ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

ATTACHMENT I.4 BASELINE REPORT

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CARLOW COUNTY COUNCIL
COMHAIRLE CHONTAE CHEATHARLOCHA

FEHILY TIMONEY & COMPANY

ATTACHMENT I.4 BASELINE REPORT

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT

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Abstract: This baseline report forms part of the response to Attachment I.4 for the IE licence review application for Powerstown Landfill and Recycling Facility which is owned and operated by Carlow County Council. It is being prepared in accordance with the requirements of Article 22(2) of Directive 2010/75/EU on industrial emissions (IED). The purpose of the report is to determine the state of contamination of soil and groundwater at the time the report is drawn up in order that a quantified comparison may be made to the state of the site upon the permanent cessation of the IE activity. The review of existing groundwater data and a site investigation to collect soil samples determined no evidence of contamination of groundwater or soil by hazardous substances.

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EXECUTIVE SUMMARY

This baseline report will form the response to Attachment I.4 for the IE licence review application for Powerstown Landfill and Recycling Facility (W0025-03), Carlow. It is being prepared in accordance with the requirements of Article 22(2) of Directive 2010/75/EU on industrial emissions (IED).

The purpose of the report is to determine the extent if any, of soil and groundwater contamination at the time the report is drawn up in order that a quantified comparison may be made to the state of the site upon the permanent cessation of the industrial emissions (IE) activity.

The facility is operated under an Industrial Emission Licence (EPA Licence Ref No W0025-03). It is a non-hazardous landfill and a recycling centre. Section I of the IE licence application form on *Existing Environment and Impact of the Activity* seeks a baseline report, where the activity involves the use, production or release of relevant hazardous substances and having regard to the possibility of soil and groundwater contamination.

The Commission produced guidance on the content of the baseline report in May 2014, *European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions*. This baseline report has been prepared in accordance with the Guidance.

Stages 1-3 were completed and identified the need for a baseline report, based on the risk of leachate migrating from the unlined portion of the landfill. Leachate has the potential to contain substances that are hazardous to soil and groundwater.

Stages 4-5 examine the site history and the environmental setting. Groundwater monitoring indicates potential contamination by leachate downgradient of the landfill. The source of this leachate is from the unlined portion of the site (Phase 1) and a damaged leachate line, identified and remedied in 2014. The indicated pollution is identified by the presence of ammonia and chloride in downgradient wells. A review of the groundwater monitoring dataset shows no evidence of groundwater contamination by hazardous substances.

Stage 6 is the site characterisation. Stage 7, a site investigation was conducted to determine the baseline condition of the soil downgradient of the landfill. The soil analysis shows no evidence of soil contamination by hazardous substances.

Stage 8 is a summary of findings.

1 REQUIREMENT FOR A BASELINE REPORT (STAGES 1 & 2)

This section includes:

- Stage 1: A list of hazardous substances used, produced or released
- Stage 2: A list of 'relevant hazardous substances' used, produced or released

As part of the IE licence review application, a table of raw materials used and generated at the site was compiled. These tables, (Table G.1.(i) and Table G.1.(ii)) provided the starting point for compiling a list of relevant hazardous substances. A master list was compiled and as each stage of the baseline report was carried out, substances were highlighted as hazardous (yellow) or non-hazardous (grey).

1.1 Stage 1: Hazardous Substances

Hazardous substances are defined as being:

> "*Substances or mixtures as defined in Article 3 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures".*

Article 3 of the same Regulations defines:

> "*A substance or a mixture fulfilling the criteria relating to physical hazards, health hazards or environmental hazards, laid down in Parts 2 to 5 of Annex I is hazardous and shall be classified in relation to the respective hazard classes provided for in that Annex".*

With these definitions in mind, a list of all process related raw materials, intermediates, products etc., which are used or generated on site are included in Table 2.1.

Table 1.1: Identification of Hazardous Substances

	Material/Substance	Active Ingredient
1	Diesel	
2	Petrol	
3	Kerosene Heating Oil	
4	Leachate	
5	K-Othrine	
6	Raco Grain	Difenaconum
7	Raco Paste	Difenaconum
8	BioKill	Permethrin
9	Ambush	Cypermethrin
10	Defy	Prosulfocarb
11	Roundup	Glyphosphate
12	Nitric Acid	
13	Sodium Persulphate	

1.2 Stage 2: Relevant Hazardous Substances

Article 3(18) of the IED Directive defines 'relevant hazardous substances' as meaning *"substances or mixtures defined within Article 3 of Regulation (EC) No 1272/2008 on the classification, labelling and packaging of substances and mixtures (CLP Regulation) which, as a result of their hazardousness, mobility, persistence and biodegradability (as well as other characteristics), are capable of contaminating soil or groundwater and are used, produced and/or released by the installation".*

Table A.2 is a list of relevant hazardous substances used at Powerstown Landfill and Recycling Facility. This list was created by eliminating substances which are deemed non-hazardous to soil and groundwater, or highlighting substances which are hazardous to either soil or groundwater using the following steps:

(Please note that the list of hazardous and relevant hazardous substances was prepared electronically. Substances that were 'eliminated' from the investigation, were not deleted, but shaded in grey and noted so that they can be filtered out of the table if required).

1.2.1 Step 1 Identification of hazardous substances to groundwater.

This list was compiled using Table G.1 (ii) from the licence application as it identifies those substances that are hazardous to groundwater as determined by the EPA[1] in accordance with the European Community Environmental Objectives Groundwater Regulations 2010 (S.I. No. 9 of 2010). The EPA classification of hazardous and non-hazardous substances to groundwater is not exhaustive, therefore, a number of the substances on the list are either 'not determined' or are 'N/A' as they do not appear in the EPA document. Therefore only substances which are defined as non-hazardous to groundwater, can be eliminated from the list.

Leachate as a substance is not included in the EPA document referenced above. However, there is the possibility that some hazardous substances may be present in leachate and it cannot be eliminated.

1.2.2 Step 2 Identification of hazardous substances to soil.

In accordance with the European Communities (Classification, Packaging and Labelling of Dangerous Preparations) Regulations 2004 (S.I. No. 62 of 2004 as amended by S.I. No. 13 of 2008), risk phrases are assigned to dangerous substances. Risk phrase, R56 denotes 'Toxic to soil organisms.' The list of substances used at Powerstown was filtered for R56. There are no substances on the list that are toxic to soil organisms.

1.2.3 Step 2 Identification of Physical State, Storage and Conveyance on Site.

All of the substances included on the list are either liquid or solid. The storage locations and methods of handling and transport on site were identified in order to determine significant risks to soil or groundwater.

[1] Classification of Hazardous and Non-Hazardous Substances in Groundwater, EPA 2010

For the purposes of this Baseline report it is only substances that have been identified as being a theoretical pollution risk to groundwater and soils that have been taken forward for consideration in Stage 3. Table 1.2 is a list of relevant hazardous substances. Substances which are hazardous to soil or groundwater are highlighted in yellow, those that are non-hazardous are highlighted in grey.

Table 1.2: Identification of Relevant Hazardous Substances

Ref No. /Code	Material/ Substance	Comment	Hazardous/Non-Hazardous	EC EO (Groundwater) Regulations 2010		R56
				Hazardous	Non-hazardous	Toxic to soil organisms
Stages in Baseline Investigation			Stage 1	Stage 2		Stage 2
1	Diesel	Diesel Fuel Machines	Yes	Yes		No
	Diesel	Diesel Generator	Yes	Yes		No
2	Petrol	Petrol	Yes	Yes		No No No
3	Kerosene Heating Oil	Kerosene Heating Oil	Yes	Yes		No
4	Leachate	Leachate	No	Note 1		
5	K-Othrine	K-Othrine	Yes	Yes		No
6	Raco Grain	Active ingredient Difenaconum	Incomplete data but is not water soluble.	N/A		No
7	Raco Paste	Active ingredient Difenaconum	Incomplete data but is not water soluble.	N/A		No
8	BioKill	Active ingredient, Permethrin	Yes	Yes		No
9	Ambush	Active ingredient, Cypermethrin	Yes	Yes		No
10	Defy	Active Ingredient Prosulfocarb	Yes	Yes		No
11	Roundup	Active Ingredient Glyphosphate	Yes		Yes	No
12	Nitric Acid	Nitric Acid	Yes	ND		No
13	Sodium Persulphate	Sodium Persulphate	No data	ND		No

2 STAGE 3: IDENTIFICATION OF POTENTIAL POLLUTION RISK

Each substance brought forward from Stage 2 was considered in the context of the site to determine whether circumstances exist which may result in the release of the substance in sufficient quantities to represent a pollution risk either as a result of a single emission or as a result of accumulation from multiple emissions.

The relevant hazardous substances identified in Table 1.2 were investigated to identify the possibility for soil or groundwater contamination at the facility. Stage 3 produced Table 2.2 which identified the relevant hazardous substances that represent a potential pollution risk on the site based on the likelihood of releases of such substances occurring. The following steps were taken in accordance with the guidance to determine those substances.

- The storage and conveyance method for each substance was noted.
- Determination of quantity stored or conveyed on site and whether that quantity has pollution potential.
- The presence and integrity of containment mechanisms, nature and condition of site surfacing, location of drains, services or other potential conduits for migration.

Table 2.1 indicates storage locations and transport systems used on site. The generation of leachate in Phase 1, the unlined phase of the landfill is a potential risk to the environment. Leachate is pumped out of Phase 1 into the leachate management system but there is no containment system under this phase of the landfill to prevent migration.

Table 2.2 shows the volumes of materials stored and used on site. The risk associated with the storage and transport of diesel, petrol, kerosene heating oil, K-othrine, biokil, ambush, defy and roundup, combined with the low volumes used and/or stored on site is negligible. They can therefore be eliminated from the list and are greyed out in Table 2.2.

Leachate is generated on site and the volume generated varies from year to year depending on the volume of waste landfilled, the extent of capping and the level of rainfall. The volume shown in Table 2.2 is an average of the volumes of leachate tankered off site in the period 2006-2014. Only a small portion of the leachate generated on site is produced in Phase 1 of the landfill. Based on the dilute and disperse design principle of Phase 1 of the landfill, leachate was identified as a substance which represents a potential pollution risk and which may contain hazardous substances.

Table 2.1: Storage and Transport of Materials/Substances

	Substance	Storage Condition/Location	Segregation System	Transport System Used on Site
1	Diesel (Plant)	Not stored on site. Diesel tanker comes to site to fill plant machinery in refuelling area. Refuelling area drains to leachate collection system.	Yes	Diesel tanker
2	Diesel (Generator)	Small diesel tank/drums stored on site in a bunded area in administration car park.	Yes	Drums not transported. Diesel drums topped up by site staff using jerry cans.
3	Petrol	Stored in portable petrol container inside storage (shipping) container.	Yes	Petrol container transported by vehicle.
4	Kerosene Heating Oil	Bunded oil tank	Yes	Delivered by oil tanker, conveyed by pipe to administration building.

	Substance	Storage Condition / Location	Segregation System	Transport System Used on Site
5	Leachate	Leachate is generated in the landfill cells and is pumped to the Lined Leachate Lagoon & Bunded Leachate Storage Tank for storage. Cells in Phases 2 and 3 of the landfill are lined. Phase 1 is unlined.	Yes Leachate management system in place	HDPE pipe to lagoon and tank, tanker from tank to gate.
6	K-Othrine	These substances are stored on site in very low volumes, in a storage (shipping container). Staff decant substances as required on slab (with drainage to leachate system).	Yes, all substances are stored in the containers in which they are purchased.	Deliveries by vehicle. Transfer around site, on foot or by vehicle as required.
7	Raco Grain			
8	Raco Paste			
9	BioKill			
10	Ambush			
11	Defy			
12	Roundup			
13	Nitric Acid			
14	Sodium Persulphate			

Table 2.2 shows the outcome of Stage 3 of the baseline report.

Table 2.2: Storage and Transport of Materials/Substances

Ref No. /Code	Material/ Substance	Comment	Hazardous /Non-Hazardous	EC EO (Groundwater) Regulations 2010		R56	Amount	Annual	Significant Risk by Volume Used, Storage and Handling	Nature of Use	R - Phrase
				Hazardous	Non-hazardous	Toxic to soil organisms	Stored (tonnes)	Usage (tonnes)			
Stages in Baseline Investigation			Stage 1	Stage 2		Stage 2	Stage 3	Stage 3	Stage 3	Stage 3	
1	Diesel	Diesel Fuel Machines	Yes	Yes		No	0	55	No	Site machinery	R40, R51/53
	Diesel	Diesel Generator	Yes	Yes		No	1	2	No	Site generator	R40, R51/53
2	Petrol	Lawnmower	Yes	Yes		No	0.1	0.5	No	Lawnmower	R11, R12, R19, R22, R26/27/28, R33, R36/38
						No					R45, R46, R48/20, R48/23/24/25, R51/53
						No					R62, R65, R66, R67
3	Kerosene Heating Oil	Kerosene Heating Oil	Yes	Yes		No	1	2	No	Central Heating	R10, R38, R51/53, R65
4	Leachate	Leachate	No	Note 1			710	15,000	Yes	Landfill by-product	
5	K-Othrine	K-Othrine	Yes	Yes		No	0	0.1	No	Insecticide	R23/24/25, R34, R40, R43, R50/53
6	Raco Grain	Active ingredient Difenaconum	Incomplete data but is not water soluble.	N/A		No	0	0.1		Rat Poison	R28, R48/25, R50/53, R83
7	Raco Paste	Active ingredient Difenaconum	Incomplete data but is not water soluble.	N/A		No	0	0.1		Rat Poison	R28, R48/25, R50/53, R83
8	BioKill	Active ingredient, Permethrin	Yes	Yes		No	0.02	0.1	No	Insecticide	R22, R50, R53, R36/38

Ref No. /Code	Material/ Substance	Comment	Hazardous /Non-Hazardous	EC EO (Groundwater) Regulations 2010		R56	Amount	Annual	Significant Risk by Volume Used, Storage and Handling	Nature of Use	R - Phrase
				Hazardous	Non-hazardous	Toxic to soil organisms	Stored	Usage			
							(tonnes)	(tonnes)			
Stages in Baseline Investigation			Stage 1	Stage 2		Stage 2	Stage 3	Stage 3	Stage 3	Stage 3	
9	Ambush	Active ingredient, Cyper-methrin	Yes	Yes		No	0.02	0.1	No	Insecticide	R22, R43, R45, R46, R65
10	Defy	Active ingredient Prosulfocarb	Yes	Yes		No	0.05	0.2	No	Surfactant	R37, R36/38
11	Roundup	Active ingredient Gly-phosphate	Yes		Yes	No	0.02	0.2	No	Herbicide	R36/38, R52/53
12	Nitric Acid	Nitric Acid	Yes	ND		No	0	0.005	No	Reagent	R8, R35
13	Sodium Persulphate	Sodium Persulphate	No data	ND		No	0	0.005	No	Reagent	R22, R36/37/38, R42/43, R8

Leachate has been identified as a relevant hazardous substance at Powerstown for the following reasons:

1. It has the potential to contain substances which are hazardous to groundwater and soil; and
2. It is present on site in Phase 1, the unlined portion of the landfill.

3 STAGES 4 & 5: SITE HISTORY AND ENVIONMENTAL SETTING

3.1 Stage 4: Site History

The landfill has been developed in three phases; Phase 1 is unlined and operated on the principal of dilute and disperse. It was operational from 1975 to 1990. Phase 2 is made up of Cells 1-13. Cells 1-6 are lined with a single HDPE liner and Cells 7-13 are lined with a single HDPE liner and engineered clay. Phase 2 was operational from 1991 to 2006. Phase 3 (cells 15-18) is fully engineered in accordance with the requirements of the Landfill Directive (99/31/EC). It commenced waste acceptance in 2007 and remains active. (There is no Cell 14.)

The facility has been in operation since 1975 and is licensed (W0025-03) to accept 40,000 tonnes per annum of waste. Phases 1 and 2 of the landfill have been permanently capped, Cells 15 and 16 are filled and have an intermediate cap. Cell 17 is filled and has an intermediate cap which was put in place in February 2015. Waste acceptance commenced in Cell 18 in January 2015. Drawing No. LW14-120-02-001 Rev A in Appendix 1 shows the site layout and infrastructure.

The recycling centre is open to the general public and provides for the recovery of glass, paper, cardboard, metal and household hazardous waste amongst others.

Powerstown Landfill and Recycling Facility is located in a rural agricultural setting in the townland of Powerstown approximately 8 km south of Carlow Town and 7 km north of Bagenalstown in County Carlow. The site is defined by a local road (L3045) to the south and west, the M9 motorway to the west & north, Powerstown Stream to the north and agricultural landscape to the east and north. The landfill occupies a total area of approximately 24 ha (including buffer zone) and lies approximately 50-60 mOD. The facility is located close to Junction No. 6 on the M9 Motorway. A location map is included in Appendix 1.

Two quarries exist along the L3045 which runs along the south of Powerstown landfill. One of these quarries abuts the boundary of Phase 1 of the facility. A second quarry is located further east on this road. The wider area includes a number of other quarries to the south and east as well as improved grassland used for grazing and silage making. Hedgerows typically form the field boundaries and consist of linear strips of shrubs with occasional trees.

Topographically, the Powerstown facility lies almost equidistant between Gallows Hill (approximately 300 mOD) 6 km to the west and a peak to the east (195 mOD) in the townland of Graiguralug. The landscape to the south and north is similar to that of the Powerstown facility. The construction of the M9 motorway along with Junction 6 in the immediate vicinity of the site has significantly altered the local landscape.

The greater landscape is characterised by fertile gently undulating pasturelands with a dense hedgerow grid defining field boundaries, copses of mature trees and small rural roads. Forestry plantations are located along Gallows Hill adding to the man-made nature of the landscape.

The surrounding landscape is dotted with farmsteads, individual dwellings and a number of archaeological sites and monuments of interest. The River Barrow is the predominant surface water feature in the landscape meandering in a north south direction to the west of the site. This river is a European designated site. A number of tributaries flow to the river from the areas of high ground to the east and west of the site including Powerstown Stream, to which the Powerstown facility drains to.

Powerstown Landfill is located within 10 km of five designated sites. A full site synopses for these designated sites is provided in Appendix 7.2 of the accompanying EIS to the IE licence review application.

The closest designated site is the River Barrow and River Nore SAC. This SAC is located 300 m from the outlet point of the on-site surface water attenuation pond. The site drains into three waterbody catchments, which in turn drain to the River Barrow and its associated SAC. Powerstown Stream, which is a tributary of the River Barrow, flows west along the northern boundary of the site.

Cloghristick Wood pNHA is 0.31 km to the northwest, which is upstream of any drainage from the site. All other designated sites are located over 5 km from the proposed development site and are upstream of site drainage.

A Natura Impact Statement was also completed to examine potential impacts arising from the proposed development on Natura 2000 sites.

This accompanies the IE licence review application. It determined that the landfill is not resulting in any loss or fragmentation of habitats for which the SAC is designated and that it is not causing significant disturbance to or affecting the population density of any of the species for which the SAC is designated.

3.1.1 Incidents on site – hazardous substances

As Phase 1 of the landfill is unlined, there is the potential for migration of leachate downgradient of the site. Groundwater monitoring downgradient of the landfill indicates that there is some contamination by leachate. This has been the subject of a Tier 3 Groundwater assessment (May 2013). Following submission of the Risk Assessment, CCC carried out pressure testing of leachate lines and one pipeline failed the test. Leachate was permanently diverted from this pipeline. The pipeline was disconnected to prevent any future use of the damaged line. The damaged line is in very close proximity to groundwater wells GW1 and GW2 and lies parallel to Powerstown Stream. Due to this finding, the DQRA report shall be revised. The line was conveying leachate from Phase 2 of the landfill to the leachate lagoon.

3.1.2 Existing Data on Groundwater and Soil

There is a groundwater dataset for the site compiled though licence compliance monitoring. There is no relevant soil monitoring data as it was not previously required.

Groundwater monitoring has been carried out quarterly in accordance with the licence at a number of groundwater wells. There are currently 12 groundwater wells with a full suite of historic data for 8 of those wells. Monitoring of the following parameters is conducted; pH, Conductivity, Dissolved Oxygen, Ammonia, Chloride, Cyanide, Metals, Fluoride, Mercury, Sulphate, Total Phosphorous, Total Organic Nitrogen and Total Organic Chloride. The groundwater samples are screened annually for List I/II substances. Table 3.1 shows the results of monitoring for substances that are hazardous to groundwater. Table 3.2 shows the results of monitoring for volatile organics substances. The laboratory certificates of analysis for the period 2011-2014 are included in Appendix 3.

The laboratory analysis confirms that the groundwater downgradient of the site is not contaminated by hazardous substances. No evidence was found of hazardous substances above the relevant standards.

The groundwater wells are shown on Drawing Number LW14-120-02-003 Rev A in Appendix 1. The location of the groundwater monitoring wells are as follows:

- RCA1 and RCA2 are upgradient of the landfill facility.
- GW3 and GW6 are background wells.
- GW1, GW2, GW7 and GW8 are downgradient of the landfill facility
- New wells BH1, BH2, BH3 and BH4[2] are downgradient of the landfill facility.

[2] There is no monitoring data for BH4 yet.

