug/l			5				
Zinc	ug/l			100				100
Total Cyanide	ug/l							37.5

Groundwater Monitoring Summary 2009

Borehole RCA2 Upgradient

Parameter	Units	Average	10-2-09	13-5-09	25-8-09	25-11-09	Trigger	Standard
Visual Inspection								
Water Level	mAOD		5	4.8	3.8	5.6		
Temperature	Deg. C		10.7	10.9	11.1	10.6		
Dissolved Oxygen	%		76	84	75	78		
PH	PH Units		7.5	7.4	7.1	7.3		
Conductivity	uS/cm		727	727	788	751		1875
Ammonia	mg/l N		.003	.005	.1	.01		0.175
Chloride	mg/l		20	19	19	20		187.5
Total Organic Carbon	mg/l C		.05		3.6	.7		
Nitrite	mg/l N							
Ortho-Phosphate	mg/l P			.007				
Total Oxidised Nitrogen	mg/l N			35				
Fluoride	mg/l							1.0
Sulphate	mg/l SO4							187.5
Alkalinity	mg/l CaCO3			293				
Aluminium	ug/l			250				150
Antimony	ug/l			5				
Arsenic	ug/l			5				7.5
Barium	ug/l			30				100
Beryllium	ug/l			5				
Boron	ug/l			10				750
Cadmium	mg/l			5				3.75
Calcium	mg/l			11.7				200
Chromium	ug/l			5				37.5
Cobalt	ug/l			5				
Copper	ug/l			30				1,500
Iron	ug/l			250				200
Lead	ug/l			5				18.75
Magnesium	mg/l			5				50
Manganese	ug/l			250				50
Mercury	ug/l			5				0.75
Molybdenum	ug/l			5				
Nickel	ug/l			5				15
Potassium	mg/l			5				5
Selenium	ug/l			5				
Silver	ug/l			5				
Sodium	mg/l			5				150
Thallium	ug/l			5				
Thorium	ug/l							
Tin	ug/l			10				
Uranium	ug/l			5				9
Vanadium	ug/l			5				
Zinc	ug/l			100				100
Total Cyanide	ug/l							37.5

ATTACHMENT 7

ANNUAL LEACHATE MONITORING RESULTS

Table 3.1 Results of Annual Leachate Monitoring

Parameter	Leachate Lagoon (LG)	Leachate Tank (LT)	L7 (LPC06)
Date Sampled	**13/05/2009**	**25/08/2009**	**25/08/2009**
Visual	Amber brown colour	Black Colour	Brown Colour
Ammonia mg/l N	1300	960	640
Conductivity µS/cm	17900	13840	10640
pH	7.7	7.9	7.2
Temperature °c	13.2	22.3	17.1
Orthophosphate mg/l P	6.3	6.1	0.99
Total Oxidised Nitrogen mg/l N	nm	2.2	16
BOD mg/l O_2	104	180	37.5
COD mg/l O_2	1375	2710	579
Chloride mg/l Cl	2338	1605	1256
Fluoride mg/l F	2.5	2.9	3.6
Sulphate mg/lSO4	110	200	610
Aluminium mg/l	<250	1800	<125
Antimony mg/l	<5	<5	<5
Arsenic ug/l	20.3	64	<5
Barium ug/l	46.7	300	89
Beryllium ug/l	<5	<5	<5
Boron ug/l	510	4100	3000
Cadmium ug/l	<5	<5	<5
Calcium mg/l	10.9	120	140
Chromium ug/l	23.4	380	37
Cobalt ug/l	7.04	14	8.5
Copper ug/l	<30	<5	<5
Iron ug/l	1020	3100	2400
Lead ug/l	<5	<5	<5
Magnesium mg/l	14.6	93	99
Manganese ug/l	<250	910	620
Mercury ug/l	<5	<5	<5
Molybdenum ug/l	<5	<5	<5
Nickel ug/l	31.6	180	120
Potassium mg/l	102	640	340
Selenium mg/l	<5	<5	<5
Sodium mg/l	190	1000	730
Thallium ug/l	<5	<5	<5
Tin ug/l	<10	33	23
Total Cyanide mg/l	<0.05	nm	nm
Uranium ug/l	<5	<5	<5
Vanadium ug/l	12.2	200	11
Zinc ug/l	<100	<30	<30

nm = not measured

ATTACHMENT 8

WATER BALANCE CALCULATIONS

Water Balance Calculation
Powerstown Landfill AER 2009

2009			LEACHATE VOLUMES (m^3)															
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**	**Total Leachate**
January	113.4	92.8	0	0	196	0	0	44	0	0	117	1,773	0	0	2,130	187	339	2,282
February	24.5	5.9	0	0	12	0	0	3	0	0	7	113	0	0	136	186	73	23
March	32.8	20.3	0	0	43	0	0	10	0	0	26	388	0	0	466	179	98	385
April	101.9	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	305	305
May	77.1	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	231	231
June	66.4	10.2	0	0	21	0	0	5	0	0	13	169	6	0	215	198	199	215
July	159.3	54.0	0	0	114	0	0	26	0	0	68	896	34	0	1,137	102	477	1,512
August	104	102.7	0	0	217	0	0	49	0	0	129	1,704	64	0	2,163	75	311	2,400
September	41.8	25.0	0	0	53	0	0	12	0	0	32	415	16	0	527	106	125	546
October	130	100.6	0	0	212	0	0	48	0	0	127	1,670	63	0	2,119	54	389	2,454
November	220.2	170.6	0	0	360	0	0	81	0	0	215	2,833	107	0	3,595	49	659	4,205
December	73.7	64.4	0	0	136	0	0	31	0	0	81	1,070	40	0	1,358	48	221	1,531
Totals	**1145.1**	**646.5**	**0**	**0**	**1,364**	**0**	**0**	**307**	**0**	**0**	**815**	**11,030**	**330**	**0**	**13,845**	**1,184**	**3,428**	**16,089**