Table 3.1: Groundwater Monitoring Results (Metals)

Date	Well	Arsenic	Cadmium	Chromium	Mercury
		µg/l	µg/l	µg/l	µg/l
OTVs[1]		7.5	3.75	37.5	0.75
IGVs[2]		10	5	30	1
Naturally occurring range[3]		-	-	0.5-8	-
(Target/ Intervention) Values[4]		7.2/60	0.06/6	1/30	0.01/0.3
July/Aug 08	GW1	<1	<1	<1	<0.5
May-09	GW1	<5	<5	<5	<5
Oct-10	GW1	<5	<5	<5	<0.5
Mar-11	GW1	0.5	<0.5	<0.5	<0.5
Jul-12	GW1	1.2	<0.5	0.9	<0.5
May-13	GW1	<0.5	<0.5	<0.5	<0.5
May-14	GW1	<1.0	0.04	<1.0	<0.50
July/Aug 08	GW2	2.16	<1	<1	<0.5
May-09	GW2	<5	<5	<5	<5
Oct-10	GW2	<5	<5	<5	<0.5
Mar-11	GW2	3.6	0.7	1.1	<0.5
Jul-12	GW2	3.5	0.7	1.3	<0.5
May-13	GW2	1.9	<0.5	<0.5	<0.5
May-14	GW2	<1.0	0.05	<1.0	<0.50
July/Aug 08	GW3	NR	NR	NR	NR
May-09	GW3	NR	NR	NR	NR
Oct-10	GW3	NR	NR	NR	NR
Mar-11	GW3	<0.5	<0.5	<0.5	<0.5
Jul-12	GW3	1	<0.5	1.1	<0.5
May-13	GW3	<0.5	<0.5	<0.5	<0.5
May-14	GW3	<1	<0.02	<1	<0.5
Oct-10	GW6	<5	<5	<5	<0.5
Mar-11	GW6	<0.5	<0.5	1.6	<0.5
Jul-12	GW6	0.8	<0.5	1	<0.5
May-13	GW6	<0.5	<0.5	<0.5	<0.5
May-14	GW6	<1	0.02	<1	<0.5
Oct-10	GW7	<5	<5	<5	<0.5
Mar-11	GW7	0.7	<0.5	0.7	<0.5
Jul-12	GW7	1	<0.5	1.3	<0.5
May-13	GW7	<0.5	<0.5	<0.5	<0.5
May-14	GW7	<1	<0.02	<1	<0.5
July/Aug 08	GW8	<1	<1	<1	<0.5
May-09	GW8	<5	<5	<5	<5

Date	Well	Arsenic	Cadmium	Chromium	Mercury
		µg/l	µg/l	µg/l	µg/l
OTVs[1]		7.5	3.75	37.5	0.75
IGVs[2]		10	5	30	1
Naturally occurring range[3]		-	-	0.5-8	-
(Target/ Intervention) Values[4]		7.2/60	0.06/6	1/30	0.01/0.3
Oct-10	GW8	<5	<5	<5	<0.5
Mar-11	GW8	<0.5	<0.5	<0.5	<0.5
Jul-12	GW8	0.9	<0.5	1.1	<0.5
May-13	GW8	<0.5	<0.5	<0.5	<0.5
May-14	GW8	<1	0.02	<1	<0.5
July/Aug 08	RCA1	<1	<1	<1	<0.5
May-09	RCA1	<5	<5	<5	<5
Oct-10	RCA1	<5	<5	<5	<0.5
Mar-11	RCA1	0.8	<0.5	<0.5	<0.5
Jul-12	RCA1	1.8	3.4	11	<0.5
May-13	RCA1	1.4	<0.5	1	<0.5
May-14	RCA1	<1.0	0.02	<1.0	<0.5
July/Aug 08	RCA2	<1	<1	<1	<0.5
May-09	RCA2	<5	<5	<5	<5
Oct-10	RCA2	<5	<5	<5	<0.5
Mar-11	RCA2	1	<0.5	<0.5	<0.5
Jul-12	RCA2	3.7	0.8	5.8	<0.5
May-13	RCA2	0.9	<0.5	<0.5	<0.5
May-14	RCA2	-	<0.03	<0.05	<0.01
Jan-12	BH1	<1	<0.08	<1	<0.5
Feb-12	BH1	<1	<0.08	<1	<0.5
Dec-13	BH1	0.32	<0.1	8.2	<0.01
Jan-14	BH1	0.27	<0.1	3.71	<0.01
Jan-12	BH2	<1	<0.08	<1	<0.5
Feb-12	BH2	<1	<0.08	<1	<0.5
Dec-13	BH2	0.36	<1	7.13	<0.01
Jan-14	BH2	0.38	<1	3.59	<0.01
Jan-12	BH3	<1	<0.08	1.1	<0.01
Feb-12	BH3	1.2	<0.08	<1	<0.5
Dec-13	BH3	0.95	<0.1	2.55	<0.01
Jan-14	BH3	1.23	<0.1	3.37	<0.05

1. OGVs, overall threshold values - European Communities, Environmental Objectives (Groundwater) Regulations, S.I No. 9 of 2010.
2. IGVs, Interim Guideline Values – Towards Setting Guideline Values for the Protection of Groundwater in Ireland, EPA 2003
3. Naturally occurring levels of selected synthetic substances (Table 3.3 of IGV report, EPA 203)

4. Target values and intervention values for groundwater, Soil Remediation Circular 2009 (Dutch List 2009)

NR not required

NM not measured

<LOD less than the laboratory limit of detection

above S.I No. 9 of 2010

above naturally occurring limit in Ireland

above Dutch list target value

above Dutch list intervention value

Table 3.2: Groundwater Monitoring Results (VOCs)

Date	Well	VOC's	1,2,4-trimethylbenzene	Chloro-form	Dichloro methane	Ethylbenz-ene	m,p Xylene	Toluene
		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
OTVs		-	-	-	-	-	-	-
IGVs			-	12	10	10	10	10
Naturally occurring range*				<0.1-2.037	-	<0.02-0.163	<0.02-0.158	<0.1-0.38
Target/ Intervention Values			-	6/400	0.01/ 1,000	4/150	7/1,000	0.2/70
July/Aug 08	GW1	NR						
May-09	GW1	<LOD						
Oct-10	GW1	all <LOD except					0.8	1.8
Mar-11	GW1	all <LOD except						0.9
Jul-12	GW1	<LOD						
May-13	GW1	all <LOD except						0.8
May-14	GW1	all <LOD except						0.6
July/Aug 08	GW2	NR						
May-09	GW2	NR						
Oct-10	GW2	<LOD						
Mar-11	GW2	<LOD						
Jul-12	GW2	all <LOD except			0.6			
May-13	GW2	<LOD						
May-14	GW2	<LOD						
July/Aug 08	GW3	NR						
May-09	GW3	NR						
Oct-10	GW3	NR						
Mar-11	GW3	all <LOD except		0.8				
Jul-12	GW3	<LOD						
May-13	GW3	<LOD						
May-14	GW3	<LOD						
Oct-10	GW6	<LOD						
Mar-11	GW6	<LOD						
Jul-12	GW6	<LOD						
May-13	GW6	all <LOD except						0.7

Date	Well	VOC's	1,2,4-trimethylbenzene	Chloro-form	Dichloro methane	Ethylbenz-ene	m,p Xylene	Toluene
		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
OTVs		-	-	-	-	-	-	-
IGVs			-	12	10	10	10	10
Naturally occurring range*				<0.1-2.037	-	<0.02-0.163	<0.02-0.158	<0.1-0.38
Target/ Intervention Values			-	6/400	0.01/ 1,000	4/150	7/1,000	0.2/70
May-14	GW6	<LOD						
Oct-10	GW7	<LOD						
Mar-11	GW7	<LOD						
Jul-12	GW7	<LOD						
May-13	GW7	all <LOD except				0.9	0.6	1.2
May-14	GW7	all <LOD except						0.6
July/Aug 08	GW8	NR						
May-09	GW8	<LOD						
Oct-10	GW8	<LOD						
Mar-11	GW8	<LOD						
Jul-12	GW8	<LOD						
May-13	GW8	all <LOD except				0.7		1
May-14	GW8	all <LOD except						0.6
July/Aug 08	RCA1	NR						
May-09	RCA1	NR						
Oct-10	RCA1	<LOD						
Mar-11	RCA1	all <LOD except		0.5				
Jul-12	RCA1	all <LOD except			1.5			
May-13	RCA1	all <LOD except		0.5				
May-14	RCA1	<LOD						
July/Aug 08	RCA2	NR						
May-09	RCA2	<LOD						
Oct-10	RCA2	all <LOD except						0.6
Mar-11	RCA2	<LOD						
Jul-12	RCA2	all <LOD except	0.5					0.6
May-13	RCA2	all <LOD except		0.5				0.6
May-14	RCA2	<LOD						

1. OGVs, overall threshold values - European Communities, Environmental Objectives (Groundwater) Regulations, S.I No. 9 of 2010 as amended by S.I. No. 327 of 2012.
2. IGVs, Interim Guideline Values – Towards Setting Guideline Values for the Protection of Groundwater in Ireland, EPA 2003
3. Naturally occurring levels of selected synthetic substances (Table 3.3 of IGV report, EPA 203)
4. Target values and intervention values for groundwater, Soil Remediation Circular 2009 (Dutch List 2009)

NR not required

NM not measured

<LOD less than the laboratory limit of detection

above S.I No. 9 of 2010

above naturally occurring limit in Ireland
above Dutch list target value
above Dutch list intervention value

3.1.3 Discussion of Results

Metals

Monitoring is carried out for a range of metals and other parameters on a quarterly and annual basis. The results shown in Table 3.1 are those for substances which are listed as hazardous to groundwater[3].

None of the results are above the OTVs, limits set by the European Communities Environmental Objectives (Groundwater) Regulations 2009. In the absence of OTVs for specific parameters, the results were compared to IGVs as set by the EPA, 2003[4]. There were no exceedances of the IGVs. The EPA, 2003 report included a range of sampling results for synthetic substances which are naturally occurring in Irish soils. These values are included for comparison. Chromium levels above these ranges were detected in groundwater in two wells; in RCA1 in 2012 (upgradient) and in BH1 in 2013 (downgradient).

Results were compared to the target and intervention levels in the Dutch List 2009[5], none of the results were above the intervention levels. Chromium and Cadmium were above the target levels at upgradient wells, background wells and downgradient wells. It is likely therefore that Cadmium and Chromium are naturally occurring in this area.

Volatile Organic Substances (VOCs)

Analysis of groundwater samples for List I/II Organics is carried out on an annual basis in accordance with the licence. These substances are hazardous to groundwater.

Table 3.2 is a summary of the groundwater database for these substances. Results are compared to IGVs, naturally occurring levels and the target and intervention levels (Dutch List 2009). There are no OGVs for these substances.

None of the results in the period 2010 to 2014 were above the IGVs or the intervention values from the Dutch list. The majority of samples in the period 2010-2014 were not recorded above the laboratory level of detection. Toluene, m,p-xylene and ethylbenzene are substances that are both naturally occurring in groundwater and are synthetic substances. They were recorded in groundwater wells on site at levels above the range which is naturally occurring in Ireland, as measured by the EPA[4]. Toluene was recorded in RCA2 (upgradient) in 2010, 2011 and 2013, and it was recorded in 3 no. downgradient wells in 2010-2014. Toluene levels recorded did not exceed the target value (Dutch List).

Dichloromethane was recorded once in 2012 at both RCA1 (1.5 ug/l) (upgradient) and GW2 (0.6 ug/l) (downgradient) at levels above the target level (0.01 ug/l) from the Dutch List.

m,p-Xylene and ethylbenzene were recorded in 3 no. downgradient wells above levels that are naturally occurring in Irish groundwaters.

3.1.4 Detailed Quantitative Risk Assessment (DQRA)

CCC commissioned a Detailed Quantitative Risk Assessment (DQRA) for Powerstown Landfill and Civic Amenity Site in 2014. The report was submitted to the EPA on 29 May 2014. It was prepared on CCC's behalf by Malone O Regan. It is included in Attachment I.4 of the IE licence review application. The focus of the DQRA was the groundwater contamination beneath the site and to evaluate the risks if any to environmental receptors and to derive groundwater compliance monitoring points and values.

[3] Classification of Hazardous and Non-Hazardous Substances in Groundwater, EPA, 2010
[4] Towards Setting Guideline Values for the Protection of Groundwater in Ireland – Interim Report
[5] Soil Remediation Circular, 2009-The Dutch List (2009)

The DQRA included a desktop study including a review of the Tier 1 GQRA, a Tier 2 assessment in accordance with the *Guidance Procedures and Training on the Licensing of Discharges to Surface Waters and to Sewer for Local Authorities* (DoEHLG, 2010) and a Tier 3 assessment that included a review and refinement of the Conceptual Site Model. The DQRA was completed taking cognisance of the *Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites* (EPA, 2013) and the EPA *Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites* (EPA, 2007).

The final task was screening of the results of the Tier 3 in accordance with the EPA document *Guidance on the Authorisation of Discharges to Groundwater* (EPA, 2014).Groundwater and surface water sampling was carried out at 9 no. groundwater wells on two occasions and at 7 no. surface water locations on three occasions.

Groundwater results were compared to OTVs, European Communities Environmental Objectives (Surface water) Regulations, 2009 (S.I. No. 272) as amended by S.I. No. 327 of 2012 (EQS), the IGVs (EPA 2003), and site specific trigger levels set of each monitoring well in 2005 (GTL).

Surface water monitoring results were compared to EQS and the Surface Water Trigger Levels set for the site in 2005 (SWTLs).

The most significant finding of the monitoring is that ammonia levels are elevated above the OTV at a number of downgradient groundwater locations. Groundwater within the gravel aquifer beneath and immediately downgradient of the site has been impacted with elevated ammonia. Surface water monitoring results did not indicate any parameters above the EQS or SWTL but this has not historically been the case and the authors assume that there remains a potential linkage from groundwater to the Powerstown stream.

The potential for migration of impacted groundwater offsite was modelled. It examine the likelihood of migration to the downgradient gravel and bedrock aquifer and to the River Barrow and Powerstown Stream. Groundwater site specific target values (SSTVs) were set for site specific compliance locations to determine if groundwater downgradient of the boundary is a risk of not meeting the relevant OTVs. These SSTVs were derived to be protective of surface water whereby an exceedance of an SSTV indicates a risk to the receiving waters of the River Barrow and Powerstown Stream. The SSTVs for the gravel aquifer are set for 5 groundwater wells and the SSTVs for the River Barrow are set at 5 groundwater wells and at 2 wells for the Powerstown Stream. The report concluded that:

- *The modelled ammonia and chloride plume lengths do not extend to the River Barrow, impacted groundwater migrating from the site is considered unlikely to present a risk to the River Barrow.*
- *It is considered that there is no unacceptable risk to the gravel aquifer downgradient of the site.*

Following completion of this report and submission to the EPA, leachate pipelines along the northern boundary of the site were pressure tested and one pipeline failed that test. Leachate was permanently diverted from this pipeline. The pipeline was disconnected to prevent any future use of the damaged line. The damaged line is in very close proximity to groundwater wells GW1 and GW2 and lies parallel to Powerstown Stream. Due to this finding, the DQRA report shall be revised to incorporate this new information. CCC is in the process of updating this report.

3.2 Stage 5: Environmental Setting

3.2.1 Soils

The soils association of the area is described from the *General Soil Map of Ireland*. There is one soil association at the site. This soil is classified as a grey-brown podzolic soil and an association of the Athy Complex. The parent material of this soil consists of calcareous, fluvio-glacial coarse gravels and sands of Weichsel Age, composed mainly of limestone, with a small proportion of sandstone, schist, shale and occasional conglomerate. Alluvial deposits also occur along Powerstown Stream and the River Barrow.

Grey brown podzolics comprise 70% of the Athy Complex association and brown earths occupy 20% of the association. Both have a wide use-range, from farm, fruit and vegetable crops to pasture land. Due to their coarse texture and very friable consistency, they are easily tilled.

The quaternary geology of the landfill area comprises unconsolidated deposits, most of which were laid down during and immediately following the last glaciation. During the various investigations carried out over the years at the Powerstown Facility, 5 m to 15 m of sands and gravel overly the thin layer of lodgement till over the area of the landfill.

3.2.2 Bedrock

The GSI database for the area shows that the site is underlain by the Milford and Ballysteen Formations. These are Dinantian dolomitised limestones. Both formations dip to the east at approximately 10º, the Milford Formation resting on top of the Ballysteen Formation.

The lower part of the Ballysteen Formation consists of well-bedded, relatively clean calcarenitic limestones, which pass gradationally up into finer-grained and more muddy limestones. Dolomitisation has taken place.

The Milford Formation is classified by the GSI from a sequence encountered in a 275 m-deep borehole drilled at Milford (1.5 km north-northwest of Powerstown landfill).

Descriptions from this borehole indicate that the bedrock is a uniform, shale-free poorly bedded, medium-grey dolomite with scattered crinoid debris and that the boundary with the underlying Ballysteen Formation is gradational.

3.2.3 Hydrogeology & Groundwater Use and Flow

The major aquifer in the Lower Carboniferous strata of the Barrow Lowlands is dolomitised limestone and it is classified as a Regionally Important Aquifer (Rkd) by the GSI. Groundwater enters Powerstown landfill via fissure flow in the bedrock and through the permeable fluvio-glacial gravel overburden. Flow direction is generally to the west towards the River Barrow, but with a northern component discharging to the Powerstown Stream.

The horizontal gradients of the water tables underlying the site are as follows:

- For the three bedrock boreholes (RCA1, RCB1 and RCC1), the horizontal gradient is approximately 0.015
- For the two overburden wells (RCA2 and RCB2), the gradient is approximately 0.25.

The overburden encountered at the site consisted of sand and gravel with cobbles. Thickness encountered in boreholes varied from 3.6 to 15 m. The underlying bedrock consisted of dolomitised limestone. A layer of discontinuous boulder clay overlying the bedrock confines the bedrock aquifer locally to the south of Phase 3.

An aquifer classification map is included in Chapter 13 of the accompanying EIS. A groundwater flow map is included in Appendix 1.

It has been confirmed by CCC in the 2013 AER that no groundwater abstraction occurs on site, while no groundwater supply wells were identified within 500 m of the site or downgradient of the site (GSI, 2014).

The GSI Source Protection Area data indicates that there are no source protection zones in the immediate vicinity of the site. The closest is over 8 km south west of the site.[6].

3.2.4 Groundwater Vulnerability

Groundwater vulnerability, as defined by the GSI, is the term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. The factors used in assessing groundwater vulnerability include subsoil type and thickness, and recharge type. The GSI procedure whereby groundwater protection is assessed is outlined in the EPA-GSI publication 'Groundwater Protection Schemes' (DELG/EPA/GSI, 1999). The procedure proposes a matrix, which relates vulnerability, source and resource such that a particular site is given a Response (R) to specific activities. However, in the construction of Phase 3 of the landfill, the sand/gravel was removed to the water table, therefore increasing the vulnerability of the site to 'Extreme.'

Extensive consultation took place with the EPA during the statutory consent process for Phase 3 and it was agreed with the Agency that a double lining system be installed in Phase 3 of Powerstown landfill. This lining system provides protection to the aquifer five times above that required by the Landfill Directive for non-hazardous landfills.

3.2.5 Hydrology

The site drains into three waterbody catchments, which in turn drain to the River Barrow, as indicated in the Water Framework Directive mapping on their website www.wfdireland.ie. The River Barrow is in Hydrometric Area HA14, which is situated in the South Eastern River Basin District (SERBD). These waterbodies are identified as follows:

- SE_BarrowMain_Clonmelsh_IE_SE_14_1391
- SE_BarrowMain_Barrow_2_IE_SE_14_196
- SE_BarrowMain_Garryhundon_IE_SE_14_1102

The Clonmelsh waterbody (Powerstown Stream) has a catchment area of 12.42 km^2 and flows in a south westerly direction along the northern boundary of the site, joining the River Barrow approximately 500 m to the west of the site. The River Barrow flows southwards through Leighlinbridge, Bagnelstown and continuing south to New Ross, where it is joined by the River Nore. It then joins the River Suir at Cheekpoint, flowing out into Waterford Harbour.

Site Drainage

The site drainage is discussed in detail in the accompanying EIS and Attachments (D.1, D.3.4, F) to the IE licence review application. There is a surface water management system which is designed to minimise the possibility of accidental spillage to surface water. Clean water is pumped to the surface water drainage system. Dirty water and leachate is diverted by pumping to the on-site leachate holding tank, from where it is transported by tanker to a municipal wastewater treatment plant. The closed and capped cells of Phases 1 and 2 are equipped with leachate pumps that discharge to a covered lagoon from which leachate is extracted on a daily basis. Leachate from Phase 3 is pumped to the leachate holding tank.

Other drained areas on the operational site include the civic amenity, reception areas and roads and hardstands. All dirty areas are drained to the leachate holding tank. These include the lower level of the civic amenity, green waste holding area, waste inspection/quarantine area and domestic waste disposal area. All other surfaced areas drain to the surface water drainage system.

The surface water drainage system drains to the surface water attenuation pond which has an outlet control device, which outfalls to the Powerstown stream at a rate of 15.9 L/sec. This surface water attenuation pond is located at the north eastern corner of the site.

[6] Environmental Risk Assessment, Powerstown Landfill and Civic Amenity Site, CCC, May 2014, Malone O' Regan.

It also acts as a settling pond to remove any suspended solids. There is a monitoring probe linked to an automatic valve on the outlet pipe from the pond. If the monitoring probe detects contaminants in the water above the allowable emission limits in the waste licence, the valve automatically closes.

The pond is also designed to act as an oil interceptor. The floating arm control device consists of a float with the outlet pipe opening hung approximately 200 mm below. Thus water drains down not from the surface but from a plane approximately 200 mm below the surface. Any petrochemicals entering the pond will float on the surface; consequently they cannot escape via the outlet discharge pipe. The outlet pipe is designed with a backfall to ensure that, even during extended dry periods, surface contaminants cannot escape through the outlet pipe. The design also includes for a floating oil boom at the inlet to the pond, which gives added protection by containing petrochemicals within a restricted area. Any surface contaminants can then be removed periodically as required.

3.2.6 Ecologically Protected Areas

The facility is located within 10 km of five designated sites, three of these being proposed Natural Heritage Areas, one Natural Heritage Area and one Special Area of Conservation (SAC). The River Barrow and River Nore SAC, site code 002162 is located 300 m to the west of Powerstown Stream.

3.2.7 Surrounding Land use and Interdependencies

The primary land use in the area up-gradient of the site is agriculture. The main sources of agricultural pollution are farmyard percolating to ground in surface runoff. Land spreading of agricultural waste, if not managed correctly, can also lead to contamination.

There are also quarries upgradient and adjacent to the site. These quarries are not operational at present, but may re-open.

3.2.8 Pathways

There are a number of potential connections on site between the above ground activities and the subsurface environment. The risk of these acting as potential pathways is mitigated by site design, site management and operational procedures. The key mitigation measures are the Liner System and the Capping System which are discussed in detail in the EIS and in the Attachments to the IE licence review application (D.1, D.3.3 and D.3.6).

Phase 1 of the landfill is unlined and is therefore there is a pathway for leachate migration into the groundwater beneath and downgradient of the site. Phase 2 and 3 of the landfill are lined and potential pathways are thus mitigated by the liner in tandem with site management and operational procedures. Ancillary infrastructure such as the surface water and leachate lagoon are fully lined. The leachate holding tank is a glass lined tank designed to BS7793 in a concrete bund. All of the facilities have been developed on a hardstanding area with integrated drainage systems and bunding where required. The drainage system also incorporates roads, car parks and pathways. Surface water collected on site via the drainage network is managed in a surface water collection system with an attenuation pond. There is continuous monitoring of the pond and automated shut-down systems in the event of trigger level breaches.

4 STAGE 6: SITE CHARACTERISATION

The results of Stages 3-5 indicate that leachate has or has had the potential to migrate off site into the aquifer beneath the site. A Detailed Quantitative Risk Assessment (DQRA) was carried out in 2014. The leachate migration off site was modelled using the P20 model (The UK Environment Agency's Remedial Target Worksheet) It determined that there is no unacceptable risk to the gravel aquifer downgradient of the landfill.

Landfilling commenced in Phase 1 in 1975 and finished in 1990. Phase 1 (or the 'old landfill') is located on the south western portion of the site. Phase 1 is an unlined landfill which was developed in a spent sand and gravel quarry and operated as a 'dilute and disperse' type landfill. It has an area of approximately 3.7 hectares (9.2 acres) and contains an estimated 130,000 tonnes of municipal solid waste (MSW).

In 2006 the Phase 1 landfill was permanently capped in accordance with the requirements of the waste licence. The specification of the cap used in Phase 1 was as follows:

- 150 mm of topsoil on
- 850 mm of subsoil on
- Drainage geocomposite on
- 1mm fully welded LLDPE geomembrane on
- Geosynthetic clay liner (GCL) on
- Gas collection geocomposite

Capping prevents the ingress of rainwater which is a major contributor to the generation of leachate. As a dilute and disperse landfill, leachate from Phase 1 would have migrated off-site since landfilling operations commenced in 1975 and the volume would be decreasing annually since the area was capped in 2006, nine years ago.

5 STAGE 7: SITE INVESTIGATION

5.1 Soil Sampling

A site investigation was carried out on site to characterise the baseline condition of soil downgradient of the facility. There is a large groundwater dataset for the site that is representative of groundwater flow and activities, but there are no soil sampling records. Carlow County Council retained Fehily Timoney and Company to carry out the subsoil investigation. It was completed in February 2015 and the laboratory report of soil sample analysis is included as Appendix 3. The drilling logs are included as Appendix 4. A targeted sampling regime was used. Three boring locations were selected as per Table 4.1. Drawing LW1412002_003 Rev A in Appendix 1 shows the existing monitoring locations and the locations of the three soil sampling locations, SS1A, SS2A and SS3A.

The soil borings were sited in locations where historical or recent activities have had the potential to impact on soil quality from leachate. The boring locations were chosen based on the groundwater gradient which is believed to be in a westerly direction but with a portion of the flow directed north toward the Powerstown Stream.

Table 5.1: Soil Boring Locations

Boring Location I.D.	Soil Sampling I.D	Site Location	Significance
BH 6	SS1A & SS1B	Off-site near groundwater monitoring well BH3	120 m west of the site boundary
BH 8	SS2A	20 m north of northern boundary; off-site near groundwater monitoring well BH4	As close to the northern boundary of the site as was possible with the drilling rig – just north of Powerstown Stream and groundwater wells GW1 and GW2
BH 7	SS3A & SS3B	Off-site near groundwater monitoring well BH2	64 m west of the site boundary

Rotary drilling was chosen over shell and auger due to the coarse gravel nature of soils in the area. J.S Drilling Ltd. were appointed to bore at 3 no. locations and to retrieve two soil samples from each location. The borings were drilled using a Beretta T44 top drive rotary rig with a percussive head for taking samples. This rig utilises a hydraulic hammer to drive 1m cylinders into the ground and retrieve 1m length cores of soil. Each core is retrieved in a dedicated plastic liner, which minimises the risk of cross contamination vertically within the hole and between borings. The boreholes were drilled to bedrock a maximum of 9.5 m or bedrock. A sample was taken at 3-4 m depth at each location and named, SS1A, SS2A and SS3A. A second sample was taken at a deeper level from 2 of the locations and named SS1B and SS3B. We were unable to retrieve a second sample from SS2A because the soil was too gravelly and stony to remain in the sampler.

The soil boring was supervised by the Consultant. No visual or olfactory evidence of contamination was noted in the fill or underlying subsoils. The shallow samples were sent to the laboratory for analysis and the deeper samples were held in the event of contamination detected in the first sample. Samples were couriered to an independent UKAS accredited laboratory in the UK, Alcontrol Laboratories.

The soils samples were analysed for:

- Metals
- PAHs
- sVOCs
- VOCs

Results were compared to:

- UK Environment Agency Soil Guideline Values (SGVs)
- The Dutch List 2009

5.1.1 Results of Soil Analysis

The laboratory analysis confirms that the subsoils are uncontaminated. No evidence was found of relevant hazardous substances VOCs.

The results are tabulated in Table 5.2.

Table 5.2: Results of Soil Sampling

Sample Description		SS1A	SS2A	SS3A	SGV[1] (lowest value)	SGV[2] (highest value)	Soil Intervention Values (Dutch List 2009)[3]
Metals - (Solids)							
Arsenic	mg/kg	10.3	2.79	4.75	32	640	76
Cadmium	mg/kg	1.37	0.221	0.594	1.8	230	13
Chromium	mg/kg	15.1	8.68	6.21			
Copper	mg/kg	36.1	5.25	10.5			190
Lead	mg/kg	19.9	6.69	5.58			530
Mercury	mg/kg	<0.14	<0.14	<0.14	1	26	
Nickel	mg/kg	36.3	7.49	11	130	130	100
Selenium	mg/kg	<1	<1	<1	120	120	100‡
Zinc	mg/kg	78.2	30.4	30.9			720
Mineral Oil / Oils & Greases							
Mineral oil >C10-C40	mg/kg	17.1	43.8	13.5			5,000

Sample Description		SS1A	SS2A	SS3A	SGV[1] (lowest value)	SGV[2] (highest value)	Soil Intervention Values (Dutch List 2009)[3]
Polyaromatic Hydrocarbons (PAHs)							
Acenaphthene	µg/kg	<8	<8	<8			
Acenaphthylene	µg/kg	<12	<12	<12			
Anthracene	µg/kg	<16	<16	<16			
Benz(a)anthracene	µg/kg	<14	<14	<14			
Benzo(a)pyrene	µg/kg	<15	<15	<15			
Benzo(b)fluoranthene	µg/kg	<15	<15	<15			
Benzo(g,h,i)perylene	µg/kg	<24	<24	<24			
Benzo(k)fluoranthene	µg/kg	<14	<14	<14			

Sample Description		SS1A	SS2A	SS3A	SGV[1] (lowest value)	SGV[2] (highest value)	Soil Intervention Values (Dutch List 2009)[3]
Chrysene	µg/kg	<10	<10	<10			
Dibenzo(a,h)anthracene	µg/kg	<23	<23	<23			
Fluoranthene	µg/kg	<17	<17	<17			
Fluorene	µg/kg	<10	<10	<10			
Indeno(1,2,3-cd)pyrene	µg/kg	<18	<18	<18			
Naphthalene	µg/kg	<9	<9	<9			
PAH, Total Detected USEPA 16	µg/kg	<118	<118	<118			40,000*
Phenanthrene	µg/kg	<15	<15	<15			
Pyrene	µg/kg	<15	<15	<15			

Sample Description		SS1A	SS2A	SS3A	SGV[1] (lowest value)	SGV2 (highest value)	Soil Intervention Values (Dutch List 2009)[3]
Semi-Volatile Organic Compounds (SVOCs)							
1,2,4-Trichlorobenzene	µg/kg	<100	<100	<100			
1,2-Dichlorobenzene	µg/kg	<100	<100	<100			
1,3-Dichlorobenzene	µg/kg	<100	<100	<100			
1,4-Dichlorobenzene	µg/kg	<100	<100	<100			
2,4,5-Trichlorophenol	µg/kg	<100	<100	<100			
2,4,6-Trichlorophenol	µg/kg	<100	<100	<100			
2,4-Dichlorophenol	µg/kg	<100	<100	<100			
2,4-Dimethylphenol	µg/kg	<100	<100	<100			
2,4-Dinitrotoluene	µg/kg	<100	<100	<100			
2,6-Dinitrotoluene	µg/kg	<100	<100	<100			
2-Chloronaphthalene	µg/kg	<100	<100	<100			
2-Chlorophenol	µg/kg	<100	<100	<100			
2-Methylnaphthalene	µg/kg	<100	<100	<100			
2-Methylphenol	µg/kg	<100	<100	<100			
2-Nitroaniline	µg/kg	<100	<100	<100			
2-Nitrophenol	µg/kg	<100	<100	<100			
3-Nitroaniline	µg/kg	<100	<100	<100			
4-Bromophenylphenylether	µg/kg	<100	<100	<100			
4-Chloro-3-methylphenol	µg/kg	<100	<100	<100			
4-Chloroaniline	µg/kg	<100	<100	<100			
4-Chlorophenylphenylether	µg/kg	<100	<100	<100			
4-Methylphenol	µg/kg	<100	<100	<100			
4-Nitroaniline	µg/kg	<100	<100	<100			
4-Nitrophenol	µg/kg	<100	<100	<100			

Sample Description		SS1A	SS2A	SS3A	SGV[1] (lowest value)	SGV2 (highest value)	Soil Intervention Values (Dutch List 2009)[3]
Acenaphthene	µg/kg	<100	<100	<100			
Acenaphthylene	µg/kg	<100	<100	<100			
Anthracene	µg/kg	<100	<100	<100			
Azobenzene	µg/kg	<100	<100	<100			
Benzo(a)anthracene	µg/kg	<100	<100	<100			
Benzo(a)pyrene	µg/kg	<100	<100	<100			
Benzo(b)fluoranthene	µg/kg	<100	<100	<100			
Benzo(g,h,i)perylene	µg/kg	<100	<100	<100			
Benzo(k)fluoranthene	µg/kg	<100	<100	<100			
bis(2-Chloroethoxy)methane	µg/kg	<100	<100	<100			
bis(2-Chloroethyl)ether	µg/kg	<100	<100	<100			
bis(2-Ethylhexyl) phthalate	µg/kg	<100	<100	<100			
Butylbenzyl phthalate	µg/kg	<100	<100	<100			
Carbazole	µg/kg	<100	<100	<100			

Sample Description		SS1A	SS2A	SS3A	SGV[1] (lowest value)	SGV2 (highest value)	Soil Intervention Values (Dutch List 2009)[3]
Chrysene	µg/kg	<100	<100	<100			
Dibenzo(a,h)anthracene	µg/kg	<100	<100	<100			
Dibenzofuran	µg/kg	<100	<100	<100			
Diethyl phthalate	µg/kg	<100	<100	<100			
Dimethyl phthalate	µg/kg	<100	<100	<100			
Fluoranthene	µg/kg	<100	<100	<100			
Fluorene	µg/kg	<100	<100	<100			
Hexachlorobenzene	µg/kg	<100	<100	<100			
Hexachlorobutadiene	µg/kg	<100	<100	<100			
Hexachlorocyclopentadiene	µg/kg	<100	<100	<100			
Hexachloroethane	µg/kg	<100	<100	<100			
Indeno(1,2,3-cd)pyrene	µg/kg	<100	<100	<100			
Isophorone	µg/kg	<100	<100	<100			
Naphthalene	µg/kg	<100	<100	<100			
n-Dibutyl phthalate	µg/kg	<100	<100	<100			
n-Dioctyl phthalate	µg/kg	<100	<100	<100			
Nitrobenzene	µg/kg	<100	<100	<100			
n-Nitroso-n-dipropylamine	µg/kg	<100	<100	<100			
Pentachlorophenol	µg/kg	<100	<100	<100			
Phenanthrene	µg/kg	<100	<100	<100			

Sample Description		SS1A	SS2A	SS3A	SGV[1] (lowest value)	SGV2 (highest value)	Soil Intervention Values (Dutch List 2009)[3]
Phenol	µg/kg	<100	<100	<100	280,000	3.20E+06	14,000
Pyrene	µg/kg	<100	<100	<100			

Sample Description		SS1A	SS2A	SS3A	SGV[1] (lowest value)	SGV2 (highest value)	Soil Intervention Values (Dutch List 2009)[3]
Volatile Organic Compounds (VOCs)							
1,1,1,2-Tetrachloroethane	µg/kg	<100	<10	<10			
1,1,1-Trichloroethane	µg/kg	<70	<7	<7			
1,1,2,2-Tetrachloroethane	µg/kg	<100	<10	<10			
1,1,2-Trichloroethane	µg/kg	<100	<10	<10			
1,1-Dichloroethane	µg/kg	<80	<8	<8			
1,1-Dichloroethene	µg/kg	<100	<10	<10			
1,1-Dichloropropene	µg/kg	<100	<10	<10			
1,2,3-Trichlorobenzene	µg/kg	<200	<20	<20			
1,2,3-Trichloropropane	µg/kg	<160	<16	<16			
1,2,4-Trichlorobenzene	µg/kg	<200	<20	<20			
1,2,4-Trimethylbenzene	µg/kg	<90	<9	<9			
1,2-Dibromo-3-chloropropane	µg/kg	<140	<14	<14			
1,2-Dibromoethane	µg/kg	<100	<10	<10			
1,2-Dichlorobenzene	µg/kg	<100	<10	<10			
1,2-Dichloroethane	µg/kg	<50	<5	<5			
1,2-Dichloropropane	µg/kg	<100	<10	<10			
1,3,5-Trimethylbenzene	µg/kg	<80	<8	<8			
1,3-Dichlorobenzene	µg/kg	<80	<8	<8			
1,3-Dichloropropane	µg/kg	<70	<7	<7			
1,4-Dichlorobenzene	µg/kg	<50	<5	<5			
2,2-Dichloropropane	µg/kg	<100	<10	<10			
2-Chlorotoluene	µg/kg	<90	<9	<9			
4-Bromofluorobenzene**	%	89.2	99.4	97.3			
4-Chlorotoluene	µg/kg	<100	<10	<10			
4-Isopropyltoluene	µg/kg	<100	<10	<10			
Benzene	µg/kg	<90	<9	<9	70	95,000	1,100
Bromobenzene	µg/kg	<100	<10	<10			
Bromochloromethane	µg/kg	<100	<10	<10			
Bromodichloromethane	µg/kg	<70	<7	<7			
Bromoform	µg/kg	<100	<10	<10			

Sample Description		SS1A	SS2A	SS3A	SGV[1] (lowest value)	SGV2 (highest value)	Soil Intervention Values (Dutch List 2009)[3]
Bromomethane	µg/kg	<100	<10	<10			
Carbon Disulphide	µg/kg	<70	<7	<7			
Carbontetrachloride	µg/kg	<100	<10	<10			
Chlorobenzene	µg/kg	<50	<5	<5			
Chloroethane	µg/kg	<100	<10	<10			
Chloroform	µg/kg	<80	<8	<8			
Chloromethane	µg/kg	<70	<7	<7			
cis-1,2-Dichloroethene	µg/kg	<60	<6	<6			
cis-1,3-Dichloropropene	µg/kg	<100	<10	<10			
Dibromochloromethane	µg/kg	<100	<10	<10			
Dibromomethane	µg/kg	<90	<9	<9			
Dichlorodifluoromethane	µg/kg	<60	<6	<6			
Dichloromethane	µg/kg	<100	<10	<10			
Ethylbenzene	µg/kg	<40	<4	<4			110,000
Hexachlorobutadiene	µg/kg	<200	<20	<20			
Isopropylbenzene	µg/kg	<50	<5	<5			
Methyl Tertiary Butyl Ether	µg/kg	<100	<10	<10			
Naphthalene	µg/kg	<130	<13	<13			
n-Butylbenzene	µg/kg	<110	<11	<11			
o-Xylene	µg/kg	<100	<10	<10	160,000	2.60E+06	17,000**
p/m-Xylene	µg/kg	<100	<10	<10	160,000/ 180,000	3.50E+06	
Propylbenzene	µg/kg	<100	<10	<10			
sec-Butylbenzene	µg/kg	<100	<10	<10			
Styrene	µg/kg	<100	<10	<10			
Tert-amyl methyl ether	µg/kg	<100	<10	<10			
tert-Butylbenzene	µg/kg	<140	<14	<14			
Tetrachloroethene	µg/kg	<50	<5	<5			
Toluene	µg/kg	<70	<7	<7	120,000	4.40E+06	32,000
trans-1,2-Dichloroethene	µg/kg	<100	<10	<10			
trans-1,3-Dichloropropene	µg/kg	<100	<10	<10			
Trichloroethene	µg/kg	<90	<9	<9			
Trichlorofluorormethane	µg/kg	<60	<6	<6			
Vinyl Chloride	µg/kg	<60	<6	<6			

6 STAGE 8: SUMMARY OF FINDINGS

This chapter includes a brief summary of each of the stages completed to produce this baseline report.

6.1 Requirement for Baseline Report

The facility is operated under an Industrial Emission Licence (EPA Licence Ref No W0025-03) with the principal activity being the deposit of waste on to land (landfilling). Section I of the IE licence application form on *Existing Environment and Impact of the Activity* seeks a baseline report, where the activity involves the use, production or release of relevant hazardous substances and having regards to the possibility of soil and groundwater contamination.

6.2 Scope of the Baseline Report

The Commission produced guidance on the content of the baseline report, *European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions*. This baseline report has been prepared in accordance with the Guidance.

The Guidance establishes a number of key tasks that should be undertaken to firstly determine the need for a baseline report and secondly the steps required to produce it. Eight stages have been identified with:

- Stages 1-3: decide whether a baseline report is required
- Stages 4-7: determine how a baseline report is to be prepared
- Stage 8: determine the content of the report.

During this process, Stages 1-3 demonstrated that a baseline report is required and Stages 4-7 were completed, resulting in this baseline report.

6.3 Stage 1: Hazardous Substances

A list of all raw materials, intermediates and products used on site was compiled. 13 no. substances generated/used and/or stored on site were classified as hazardous. The non-hazardous substances were denoted as such on the list and eliminated from the baseline investigation process.

6.4 Stage 2: Relevant Hazardous Substances

Relevant hazardous substances are those which are capable of contaminating soil or groundwater. Using Annex 1 of *Classification of Hazardous and Non-Hazardous Substances in Groundwater*, EPA 2010, the list of hazardous substances was checked to determine their classification. Annex 1 is not an exhaustive list of all substances, therefore the following notes were applied to the table: hazardous, non-hazardous, not determined, or N/A (where the substance was not included on Annex 1).

Substances with the risk phrase R56 are toxic to soil organisms. None of the substances on the list have the risk phrase R56. Risk phrases are as per the European Communities (Classification, Packaging and Labelling of Dangerous Preparations) Regulations 2004 (S.I. No. 62 of 2004 as amended by S.I. No. 271 of 2008[7]).

[7] Regulation (EC) No. 1272 of 2008

6.5 Stage 3: Identification of Potential Pollution Risk

Each substance brought forward from Stage 2 was considered in the context of the site to determine whether circumstances exist which may result in the release of the substance in sufficient quantities to represent a pollution risk either as a result of a single emission or as a result of accumulation from multiple emissions.

6.6 Outcome of Stages 1-3

Leachate was the only substance brought forward to Stage 3. Phase 1 of the landfill is unlined and there were a breach in a leachate line which was discovered in 2014.

Based on the unlined portion of the site, it was determined that a baseline study was required for the site.

6.7 Stage 4: Site History

The landfill has been developed in three phases; Phase 1 is unlined and operated on the principal of dilute and disperse. It was operational from 1975 to 1990. Phase 2 is made up of Cells 1-13. Cells 1-6 are lined with a single HDPE liner and Cells 7-13 are lined with a single HDPE liner and engineered clay. Phase 2 was operational from 1991 to 2006. Phase 3 (cells 15-18) is fully engineered in accordance with the requirements of the Landfill Directive (99/31/EC). It commenced waste acceptance in 2007 and remains active. (There is no Cell 14.)

The facility has been in operation since 1975 and is licensed (W0025-03) to accept 40,000 tonnes per annum of non-hazardous waste. The recycling centre is open to the general public and provides for the recovery of glass, paper, cardboard, metal and household hazardous waste amongst others.

Two quarries exist along the L3045 which runs along the south of Powerstown landfill. One of these quarries abuts the boundary of Phase 1 of the facility A second quarry is located further east on this road. The wider area includes a number of other quarries to the south and east.

There have been no one-off incidents involving emissions of hazardous substances to groundwater or soil.

CCC carried out pressure testing of leachate lines in 2014 and one pipeline failed the test. Leachate was isolated from this pipeline. The pipeline was disconnected to prevent any future use of the damaged line. The damaged line is in very close proximity to groundwater wells GW1 and GW2 and lies parallel to Powerstown Stream. The ruptured line was conveying leachate from Phase 2 of the landfill to the leachate lagoon.

A review of all monitoring results was carried out. The site has been licensed by the EPA since 2000, so there is a significant database of licence compliance monitoring results. Groundwater monitoring has been carried out quarterly and annually for a range of pollutants including the priority pollutants list substances. There is evidence of contamination of groundwater by leachate in the downgradient wells as ammonia and chloride levels are elevated above the groundwater trigger levels and relevant standards. There were no exceedances of relevant standards for hazardous substances in the period 2010 - 2014, nor is there an upward trend in hazardous parameter concentrations since monitoring began.

6.8 Stage 5: Environmental Setting

Powerstown Landfill and Recycling Facility is located in a rural agricultural setting and occupies a total area of approximately 24 ha (including buffer zone).

The quaternary geology of the landfill area comprises unconsolidated deposits, most of which were laid down during and immediately following the last glaciation.

The GSI database for the area shows that the site is underlain by the Milford and Ballysteen Formations. These are Dinantian dolomitised limestones.

The overburden encountered at the site consisted of sand and gravel with cobbles. Thickness encountered in boreholes varied from 3.6 to 15 m. The underlying bedrock consisted of dolomitised limestone.

The major aquifer in the Lower Carboniferous strata of the Barrow Lowlands is dolomitised limestone and it is classified as a Regionally Important Aquifer (Rkd) by the GSI. Groundwater enters Powerstown landfill via fissure flow in the bedrock and through the permeable fluvio-glacial gravel overburden. Flow direction is generally to the west towards the River Barrow, but with a northern component discharging to the Powerstown Stream.

In the construction of phase 3 of the landfill, the sand/gravel was removed to the water table, therefore increasing the vulnerability of the site from 'High' to 'Extreme.'

Extensive consultation took place with the EPA during the statutory consent process for Phase 3 and it was agreed with the Agency that a double lining system be installed in Phase 3 of Powerstown landfill. This lining system provides protection to the aquifer five times above that required by the Landfill Directive for non-hazardous landfills.

6.9 Stage 7: Site Characterisation

The results of Stages 3-5 indicate that leachate has or has had the potential to migrate off site into the aquifer beneath the site. A Detailed Quantitative Risk Assessment (DQRA) was carried out in 2014. The leachate migration off site was modelled using the P20 model (The UK Environment Agency's Remedial Target Worksheet) It determined that there is no unacceptable risk to the gravel aquifer downgradient of the landfill.

Landfilling commenced in Phase 1 in 1975 and finished in 1990. Phase 1 is an unlined landfill which was developed in a spent sand and gravel quarry and operated as a 'dilute and disperse' type landfill. In 2006 the Phase 1 landfill was permanently capped in accordance with the requirements of the waste licence. Capping prevents the ingress of rainwater which is a major contributor to the generation of leachate. Leachate is pumped from Phase 1 to the leachate lagoon for transfer off-site.

As a dilute and disperse landfill, leachate from Phase 1 would have migrated off-site since landfilling operations commenced in 1975 and the volume would be decreasing annually since the area was capped in 2006, nine years ago.

6.10 Stage 7: Site Investigation

A site investigation was carried out on site to characterise the baseline conditions of soil downgradient of the facility.

The soils samples were analysed for:

- Metals
- PAHs
- sVOCs
- VOCs

Results were compared to:

- UK Environment Agency Soil Guideline Values (SGVs)
- The Dutch List 2009

The laboratory analysis confirms that the subsoils are uncontaminated by hazardous substances.