Rainfall	Effective Rainfall
113.4	92.8
24.5	5.9
32.8	20.3
101.9	0.0
77.1	0.0
66.4	10.2
159.3	54.0
104	102.7
41.8	25.0
130	100.6
220.2	170.6
73.7	64.4

Waste Deposition	
Month	Tonnes
Jan-09	2,673
Feb-09	2,654
Mar-09	2,564
Apr-09	2,390
May-09	2,378
Jun-09	2,830
Jul-09	1,455
Aug-09	1,065
Sep-09	1,512
Oct-09	775
Nov-09	706
Dec-09	683

Infiltration Coefficient	
Active	1
Temp Cap	0.25
Perm Cap	0.05

Run-off Coefficient	
Paved Areas	0.95

Absorptive Capacity of waste **0.07 m^3/t**

Summary of Waste Bearing Zones at Powerstown Landfill

Zone	Total Area (m^2)	Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			Zone Areas (m^2)											
Unlined Cell	42200	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	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	0	0	0	0	0	0	0	0	0	0	0	0
		Perm Cap	25200	25200	25200	25200	25200	25200	25200	25200	25200	25200	25200	25200
Cells 15 - 16	19100	Active	19100	19100	19100	19100	19100	16600	16600	16600	16600	16600	16600	16600
		Temp Cap	0	0	0	0	0	2500	2500	2500	2500	2500	2500	2500
		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

Notes:

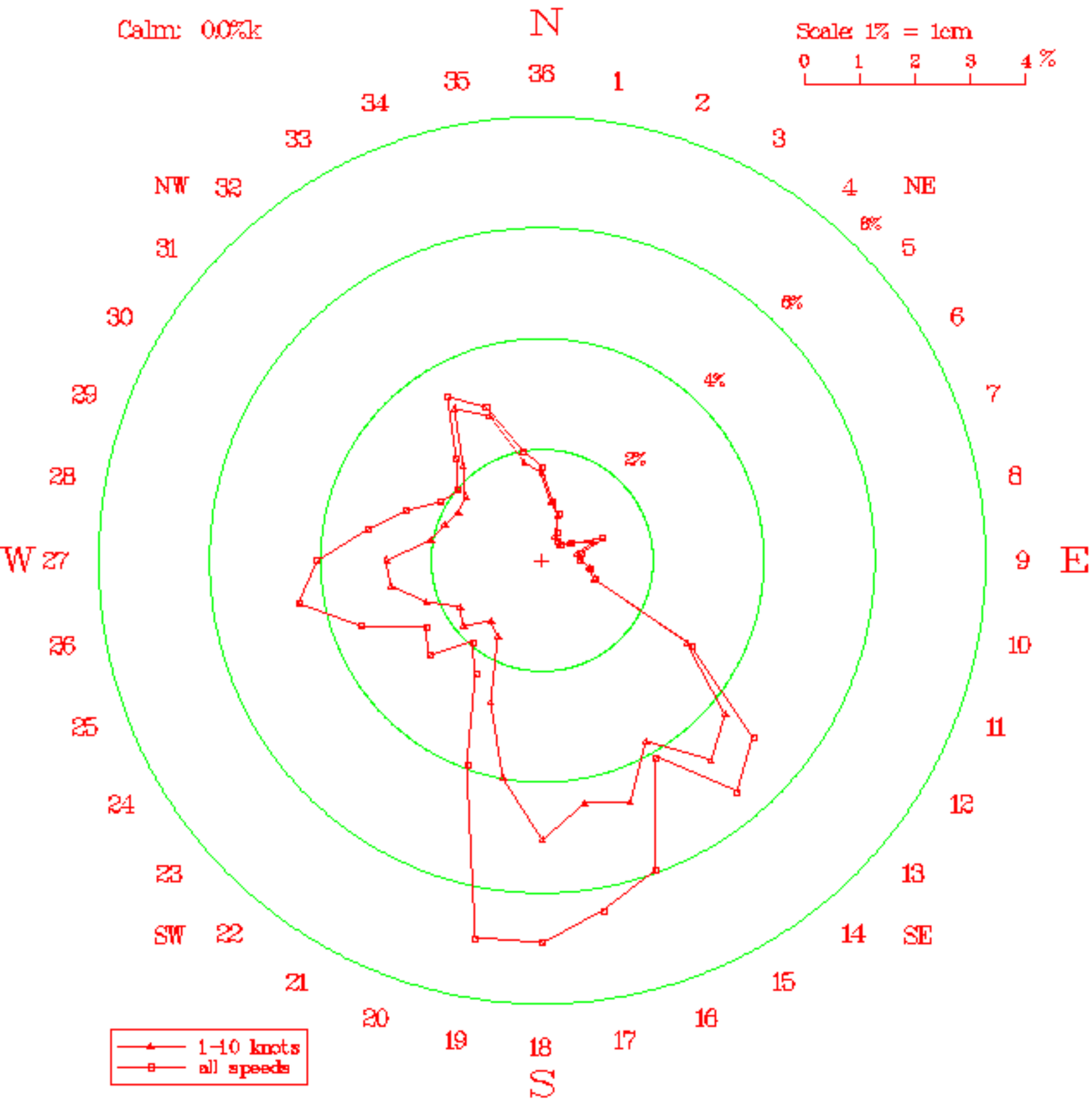
1. No Potential evapotranspiration data available from site, effective rainfall calcualted as a percentage of incident rainfall based on data used in the 2008 water balance
2. Capping of Cells 6 - 13 and completion of the cap to the unlined cell commenced in March 2008 and completed September 2008
3. In the absence of information from site in relation to temp. capping, FTC has assumed that 2,500 m² was installed over Cells 15-16 in June 2009; based on recommendations from FTC on Drawing 2006-120-06-701
4. Waste deposition & Rainfall data provided by Powerstown landfill management

ATTACHMENT 9

METEOROLOGICAL DATA

OAK PARK 2009

Percentage Frequency of Occurrence of Wind Directions



Percentage Frequency of Occurrence of Wind Speeds

+ less than 0.1

0	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	over 48	knots
0.0	21.3	27.1	29.5	18.3	3.2	0.6	+	0.0	0.0	0.0	%

mean wind speed: 7.4 knots standard deviation: 4.5 knots

anemometer height: 12m

Met Eireann, Glasnevin Hill, Dublin 9.