Appendix 1

Maps/Drawings

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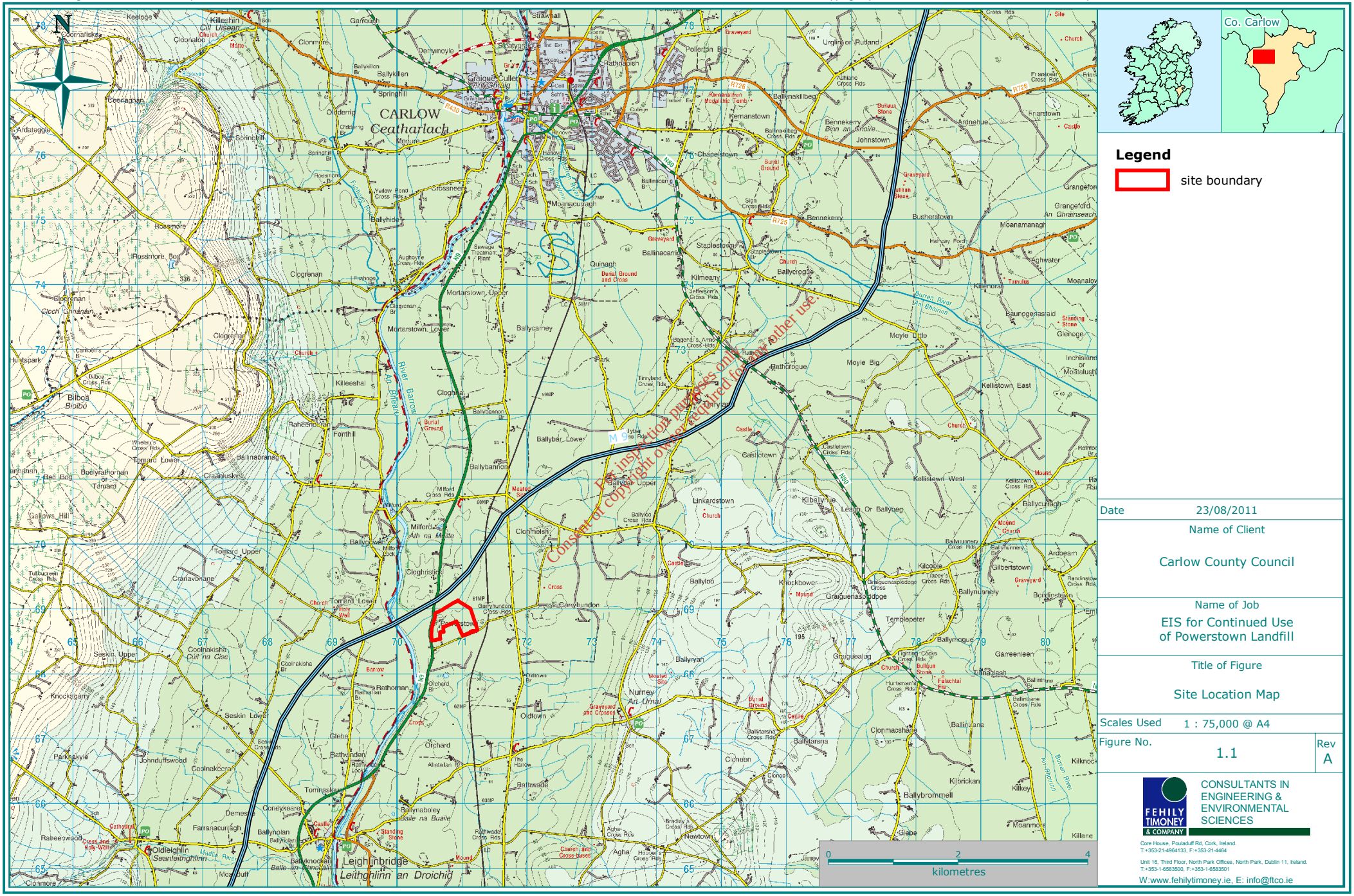
LW11-120-03_Figure 1.1_Site Location Map_Rev A



Date	23/08/2011
Name of Client	Carlow County Council
Name of Job	EIS for Continued Use of Powerstown Landfill
Title of Figure	Site Location Map
Scales Used	1 : 75,000 @ A4
Figure No.	1.1
Rev	A

FEHILY TIMONEY & COMPANY
CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
Core House, Pouladuff Rd, Cork, Ireland.
T:+353-21-4964133, F:+353-21-4464
Unit 16, Third Floor, North Park Offices, North Park, Dublin 11, Ireland.
T:+353-1-6583500, F:+353-1-6583501
W:www.fehilytimoney.ie, E: info@ftco.ie

M9 Junction 6

Phase 3 Landfill
Cells 15 & 16
Intermediate cap
(as of October 2014)

Phase 3 Landfill
Cell 18
Empty Cell (as of October 2014)

Phase 2 Landfill
Cells 1 - 13
(Closed & Capped)

Buffer Zone
(Farm Land)

Site Boundary

Storm Water
Settling Pond

Discharge
to Powerstown
stream

CELL 15

CELL 16

CELL 17

CELL 18

Old Weighbridge

Old Flare

Salt Barn

Leachate Lagoon

Flare
Compound

Existing
Chainlink Fence
to be retained

Access roadway
to S.W Pond

10m x 10m Plant
Refuelling Area.

Haul Road to Tiphead

E 271000
N 168800

Wheel Bath

2.4m High Security
Fence.

Access roadway

Green Waste
Holding Slabs

Waste Inspection/
Quarantine Slabs

Leachate Tank
Farm

Civic
Amenity Area

Weighbridge hut &
2 no. Weighbridges

Administration Building

Site Entrance

Site Notice

2.4m High Security
Fence.

Pond

Phase 1 Landfill
(Closed & Capped)

Phase 3 Landfill
Cell 17
Active Area (as of October 2014)

Gravel Pit

Liable to Flooding

RIVER BARROW

Sand&Gravel

Rev.	Drawn	Chk'd	App'd		
A	CW	PC	BO	Cork 20.11.14	ISSUE FOR LICENCE REVIEW
Revision History				Rev Origin / Date	Description
A					

Name of Client

CARLOW COUNTY COUNCIL

Name of Job

POWERSTOWN LANDFILL
IE LICENCE REVIEW

Title of Drawing

EXISTING SITE LAYOUT

Scales Used
A1 1:2000 A3 1:4000

This Drawing was printed to A1-

Dwg. No.
LW14-120-02-001

Rev.
A

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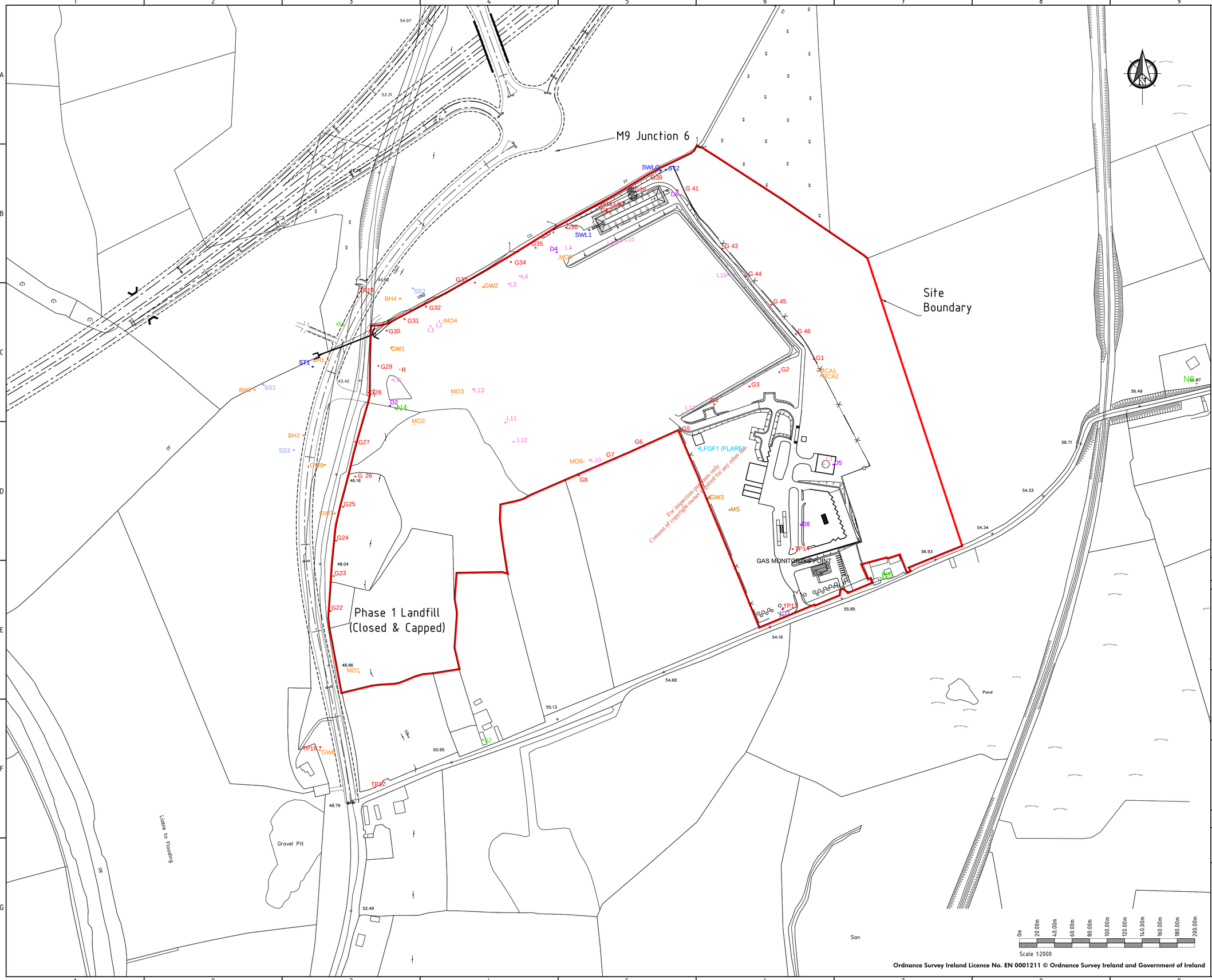
FEHILY TIMONEY & COMPANY
CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
W: www.fehilytimoney.ie, E: info@ftco.ie
Core House, Pouladuff Rd, Cork, Ireland.
T:+353-21-4964133, F:+353-21-4964464
J5 Plaza, North Park Business Park,
North Road, Dublin 11, Ireland
T:+353-1-6583500, F:+353-1-6583501

Scale 1:2000

ORIGINAL DRAWING SIZE A1 - (841 x 594)

SCALE HORIZ.

SCALE - VERTICAL



Note:
1. This Drawing Is Based On Dwg 2005-120-01-012 Proposed Final Contours As Referenced In Condition 4.3.1 Of Waste License Register No 25-3

2. LFG1 and SWL0 are both emission points. The remaining locations are all monitoring points.

3. Soil Samples taken at a shallow and deeper depth:
a = shallow
b = deeper

LEGEND

TP & G = PERIMETER GAS WELLS

SW = SURFACE WATER

LFG1 = LANDFILL GAS FLARE

GW+RCA+BH = GROUNDWATER WELLS

N1+S1 = NOISE MONITORING LOCATIONS

D1 - D6 = DUST MONITORING LOCATIONS

L1 - L17 = LEACHATE MONITORING LOCATIONS

MS = MET STATION

SS = Soil Samples

Rev.	Drawn	Chkd	App'd		
A	CH	TR	SG	Cork	ISSUE FOR LICENCE REVIEW
				23/02/15	
				Rev Origin	Description
				Date	

Revision History: A

Name of Client

CARLOW COUNTY COUNCIL

Name of Job

POWERSTOWN LANDFILL
IE LICENCE REVIEW

Title of Drawing

BASELINE REPORT, SOIL
&
GROUNDWATER MONITORING LOCATIONS

Scales Used	This Drawing was printed to
1:2000	A1-

Dwg. No.	Rev.
LW14-120-02-003	A

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Scale 1:2000

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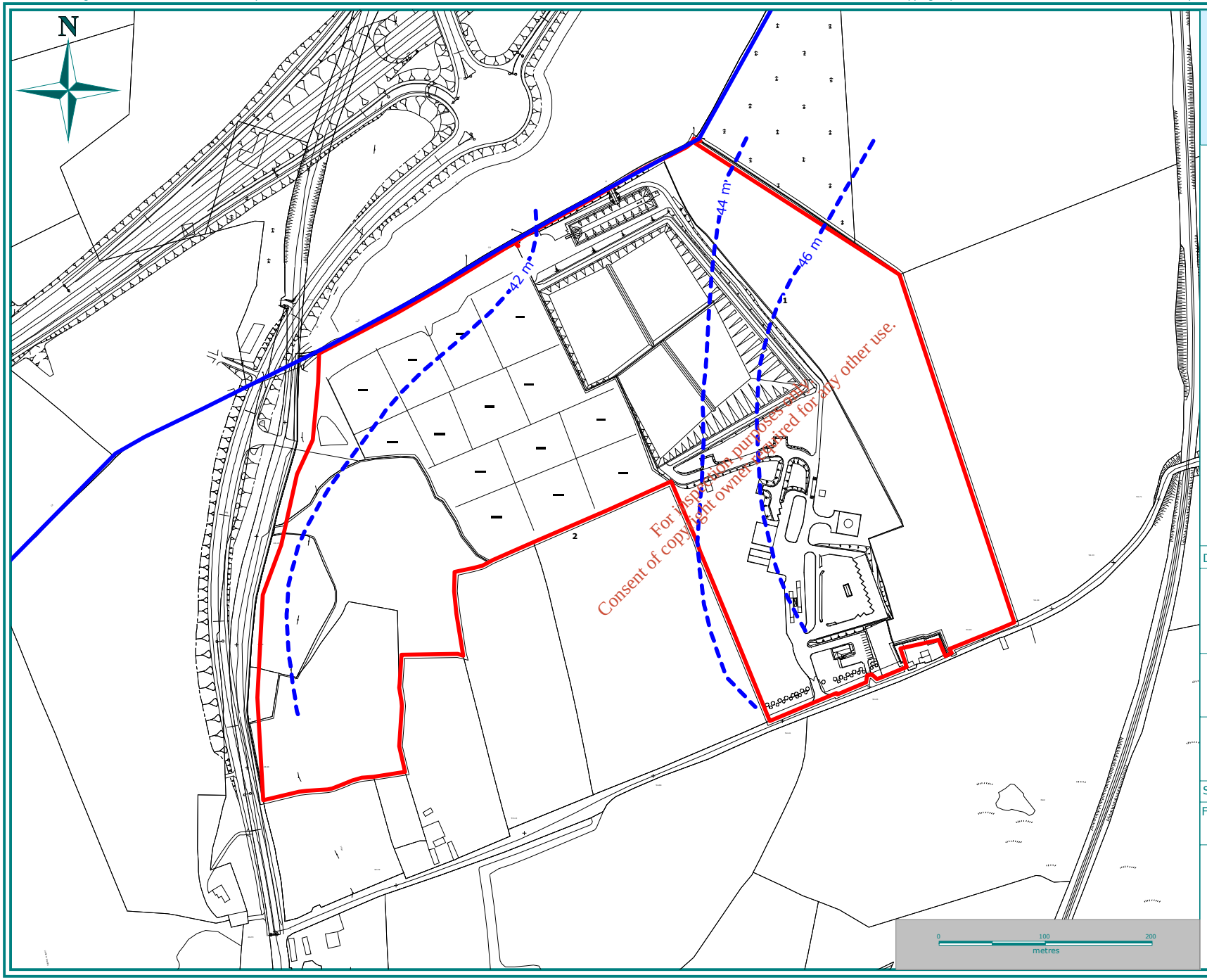
CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
W: www.fehilytimoney.ie, E: info@ftco.ie
Core House, Pouladuff Rd, Cork, Ireland.
T:+353-21-4964133, F:+353-21-4964464
J5 Plaza, North Park Business Park,
North Road, Dublin 11, Ireland
T:+353-1-6583500, F:+353-1-6583501

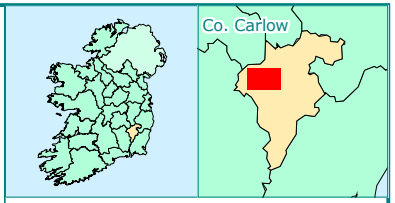
ORIGINAL DRAWING SIZE A1 - (841 x 594)

SCALE - VERTICAL

SCALE HORIZ.

R:\Map Production\2011\LW11\120\03\Workspace\
LW11-120-03_Figure 13.4_Groundwater Contour Map_Rev A





Legend

- site boundary
- line of equal groundwater elevation (m OD)
- stream

Date	23/08/2011
Name of Client	Carlow County Council
Name of Job	EIS for Continued Use of Powerstown Landfill
Title of Figure	Groundwater Contour Map
Scales Used	1 : 5,000 @ A4
Figure No.	13.4
Rev	A

FEHILY TIMONEY & COMPANY
CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
Core House, Pouladuff Rd, Cork, Ireland.
T:+353-21-4964133, F:+353-21-4464
Unit 16, Third Floor, North Park Offices, North Park, Dublin 11, Ireland.
T:+353-1-6583500, F:+353-1-6583501
W:www.fehilytimoney.ie, E: info@ftco.ie

Appendix 2

Groundwater Sampling Analytical Results

2011

Environmental Protection Agency
Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny

Test Report

Report of:	Analysis of landfill site sample(s)
Report to:	Carlow County Council
Report date:	21/06/11

Facility:	**Powerstown Landfill Site** Kilkenny Rd., Co Carlow,
Reference No:	W0025-02

Date collected:	08/03/2011	Date received:	08/03/2011

			Laboratory Ref:	1101241	1101242	1101243	1101244	1101245	1101246	1101247
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW3	WST-W0025-02-RCA1	WST-W0025-02-RCA2	WST-W0025-02-GW2	WST-W0025-02-GW1	WST-W0025-02-GW6	WST-W0025-02-GW7
			Sampling point:	unable to purge, bailer used, clear with sediment	muddy	muddy	slightly brown	clear	cloudy	cloudy
			Sampled by:	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry
			Time Sampled:	11:35	12:03	12:18	14:50	15:11	16:22	17:18
			Start/End - Dates of Analysis:	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
F	Depth of Borehole	m		43	16.4	16.6	3.7	16.4	22	18.5
F	Water Level	m		27	5	5.3	1.5	10.2	13.5	11.1
F	Temperature	°C		11.0	10.6	10.6	8.6	11.5	10.7	10.9
F	Dissolved Oxygen (as %Sat)	% Saturation		80.0	73.0	76.0	22.0	22.0	68.0	39.0
	pH	pH		7.5	7.3	7.3	7.1	7.1	7.4	7.3
	Conductivity @25°C	µS/cm		621	770	757	1505	1130	715	679
	Ammonia	mg/l N		0.03	<0.01	0.01	0.61	13	0.12	0.01
	Chloride	mg/l Cl		20	18	17	125	52	22	20
	ortho-Phosphate (as P)	mg/l P		0.02	0.04	0.03	0.03	0.04	0.03	0.02
	Total Oxidised Nitrogen (as N)	mg/l N		7.76	9.59	9.5	34.98	4.54	8.1	7.99
	Fluoride	mg/l F		<.25	<0.25	<0.25	<0.5	1.1	<0.25	<0.25
	Sulphate	mg/l SO4		43	43	37	120	54	29	40
	Alkalinity-total (as CaCO3)	mg/l CaCO3		226	298	317	326	420	280	251
	1,1,1,2-Tetrachloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,1,1-Trichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,1,2,2-Tetrachloroethane	µg/l		<1	<1	<1	<1	<1	<1	<1
	1,1,2-Trichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,1-Dichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,1-Dichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,1-Dichloropropene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,2,3-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
	1,2,3-Trichloropropane	µg/l		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
	1,2,4-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4

			Laboratory Ref:	1101241	1101242	1101243	1101244	1101245	1101246	1101247
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW3	WST-W0025-02-RCA1	WST-W0025-02-RCA2	WST-W0025-02-GW2	WST-W0025-02-GW1	WST-W0025-02-GW6	WST-W0025-02-GW7
			Sampling point:	unable to purge, bailer used, clear with sediment	muddy	muddy	slightly brown	clear	cloudy	cloudy
			Sampled by:	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry
			Time Sampled:	11:35	12:03	12:18	14:50	15:11	16:22	17:18
			Start/End - Dates of Analysis:	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
	1,2,4-Trimethylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,2-Dibromo-3-Chloropropane	µg/l		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
	1,2-Dibromoethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,2-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,2-Dichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,2-Dichloropropane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,3,5-Trimethylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,3-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,3-Dichloropropane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1,4-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2,2-Dichloropropane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2-Chlorotoluene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	4-Chlorotoluene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	4-Isopropyltoluene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Bromobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Bromochloromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Bromodichloromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Bromoform	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Bromomethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	c-1,2-Dichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	c-1,3-Dichloropropene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Carbon Tetrachloride	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

			Laboratory Ref:	1101241	1101242	1101243	1101244	1101245	1101246	1101247
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW3	WST-W0025-02-RCA1	WST-W0025-02-RCA2	WST-W0025-02-GW2	WST-W0025-02-GW1	WST-W0025-02-GW6	WST-W0025-02-GW7
			Sampling point:	unable to purge, bailer used, clear with sediment	muddy	muddy	slightly brown	clear	cloudy	cloudy
			Sampled by:	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry
			Time Sampled:	11:35	12:03	12:18	14:50	15:11	16:22	17:18
			Start/End - Dates of Analysis:	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
	Chlorobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Chloroform	µg/l		0.8	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Dibromochloromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Dibromomethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Dichlorodifluoromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Dichloromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Ethylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Hexachlorobutadiene	µg/l		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Isopropylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	m,p-Xylene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Naphthalene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	n-Butylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	n-Propylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	o-Xylene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	sec-Butylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Styrene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	t-1,2-Dichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	t-1,3-Dichloropropene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	tert-Butylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Tetrachloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	µg/l		<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5
	Trichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Trichlorofluoromethane	µg/l		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6

			Laboratory Ref:	1101241	1101242	1101243	1101244	1101245	1101246	1101247
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW3	WST-W0025-02-RCA1	WST-W0025-02-RCA2	WST-W0025-02-GW2	WST-W0025-02-GW1	WST-W0025-02-GW6	WST-W0025-02-GW7
			Sampling point:	unable to purge, bailer used, clear with sediment	muddy	muddy	slightly brown	clear	cloudy	cloudy
			Sampled by:	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry
			Time Sampled:	11:35	12:03	12:18	14:50	15:11	16:22	17:18
			Start/End - Dates of Analysis:	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
	Vinyl Chloride	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Aluminium	ug/l		<25	220	270	180	<25	590	320
	Antimony	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Arsenic	ug/l		<0.5	0.8	1	3.6	0.5	<0.5	0.7
	Barium	ug/l		20	18	15	110	100	27	18
	Beryllium	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Boron	ug/l		120	100	100	150	180	70	80
	Cadmium	ug/l		<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5
	Calcium	mg/l		120	140	140	200	150	130	120
	Chromium	ug/l		<0.5	<0.5	<0.5	1.1	<0.5	1.6	0.7
	Cobalt	ug/l		<0.5	<0.5	0.5	4.2	1.9	0.9	0.5
	Copper	ug/l		<0.5	0.7	0.9	5.1	1.5	1.1	0.5
	Iron	ug/l		69	460	580	3500	28	780	680
	Lead	ug/l		<0.5	<0.5	<0.5	2	<0.5	1.1	<0.5
	Magnesium	mg/l		13	17	17	28	27	18	17
	Manganese	ug/l		<25	27	35	1700	94	36	<25
	Mercury	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Molybdenum	ug/l		2	<0.5	<0.5	1	<0.5	<0.5	<0.5
	Nickel	ug/l		1	1.4	1.2	13	7	2.2	1.3
	Potassium	mg/l		4.1	2.1	2.2	21	19	1.3	2.5
	Selenium	ug/l		1.4	1.4	1.5	2.4	1.1	0.8	0.9
	Sodium	mg/l		11	11	9.8	87	47	12	11
	Thallium	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

			Laboratory Ref:	1101241	1101242	1101243	1101244	1101245	1101246	1101247
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW3	WST-W0025-02-RCA1	WST-W0025-02-RCA2	WST-W0025-02-GW2	WST-W0025-02-GW1	WST-W0025-02-GW6	WST-W0025-02-GW7
			Sampling point:	unable to purge, bailer used, clear with sediment	muddy	muddy	slightly brown	clear	cloudy	cloudy
			Sampled by:	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry	Jim McGarry
			Time Sampled:	11:35	12:03	12:18	14:50	15:11	16:22	17:18
			Start/End - Dates of Analysis:	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
	Tin	ug/l		<1	<1	<1	<1	<1	<1	<1
	Uranium	ug/l		3.7	5.9	6	6.2	4	4.4	4.1
	Vanadium	ug/l		<0.5	0.6	0.8	1.6	<0.5	1.4	0.7
	Zinc	ug/l		23	23	22	19	25	15	13

Comments:

1) Results highlighted and in bold are outside specified limits.