January

julian day	day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
1	1	0.4	0	1.4	99.3	1020.8
2	2	2.8	0	2.9	88.2	1022.9
3	3	2.1	0	1.7	78.7	1022.2
4	4	1.1	0	1.2	96.4	1016.2
5	5	-0.2	0	0.9	98.7	1017.6
6	6	-2.1	0	1	90.6	1021.3
7	7	-1.9	0	0.7	91.5	1020.1
8	8	-0.4	0	1.7	91.5	1020.1
9	9	2.8	0.2	2.6	86.8	1017.6
10	10	5.8	0.3	7.3	79.5	1009.3
11	11	9.7	13.5	10.9	93.9	999.8
12	12	8.1	1.8	3.7	93.4	995.6
13	13	3.3	0.7	2.3	91.5	1001
14	14	4.4	10.5	6.7	95.5	996.9
15	15	8	7.6	6.5	91.6	992
16	16	6.6	3.4	4.6	92.4	994.9
17	17	5.5	9.4	8.2	88.5	985.9
18	18	2.7	7.1	6.1	88.7	982
19	19	3.1	8	4.9	89.7	969.9
20	20	2.3	0	4.7	87.7	980
21	21	4.9	10.1	5.2	94.3	983.4
22	22	6.3	3.8	4.2	86	972.2
23	23	3.2	0	4.3	89.8	972.5
24	24	3.3	1.5	4.5	91.1	977
25	25	5	6.2	5	93.3	967.3
26	26	5	1.2	3.1	88.7	992.2
27	27	5.4	1.3	1.8	97.2	1000.2
28	28	4	0	2.1	94.7	1005
29	29	6.6	4.1	7.6	94	998
30	30	9.1	16	9.4	96.1	993.7
31	31	6	6.7	4.8	96.1	996.5
		3.964516129	113.4	4.258064516	91.46452	998.1967742

Feb-09

julian day	day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
32	1	3.5	0	4.1	75.4	1003.3
33	2	0	6.6	4	93.4	998
34	3	0.2	5.4	3.3	98.9	980.5
35	4	2.8	2	3.5	92.6	983.3
36	5	0.9	0.9	4.9	94.9	986.5
37	6	1.4	0	3.9	87.6	990.9
38	7	0.7	0	4	80.6	995.9
39	8	2.1	5	2.4	90.4	992.6
40	9	1.7	0	3.1	96.2	987.7
41	10	3.8	0	3.4	88.1	1000.3
42	11	3.2	0	1.6	93.3	1012.6
43	12	5.9	1.5	3.1	90.9	1017.8
44	13	7.3	0	1.4	91.3	1017.9
45	14	6.8	0	1.9	91.6	1019.5
46	15	8.3	0	2.3	82.7	1020.6
47	16	5.9	0	3	82.5	1020.7
48	17	8.9	0	2.8	76.6	1022.4
49	18	6.9	0	2	77.6	1020.3
50	19	6.1	0.3	1.8	89.9	1021.8
51	20	4.3	0	1.5	88.2	1025.3
52	21	5	0	2.6	88.8	1026.3
53	22	8.7	0	3.7	84.7	1023.8
54	23	8.7	0.3	2.5	91.9	1021.4
55	24	8.4	0	1.8	89.8	1021
56	25	6.6	0	3.8	81.6	1020.5
57	26	6.5	0	3.9	85.3	1017
58	27	8.3	0	3.9	85.6	1011.6
59	28	8	2.5	4.9	90.6	1002.3
		5.032142857	24.5	3.039285714	87.8928571	1009.35

julian day	Mar-09 day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
60	1	6.7	1.3	4	84.1	1002.1
61	2	5.5	0.7	3.5	90.7	1007.1
62	3	3.4	10.6	5	90.2	986.7
63	4	2.1	0.2	3.4	87.6	974.2
64	5	3.6	0.7	3.2	84.9	990
65	6	5.4	0.9	3.6	92.2	997.5
66	7	9.3	1.6	6.5	85.5	996.9
67	8	4.4	3.3	8.4	82.7	994.2
68	9	5.8	7.6	5.8	82.7	1001.6
69	10	8.4	1	3.6	88.6	1004.1
70	11	10.6	0.2	4.3	86.7	1011.6
71	12	9.3	0.1	3.9	79.7	1012.1
72	13	8.4	1.3	5.5	91.6	1005.6
73	14	9.1	0.1	5.7	72.9	1011.3
74	15	7.6	0	3.8	79	1023.2
75	16	7.5	0	2.5	82.4	1024.1
76	17	7.2	0	2.8	85.2	1025.7
77	18	7.8	0.1	2.4	91.2	1023
78	19	7.5	0.1	2.7	85.3	1020.2
79	20	7.6	0	4	86	1021.5
80	21	6	0	2.1	91.4	1027
81	22	7.3	0	3.5	83.5	1027.8
82	23	8.1	0.3	6.6	75.8	1016.5
83	24	6.4	0.1	5.1	80.9	1012
84	25	9.4	0	7.6	69.4	1002.4
85	26	6.9	1.3	7.9	77.2	994.7
86	27	5.8	1.2	6.5	77.5	990.9
87	28	3.6	0	6	62.6	1001.5
88	29	4.4	0	4.5	82	1004
89	30	9.2	0	2.2	84.5	1010.8
90	31	8.9	0.1	2.3	81.3	1014.9
		6.877419355	32.8	4.480645161	83.07419	1007.587097