2) **nm** "Not measured"
3) **nd** "None detected"
4) **nt** "No time" - Time not recorded
5) **tntc** "Too numerous to count"
6) **F** "Field measured parameters"

Signed: PP _____ Date: 21/Jun/2011

Caroline Bowden, Regional Chemist

Environmental Protection Agency
Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny

Test Report

Report of: Analysis of landfill site sample(s)
Report to: Carlow County Council
Report date: 21/06/11

Facility: **Powerstown Landfill Site**
Kilkenny Rd., Co Carlow,
Reference No: W0025-02

Date collected: 08/03/2011 Date received: 08/03/2011

			Laboratory Ref:	1101248	1101249	1101250
			Type of sample:	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW Purcells	WST-W0025-02-GW Doyles	WST-W0025-02-GW8
			Sampling point:	Clear, tap outside front door	Clear, tap at back window supplied by well, in use	Clear
			Sampled by:	Jim McGarry	Jim McGarry	Jim McGarry
			Time Sampled:	15:55	16:50	17:40
			Start/End - Dates of Analysis:	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11
			Status of results:	**Final Report**	**Final Report**	**Final Report**
F	Depth of Borehole	m		-	-	13
F	Water Level	m		-	-	8.3
F	Temperature	°C		7.0	7.1	11.4
F	Dissolved Oxygen (as %Sat)	% Saturation		88.0	67.0	16.0
	pH	pH		7.5	7.2	7.3
	Conductivity @25°C	µS/cm		586	831	746
	Ammonia	mg/l N		<0.01	0.01	0.91
	Chloride	mg/l Cl		29	22	22
	ortho-Phosphate (as P)	mg/l P		0.03	0.06	0.03
	Total Oxidised Nitrogen (as N)	mg/l N		4.01	18.21	9.03
	Fluoride	mg/l F		<0.25	<0.25	<0.25
	Sulphate	mg/l SO4		18	29	37
	Alkalinity-total (as CaCO3)	mg/l CaCO3		227	299	291
	Total coliforms	No/100 ml		0	2	-
	1,1,1,2-Tetrachloroethane	µg/l		<0.5	<0.5	<0.5
	1,1,1-Trichloroethane	µg/l		<0.5	<0.5	<0.5
	1,1,2,2-Tetrachloroethane	µg/l		<1	<1	<1
	1,1,2-Trichloroethane	µg/l		<0.5	<0.5	<0.5
	1,1-Dichloroethane	µg/l		<0.5	<0.5	<0.5
	1,1-Dichloroethene	µg/l		<0.5	<0.5	<0.5
	1,1-Dichloropropene	µg/l		<0.5	<0.5	<0.5
	1,2,3-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4
	1,2,3-Trichloropropane	µg/l		<0.6	<0.6	<0.6

			Laboratory Ref:	1101248	1101249	1101250
			Type of sample:	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW Purcells	WST-W0025-02-GW Doyles	WST-W0025-02-GW8
			Sampling point:	Clear, tap outside front door.	Clear, tap at back window supplied by well, in use	Clear
			Sampled by:	Jim McGarry	Jim McGarry	Jim McGarry
			Time Sampled:	15:55	16:50	17:40
			Start/End - Dates of Analysis:	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11
			Status of results:	**Final Report**	**Final Report**	**Final Report**
	1,2,4-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4
	1,2,4-Trimethylbenzene	µg/l		<0.5	<0.5	<0.5
	1,2-Dibromo-3-Chloropropane	µg/l		<1.3	<1.3	<1.3
	1,2-Dibromoethane	µg/l		<0.5	<0.5	<0.5
	1,2-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5
	1,2-Dichloroethane	µg/l		<0.5	<0.5	<0.5
	1,2-Dichloropropane	µg/l		<0.5	<0.5	<0.5
	1,3,5-Trimethylbenzene	µg/l		<0.5	<0.5	<0.5
	1,3-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5
	1,3-Dichloropropane	µg/l		<0.5	<0.5	<0.5
	1,4-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5
	2,2-Dichloropropane	µg/l		<0.5	<0.5	<0.5
	2-Chlorotoluene	µg/l		<0.5	<0.5	<0.5
	4-Chlorotoluene	µg/l		<0.5	<0.5	<0.5
	4-Isopropyltoluene	µg/l		<0.5	<0.5	<0.5
	Benzene	µg/l		<0.5	<0.5	<0.5
	Bromobenzene	µg/l		<0.5	<0.5	<0.5
	Bromochloromethane	µg/l		<0.5	<0.5	<0.5
	Bromodichloromethane	µg/l		<0.5	<0.5	<0.5
	Bromoform	µg/l		4.8	<0.5	<0.5
	Bromomethane	µg/l		<0.5	<0.5	<0.5
	c-1,2-Dichloroethene	µg/l		<0.5	<0.5	<0.5
	c-1,3-Dichloropropene	µg/l		<0.5	<0.5	<0.5
	Carbon Tetrachloride	µg/l		<0.5	<0.5	<0.5
	Chlorobenzene	µg/l		<0.5	<0.5	<0.5
	Chloroform	µg/l		<0.5	<0.5	<0.5
	Dibromochloromethane	µg/l		2	<0.5	<0.5
	Dibromomethane	µg/l		<0.5	<0.5	<0.5
	Dichlorodifluoromethane	µg/l		<0.5	<0.5	<0.5
	Dichloromethane	µg/l		<0.5	<0.5	<0.5
	E Coli	per 100ml		0	0	-
	Ethylbenzene	µg/l		<0.5	<0.5	<0.5
	Hexachlorobutadiene	µg/l		<0.1	<0.1	<0.1
	Isopropylbenzene	µg/l		<0.5	<0.5	<0.5
	m,p-Xylene	µg/l		<0.5	<0.5	<0.5
	Naphthalene	µg/l		<0.5	<0.5	<0.5
	n-Butylbenzene	µg/l		<0.5	<0.5	<0.5
	n-Propylbenzene	µg/l		<0.5	<0.5	<0.5
	o-Xylene	µg/l		<0.5	<0.5	<0.5
	sec-Butylbenzene	µg/l		<0.5	<0.5	<0.5

			Laboratory Ref:	1101248	1101249	1101250
			Type of sample:	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW Purcells	WST-W0025-02-GW Doyles	WST-W0025-02-GW8
			Sampling point:	Clear, tap outside front door.	Clear, tap at back window supplied by well, in use	Clear
			Sampled by:	Jim McGarry	Jim McGarry	Jim McGarry
			Time Sampled:	15:55	16:50	17:40
			Start/End - Dates of Analysis:	08-03-11/28-04-11	08-03-11/28-04-11	08-03-11/28-04-11
			Status of results:	**Final Report**	**Final Report**	**Final Report**
	Styrene	µg/l		<0.5	<0.5	<0.5
	t-1,2-Dichloroethene	µg/l		<0.5	<0.5	<0.5
	t-1,3-Dichloropropene	µg/l		<0.5	<0.5	<0.5
	tert-Butylbenzene	µg/l		<0.5	<0.5	<0.5
	Tetrachloroethene	µg/l		<0.5	<0.5	<0.5
	Toluene	µg/l		0.5	<0.5	<0.5
	Trichloroethene	µg/l		<0.5	<0.5	<0.5
	Trichlorofluoromethane	µg/l		<0.6	<0.6	<0.6
	Vinyl Chloride	µg/l		<0.5	<0.5	<0.5
	Aluminium	ug/l		<25	<25	42
	Antimony	ug/l		<0.5	<0.5	<0.5
	Arsenic	ug/l		<0.5	<0.5	<0.5
	Barium	ug/l		<3	43	29
	Beryllium	ug/l		<0.5	<0.5	<0.5
	Boron	ug/l		20	81	96
	Cadmium	ug/l		<0.5	<0.5	<0.5
	Calcium	mg/l		82	160	120
	Chromium	ug/l		<0.5	<0.5	<0.5
	Cobalt	ug/l		<0.5	<0.5	<0.5
	Copper	ug/l		1.6	5.5	<0.5
	Iron	ug/l		<25	47	87
	Lead	ug/l		<0.5	<0.5	<0.5
	Magnesium	mg/l		20	12	18
	Manganese	ug/l		<25	<25	<25
	Mercury	ug/l		<0.5	<0.5	<0.5
	Molybdenum	ug/l		<0.5	<0.5	<0.5
	Nickel	ug/l		<0.5	1	2.3
	Potassium	mg/l		0.8	9.2	4.6
	Selenium	ug/l		0.7	1.1	0.9
	Sodium	mg/l		17	12	13
	Thallium	ug/l		<0.5	<0.5	<0.5
	Tin	ug/l		<1	<1	<1
	Uranium	ug/l		1.8	3.3	3.8
	Vanadium	ug/l		<0.5	<0.5	<0.5
	Zinc	ug/l		20	30	18

Comments:

1) Results highlighted and in bold are outside specified limits.

2) **nm** "Not measured"
3) **nd** "None detected"
4) **nt** "No time" - Time not recorded
5) **tntc** "Too numerous to count"
6) **F** "Field measured parameters"

Signed: PP _____ Date: 21/Jun/2011

Caroline Bowden, Regional Chemist

2012

Environmental Protection Agency
Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny

Test Report

Report of: Analysis of landfill site sample(s)
Report to: Carlow County Council
Report date: 06/09/12

Facility: **Powerstown Landfill Site**
Kilkenny Rd., Co Carlow,
Reference No: W0025-02

Date collected: 25/07/2012 Date received: 25/07/2012

			Laboratory Ref:	1203167	1203168	1203169
			Type of sample:	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA1	WST-W0025-02-GW1	WST-W0025-02-GW2
			Sampling point:	Sandy brown, tubing needs to be replaced	Clear	Clear
			Sampled by:	DB/SB	DB/SB	DB/SB
			Time Sampled:	11:25	12:30	12:20
			Start/End - Dates of Analysis:			
			Status of results:	**Final Report**	**Final Report**	**Final Report**
F	Depth of Borehole	m		16.4	16.4	3.7
F	Water Level	m		3.6	10.1	1.7
F	Temperature	°C		11.9	12.9	14.7
F	Dissolved Oxygen (as %Sat)	% Saturation		73.0	23.0	29.0
F	pH	pH		7.2	7.1	7.1
F	Conductivity @25°C	µS/cm		754	1315	1062
L	Ammonia	mg/l N		0.1	26	0.12
L	Chloride	mg/l Cl		19	60	57
L	Nitrite (as N)	mg/l N		-	nm	-
L	ortho-Phosphate (as P)	mg/l P		0.01	0.01	<0.01
L	Total Oxidised Nitrogen (as N)	mg/l N		8.74	1.59	8.7
L	Fluoride	mg/l F		<0.25	<0.5	<0.25
L	Sulphate	mg/l SO4		58	58	100
L	Alkalinity-total (as CaCO3)	mg/l CaCO3		347	592	373
L	Total Organic Carbon	mg/l C		878.1	4.6	8.9
L	1,1,1,2-Tetrachloroethane	µg/l		<0.5	<0.5	<0.5
L	1,1,1-Trichloroethane	µg/l		<0.5	<0.5	<0.5
L	1,1,2,2-Tetrachloroethane	µg/l		<1	<1	<1
L	1,1,2-Trichloroethane	µg/l		<0.5	<0.5	<0.5
L	1,1-Dichloroethane	µg/l		<0.5	<0.5	<0.5
L	1,1-Dichloroethene	µg/l		<0.5	<0.5	<0.5
L	1,1-Dichloropropene	µg/l		<0.5	<0.5	<0.5
L	1,2,3-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4

				Laboratory Ref:	1203167	1203168	1203169
				Type of sample:	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-RCA1	WST-W0025-02-GW1	WST-W0025-02-GW2
				Sampling point:	Sandy brown, tubing needs to be replaced	Clear	Clear
				Sampled by:	DB/SB	DB/SB	DB/SB
				Time Sampled:	11:25	12:30	12:20
				Start/End - Dates of Analysis:			
				Status of results:	**Final Report**	**Final Report**	**Final Report**
L	1,2,3-Trichloropropane	µg/l			<0.6	<0.6	<0.6
L	1,2,4-Trichlorobenzene	µg/l			<0.4	<0.4	<0.4
L	1,2,4-Trimethylbenzene	µg/l			<0.5	<0.5	<0.5
L	1,2-Dibromo-3-Chloropropane	µg/l			<1.3	<1.3	<1.3
L	1,2-Dibromoethane	µg/l			<0.5	<0.5	<0.5
L	1,2-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5
L	1,2-Dichloroethane	µg/l			<0.5	<0.5	<0.5
L	1,2-Dichloropropane	µg/l			<0.5	<0.5	<0.5
L	1,3,5-Trimethylbenzene	µg/l			<0.5	<0.5	<0.5
L	1,3-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5
L	1,3-Dichloropropane	µg/l			<0.5	<0.5	<0.5
L	1,4-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5
L	2,2-Dichloropropane	µg/l			<0.5	<0.5	<0.5
L	2-Chlorotoluene	µg/l			<0.5	<0.5	<0.5
L	4-Chlorotoluene	µg/l			<0.5	<0.5	<0.5
L	4-Isopropyltoluene	µg/l			<0.5	<0.5	<0.5
L	Benzene	µg/l			<0.5	<0.5	<0.5
L	Bromobenzene	µg/l			<0.5	<0.5	<0.5
L	Bromochloromethane	µg/l			<0.5	<0.5	<0.5
L	Bromodichloromethane	µg/l			<0.5	<0.5	<0.5
L	Bromoform	µg/l			<0.5	<0.5	<0.5
L	Bromomethane	µg/l			<0.5	<0.5	<0.5
L	c-1,2-Dichloroethene	µg/l			<0.5	<0.5	<0.5
L	c-1,3-Dichloropropene	µg/l			<0.5	<0.5	<0.5
L	Carbon Tetrachloride	µg/l			<0.5	<0.5	<0.5
L	Chlorobenzene	µg/l			<0.5	<0.5	<0.5
L	Chloroform	µg/l			<0.5	<0.5	<0.5
L	Dibromochloromethane	µg/l			<0.5	<0.5	<0.5
L	Dibromomethane	µg/l			<0.5	<0.5	<0.5
L	Dichlorodifluoromethane	µg/l			<0.5	<0.5	<0.5
L	Dichloromethane	µg/l			1.5	<0.5	0.6
L	Ethylbenzene	µg/l			<0.5	<0.5	<0.5
L	Hexachlorobutadiene	µg/l			<0.1	<0.1	<0.1
L	Isopropylbenzene	µg/l			<0.5	<0.5	<0.5
L	m,p-Xylene	µg/l			<0.5	<0.5	<0.5
L	Naphthalene	µg/l			<0.5	<0.5	<0.5
L	n-Butylbenzene	µg/l			<0.5	<0.5	<0.5
L	n-Propylbenzene	µg/l			<0.5	<0.5	<0.5
L	o-Xylene	µg/l			<0.5	<0.5	<0.5
L	sec-Butylbenzene	µg/l			<0.5	<0.5	<0.5

				Laboratory Ref:	1203167	1203168	1203169
				Type of sample:	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-RCA1	WST-W0025-02-GW1	WST-W0025-02-GW2
				Sampling point:	Sandy brown, tubing needs to be replaced	Clear	Clear
				Sampled by:	DB/SB	DB/SB	DB/SB
				Time Sampled:	11:25	12:30	12:20
				Start/End - Dates of Analysis:			
				Status of results:	**Final Report**	**Final Report**	**Final Report**
L	Styrene	µg/l			<0.5	<0.5	<0.5
L	t-1,2-Dichloroethene	µg/l			<0.5	<0.5	<0.5
L	t-1,3-Dichloropropene	µg/l			<0.5	<0.5	<0.5
L	tert-Butylbenzene	µg/l			<0.5	<0.5	<0.5
L	Tetrachloroethene	µg/l			<0.5	<0.5	<0.5
L	Toluene	µg/l			<0.5	<0.5	<0.5
L	Trichloroethene	µg/l			<0.5	<0.5	<0.5
L	Trichlorofluoromethane	µg/l			<0.6	<0.6	<0.6
L	Vinyl Chloride	µg/l			<0.5	<0.5	<0.5
L	Aluminium	ug/l			150	43	110
L	Antimony	ug/l			1.1	1	1.3
L	Arsenic	ug/l			1.8	1.2	3.5
L	Barium	ug/l			480	74	50
L	Beryllium	ug/l			<0.5	<0.5	<0.5
L	Boron	ug/l			22	220	110
L	Cadmium	ug/l			3.4	<0.5	0.7
L	Calcium	mg/l			4100	130	140
L	Chromium	ug/l			11	0.9	1.3
L	Cobalt	ug/l			6.2	3	2.1
L	Copper	ug/l			1.8	3.7	4.9
L	Iron	ug/l			200	66	2700
L	Lead	ug/l			<0.5	<0.5	1.3
L	Magnesium	mg/l			24	21	15
L	Manganese	ug/l			5200	96	630
L	Mercury	ug/l			<0.5	<0.5	<0.5
L	Molybdenum	ug/l			2.7	1.6	1.9
L	Nickel	ug/l			83	14	9.3
L	Potassium	mg/l			3.3	31	18
L	Selenium	ug/l			2.6	1.8	1.3
L	Sodium	mg/l			7.4	38	34
L	Thallium	ug/l			<0.5	<0.5	<0.5
L	Tin	ug/l			<1	<1	<1
L	Uranium	ug/l			17	2.6	3.9
L	Vanadium	ug/l			1.1	0.7	1.2
L	Zinc	ug/l			<3	4	<3

Comments:

1) Results highlighted and in bold are outside specified limits.

2) **nm** "Not measured"
3) **nd** "None detected"
4) **nt** "No time" - Time not recorded
5) **tntc** "Too numerous to count"
6) **F** "Field measured parameters"
7) **L** "Lab measured parameters"

Signed: PP _____ Date: 06/Sep/2012

Caroline Bowden, Regional Chemist

Environmental Protection Agency
Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny

Test Report

Report of: Analysis of landfill site sample(s)
Report to: Carlow County Council
Report date: 06/09/12

Facility: **Powerstown Landfill Site**
Kilkenny Rd., Co Carlow,
Reference No: W0025-02

Date collected:	25/07/2012	Date received:	25/07/2012

			Laboratory Ref:	1203170	1203171	1203172	1203173	1203174
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8	WST-W0025-02-RCA2	WST-W0025-02-GW3
			Sampling point:	Clear, hard to take sample	Clear	Clear, very overgrown difficult to find and sample	Sandy brown, cloudy	Clear, pumped until conductivity stable
			Sampled by:	DB/SB	DB/SB	DB/SB	DB/SB	DB/SB
			Time Sampled:	11:00	10:05	09:40	11:30	11:20
			Start/End - Dates of Analysis:					
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
F	Depth of Borehole	m		21.4	18.5	13.2	16.4	43
F	Water Level	m		12.7	10.9	8.2	3.9	-
F	Temperature	°C		11.5	11.8	12.0	11.2	11.7
F	Dissolved Oxygen (as %Sat)	% Saturation		70.2	31.7	21.0	78.0	36.5
F	pH	pH		7.3	7.3	7.1	7.3	7.3
F	Conductivity @25°C	µS/cm		714	671	742	827	748
L	Ammonia	mg/l N		0.08	0.19	0.38	0.19	0.03
L	Chloride	mg/l Cl		22	21	22	19	24
L	ortho-Phosphate (as P)	mg/l P		0.01	<0.01	0.02	0.03	0.02
L	Total Oxidised Nitrogen (as N)	mg/l N		7.77	8.09	9.74	8.97	8.91
L	Fluoride	mg/l F		<0.25	<0.25	<0.25	<0.25	<0.25
L	Sulphate	mg/l SO4		29	39	38	57	25
L	Alkalinity-total (as CaCO3)	mg/l CaCO3		306	259	307	393	276
L	Total Organic Carbon	mg/l C		<1.0	<1.0	<1.0	2.0	<1.0
L	1,1,1,2-Tetrachloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1,1-Trichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1,2,2-Tetrachloroethane	µg/l		<1	<1	<1	<1	<1
L	1,1,2-Trichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1-Dichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1-Dichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1-Dichloropropene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,2,3-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4	<0.4	<0.4
L	1,2,3-Trichloropropane	µg/l		<0.6	<0.6	<0.6	<0.6	<0.6

				Laboratory Ref:	1203170	1203171	1203172	1203173	1203174
				Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8	WST-W0025-02-RCA2	WST-W0025-02-GW3
				Sampling point:	Clear, hard to take sample	Clear	Clear, very overgrown difficult to find and sample	Sandy brown, cloudy	Clear, pumped until conductivity stable
				Sampled by:	DB/SB	DB/SB	DB/SB	DB/SB	DB/SB
				Time Sampled:	11:00	10:05	09:40	11:30	11:20
				Start/End - Dates of Analysis:					
				Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
L	1,2,4-Trichlorobenzene	µg/l			<0.4	<0.4	<0.4	<0.4	<0.4
L	1,2,4-Trimethylbenzene	µg/l			<0.5	<0.5	<0.5	0.5	<0.5
L	1,2-Dibromo-3-Chloropropane	µg/l			<1.3	<1.3	<1.3	<1.3	<1.3
L	1,2-Dibromoethane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	1,2-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	1,2-Dichloroethane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	1,2-Dichloropropane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	1,3,5-Trimethylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	1,3-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	1,3-Dichloropropane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	1,4-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	2,2-Dichloropropane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	2-Chlorotoluene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	4-Chlorotoluene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	4-Isopropyltoluene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Benzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromochloromethane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromodichloromethane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromoform	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromomethane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	c-1,2-Dichloroethene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	c-1,3-Dichloropropene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Carbon Tetrachloride	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5

				Laboratory Ref:	1203170	1203171	1203172	1203173	1203174
				Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8	WST-W0025-02-RCA2	WST-W0025-02-GW3
				Sampling point:	Clear, hard to take sample	Clear	Clear, very overgrown difficult to find and sample	Sandy brown, cloudy	Clear, pumped until conductivity stable
				Sampled by:	DB/SB	DB/SB	DB/SB	DB/SB	DB/SB
				Time Sampled:	11:00	10:05	09:40	11:30	11:20
				Start/End - Dates of Analysis:					
				Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
L	Chlorobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Chloroform	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Dibromochloromethane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Dibromomethane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Dichlorodifluoromethane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Dichloromethane	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Ethylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Hexachlorobutadiene	µg/l			<0.1	<0.1	<0.1	<0.1	<0.1
L	Isopropylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	m,p-Xylene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Naphthalene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	n-Butylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	n-Propylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	o-Xylene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	sec-Butylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Styrene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	t-1,2-Dichloroethene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	t-1,3-Dichloropropene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	tert-Butylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Tetrachloroethene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Toluene	µg/l			<0.5	<0.5	<0.5	0.6	<0.5
L	Trichloroethene	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Trichlorofluoromethane	µg/l			<0.6	<0.6	<0.6	<0.6	<0.6
L	Vinyl Chloride	µg/l			<0.5	<0.5	<0.5	<0.5	<0.5

				Laboratory Ref:	1203170	1203171	1203172	1203173	1203174
				Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8	WST-W0025-02-RCA2	WST-W0025-02-GW3
				Sampling point:	Clear, hard to take sample	Clear	Clear, very overgrown difficult to find and sample	Sandy brown, cloudy	Clear, pumped until conductivity stable
				Sampled by:	DB/SB	DB/SB	DB/SB	DB/SB	DB/SB
				Time Sampled:	11:00	10:05	09:40	11:30	11:20
				Start/End - Dates of Analysis:					
				Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
L	Aluminium	ug/l			77	240	160	3400	<25
L	Antimony	ug/l			1	1	1	1.1	1.3
L	Arsenic	ug/l			0.8	1	0.9	3.7	1
L	Barium	ug/l			33	32	36	39	35
L	Beryllium	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Boron	ug/l			63	73	85	83	95
L	Cadmium	ug/l			<0.5	<0.5	<0.5	0.8	<0.5
L	Calcium	mg/l			120	110	120	190	120
L	Chromium	ug/l			1	1.3	1.1	5.8	1.1
L	Cobalt	ug/l			<0.5	<0.5	<0.5	4.7	<0.5
L	Copper	ug/l			0.7	1.1	1.1	9.7	1
L	Iron	ug/l			94	330	220	4700	34
L	Lead	ug/l			<0.5	0.6	<0.5	5.5	<0.5
L	Magnesium	mg/l			12	13	13	17	13
L	Manganese	ug/l			<25	33	<25	410	<25
L	Mercury	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Molybdenum	ug/l			1.4	1.4	1.4	1.3	2.3
L	Nickel	ug/l			1.9	2.4	2.4	13	3.4
L	Potassium	mg/l			1.7	2.8	4	2.2	2.4
L	Selenium	ug/l			1	1.2	1.2	1.5	1.5
L	Sodium	mg/l			9.5	9.2	10	8.7	9.9
L	Thallium	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5
L	Tin	ug/l			<1	<1	<1	<1	<1
L	Uranium	ug/l			2.6	2.5	2.4	4.7	3

			Laboratory Ref:	1203170	1203171	1203172	1203173	1203174
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8	WST-W0025-02-RCA2	WST-W0025-02-GW3
			Sampling point:	Clear, hard to take sample	Clear	Clear, very overgrown difficult to find and sample	Sandy brown, cloudy	Clear, pumped until conductivity stable
			Sampled by:	DB/SB	DB/SB	DB/SB	DB/SB	DB/SB
			Time Sampled:	11:00	10:05	09:40	11:30	11:20
			Start/End - Dates of Analysis:					
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
L	Vanadium	ug/l		0.7	1	0.9	6.6	0.9
L	Zinc	ug/l		<3	3	<3	23	8

Comments:

1) Results highlighted and in bold are outside specified limits.