Apr-09 julian day	day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
91	1	9	0	2.4	74.3	1016.1
92	2	8.5	0	2.2	79.4	1013.3
93	3	7.1	4.9	4.6	91.6	1006.6
94	4	7.4	0.1	4.3	73.2	1010.9
95	5	6.3	0.4	3.8	81.9	1011.7
96	6	7.5	9.3	4.9	89.2	995.7
97	7	7.6	8.5	8	85.4	990
98	8	9.8	2.9	5.8	74.1	994.4
99	9	9.3	13	8.9	92.5	988.4
100	10	7.5	0.6	3.1	77.3	992.6
101	11	7.2	0.3	2.8	82.6	1001.4
102	12	7.7	0	3.8	85.1	1006
103	13	8.7	4.2	4.9	92.9	998.4
104	14	9.6	2	3.6	88.3	999.3
105	15	8.9	0.9	2.6	91	1000
106	16	11.1	4.8	3	88.6	1000.2
107	17	9.2	1.6	2.3	90.7	1005.2
108	18	9.3	0	2.3	73.6	1012.3
109	19	9.1	0	2.2	80.1	1017.3
110	20	10.8	0	2.5	79.8	1019.9
111	21	12	0	3.4	75.8	1019.5
112	22	9.9	0.2	6	85.7	1015.4
113	23	10.9	5.8	3	94	1009.4
114	24	9.8	16.4	3.1	94.6	1001.5
115	25	8.5	11.6	4.3	86.4	995.9
116	26	7.6	3.6	3.3	90.2	997.3
117	27	8.3	4.4	3.9	81.8	987.6
118	28	8.1	0.1	1.9	81	996
119	29	9.6	4.3	3.8	91.8	995.9
120	30	11.8	2	2.6	77.4	1004
		8.936666667	101.9	3.776666667	84.34333333	1003.406667

julian day	May-09	day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
	121	1	10.7	4.4	5.4	76.5	1011.9
	122	2	9.3	4.6	3.7	81.6	1019.8
	123	3	8.5	0.1	4.1	75	1022.5
	124	4	10.6	0.8	6.2	86	1017.5
	125	5	13.4	0	7.1	77.6	1012.7
	126	6	12.2	1.5	7	79.9	1006
	127	7	9.9	2.8	6.7	76	999.4
	128	8	9.3	1.5	7	73.5	999.3
	129	9	10.1	0.6	4.5	73.9	1004.7
	130	10	9.8	0	1.5	74.4	1012.4
	131	11	10.1	0	3.4	65.6	1015.9
	132	12	9.7	0	3.1	65.6	1015
	133	13	8.3	0.9	2.3	84.5	1006.9
	134	14	11.8	1	1.7	93.4	1000.9
	135	15	9.2	1.2	2.7	90	992.9
	136	16	9.5	11.4	7.1	85.9	985.6
	137	17	9.3	7.9	4.7	85.6	989.1
	138	18	11	15.2	5.4	86.9	995.5
	139	19	11.4	6.7	5	87	1002.8
	140	20	11.2	9.7	3.6	87.5	1006.8
	141	21	10.9	0.1	3.4	77.1	1006.7
	142	22	14.3	1	4	87.6	1005.8
	143	23	10.5	0.9	4.5	80.4	1008.1
	144	24	11.4	0	3.3	74.8	1012.1
	145	25	12.6	0.2	2.6	83.7	1008
	146	26	9.6	0.8	5.3	73.9	1010.2
	147	27	12.4	3.8	5.8	91.4	1010.6
	148	28	16.9	0	2.5	81.3	1021.8
	149	29	15	0	3.8	86.7	1020.5
	150	30	14.9	0	3.1	73.1	1017.2
	151	31	14.3	0	1.8	70.1	1019.8
			11.22903226	77.1	4.267741935	80.20968	1008.335484

Jun-09 julian day	day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
152	1	16.1	0	1.5	71.5	1020.2
153	2	17.8	0	1.1	66.7	1019.6
154	3	14.9	0	2.7	74.9	1015.7
155	4	13.3	0	1.6	76.1	1011.1
156	5	10.8	0	3.5	76.4	1003.3
157	6	7.2	16.7	4.7	90.7	996.6
158	7	11	1.2	4.1	76.2	997.6
159	8	9.8	0.3	3.3	79.1	999.6
160	9	11.5	0.1	2.8	72.8	1002.8
161	10	10.8	0.3	1.5	79.3	1004.4
162	11	11.7	0.4	2.5	73.1	1011.2
163	12	12.9	0.8	3.8	84.5	1010.7
164	13	14.7	0.1	4.7	77.4	1009.2
165	14	13.7	3.1	2.8	83.8	1009.8
166	15	13.2	0.4	2.1	85.2	1008.9
167	16	14.3	1	4	81.2	1012.2
168	17	13.1	26.4	5.8	81.2	1004.8
169	18	12.8	0.7	5.6	78	1008.8
170	19	13.1	0	5.4	74.4	1015.6
171	20	15.1	0	3.9	75.2	1019
172	21	17.2	0.4	2.5	85.6	1019.3
173	22	18.3	0	2	86.2	1021.2
174	23	19.1	0	2.1	77.3	1020
175	24	16.3	0	2.7	72.1	1013.8
176	25	17.1	0.1	2.1	74.3	1007
177	26	16.4	11.5	2	93	1005.2
178	27	17	0	2.6	85.8	1007.8
179	28	15.2	2.6	2.9	86.8	1007.1
180	29	17.4	0.1	2.2	90.1	1008.8
181	30	17.4	0.2	3.6	88.1	1012
		14.30666667	66.4	3.07	79.9	1010.11

julian day	Jul-09 day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
182	1	18.1	5.9	3	97.1	1013.2
183	2	17.7	15.3	2.7	96.8	1009
184	3	17.3	0.2	4.8	85.2	1003.2
185	4	16.2	17.7	4.7	84.8	1000.3
186	5	14.6	3.8	4.6	87.1	996.4
187	6	13.4	5.1	2.9	88.5	995.3
188	7	16.1	0	4.8	76	1001.8
189	8	15.2	0	3.2	72.7	1009.4
190	9	14	0	2.4	73.4	1011.7
191	10	11.7	1.7	2.1	90	1008.7
192	11	15.9	23.2	3.9	94.5	998.5
193	12	15.5	6.4	4.7	82.4	996
194	13	13.9	11.7	3.7	91.3	995.1
195	14	14.7	10.4	2.5	89.8	994.9
196	15	15.6	0.2	2.6	81.6	1002.3
197	16	14.3	6.5	1.7	86.8	1008.3
198	17	15.2	0.1	4.9	73.4	1006.6
199	18	13.3	3.3	3	86.5	1004
200	19	15	1.4	3.1	81.9	1001.8
201	20	14.9	0	4.1	80.2	1004
202	21	15.7	9.1	5.7	87.3	990.3
203	22	16.3	1.5	4.2	89.1	987
204	23	16.2	8.6	3.4	88.8	992.6
205	24	15.5	2	3	87.7	1002.3
206	25	14.6	2.4	3.9	86.1	1011.1
207	26	16	6.7	6	86.5	1001
208	27	16	0.1	5.2	76.6	1001.6
209	28	14.2	4.3	5.4	93.2	1000.8
210	29	13.4	0.2	2.8	85	1001.5
211	30	14.4	0	4.6	75.4	1010.4
212	31	12.9	11.5	5.6	96.7	1004.7
		15.09032258	159.3	3.84516129	85.56129	1002.058065

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julian day	day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
213	1	14.5	0.1	5.2	82.2	999.4
214	2	14	0.1	4	83.8	1002.9
215	3	16.5	6.8	5.9	93.3	998.8
216	4	17.1	0.1	5.7	85.6	1000.2
217	5	16.5	0	5.6	78.1	1006.6
218	6	15.2	0.2	2.7	84.6	1011.9
219	7	14.2	0	2.3	79.7	1014.1
220	8	17.2	4.8	3.4	89.6	1012.6
221	9	16.7	0.4	3.2	91.1	1010
222	10	16.7	1.1	4.1	91	1006.5
223	11	17.6	0	3.5	87.4	1014.4
224	12	17.8	0.8	3.3	90.9	1012.8
225	13	15.7	0	1.6	79	1013.1
226	14	17.4	0.1	5	90.6	1005.1
227	15	16.3	5.2	5.2	87.8	1002.3
228	16	15.9	0.2	5.1	82.8	1006.8
229	17	17.4	0.2	4.3	83.1	1007.4
230	18	16.7	0.8	5.6	96	1005.3
231	19	18.6	10	6.1	95.9	1000.2
232	20	15.1	32.4	5.2	88.9	999.1
233	21	13.9	0.9	4.8	80.4	1009.5
234	22	13.8	1.9	4.6	87.9	1010.8
235	23	14.8	2.1	6	95.7	999.4
236	24	13	2.1	4.8	87.2	996
237	25	14.2	1	4.5	83.8	997.2
238	26	16.7	9.8	5.4	91.5	993.7
239	27	13.1	2.4	5.2	85.2	1000.7
240	28	13.4	3.6	5.8	81.1	1005.5
241	29	13.2	0	4.1	77	1012.5
242	30	14.3	4.3	4.3	94.6	1003.7
243	31	14	12.6	5.9	93.2	994.4
		15.53225806	104	4.593548387	87.06452	1004.932258

September

day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
1	13.6	3.9	4.5	83.5	994.4
2	12	25.6	3.9	94.6	991.9
3	12.8	1.1	5.8	82	994.3
4	12.8	0.8	5.8	80.4	1004.5
5	13.2	0	4.4	79.9	1013.2
6	13.8	5.4	5.5	90.6	1007.8
7	14.7	0.4	4.6	84.6	1006.5
8	13.8	3.5	5.8	91.8	1005.6
9	12.2	0.1	1.7	82.2	1024.8
10	12.6	0.1	1.6	84.4	1031.3
11	12.7	0.1	0.8	84.8	1030.5
12	13.3	0.2	1.2	83.9	1025.5
13	13.3	0.1	1.2	88.4	1023.4
14	11.9	0.1	2.1	86.3	1023.3
15	11.7	0	3.5	87.5	1021.6
16	13.1	0.1	3.2	83.3	1020.4
17	10.4	0	1.4	84.9	1017.3
18	11.7	0	1.3	84.3	1011
19	10.8	0.1	2.1	90.2	1010.4
20	10.6	0	2.5	84.1	1017
21	15	0	5.7	83.8	1014.2
22	14.2	0.1	5.2	81.7	1014.1
23	12.5	0.1	4.3	84.7	1018
24	11.6	0	2.7	84.7	1019.9
25	14.1	0	3.3	81.8	1020
26	15	0	1.4	86.7	1021.1
27	14.7	0	2.7	90.9	1022
28	15.4	0	3.6	87.9	1021.1
29	15	0	2.8	90.7	1017.7
30	13.9	0	1.8	89.9	1014.3
	13.08	41.8	3.213333333	85.81667	1015.236667

julian day	Oct-09	day	mean temp	total rainfall	mean windspee	humidity	cbl pressure
	274	1	11.2	0	2.5	85.2	1015.5
	275	2	12.5	0	4.9	89.2	1012.4
	276	3	11.4	1.4	5.7	86.9	1001.2
	277	4	10.4	0	1.9	88.8	1004.6
	278	5	12	0	1.9	87.9	1001.3
	279	6	9.7	26.8	3.1	99.5	995.8
	280	7	7.1	0.1	1	94.7	1006.2
	281	8	9.8	0	0.8	86.5	1011.7
	282	9	10.7	10.2	3.4	97.5	1003.3
	283	10	12.2	0.2	2.3	93.5	1008.2
	284	11	11.4	1.6	3.5	93	1011.4
	285	12	8.8	0.1	1.6	92.4	1022.3
	286	13	10	0.1	1.3	97.2	1023
	287	14	12.8	0.1	1.7	99	1023.2
	288	15	12.8	0.1	1.1	96.7	1026.6
	289	16	10	0	1.7	97	1028.8
	290	17	7.7	0	1.3	92.6	1024.4
	291	18	10.5	0.6	3.3	98.5	1013.6
	292	19	11.6	0.7	5.6	95.8	996.6
	293	20	11.7	11	5	95.7	980.1
	294	21	11.3	28.5	5.3	98.8	979
	295	22	11.8	20.8	2.7	99.9	983.7
	296	23	11.2	0.8	2.6	99.9	995.2
	297	24	13.7	5.8	7.1	95.6	990.4
	298	25	12.8	0.3	6.2	96.3	1001.2
	299	26	10.2	0.2	2.5	99	1008.1
	300	27	13.9	3.3	6	98.3	1002.6
	301	28	13.9	0.2	3.8	97.7	1006.9
	302	29	14.2	0.2	5.5	100	1007.9
	303	30	14.3	16.4	6.1	100	1004.6
	304	31	13.7	0.5	3.6	99.3	1008.1
			11.46129032	130	3.387096774	95.23871	1006.383871