2) **nm** "Not measured"
3) **nd** "None detected"
4) **nt** "No time" - Time not recorded
5) **tntc** "Too numerous to count"
6) **F** "Field measured parameters"
7) **L** "Lab measured parameters"

Signed: PP

Caroline Bowden, Regional Chemist

Date: 06/Sep/2012

Environmental Protection Agency
Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny

Test Report

Report of: Analysis of landfill site sample(s)
Report to: Carlow County Council
Report date: 16/01/13

Facility: **Powerstown Landfill Site**
Kilkenny Rd., Co Carlow,
Reference No: W0025-02

Date collected: 16/10/2012 Date received: 16/10/2012

			Laboratory Ref:	1204529	1204530	
			Type of sample:	Groundwater	Groundwater	
			Location code:	WST-W0025-02-GW Doyles	WST-W0025-02-GW Purcells	
			Sampling point:	Clear	No sample, tap not operational	
			Sampled by:	DB/ED	DB/ED	
			Time Sampled:	12:50	nm	
			Start/End - Dates of Analysis:	16-10-12/29-10-12	16-10-12/16-10-12	
			Status of results:	**Final Report**	**Final Report**	
Parameter		**Units**	**Limits**			
F	Temperature	°C		11.8	-	
F	Dissolved Oxygen (as %Sat)	% Saturation		60.0	-	
L	pH	pH		7.1	-	
L	Conductivity @25°C	µS/cm		795	-	
L	Ammonia	mg/l N		<0.01	-	
L	Chloride	mg/l Cl		18	-	
L	Nitrite (as N)	mg/l N		<0.002	-	
L	ortho-Phosphate (as P)	mg/l P		0.01	-	
L	Total Oxidised Nitrogen (as N)	mg/l N		14.71	-	
L	Fluoride	mg/l F		<0.25	-	
L	Sulphate	mg/l SO4		33	-	
L	Alkalinity-total (as CaCO3)	mg/l CaCO3		304	-	
L	Total Organic Carbon	mg/l C		64.6	-	
L	1,1,1,2-Tetrachloroethane	µg/l		<0.5	-	
L	1,1,1-Trichloroethane	µg/l		<0.5	-	
L	1,1,2,2-Tetrachloroethane	µg/l		<1	-	
L	1,1,2-Trichloroethane	µg/l		<0.5	-	
L	1,1-Dichloroethane	µg/l		<0.5	-	
L	1,1-Dichloroethene	µg/l		<0.5	-	
L	1,1-Dichloropropene	µg/l		<0.5	-	
L	1,2,3-Trichlorobenzene	µg/l		<0.4	-	
L	1,2,3-Trichloropropane	µg/l		<0.6	-	

			Laboratory Ref:	1204529	1204530	
			Type of sample:	Groundwater	Groundwater	
			Location code:	WST-W0025-02-GW Doyles	WST-W0025-02-GW Purcells	
			Sampling point:	Clear	No sample, tap not operational	
			Sampled by:	DB/ED	DB/ED	
			Time Sampled:	12:50	nm	
			Start/End - Dates of Analysis:	16-10-12/29-10-12	16-10-12/16-10-12	
			Status of results:	**Final Report**	**Final Report**	
Parameter		**Units**	**Limits**			
L	1,2,4-Trichlorobenzene	µg/l		<0.4	-	
L	1,2,4-Trimethylbenzene	µg/l		<0.5	-	
L	1,2-Dibromo-3-Chloropropane	µg/l		<1.3	-	
L	1,2-Dibromoethane	µg/l		<0.5	-	
L	1,2-Dichlorobenzene	µg/l		<0.5	-	
L	1,2-Dichloroethane	µg/l		<0.5	-	
L	1,2-Dichloropropane	µg/l		<0.5	-	
L	1,3,5-Trimethylbenzene	µg/l		<0.5	-	
L	1,3-Dichlorobenzene	µg/l		<0.5	-	
L	1,3-Dichloropropane	µg/l		<0.5	-	
L	1,4-Dichlorobenzene	µg/l		<0.5	-	
L	2,2-Dichloropropane	µg/l		<0.5	-	
L	2-Chlorotoluene	µg/l		<0.5	-	
L	4-Chlorotoluene	µg/l		<0.5	-	
L	4-Isopropyltoluene	µg/l		<0.5	-	
L	Benzene	µg/l		<0.5	-	
L	Bromobenzene	µg/l		<0.5	-	
L	Bromochloromethane	µg/l		<0.5	-	
L	Bromodichloromethane	µg/l		<0.5	-	
L	Bromoform	µg/l		<0.5	-	
L	Bromomethane	µg/l		<0.5	-	
L	c-1,2-Dichloroethene	µg/l		<0.5	-	
L	c-1,3-Dichloropropene	µg/l		<0.5	-	
L	Carbon Tetrachloride	µg/l		<0.5	-	
L	Chlorobenzene	µg/l		<0.5	-	
L	Chloroform	µg/l		<0.5	-	
L	Dibromochloromethane	µg/l		<0.5	-	
L	Dibromomethane	µg/l		<0.5	-	
L	Dichlorodifluoromethane	µg/l		<0.5	-	
L	Dichloromethane	µg/l		<0.5	-	
L	Ethylbenzene	µg/l		<0.5	-	
L	Hexachlorobutadiene	µg/l		<0.1	-	
L	Isopropylbenzene	µg/l		<0.5	-	
L	m,p-Xylene	µg/l		<0.5	-	
L	Naphthalene	µg/l		<0.5	-	
L	n-Butylbenzene	µg/l		<0.5	-	
L	n-Propylbenzene	µg/l		<0.5	-	
L	o-Xylene	µg/l		<0.5	-	
L	sec-Butylbenzene	µg/l		<0.5	-	
L	Styrene	µg/l		<0.5	-	

			Laboratory Ref:	1204529	1204530	
			Type of sample:	Groundwater	Groundwater	
			Location code:	WST-W0025-02-GW Doyles	WST-W0025-02-GW Purcells	
			Sampling point:	Clear	No sample, tap not operational	
			Sampled by:	DB/ED	DB/ED	
			Time Sampled:	12:50	nm	
			Start/End - Dates of Analysis:	16-10-12/29-10-12	16-10-12/16-10-12	
			Status of results:	**Final Report**	**Final Report**	
Parameter		**Units**	**Limits**			
L	t-1,2-Dichloroethene	µg/l		<0.5	-	
L	t-1,3-Dichloropropene	µg/l		<0.5	-	
L	tert-Butylbenzene	µg/l		<0.5	-	
L	Tetrachloroethene	µg/l		<0.5	-	
L	Toluene	µg/l		<0.5	-	
L	Trichloroethene	µg/l		<0.5	-	
L	Trichlorofluoromethane	µg/l		<0.6	-	
L	Vinyl Chloride	µg/l		<0.5	-	
L	Aluminium	ug/l		<25	-	
L	Antimony	ug/l		<0.5	-	
L	Arsenic	ug/l		<0.5	-	
L	Barium	ug/l		9	-	
L	Beryllium	ug/l		<0.5	-	
L	Boron	ug/l		<5	-	
L	Cadmium	ug/l		<0.5	-	
L	Calcium	mg/l		<0.5	-	
L	Chromium	ug/l		<0.5	-	
L	Cobalt	ug/l		<0.5	-	
L	Copper	ug/l		<0.5	-	
L	Iron	ug/l		<25	-	
L	Lead	ug/l		<0.5	-	
L	Magnesium	mg/l		<0.5	-	
L	Manganese	ug/l		<25	-	
L	Mercury	ug/l		<0.5	-	
L	Molybdenum	ug/l		<0.5	-	
L	Nickel	ug/l		<0.5	-	
L	Potassium	mg/l		<0.5	-	
L	Selenium	ug/l		<0.5	-	
L	Sodium	mg/l		<0.5	-	
L	Thallium	ug/l		<0.5	-	
L	Tin	ug/l		1	-	
L	Uranium	ug/l		<0.5	-	
L	Vanadium	ug/l		<0.5	-	
L	Zinc	ug/l		<3	-	
L	E Coli	per 100ml		0	-	
L	Total coliforms	No/100 ml		0	-	
L	Turbidity	FTU		0.7	-	

Comments:

1) **Results hilighted and in bold are outside specified limits.**
2) **nm - "not measured".**
3) **nd - "none detected".**
4) **nt - "time not recorded".**
5) **nr - "not reported".**
6) **tntc - "too numerous to count".**
7) **F - Field measured parameter.**
8) **L - Lab measured parameter.**
9) **Test Reports relate only to the samples tested and as described on the report form.**
10) **Test Reports shall not be reproduced, except in full, without consent of the EPA.**

Signed: PP

Caroline Bowden, Regional Chemist

Date: 16/Jan/2013

2013

Environmental Protection Agency
Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny

Test Report

Report of: Analysis of landfill site sample(s)
Report to: Carlow County Council
Report date: 23/07/13

Facility: **Powerstown Landfill Site**
Kilkenny Rd., Co Carlow,
Reference No: W0025-02

Date collected:	08/05/2013	Date received:	08/05/2013

			Laboratory Ref:	1302127	1302128	1302129	1302130	1302131
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA2	WST-W0025-02-GW3	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8
			Sampling point:	sandy	clear	cloudy	clear	clear
			Sampled by:	DB & EH	DB & EH	DB & EH	DB & EH	DB & EH
			Time Sampled:	11:25	11:05	09:40	10:20	10:05
			Start/End - Dates of Analysis:	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**					
F	Depth of Borehole	m		16.4	43	21.5	18.5	13.2
F	Water Level	m		4.5	nm	13	10.7	8.1
F	Temperature	℃		11.0	11.3	11.3	11.4	11.8
F	Dissolved Oxygen (as %Sat)	% Saturation		76.0	27.0	75.5	49.1	24.6
F	pH	pH		7.2	7.2	7.2	7.1	7.1
F	Conductivity @25℃	µS/cm		780	761	700	671	713
L	Ammonia	mg/l N		0.05	<0.01	0.04	0.04	0.06
L	Chloride	mg/l Cl		16	21	21	19	20
L	Nitrite (as N)	mg/l N		<0.002	0.015	<0.002	<0.002	<0.002
L	ortho-Phosphate (as P)	mg/l P		0.02	0.01	0.01	0.02	0.02
L	Total Oxidised Nitrogen (as N)	mg/l N		10.42	7.43	7.69	7.46	8.65
L	Fluoride	mg/l F		<0.25	<0.25	<0.25	<0.25	<0.25
L	Sulphate	mg/l SO4		40	55	27	37	39
L	Alkalinity-total (as CaCO3)	mg/l CaCO3		325	300	302	271	285
L	Total Organic Carbon	mg/l C		3.4	1.3	1.1	1.9	1.2
L	1,1,1,2-Tetrachloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1,1-Trichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1,2,2-Tetrachloroethane	µg/l		<1	<1	<1	<1	<1
L	1,1,2-Trichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1-Dichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1-Dichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,1-Dichloropropene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,2,3-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4	<0.4	<0.4

			Laboratory Ref:	1302127	1302128	1302129	1302130	1302131
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA2	WST-W0025-02-GW3	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8
			Sampling point:	sandy	clear	cloudy	clear	clear
			Sampled by:	DB & EH	DB & EH	DB & EH	DB & EH	DB & EH
			Time Sampled:	11:25	11:05	09:40	10:20	10:05
			Start/End - Dates of Analysis:	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**					
L	1,2,3-Trichloropropane	µg/l		<0.6	<0.6	<0.6	<0.6	<0.6
L	1,2,4-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4	<0.4	<0.4
L	1,2,4-Trimethylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,2-Dibromo-3-Chloropropane	µg/l		<1.3	<1.3	<1.3	<1.3	<1.3
L	1,2-Dibromoethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,2-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,2-Dichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,2-Dichloropropane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,3,5-Trimethylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,3-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,3-Dichloropropane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	1,4-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	2,2-Dichloropropane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	2-Chlorotoluene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	4-Chlorotoluene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	4-Isopropyltoluene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Benzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromochloromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromodichloromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromoform	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Bromomethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	c-1,2-Dichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5

			Laboratory Ref:	1302127	1302128	1302129	1302130	1302131
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA2	WST-W0025-02-GW3	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8
			Sampling point:	sandy	clear	cloudy	clear	clear
			Sampled by:	DB & EH	DB & EH	DB & EH	DB & EH	DB & EH
			Time Sampled:	11:25	11:05	09:40	10:20	10:05
			Start/End - Dates of Analysis:	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**					
L	c-1,3-Dichloropropene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Carbon Tetrachloride	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Chlorobenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Chloroform	µg/l		0.5	<0.5	<0.5	<0.5	<0.5
L	Dibromochloromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Dibromomethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Dichlorodifluoromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Dichloromethane	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Ethylbenzene	µg/l		<0.5	<0.5	<0.5	0.9	0.7
L	Hexachlorobutadiene	µg/l		<0.1	<0.1	<0.1	<0.1	<0.1
L	Isopropylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	m,p-Xylene	µg/l		<0.5	<0.5	<0.5	0.6	<0.5
L	Naphthalene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	n-Butylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	n-Propylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	o-Xylene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	sec-Butylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Styrene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	t-1,2-Dichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	t-1,3-Dichloropropene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	tert-Butylbenzene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Tetrachloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Toluene	µg/l		0.6	<0.5	0.7	1.2	1

			Laboratory Ref:	1302127	1302128	1302129	1302130	1302131
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA2	WST-W0025-02-GW3	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8
			Sampling point:	sandy	clear	cloudy	clear	clear
			Sampled by:	DB & EH	DB & EH	DB & EH	DB & EH	DB & EH
			Time Sampled:	11:25	11:05	09:40	10:20	10:05
			Start/End - Dates of Analysis:	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**					
L	Trichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Trichlorofluoromethane	µg/l		<0.6	<0.6	<0.6	<0.6	<0.6
L	Vinyl Chloride	µg/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Aluminium	ug/l		350	<25	460	110	71
L	Antimony	ug/l		<0.5	1.2	<0.5	<0.5	<0.5
L	Arsenic	ug/l		0.9	0.5	<0.5	<0.5	<0.5
L	Barium	ug/l		20	29	27	20	28
L	Beryllium	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Boron	ug/l		73	60	57	65	74
L	Cadmium	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Calcium	mg/l		140	130	120	110	110
L	Chromium	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Cobalt	ug/l		0.9	<0.5	1	<0.5	<0.5
L	Copper	ug/l		2.2	1	1.3	0.5	0.7
L	Iron	ug/l		850	34	690	220	120
L	Lead	ug/l		1.2	<0.5	1.3	<0.5	<0.5
L	Magnesium	mg/l		14	14	14	14	14
L	Manganese	ug/l		47	<25	58	<25	<25
L	Mercury	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Molybdenum	ug/l		<0.5	2	<0.5	<0.5	<0.5
L	Nickel	ug/l		1.1	3.5	1.4	<0.5	<0.5
L	Potassium	mg/l		1.5	2.4	1.2	2.1	3.1
L	Selenium	ug/l		1.4	0.7	0.6	0.5	0.9

			Laboratory Ref:	1302127	1302128	1302129	1302130	1302131
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA2	WST-W0025-02-GW3	WST-W0025-02-GW6	WST-W0025-02-GW7	WST-W0025-02-GW8
			Sampling point:	sandy	clear	cloudy	clear	clear
			Sampled by:	DB & EH	DB & EH	DB & EH	DB & EH	DB & EH
			Time Sampled:	11:25	11:05	09:40	10:20	10:05
			Start/End - Dates of Analysis:	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**					
L	Sodium	mg/l		7.6	9.8	9.6	9	9.5
L	Thallium	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5
L	Uranium	ug/l		9.1	7	6.7	6.5	6.1
L	Vanadium	ug/l		1.3	<0.5	1.4	<0.5	<0.5
L	Zinc	ug/l		12	32	13	7	11

Comments:

1) **Results hilighted and in bold are outside specified limits.**
2) **nm - "not measured".**
3) **nd - "none detected".**
4) **nt - "time not recorded".**
5) **nr - "not reported".**
6) **tntc - "too numerous to count".**
7) **F - Field measured parameter.**
8) **L - Lab measured parameter.**
9) **Test Reports relate only to the samples tested and as described on the report form.**
10) **Test Reports shall not be reproduced, except in full, without consent of the EPA.**

Signed: PP

Caroline Bowden, Regional Chemist

Date: 23/Jul/2013

Environmental Protection Agency
Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny

Test Report

Report of: Analysis of landfill site sample(s)
Report to: Carlow County Council
Report date: 23/07/13

Facility: **Powerstown Landfill Site**
Kilkenny Rd., Co Carlow,
Reference No: W0025-02

Date collected: 08/05/2013 Date received: 08/05/2013

				Laboratory Ref:	1302124	1302125	1302126
				Type of sample:	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-RCA1	WST-W0025-02-GW1	WST-W0025-02-GW2
				Sampling point:	sandy	clear	brownish
				Sampled by:	DB & EH	DB & EH	DB & EH
				Time Sampled:	11:35	12:35	12:15
				Start/End - Dates of Analysis:	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13
				Status of results:	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**				
F	Depth of Borehole	m			16.4	16.4	3.7
F	Water Level	m			4.5	10	1.6
F	Temperature	℃			10.8	11.8	11.4
F	Dissolved Oxygen (as %Sat)	% Saturation			74.0	28.0	35.0
F	pH	pH			7.3	6.9	6.9
F	Conductivity @25℃	µS/cm			792	1023	923
L	Ammonia	mg/l N			0.06	12	0.08
L	Chloride	mg/l Cl			16	33	34
L	Nitrite (as N)	mg/l N			<0.002	<0.002	0.019
L	ortho-Phosphate (as P)	mg/l P			0.01	0.01	<0.01
L	Total Oxidised Nitrogen (as N)	mg/l N			10	2.87	1.99
L	Fluoride	mg/l F			<0.25	<0.25	<0.25
L	Sulphate	mg/l SO4			47	52	87
L	Alkalinity-total (as CaCO3)	mg/l CaCO3			326	432	360
L	Total Organic Carbon	mg/l C			2.9	2.8	8.4
L	1,1,1,2-Tetrachloroethane	µg/l			<0.5	<0.5	<0.5
L	1,1,1-Trichloroethane	µg/l			<0.5	<0.5	<0.5
L	1,1,2,2-Tetrachloroethane	µg/l			<1	<1	<1
L	1,1,2-Trichloroethane	µg/l			<0.5	<0.5	<0.5
L	1,1-Dichloroethane	µg/l			<0.5	<0.5	<0.5
L	1,1-Dichloroethene	µg/l			<0.5	<0.5	<0.5
L	1,1-Dichloropropene	µg/l			<0.5	<0.5	<0.5

			Laboratory Ref:	1302124	1302125	1302126
			Type of sample:	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA1	WST-W0025-02-GW1	WST-W0025-02-GW2
			Sampling point:	sandy	clear	brownish
			Sampled by:	DB & EH	DB & EH	DB & EH
			Time Sampled:	11:35	12:35	12:15
			Start/End - Dates of Analysis:	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13
			Status of results:	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**			
L	1,2,3-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4
L	1,2,3-Trichloropropane	µg/l		<0.6	<0.6	<0.6
L	1,2,4-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4
L	1,2,4-Trimethylbenzene	µg/l		<0.5	<0.5	<0.5
L	1,2-Dibromo-3-Chloropropane	µg/l		<1.3	<1.3	<1.3
L	1,2-Dibromoethane	µg/l		<0.5	<0.5	<0.5
L	1,2-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5
L	1,2-Dichloroethane	µg/l		<0.5	<0.5	<0.5
L	1,2-Dichloropropane	µg/l		<0.5	<0.5	<0.5
L	1,3,5-Trimethylbenzene	µg/l		<0.5	<0.5	<0.5
L	1,3-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5
L	1,3-Dichloropropane	µg/l		<0.5	<0.5	<0.5
L	1,4-Dichlorobenzene	µg/l		<0.5	<0.5	<0.5
L	2,2-Dichloropropane	µg/l		<0.5	<0.5	<0.5
L	2-Chlorotoluene	µg/l		<0.5	<0.5	<0.5
L	4-Chlorotoluene	µg/l		<0.5	<0.5	<0.5
L	4-Isopropyltoluene	µg/l		<0.5	<0.5	<0.5
L	Benzene	µg/l		<0.5	<0.5	<0.5
L	Bromobenzene	µg/l		<0.5	<0.5	<0.5
L	Bromochloromethane	µg/l		<0.5	<0.5	<0.5
L	Bromodichloromethane	µg/l		<0.5	<0.5	<0.5
L	Bromoform	µg/l		<0.5	<0.5	<0.5
L	Bromomethane	µg/l		<0.5	<0.5	<0.5
L	c-1,2-Dichloroethene	µg/l		<0.5	<0.5	<0.5
L	c-1,3-Dichloropropene	µg/l		<0.5	<0.5	<0.5
L	Carbon Tetrachloride	µg/l		<0.5	<0.5	<0.5
L	Chlorobenzene	µg/l		<0.5	<0.5	<0.5
L	Chloroform	µg/l		0.5	<0.5	<0.5
L	Dibromochloromethane	µg/l		<0.5	<0.5	<0.5
L	Dibromomethane	µg/l		<0.5	<0.5	<0.5
L	Dichlorodifluoromethane	µg/l		<0.5	<0.5	<0.5
L	Dichloromethane	µg/l		<0.5	<0.5	<0.5
L	Ethylbenzene	µg/l		<0.5	<0.5	<0.5
L	Hexachlorobutadiene	µg/l		<0.1	<0.1	<0.1
L	Isopropylbenzene	µg/l		<0.5	<0.5	<0.5
L	m,p-Xylene	µg/l		<0.5	<0.5	<0.5
L	Naphthalene	µg/l		<0.5	<0.5	<0.5
L	n-Butylbenzene	µg/l		<0.5	<0.5	<0.5
L	n-Propylbenzene	µg/l		<0.5	<0.5	<0.5
L	o-Xylene	µg/l		<0.5	<0.5	<0.5