julian day	Nov-09	day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
	305	1	9.6	24.7	5.2	97.8	990.6
	306	2	8	2.6	4.3	99.8	989.8
	307	3	8.8	5.8	5.8	97.1	978.1
	308	4	9	1.7	6.8	96.8	977.9
	309	5	9	0	6.9	95.5	990.5
	310	6	7.9	4.6	4.6	96.7	990.4
	311	7	6.2	4.9	4.8	100	984.8
	312	8	6.3	0	3.4	97.5	1004.1
	313	9	5.1	13.8	2.4	100	1009.6
	314	10	5.8	1.8	2.2	99.8	1004.6
	315	11	4.9	12.1	2.1	100	993.3
	316	12	8.9	6.1	5.1	99.4	983.2
	317	13	7.4	9.1	2.9	100	981.9
	318	14	6.8	6.2	4.6	99.8	977.1
	319	15	8.9	1.2	4.1	99.8	989.6
	320	16	9	11.4	6	99.6	984.9
	321	17	7.8	1.4	5.6	98.9	993.5
	322	18	9.8	11.9	8	100	991.8
	323	19	12.9	32.1	10.6	100	987.1
	324	20	8.9	0.3	4.4	97.8	998.4
	325	21	11.4	17.9	8.7	99.4	990.8
	326	22	7.6	6.5	9.7	99.8	983.2
	327	23	9	13.4	6.3	99.9	989.7
	328	24	9.1	10.8	7.1	100	987
	329	25	7.2	0.4	7.9	99.5	983.7
	330	26	6	0.1	4.3	99	988
	331	27	4.4	0.1	3.7	100	988.3
	332	28	0.9	5.9	2.1	100	983.3
	333	29	3.6	13.4	7.3	100	983.2
	334	30	1	0	3.2	94	1002.5
			7.373333333	220.2	5.336666667	98.93	989.363333

	Dec-09					
julian day	day	mean temp	total rainfall	mean windspeed	humidity	cbl pressure
335	1	3.2	5.2	5.2	90.4	995
336	2	6.2	9.8	2.7	93.1	984.6
337	3	4.5	0.5	5.3	83.4	995.2
338	4	4.9	13.6	2.7	94.6	994.3
339	5	8.6	9.2	5.8	90.9	981.1
340	6	6.2	0.5	5.8	82	980.6
341	7	5.8	5.4	4.7	88.3	984.9
342	8	7.3	3.4	4.7	89.7	995
343	9	8	3.9	3.9	87.9	1004.7
344	10	5.1	0.2	2.5	90.7	1019.7
345	11	6.4	0	4.2	87.3	1022.6
346	12	4.3	0	2.1	86.2	1025.9
347	13	0.6	0	1.7	95.5	1025.2
348	14	2.4	0.3	2.3	95.4	1018.5
349	15	4.6	1.3	3.3	91.6	1012.7
350	16	4.1	1.1	2.6	95.2	1008.3
351	17	2.5	0.3	3.7	90.9	1010.5
352	18	-0.9	0.1	3.3	81.2	1016.1
353	19	0.3	2.1	2.5	91.4	1006.3
354	20	0.2	0	4.4	87.6	993.5
355	21	-1	0	2.1	94.1	981.3
356	22	-0.8	0	1.9	93.3	979.1
357	23	-1.9	0	1.8	93.4	979.3
358	24	-1.4	0	3	93.9	981.3
359	25	-0.5	4.7	2.2	96.9	988
360	26	3	0.7	3.4	90	985.4
361	27	2	0.1	4.3	84.4	993.2
362	28	-0.4	0	1.2	94.3	994.8
363	29	3.6	2.2	5	83.4	986
364	30	3.6	8.3	5.9	85.4	984.3
365	31	1	0.8	4.6	83	998.1
		2.951612903	73.7	3.509677419	89.85161	997.5967742

ATTACHMENT 10

COMMUNITY MEETING MINUTES

Minutes of Residents Liaison Meeting held on Tuesday May 19th 2009 in the Oval Room, County Offices, Athy Road, Carlow

Attendance: Liam Walsh, Derek Deacon, Colette Dermody, Denis Murphy, Tommy Doyle, James Daly, Frank Bermingham, Cllr Arthur McDonald, Cllr. David O'Brien, Cllr. Denis Foley (Chairperson), John Carley, Fergus Mulhare, Bernard Duff

Apologies: Cllr. Jim Townsend and Cllr. Michael Doran

Review of Actions agreed at previous Resident Liaison Meeting
John Carley updated the meeting in relation to actions agreed and completed since the last meeting.

Odour Management Plan prepared by Carlow County Council
Fergus Mulhare gave an overview of the Odour Management Plan which had been circulated by post to each resident prior to the meeting and he also answered a number of queries raised by the meeting.

Improvement Works at Landfill Site
Fergus Mulhare outlined the latest improvement works completed including – gas balancing, gas extraction and new leachate extraction system. The meeting raised queries in relation to this matter.

Installation of Gas Liner/Barrier
The meeting was informed that a new Gas Liner/Barrier had been installed along the outside slopes of the active area of the Landfill. The meeting welcomed the introduction of any system that would reduce the amount of gas escaping from the Landfill. Queries were raised in relation to further attempts to reduce the gas escaping and therefore reducing the odour coming from the Landfill.

Installation of Monitoring Wells
Fergus Mulhare explained to the meeting that new monitoring wells had been installed that for gas and ground water monitoring.

E.P.A. Audit and Inspections
Fergus Mulhare gave an overview of the recent E.P.A. Audit and Inspection carried out on April 30th 2009 and highlighted that the E.P.A. inspector stated that there were no strong smells detected. The meeting raised a number of queries in relation to the report and it was agreed that Staff Members would visit some local dwellings to investigate that complaints of strong odours still existing.

Importing of Clay to Powerstown Landfill
The meeting raised concern in relation to the clay that is currently being imported into Powerstown Landfill for use on the cells to prevent and control gas escaping. The residents questioned the cost and the source of this clay.

Control of Litter
The meeting raised concern in relation to the depositing of waste/litter in areas surrounding Powerstown Landfill. Fergus Mulhare explained that as a result of complaints received from local residents a Litter Prevention/Recovery System has been put in place. Fergus informed the meeting that a number of litter fines have been issued together with clean up costs to some individuals.

Landscaping of Entrance Area
Fergus Mulhare informed the meeting that landscaping had been carried out in the area surrounding and adjacent to the main entrance to Powerstown Landfill.

Commitment from Carlow County Council
The residents compliment Carlow County Council on the improvement works completed to date and requested a commitment that further improvement works will continue.

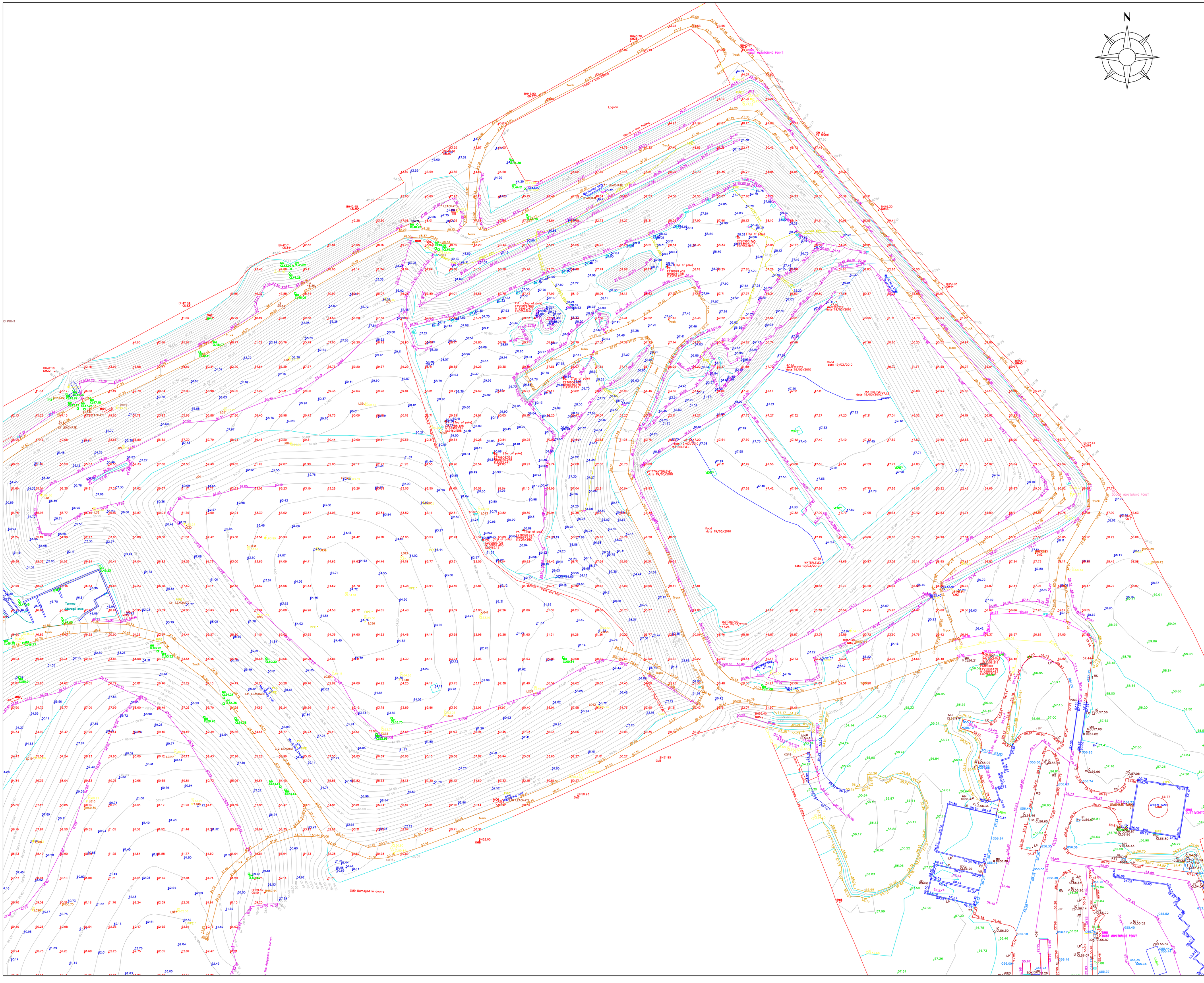
Public Opening Hours of Powerstown Landfill
John Carley outlined details of the proposed reduction in public opening hours of Powerstown Landfill. The revised opening hours are being considered due to the perceived reduction in the amount of waste being accepted.

Community Fund
John Carley outlined details of the Community Fund and advised the meeting that the residents will decide the Community Projects on which the money will be spent.