			Laboratory Ref:	1302124	1302125	1302126
			Type of sample:	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA1	WST-W0025-02-GW1	WST-W0025-02-GW2
			Sampling point:	sandy	clear	brownish
			Sampled by:	DB & EH	DB & EH	DB & EH
			Time Sampled:	11:35	12:35	12:15
			Start/End - Dates of Analysis:	08-05-13/18-07-13	08-05-13/18-07-13	08-05-13/18-07-13
			Status of results:	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**			
L	sec-Butylbenzene	µg/l		<0.5	<0.5	<0.5
L	Styrene	µg/l		<0.5	<0.5	<0.5
L	t-1,2-Dichloroethene	µg/l		<0.5	<0.5	<0.5
L	t-1,3-Dichloropropene	µg/l		<0.5	<0.5	<0.5
L	tert-Butylbenzene	µg/l		<0.5	<0.5	<0.5
L	Tetrachloroethene	µg/l		<0.5	<0.5	<0.5
L	Toluene	µg/l		<0.5	0.8	<0.5
L	Trichloroethene	µg/l		<0.5	<0.5	<0.5
L	Trichlorofluoromethane	µg/l		<0.6	<0.6	<0.6
L	Vinyl Chloride	µg/l		<0.5	<0.5	<0.5
L	Aluminium	ug/l		950	67	<25
L	Antimony	ug/l		<0.5	<0.5	<0.5
L	Arsenic	ug/l		1.4	<0.5	1.9
L	Barium	ug/l		23	90	50
L	Beryllium	ug/l		<0.5	<0.5	<0.5
L	Boron	ug/l		70	140	70
L	Cadmium	ug/l		<0.5	<0.5	<0.5
L	Calcium	mg/l		140	120	140
L	Chromium	ug/l		1	<0.5	<0.5
L	Cobalt	ug/l		1.6	1.6	1
L	Copper	ug/l		3.4	1.8	2.7
L	Iron	ug/l		1800	130	2500
L	Lead	ug/l		1.9	<0.5	<0.5
L	Magnesium	mg/l		14	19	17
L	Manganese	ug/l		98	140	320
L	Mercury	ug/l		<0.5	<0.5	<0.5
L	Molybdenum	ug/l		<0.5	<0.5	<0.5
L	Nickel	ug/l		2.7	5.7	1.6
L	Potassium	mg/l		1.6	19	8.2
L	Selenium	ug/l		1	<0.5	0.5
L	Sodium	mg/l		7.8	29	29
L	Thallium	ug/l		<0.5	<0.5	<0.5
L	Uranium	ug/l		9.4	5.5	8.8
L	Vanadium	ug/l		2.2	<0.5	<0.5
L	Zinc	ug/l		15	9	8

Comments:

1) **Results hilighted and in bold are outside specified limits.**
2) **nm - "not measured".**
3) **nd - "none detected".**
4) **nt - "time not recorded".**
5) **nr - "not reported".**
6) **tntc - "too numerous to count".**
7) **F - Field measured parameter.**
8) **L - Lab measured parameter.**
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Signed: PP _____ Date: 23/Jul/2013

Caroline Bowden, Regional Chemist

2014

Environmental Protection Agency
Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny

Test Report

Report of: Analysis of landfill site sample(s)
Report to: Office of Environmental Enforcement
Report date: 19/06/14

Licensee: **Carlow County Council**
Facility: **Powerstown Landfill Site**
Kilkenny Rd., Co Carlow,
Reference No: W0025-02

Date collected: 08/05/2014 Date received: 08/05/2014

			Laboratory Ref:	1421856	1421857	1421858
			Type of sample:	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA1	WST-W0025-02-GW1	WST-W0025-02-GW2
			Sampling point:	Sandy	Sandy	Brownish
			Sampled by:	DB/MDM	DB/MDM	DB/MDM
			Time Sampled:	11:05	11:30	11:20
			Start/End - Dates of Analysis:	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14
			Status of results:	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**			
F **	Depth of Borehole	m		16.4	16.4	3.7
F **	Water Level	m		11	6.3	1.7
F **	Temperature	℃		11.1	12.0	12.1
F **	Dissolved Oxygen (as %Sat)	% Saturation		108.0	17.0	29.0
F	pH	pH		7.1	6.9	6.9
F	Conductivity @25℃	µS/cm		696	904	975
L	Ammonia	mg/l N		NR	NR	NR
L	Chloride	mg/l Cl		19	27	59
L	ortho-Phosphate	mg/l P		0.011	<0.010	<0.010
L	Total Oxidised Nitrogen	mg/l N		NR	NR	NR
L	Fluoride	mg/l F		<0.25	<0.25	<0.25
L	Sulphate	mg/l SO4		32	49	53
L **	Alkalinity-total	mg/l CaCO3		273	366	307
L **	Total Organic Carbon	mg/l C		<1.0	2.0	2.8
L **	1,1,1,2-Tetrachloroethane	µg/l		<0.5	<0.5	<0.5
L **	1,1,1-Trichloroethane	µg/l		<0.5	<0.5	<0.5
L **	1,1,2,2-Tetrachloroethane	µg/l		<1	<1	<1
L **	1,1,2-Trichloroethane	µg/l		<0.5	<0.5	<0.5
L **	1,1-Dichloroethane	µg/l		<0.5	<0.5	<0.5
L **	1,1-Dichloroethene	µg/l		<0.5	<0.5	<0.5

				Laboratory Ref:	1421856	1421857	1421858
				Type of sample:	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-RCA1	WST-W0025-02-GW1	WST-W0025-02-GW2
				Sampling point:	Sandy	Sandy	Brownish
				Sampled by:	DB/MDM	DB/MDM	DB/MDM
				Time Sampled:	11:05	11:30	11:20
				Start/End - Dates of Analysis:	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14
				Status of results:	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**				
L **	1,1-Dichloropropene	µg/l			<0.5	<0.5	<0.5
L **	1,2,3-Trichlorobenzene	µg/l			<0.4	<0.4	<0.4
L **	1,2,3-Trichloropropane	µg/l			<0.6	<0.6	<0.6
L **	1,2,4-Trichlorobenzene	µg/l			<0.4	<0.4	<0.4
L **	1,2,4-Trimethylbenzene	µg/l			<0.5	<0.5	<0.5
L **	1,2-Dibromo-3-Chloropropane	µg/l			<1.3	<1.3	<1.3
L **	1,2-Dibromoethane	µg/l			<0.5	<0.5	<0.5
L **	1,2-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5
L **	1,2-Dichloroethane	µg/l			<0.5	<0.5	<0.5
L **	1,2-Dichloropropane	µg/l			<0.5	<0.5	<0.5
L **	1,3,5-Trimethylbenzene	µg/l			<0.5	<0.5	<0.5
L **	1,3-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5
L **	1,3-Dichloropropane	µg/l			<0.5	<0.5	<0.5
L **	1,4-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5
L **	2,2-Dichloropropane	µg/l			<0.5	<0.5	<0.5
L **	2-Chlorotoluene	µg/l			<0.5	<0.5	<0.5
L **	4-Chlorotoluene	µg/l			<0.5	<0.5	<0.5
L **	4-Isopropyltoluene	µg/l			<0.5	<0.5	<0.5
L **	Benzene	µg/l			<0.5	<0.5	<0.5
L **	Bromobenzene	µg/l			<0.5	<0.5	<0.5
L **	Bromochloromethane	µg/l			<0.5	<0.5	<0.5
L **	Bromodichloromethane	µg/l			<0.5	<0.5	<0.5
L **	Bromoform	µg/l			<0.5	<0.5	<0.5
L **	Bromomethane	µg/l			<0.5	<0.5	<0.5
L **	c-1,2-Dichloroethene	µg/l			<0.5	<0.5	<0.5
L **	c-1,3-Dichloropropene	µg/l			<0.5	<0.5	<0.5
L **	Carbon Tetrachloride	µg/l			<0.5	<0.5	<0.5
L **	Chlorobenzene	µg/l			<0.5	<0.5	<0.5
L **	Chloroform	µg/l			<0.5	<0.5	<0.5
L **	Dibromochloromethane	µg/l			<0.5	<0.5	<0.5
L **	Dibromomethane	µg/l			<0.5	<0.5	<0.5
L **	Dichlorodifluoromethane	µg/l			<0.5	<0.5	<0.5
L **	Dichloromethane	µg/l			<0.5	<0.5	<0.5
L **	Ethylbenzene	µg/l			<0.5	<0.5	<0.5
L **	Hexachlorobutadiene	µg/l			<0.1	<0.1	<0.1
L **	Isopropylbenzene	µg/l			<0.5	<0.5	<0.5
L **	m,p-Xylene	µg/l			<0.5	<0.5	<0.5
L **	Naphthalene	µg/l			<0.5	<0.5	<0.5
L **	n-Butylbenzene	µg/l			<0.5	<0.5	<0.5
L **	n-Propylbenzene	µg/l			<0.5	<0.5	<0.5

			Laboratory Ref:	1421856	1421857	1421858
			Type of sample:	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-RCA1	WST-W0025-02-GW1	WST-W0025-02-GW2
			Sampling point:	Sandy	Sandy	Brownish
			Sampled by:	DB/MDM	DB/MDM	DB/MDM
			Time Sampled:	11:05	11:30	11:20
			Start/End - Dates of Analysis:	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14
			Status of results:	**Final Report**	**Final Report**	**Final Report**
	Parameter	**Units**	**Limits**			
L **	o-Xylene	µg/l		<0.5	<0.5	<0.5
L **	sec-Butylbenzene	µg/l		<0.5	<0.5	<0.5
L **	Styrene	µg/l		<0.5	<0.5	<0.5
L **	t-1,2-Dichloroethene	µg/l		<0.5	<0.5	<0.5
L **	t-1,3-Dichloropropene	µg/l		<0.5	<0.5	<0.5
L **	tert-Butylbenzene	µg/l		<0.5	<0.5	<0.5
L **	Tetrachloroethene	µg/l		<0.5	<0.5	<0.5
L **	Toluene	µg/l		<0.5	0.6	<0.5
L **	Trichloroethene	µg/l		<0.5	<0.5	<0.5
L **	Trichlorofluoromethane	µg/l		<0.6	<0.6	<0.6
L **	Vinyl Chloride	µg/l		<0.5	<0.5	<0.5
L **	Mercury	ug/l		<0.50	<0.50	<0.50
L **	Aluminium	ug/l		<10.0	<10.0	<10.0
L **	Arsenic	ug/l		<1.0	<1.0	<1.0
L **	Barium	ug/l		16	69	51
L **	Beryllium	ug/l		<1.0	<1.0	<1.0
L **	Boron	ug/l		68	120	66
L **	Cadmium	ug/l		0.02	0.04	0.05
L **	Calcium	mg/l		130	130	160
L **	Cobalt	ug/l		<1.0	<1.0	<1.0
L **	Iron	ug/l		<10.0	<10.0	<10.0
L **	Lead	ug/l		<1.0	<1.0	<1.0
L **	Magnesium	mg/l		14	20	18
L **	Manganese	ug/l		<5.0	68	61
L **	Nickel	ug/l		<1.0	2.2	2.3
L **	Potassium	mg/l		1.7	17	5.5
L **	Selenium	ug/l		<1.0	<1.0	<1.0
L **	Sodium	mg/l		8.1	23	29
L **	Strontium	ug/l		150	250	210
L **	Thallium	ug/l		<1.0	<1.0	<1.0
L **	Uranium	ug/l		7.2	4.8	8.9
L **	Vanadium	ug/l		<1.0	<1.0	<1.0
L **	Antimony	ug/l		<1.0	<1.0	<1.0
L **	Chromium	ug/l		<1.0	<1.0	<1.0
L **	Copper	ug/l		<1.0	<1.0	1.6
L **	Molybdenum	ug/l		<1.0	<1.0	<1.0
L **	Zinc	ug/l		14	12	13

Comments: Ammonia and TON are not reported due to quality control criteria not being met.

1) **Results hilighted and in bold are outside specified limits.**
2) **nm - "not measured".**
3) **nd - "none detected".**
4) **nt - "time not recorded".**
5) **nr - "not reported".**
6) **tntc - "too numerous to count".**
7) **F - Field measured parameter.**
8) **L - Lab measured parameter.**
9) **** - Results produced by non-accredited analytical methods.**
10) **Test Reports relate only to the samples tested and as described on the report form.**
11) **Test Reports shall not be reproduced, except in full, without consent of the EPA.**
12) **The laboratory is accredited by INAB only for the parameters listed in the Scope of Accreditation.**
13) **Opinions and interpretations are not included in the scope of INAB accreditation.**

Signed: PP 

Caroline Bowden, Regional Chemist

Date: 19/Jun/2014

Environmental Protection Agency
Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny

Test Report

Report of: Analysis of landfill site sample(s)
Report to: Carlow County Council
Report date: 19/06/14

Facility: **Powerstown Landfill Site**
Kilkenny Rd., Co Carlow,
Reference No: W0025-02

Date collected:	08/05/2014	Date received:	08/05/2014

			Laboratory Ref:	1421859	1421860	1421861	1421862	1421863
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW8	WST-W0025-02-GW7	WST-W0025-02-GW6	WST-W0025-02-GW3	WST-W0025-02-RCA2
			Sampling point:	Clear	Clear	Clear	Clear	No sample
			Sampled by:	DB/MDM	DB/MDM	DB/MDM	DB/MDM	DB/MDM
			Time Sampled:	09:10	09:25	09:45	10:05	nm
			Start/End - Dates of Analysis:	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/08-05-14
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**					
F **	Depth of Borehole	m		13.2	18.5	21.5	43	-
F **	Water Level	m		8.5	11.3	13	nm	-
F **	Temperature	℃		11.9	11.2	11.4	11.2	-
F **	Dissolved Oxygen (as %Sat)	% Saturation		20.0	52.0	79.0	27.0	-
F	pH	pH		7.1	7.2	7.2	7.0	-
F	Conductivity @25℃	µS/cm		705	666	708	781	-
L	Ammonia	mg/l N		NR	NR	NR	NR	-
L	Chloride	mg/l Cl		22	20	23	22	-
L	ortho-Phosphate	mg/l P		<0.010	<0.010	<0.010	<0.010	-
L	Total Oxidised Nitrogen	mg/l N		NR	NR	NR	NR	-
L	Fluoride	mg/l F		<0.25	<0.25	<0.25	<0.25	-
L	Sulphate	mg/l SO4		39	36	27	69	-
L **	Alkalinity-total	mg/l CaCO3		262	263	281	289	-
L **	Total Organic Carbon	mg/l C		<1.0	<1.0	<1.0	<1.0	-
L **	1,1,1,2-Tetrachloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	-
L **	1,1,1-Trichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	-
L **	1,1,2,2-Tetrachloroethane	µg/l		<1	<1	<1	<1	-
L **	1,1,2-Trichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	-
L **	1,1-Dichloroethane	µg/l		<0.5	<0.5	<0.5	<0.5	-
L **	1,1-Dichloroethene	µg/l		<0.5	<0.5	<0.5	<0.5	-
L **	1,1-Dichloropropene	µg/l		<0.5	<0.5	<0.5	<0.5	-
L **	1,2,3-Trichlorobenzene	µg/l		<0.4	<0.4	<0.4	<0.4	-
L **	1,2,3-Trichloropropane	µg/l		<0.6	<0.6	<0.6	<0.6	-

				Laboratory Ref:	1421859	1421860	1421861	1421862	1421863
				Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-GW8	WST-W0025-02-GW7	WST-W0025-02-GW6	WST-W0025-02-GW3	WST-W0025-02-RCA2
				Sampling point:	Clear	Clear	Clear	Clear	No sample
				Sampled by:	DB/MDM	DB/MDM	DB/MDM	DB/MDM	DB/MDM
				Time Sampled:	09:10	09:25	09:45	10:05	nm
				Start/End - Dates of Analysis:	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/08-05-14
				Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**						
L **	1,2,4-Trichlorobenzene	µg/l			<0.4	<0.4	<0.4	<0.4	-
L **	1,2,4-Trimethylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	1,2-Dibromo-3-Chloropropane	µg/l			<1.3	<1.3	<1.3	<1.3	-
L **	1,2-Dibromoethane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	1,2-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	1,2-Dichloroethane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	1,2-Dichloropropane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	1,3,5-Trimethylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	1,3-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	1,3-Dichloropropane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	1,4-Dichlorobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	2,2-Dichloropropane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	2-Chlorotoluene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	4-Chlorotoluene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	4-Isopropyltoluene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Benzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Bromobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Bromochloromethane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Bromodichloromethane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Bromoform	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Bromomethane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	c-1,2-Dichloroethene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	c-1,3-Dichloropropene	µg/l			<0.5	<0.5	<0.5	<0.5	-

				Laboratory Ref:	1421859	1421860	1421861	1421862	1421863
				Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-GW8	WST-W0025-02-GW7	WST-W0025-02-GW6	WST-W0025-02-GW3	WST-W0025-02-RCA2
				Sampling point:	Clear	Clear	Clear	Clear	No sample
				Sampled by:	DB/MDM	DB/MDM	DB/MDM	DB/MDM	DB/MDM
				Time Sampled:	09:10	09:25	09:45	10:05	nm
				Start/End - Dates of Analysis:	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/08-05-14
				Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**						
L **	Carbon Tetrachloride	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Chlorobenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Chloroform	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Dibromochloromethane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Dibromomethane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Dichlorodifluoromethane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Dichloromethane	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Ethylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Hexachlorobutadiene	µg/l			<0.1	<0.1	<0.1	<0.1	-
L **	Isopropylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	m,p-Xylene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Naphthalene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	n-Butylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	n-Propylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	o-Xylene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	sec-Butylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Styrene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	t-1,2-Dichloroethene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	t-1,3-Dichloropropene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	tert-Butylbenzene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Tetrachloroethene	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Toluene	µg/l			0.6	0.6	<0.5	<0.5	-
L **	Trichloroethene	µg/l			<0.5	<0.5	<0.5	<0.5	-

				Laboratory Ref:	1421859	1421860	1421861	1421862	1421863
				Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
				Location code:	WST-W0025-02-GW8	WST-W0025-02-GW7	WST-W0025-02-GW6	WST-W0025-02-GW3	WST-W0025-02-RCA2
				Sampling point:	Clear	Clear	Clear	Clear	No sample
				Sampled by:	DB/MDM	DB/MDM	DB/MDM	DB/MDM	DB/MDM
				Time Sampled:	09:10	09:25	09:45	10:05	nm
				Start/End - Dates of Analysis:	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/08-05-14
				Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**						
L **	Trichlorofluoromethane	µg/l			<0.6	<0.6	<0.6	<0.6	-
L **	Vinyl Chloride	µg/l			<0.5	<0.5	<0.5	<0.5	-
L **	Mercury	ug/l			<0.50	<0.50	<0.50	<0.50	-
L **	Aluminium	ug/l			120	38	81	<10.0	-
L **	Arsenic	ug/l			<1.0	<1.0	<1.0	<1.0	-
L **	Barium	ug/l			28	18	25	28	-
L **	Beryllium	ug/l			<1.0	<1.0	<1.0	<1.0	-
L **	Boron	ug/l			76	64	60	63	-
L **	Cadmium	ug/l			0.02	<0.020	0.02	<0.020	-
L **	Calcium	mg/l			120	120	130	150	-
L **	Cobalt	ug/l			<1.0	<1.0	<1.0	<1.0	-
L **	Iron	ug/l			76	15	69	<10.0	-
L **	Lead	ug/l			<1.0	<1.0	<1.0	<1.0	-
L **	Magnesium	mg/l			16	15	16	16	-
L **	Manganese	ug/l			7.2	<5.0	8.1	<5.0	-
L **	Nickel	ug/l			<1.0	<1.0	<1.0	1.4	-
L **	Potassium	mg/l			4	2.1	1.6	3.3	-
L **	Selenium	ug/l			1	<1.0	<1.0	<1.0	-
L **	Sodium	mg/l			11	9.9	12	12	-
L **	Strontium	ug/l			170	150	170	200	-
L **	Thallium	ug/l			<1.0	<1.0	<1.0	<1.0	-
L **	Uranium	ug/l			5.1	4.2	6.6	7.1	-
L **	Vanadium	ug/l			<1.0	<1.0	<1.0	<1.0	-

			Laboratory Ref:	1421859	1421860	1421861	1421862	1421863
			Type of sample:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
			Location code:	WST-W0025-02-GW8	WST-W0025-02-GW7	WST-W0025-02-GW6	WST-W0025-02-GW3	WST-W0025-02-RCA2
			Sampling point:	Clear	Clear	Clear	Clear	No sample
			Sampled by:	DB/MDM	DB/MDM	DB/MDM	DB/MDM	DB/MDM
			Time Sampled:	09:10	09:25	09:45	10:05	nm
			Start/End - Dates of Analysis:	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/29-05-14	08-05-14/08-05-14
			Status of results:	**Final Report**	**Final Report**	**Final Report**	**Final Report**	**Final Report**
Parameter		**Units**	**Limits**					
L **	Antimony	ug/l		<1.0	<1.0	<1.0	<1.0	-
L **	Chromium	ug/l		<1.0	<1.0	<1.0	<1.0	-
L **	Copper	ug/l		<1.0	<1.0	<1.0	4	-
L **	Molybdenum	ug/l		<1.0	<1.0	<1.0	1.5	-
L **	Zinc	ug/l		11	8.8	13	50	-

Comments: Ammonia and TON are not reported due to quality control criteria not being met.
There is not sample from RCA2 as there is a bird nesting in the borehole.

1) **Results hilighted and in bold are outside specified limits.**
2) **nm - "not measured".**
3) **nd - "none detected".**
4) **nt - "time not recorded".**
5) **nr - "not reported".**
6) **tntc - "too numerous to count".**
7) **F - Field measured parameter.**
8) **L - Lab measured parameter.**
9) **** - Results produced by non-accredited analytical methods.**
10) **Test Reports relate only to the samples tested and as described on the report form.**
11) **Test Reports shall not be reproduced, except in full, without consent of the EPA.**
12) **The laboratory is accredited by INAB only for the parameters listed in the Scope of Accreditation.**
13) **Opinions and interpretations are not included in the scope of INAB accreditation.**

Signed: PP

Caroline Bowden, Regional Chemist

Date: 19/Jun/2014

Appendix 3

Soil Sampling Analytical Results

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Fehily Timoney
3rd Floor
North Park Offices
North Park Business Park
North Road
Dublin
Dublin 11

Attention: Tanya Ruddy

CERTIFICATE OF ANALYSIS

Date:	27 February 2015
Customer:	D_FTIM_DUB
Sample Delivery Group (SDG):	150211-75
Your Reference:	LW14-120-03
Location:	Powerstown
Report No:	303565

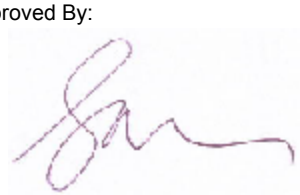
This report has been revised and directly supersedes 302567 in its entirety.