Conclusion of meeting

ATTACHMENT 11

TOPOGRAPHICAL SURVEY MAP



Symbol	Details/Explanation
TP EP	POLE Telecom or ESB
CB	CONTROL BOX (ESB OR OTHER)
FH SV	HYDRANT, STOP VALVE
WSV WSC	WATER VALVE, WATER STOP COCK
MH CL+67. 67m MH	MANHOLE & COVER LEVEL
GY	GULLY
TIC ESB	TELECOM or ESB INSPECTION COVER
IC	UNKNOWN INSPCTION COVER
CATV	CABLE TV INSPECTION COVER
EL EL	ROOF RIDGE LEVEL, ROOF EAVE LEVEL
SL IL	SOFFIT LEVEL, INVERT LEVEL
BOL BS	ROAD BOLLARD, BUS STOP
LP TF	LIGHT POLE, TRAFFIC LIGHT
RS SN	ROAD SIGN, SIGN
	TREE
	BUILDING
	FENCE LINE
	WALL
	ROAD EDGE
	TOP OF KERB
	CABLES OVERHEAD ESB / TELECOM
	HEDGE LINE
	EDGE OF PATH

NOTES

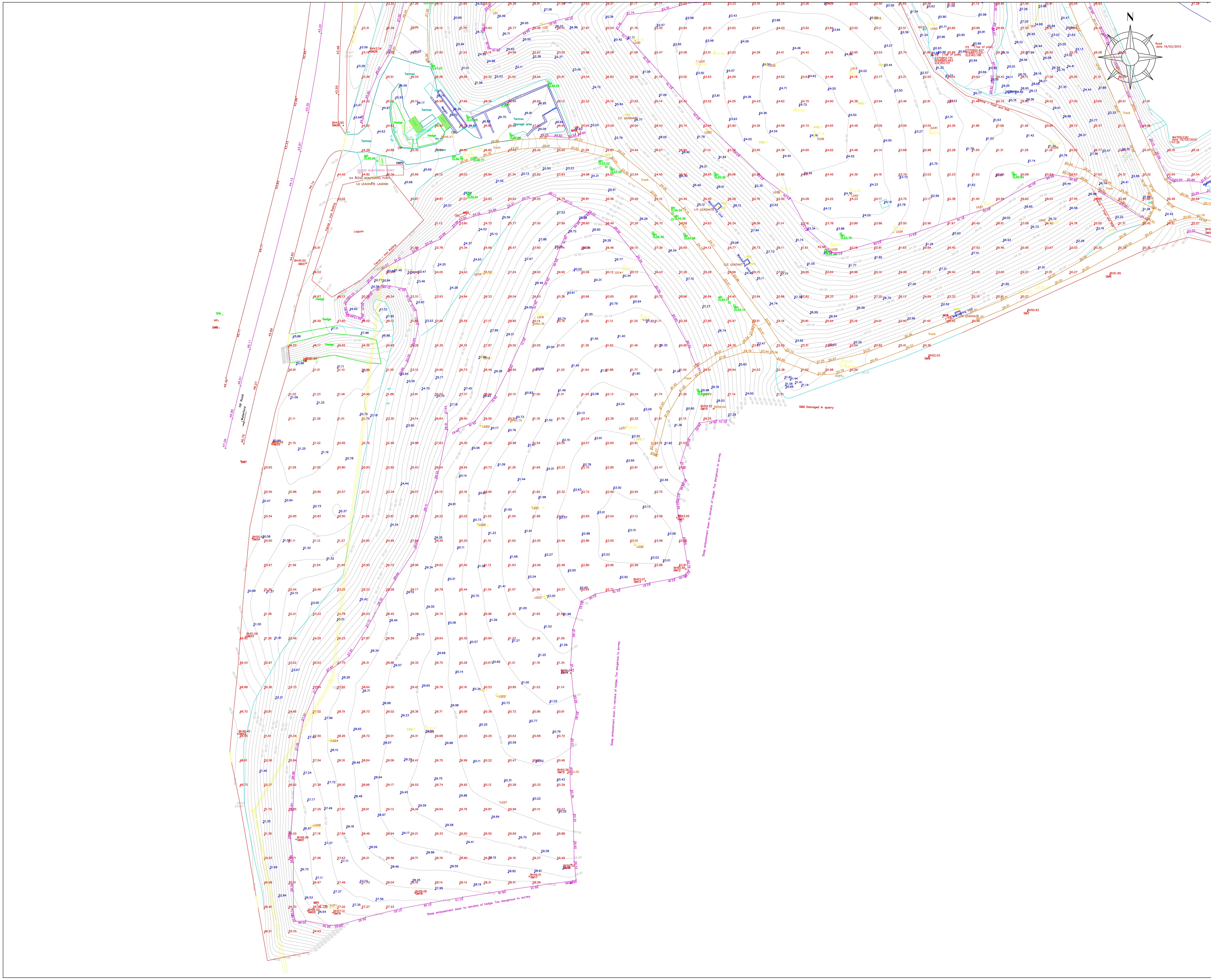
Survey is based on Existing Grid coordinates and Datum as per previous survey.

Rev.	By	Date	Description
–			

FCG Surveys
St John's Lane, Athy, Co Kildare, Ireland
Tel: 059 8632888 – Fax: 059 8632893
email: info@fcgsurveys.ie
web: www.fcgsurveys.ie

Client	Carlow County Council Powerstown Landfill Carlow
Title	Topographical Survey of the site at Powerstown Landfill
Date	19 MARCH 2010
Drawing No.	FCG/3025/500/001
Scale	1:500
Drawn by:	MS
Checked By:	JR

Revision –



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BOL BS	ROAD BOLLARD, BUS STOP
LP TF	LIGHT POLE, TRAFFIC LIGHT
RS SN	ROAD SIGN, SIGN
	TREE

BUILDING

FENCE LINE

WALL

ROAD EDGE

TOP OF KERB

CABLES OVERHEAD ESB TELECOM

HEDGE LINE

EDGE OF PATH

NOTES

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

Rev.	By	Date	Description
-			

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Tel: 059 8632888 - Fax: 059 8632893
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web: www.fcgsurveys.ie

Client	Carlow County Council Powerstown Landfill Carlow
Title	Topographical Survey of the site at Powerstown Landfill
Date	19 MARCH 2010
Drawing No.	FCG/3025/500/002
Scale	1:500
Drawn by:	MS
Checked By:	JR

Revision

-

Symbol	Details/Explanation
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CB	CONTROL BOX (ESB OR OTHER)
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WSV WSC	WATER VALVE, WATER STOP COCK
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NOTES

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Scale	1:500
Drawn by:	MS
Checked By:	JR
Revision	–