We received 5 samples on Wednesday February 11, 2015 and 5 of these samples were scheduled for analysis which was completed on Friday February 27, 2015. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Approved By:



Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
10815414	SS1A		0.00 - 0.00	09/02/2015
10815419	SS3A		0.00 - 0.00	09/02/2015
10815424	SS1A (VOC)		0.00 - 0.00	09/02/2015
10815426	SS2A (VOC)		0.00 - 0.00	09/02/2015
10815429	SS3A (VOC)		0.00 - 0.00	09/02/2015

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

SOLID

Results Legend

X **Test**

N **No Determination Possible**

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
			10815414	SS1A		0.00 - 0.00	250g Amber Jar (AL
			10815419	SS3A		0.00 - 0.00	250g Amber Jar (AL
			10815424	SS1A (VOC)		0.00 - 0.00	250g Amber Jar (AL
			10815426	SS2A (VOC)		0.00 - 0.00	250g Amber Jar (AL
			10815429	SS3A (VOC)		0.00 - 0.00	250g Amber Jar (AL
Metals in solid samples by OES	All	NDPs: 0 Tests: 3	X	X		X	
Mineral Oil	All	NDPs: 0 Tests: 3	X	X		X	
PAH by GCMS	All	NDPs: 0 Tests: 3	X	X		X	
Sample description	All	NDPs: 0 Tests: 5	X	X	X	X	X
Semi Volatile Organic Compounds	All	NDPs: 0 Tests: 3	X	X		X	
VOC MS (S)	All	NDPs: 0 Tests: 3			X	X	X

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
10815414	SS1A	0.00 - 0.00	Grey	Silt Loam	0.063 - 0.1 mm	None	None
10815419	SS3A	0.00 - 0.00	Dark Brown	Sand	0.1 - 2 mm	Stones	None
10815424	SS1A (VOC)	0.00 - 0.00	Grey	Silt Loam	0.063 - 0.1 mm	None	None
10815426	SS2A (VOC)	0.00 - 0.00	Dark Brown	Gravel	2 - 10 mm	None	None
10815429	SS3A (VOC)	0.00 - 0.00	Dark Brown	Sand	0.1 - 2 mm	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SS1A	SS3A	SS1A (VOC)	SS2A (VOC)	SS3A (VOC)
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	09/02/2015	09/02/2015	09/02/2015	09/02/2015	09/02/2015
			Sample Time	.	.	.	.	.
			Date Received	11/02/2015	11/02/2015	11/02/2015	11/02/2015	11/02/2015
			SDG Ref	150211-75	150211-75	150211-75	150211-75	150211-75
			Lab Sample No.(s)	10815414	10815419	10815424	10815426	10815429
			AGS Reference					
Moisture Content Ratio (% of as received sample)	%	PM024		18	4.1	16	4.7	4.1
Mineral oil >C10-C40	<1 mg/kg	TM061		17.1	13.5		43.8 &	
Mineral Oil Surrogate % recovery**	%	TM061		76	112		87.9 &	
Arsenic	<0.6 mg/kg	TM181		10.3 M	4.75 M		2.79 #	
Cadmium	<0.02 mg/kg	TM181		1.37 M	0.594 M		0.221 #	
Chromium	<0.9 mg/kg	TM181		15.1 M	6.21 M		8.68 #	
Copper	<1.4 mg/kg	TM181		36.1 M	10.5 M		5.25 #	
Lead	<0.7 mg/kg	TM181		19.9 M	5.58 M		6.69 #	
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M		<0.14 #	
Nickel	<0.2 mg/kg	TM181		36.3 M	11 M		7.49 #	
Selenium	<1 mg/kg	TM181		<1 #	<1 #		<1 #	
Zinc	<1.9 mg/kg	TM181		78.2 M	30.9 M		30.4 #	

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SS1A	SS3A	SS2A (VOC)			
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00			
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid			
			Date Sampled	09/02/2015	09/02/2015	09/02/2015			
			Sample Time	.	.	.			
			Date Received	11/02/2015	11/02/2015	11/02/2015			
			SDG Ref	150211-75	150211-75	150211-75			
			Lab Sample No.(s)	10815414	10815419	10815426			
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		117	101	108			
Acenaphthene-d10 % recovery**	%	TM218		115	98.4	103			
Phenanthrene-d10 % recovery**	%	TM218		112	97.1	101			
Chrysene-d12 % recovery**	%	TM218		100	88.2	102			
Perylene-d12 % recovery**	%	TM218		96.1	86.2	103			
Naphthalene	<9 µg/kg	TM218		<9 M	<9 M	<9 #			
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M	<12 #			
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M	<8 #			
Fluorene	<10 µg/kg	TM218		<10 M	<10 M	<10 #			
Phenanthrene	<15 µg/kg	TM218		<15 M	<15 M	<15 #			
Anthracene	<16 µg/kg	TM218		<16 M	<16 M	<16 #			
Fluoranthene	<17 µg/kg	TM218		<17 M	<17 M	<17 #			
Pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 #			
Benz(a)anthracene	<14 µg/kg	TM218		<14 M	<14 M	<14 #			
Chrysene	<10 µg/kg	TM218		<10 M	<10 M	<10 #			
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 M	<15 M	<15 #			
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 M	<14 M	<14 #			
Benzo(a)pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 #			
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 M	<18 M	<18 #			
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M	<23 #			
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 M	<24 M	<24 #			
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		<118	<118	<118			

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

Semi Volatile Organic Compounds

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SS1A	SS3A	SS2A (VOC)			
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00			
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid			
			Date Sampled	09/02/2015	09/02/2015	09/02/2015			
			Sample Time	.	.	.			
			Date Received	11/02/2015	11/02/2015	11/02/2015			
			SDG Ref	150211-75	150211-75	150211-75			
			Lab Sample No.(s)	10815414	10815419	10815426			
			AGS Reference						
Phenol	<100 µg/kg	TM157		<100	<100	<100			
Pentachlorophenol	<100 µg/kg	TM157		<100	<100	<100			
n-Nitroso-n-dipropylamine	<100 µg/kg	TM157		<100	<100	<100			
Nitrobenzene	<100 µg/kg	TM157		<100	<100	<100			
Isophorone	<100 µg/kg	TM157		<100	<100	<100			
Hexachloroethane	<100 µg/kg	TM157		<100	<100	<100			
Hexachlorocyclopentadiene	<100 µg/kg	TM157		<100	<100	<100			
Hexachlorobutadiene	<100 µg/kg	TM157		<100	<100	<100			
Hexachlorobenzene	<100 µg/kg	TM157		<100	<100	<100			
n-Dioctyl phthalate	<100 µg/kg	TM157		<100	<100	<100			
Dimethyl phthalate	<100 µg/kg	TM157		<100	<100	<100			
Diethyl phthalate	<100 µg/kg	TM157		<100	<100	<100			
n-Dibutyl phthalate	<100 µg/kg	TM157		<100	<100	<100			
Dibenzofuran	<100 µg/kg	TM157		<100	<100	<100			
Carbazole	<100 µg/kg	TM157		<100	<100	<100			
Butylbenzyl phthalate	<100 µg/kg	TM157		<100	<100	<100			
bis(2-Ethylhexyl) phthalate	<100 µg/kg	TM157		<100	<100	<100			
bis(2-Chloroethoxy)methane	<100 µg/kg	TM157		<100	<100	<100			
bis(2-Chloroethyl)ether	<100 µg/kg	TM157		<100	<100	<100			
Azobenzene	<100 µg/kg	TM157		<100	<100	<100			
4-Nitrophenol	<100 µg/kg	TM157		<100	<100	<100			
4-Nitroaniline	<100 µg/kg	TM157		<100	<100	<100			
4-Methylphenol	<100 µg/kg	TM157		<100	<100	<100			
4-Chlorophenylphenylether	<100 µg/kg	TM157		<100	<100	<100			
4-Chloroaniline	<100 µg/kg	TM157		<100	<100	<100			
4-Chloro-3-methylphenol	<100 µg/kg	TM157		<100	<100	<100			
4-Bromophenylphenylether	<100 µg/kg	TM157		<100	<100	<100			
3-Nitroaniline	<100 µg/kg	TM157		<100	<100	<100			
2-Nitrophenol	<100 µg/kg	TM157		<100	<100	<100			
2-Nitroaniline	<100 µg/kg	TM157		<100	<100	<100			
2-Methylphenol	<100 µg/kg	TM157		<100	<100	<100			
1,2,4-Trichlorobenzene	<100 µg/kg	TM157		<100	<100	<100			

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

Semi Volatile Organic Compounds

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SS1A	SS3A	SS2A (VOC)			
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00			
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid			
			Date Sampled	09/02/2015	09/02/2015	09/02/2015			
			Sample Time	.	.	.			
			Date Received	11/02/2015	11/02/2015	11/02/2015			
			SDG Ref	150211-75	150211-75	150211-75			
			Lab Sample No.(s)	10815414	10815419	10815426			
			AGS Reference						
2-Chlorophenol	<100 µg/kg	TM157		<100	<100	<100			
2,6-Dinitrotoluene	<100 µg/kg	TM157		<100	<100	<100			
2,4-Dinitrotoluene	<100 µg/kg	TM157		<100	<100	<100			
2,4-Dimethylphenol	<100 µg/kg	TM157		<100	<100	<100			
2,4-Dichlorophenol	<100 µg/kg	TM157		<100	<100	<100			
2,4,6-Trichlorophenol	<100 µg/kg	TM157		<100	<100	<100			
2,4,5-Trichlorophenol	<100 µg/kg	TM157		<100	<100	<100			
1,4-Dichlorobenzene	<100 µg/kg	TM157		<100	<100	<100			
1,3-Dichlorobenzene	<100 µg/kg	TM157		<100	<100	<100			
1,2-Dichlorobenzene	<100 µg/kg	TM157		<100	<100	<100			
2-Chloronaphthalene	<100 µg/kg	TM157		<100	<100	<100			
2-Methylnaphthalene	<100 µg/kg	TM157		<100	<100	<100			
Acenaphthylene	<100 µg/kg	TM157		<100	<100	<100			
Acenaphthene	<100 µg/kg	TM157		<100	<100	<100			
Anthracene	<100 µg/kg	TM157		<100	<100	<100			
Benzo(a)anthracene	<100 µg/kg	TM157		<100	<100	<100			
Benzo(b)fluoranthene	<100 µg/kg	TM157		<100	<100	<100			
Benzo(k)fluoranthene	<100 µg/kg	TM157		<100	<100	<100			
Benzo(a)pyrene	<100 µg/kg	TM157		<100	<100	<100			
Benzo(g,h,i)perylene	<100 µg/kg	TM157		<100	<100	<100			
Chrysene	<100 µg/kg	TM157		<100	<100	<100			
Fluoranthene	<100 µg/kg	TM157		<100	<100	<100			
Fluorene	<100 µg/kg	TM157		<100	<100	<100			
Indeno(1,2,3-cd)pyrene	<100 µg/kg	TM157		<100	<100	<100			
Phenanthrene	<100 µg/kg	TM157		<100	<100	<100			
Pyrene	<100 µg/kg	TM157		<100	<100	<100			
Naphthalene	<100 µg/kg	TM157		<100	<100	<100			
Dibenzo(a,h)anthracene	<100 µg/kg	TM157		<100	<100	<100			

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

VOC MS (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SS1A (VOC)	SS2A (VOC)	SS3A (VOC)			
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00			
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid			
			Date Sampled	09/02/2015	09/02/2015	09/02/2015			
			Sample Time	.	.	.			
			Date Received	11/02/2015	11/02/2015	11/02/2015			
			SDG Ref	150211-75	150211-75	150211-75			
			Lab Sample No.(s)	10815424	10815426	10815429			
			AGS Reference						
Dibromofluoromethane**	%	TM116		105 2	107 2	108 2			
Toluene-d8**	%	TM116		98.1 2	99.6 2	100 2			
4-Bromofluorobenzene**	%	TM116		89.2 2	99.4 2	97.3 2			
Dichlorodifluoromethane	<6 µg/kg	TM116		<60 2 M	<6 2 #	<6 2 M			
Chloromethane	<7 µg/kg	TM116		<70 2 #	<7 2 #	<7 2 #			
Vinyl Chloride	<6 µg/kg	TM116		<60 2 M	<6 2 #	<6 2 M			
Bromomethane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Chloroethane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Trichlorofluorormethane	<6 µg/kg	TM116		<60 2 M	<6 2 #	<6 2 M			
1,1-Dichloroethene	<10 µg/kg	TM116		<100 2 #	<10 2 #	<10 2 #			
Carbon Disulphide	<7 µg/kg	TM116		<70 2 M	<7 2 #	<7 2 M			
Dichloromethane	<10 µg/kg	TM116		<100 2 #	<10 2 #	<10 2 #			
Methyl Tertiary Butyl Ether	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
trans-1,2-Dichloroethene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
1,1-Dichloroethane	<8 µg/kg	TM116		<80 2 M	<8 2 #	<8 2 M			
cis-1,2-Dichloroethene	<6 µg/kg	TM116		<60 2 M	<6 2 #	<6 2 M			
2,2-Dichloropropane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Bromochloromethane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Chloroform	<8 µg/kg	TM116		<80 2 M	<8 2 #	<8 2 M			
1,1,1-Trichloroethane	<7 µg/kg	TM116		<70 2 M	<7 2 #	<7 2 M			
1,1-Dichloropropene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Carbontetrachloride	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
1,2-Dichloroethane	<5 µg/kg	TM116		<50 2 M	<5 2 #	<5 2 M			
Benzene	<9 µg/kg	TM116		<90 2 M	<9 2 #	<9 2 M			
Trichloroethene	<9 µg/kg	TM116		<90 2 #	<9 2 #	<9 2 #			
1,2-Dichloropropane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Dibromomethane	<9 µg/kg	TM116		<90 2 M	<9 2 #	<9 2 M			
Bromodichloromethane	<7 µg/kg	TM116		<70 2 M	<7 2 #	<7 2 M			
cis-1,3-Dichloropropene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Toluene	<7 µg/kg	TM116		<70 2 M	<7 2 #	<7 2 M			
trans-1,3-Dichloropropene	<10 µg/kg	TM116		<100 2	<10 2	<10 2			
1,1,2-Trichloroethane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

VOC MS (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SS1A (VOC)	SS2A (VOC)	SS3A (VOC)			
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00			
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid			
			Date Sampled	09/02/2015	09/02/2015	09/02/2015			
			Sample Time	.	.	.			
			Date Received	11/02/2015	11/02/2015	11/02/2015			
			SDG Ref	150211-75	150211-75	150211-75			
			Lab Sample No.(s)	10815424	10815426	10815429			
			AGS Reference						
1,3-Dichloropropane	<7 µg/kg	TM116		<70 2 M	<7 2 #	<7 2 M			
Tetrachloroethene	<5 µg/kg	TM116		<50 2 M	<5 2 #	<5 2 M			
Dibromochloromethane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
1,2-Dibromoethane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Chlorobenzene	<5 µg/kg	TM116		<50 2 M	<5 2 #	<5 2 M			
1,1,1,2-Tetrachloroethane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Ethylbenzene	<4 µg/kg	TM116		<40 2 M	<4 2 #	<4 2 M			
p/m-Xylene	<10 µg/kg	TM116		<100 2 #	<10 2 #	<10 2 #			
o-Xylene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Styrene	<10 µg/kg	TM116		<100 2 #	<10 2 #	<10 2 #			
Bromoform	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Isopropylbenzene	<5 µg/kg	TM116		<50 2 #	<5 2 #	<5 2 #			
1,1,2,2-Tetrachloroethane	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
1,2,3-Trichloropropane	<16 µg/kg	TM116		<160 2 M	<16 2 #	<16 2 M			
Bromobenzene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
Propylbenzene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
2-Chlorotoluene	<9 µg/kg	TM116		<90 2 M	<9 2 #	<9 2 M			
1,3,5-Trimethylbenzene	<8 µg/kg	TM116		<80 2 M	<8 2 #	<8 2 M			
4-Chlorotoluene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
tert-Butylbenzene	<14 µg/kg	TM116		<140 2 M	<14 2 #	<14 2 M			
1,2,4-Trimethylbenzene	<9 µg/kg	TM116		<90 2 #	<9 2 #	<9 2 #			
sec-Butylbenzene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
4-Isopropyltoluene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
1,3-Dichlorobenzene	<8 µg/kg	TM116		<80 2 M	<8 2 #	<8 2 M			
1,4-Dichlorobenzene	<5 µg/kg	TM116		<50 2 M	<5 2 #	<5 2 M			
n-Butylbenzene	<11 µg/kg	TM116		<110 2	<11 2	<11 2			
1,2-Dichlorobenzene	<10 µg/kg	TM116		<100 2 M	<10 2 #	<10 2 M			
1,2-Dibromo-3-chloropropane	<14 µg/kg	TM116		<140 2 M	<14 2 #	<14 2 M			
Tert-amyl methyl ether	<10 µg/kg	TM116		<100 2 #	<10 2 #	<10 2 #			
1,2,4-Trichlorobenzene	<20 µg/kg	TM116		<200 2	<20 2	<20 2			
Hexachlorobutadiene	<20 µg/kg	TM116		<200 2	<20 2	<20 2			
Naphthalene	<13 µg/kg	TM116		<130 2 M	<13 2 #	<13 2 M			

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

VOC MS (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SS1A (VOC)	SS2A (VOC)	SS3A (VOC)			
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00			
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid			
			Date Sampled	09/02/2015	09/02/2015	09/02/2015			
			Sample Time	.	.	.			
			Date Received	11/02/2015	11/02/2015	11/02/2015			
			SDG Ref	150211-75	150211-75	150211-75			
			Lab Sample No.(s)	10815424	10815426	10815429			
			AGS Reference						
1,2,3-Trichlorobenzene	<20 µg/kg	TM116		<200 2 #	<20 2 #	<20 2 #			

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM157	HP 6890 Gas Chromatograph (GC) system and HP 5973 Mass Selective Detector (MSD).	Determination of SVOC in Soils by GC-MS extracted by sonication in DCM/Acetone		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

Test Completion Dates

Lab Sample No(s)	10815414	10815419	10815424	10815426	10815429
Customer Sample Ref.	SS1A	SS3A	SS1A (VOC)	SS2A (VOC)	SS3A (VOC)
AGS Ref.					
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	SOLID	SOLID	SOLID	SOLID	SOLID
Metals in solid samples by OES	19-Feb-2015	18-Feb-2015		27-Feb-2015	
Mineral Oil	19-Feb-2015	19-Feb-2015		25-Feb-2015	
PAH by GCMS	18-Feb-2015	18-Feb-2015		25-Feb-2015	
Sample description	16-Feb-2015	16-Feb-2015	16-Feb-2015	16-Feb-2015	16-Feb-2015
Semi Volatile Organic Compounds	19-Feb-2015	19-Feb-2015		25-Feb-2015	
VOC MS (S)			18-Feb-2015	18-Feb-2015	18-Feb-2015

CERTIFICATE OF ANALYSIS

SDG:	150211-75	**Location:**	Powerstown	**Order Number:**	5972
Job:	D_FTIM_DUB-160	**Customer:**	Fehily Timoney	**Report Number:**	303565
Client Reference:	LW14-120-03	**Attention:**	Tanya Ruddy	**Superseded Report:**	302567

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
5	Samples exceeded holding time before presevation was performed
$	Sampled on date not provided
*	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to sampled on date
&	Sample Holding Time exceeded - Late arrival of instructions.

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix 4

Drilling Logs for Soil Sample Retrieval

JS DRILLING
Geological & Environmental Drilling Contractors

MOBILE: 0877433451
FAX: 0567793887
E-MAIL: jim@jsdrilling.ie
WEBSITE: www.jsdrilling.ie
VAT. NO: IE 6431197 F

JS DRILLING LTD
20 THE BELFRY
CHAPEL LANE
THOMASTOWN
CO. KILKENNY

Borehole Log

Location: Powerstown	Site: landfill
Client: Fehiley Timoney & Co	Borehole No: BH 6
Date: 5-2-2015	Sheet: 1 of 1
Ground Level: m (Ordnance datum)	Engineer: Tanya Ruddy
Weather: ~~Fine~~ / Drizzling / Raining / Stormy / Snow	
Rig Type: T44	

Description of Strata

Depth to base of strata (m)	soft firm stiff	loose med.d. dense	colour	clayey silty sandy	fine med. coarse	soil name	gravel, cobbles, sand bands, etc
0-3	Firm			sandy		gravel	
3-7.5	Stiff			silty	sandy		
7.5-9.60	Stiff			~~silty~~ clayey silt			
	End of days boring						Time

Samples / Tests

No.	Type	Depth (m) From	Depth (m) To	Remarks
1	U	3	3.8	Sandy silt
2	U	9	9.5	clayey silt

U – Undisturbed D – Disturbed B – Bulk W – Water S – S.P.T. C – C.P.T.

Installations

mm	Well Casing Diameter
m	Plain Casing
m	Slotted Casing
m	Geosock
	End Cap
	Gas Valve
m	Gravel Pack
m	Bentonite Pellets
m	Bentonite Grout
	Flush Cover – 6" / 8"
	Raised Cover
	Padlock

Water Strike	7.5 m	m	m	m	Overnight
Duration	mins	mins	mins	mins	
Depth to water					
Depth cased	9				
Depth of hole	9.5				

Drill Casing

Size (mm)	From (m)	To (m)
6	0	9

Trial pits, standing time, delays, bad access, etc...

Open Hole Drilling

Diameter (mm)	From (m)	To (m)	Type

Client: Tanya Ruddy

Driller: Peter Murphy

5003

J S DRILLING
Geological & Environmental Drilling Contractors

MOBILE: 0877433451
FAX: 0567793887
E-MAIL: jim@jsdrilling.ie
WEBSITE: www.jsdrilling.ie
VAT. NO: IE 6431197 F

JS DRILLING LTD
20 THE BELFRY
CHAPEL LANE
THOMASTOWN
CO. KILKENNY

Borehole Log

Location: Powerstown Landfill	Site: landfill
Client: Fehilly Timoney & Co.	Borehole No: 4
Date: 9-2-2015	Sheet: 1 of 1
Ground Level: m (Ordnance datum)	Engineer:
Weather: Fine / Drizzling / Raining / Stormy / Snow	
Rig Type: T 44	

Depth to base of strata (m)	Description of Strata						
	soft firm stiff	loose med.d. dense	colour	clayey silty sandy	fine med. coarse	soil name	gravel, cobbles, sand bands, etc
0-1	Soft clay						
1-10	Soft sand and gravels						
10-11.5	Soft clay and gravels						
	End of days boring						Time

Samples / Tests

No.	Type	Depth (m) From	Depth (m) To	Remarks

U – Undisturbed D – Disturbed B – Bulk W – Water S – S.P.T. C – C.P.T.

Installations

mm	Well Casing Diameter
m	Plain Casing
m	Slotted Casing
m	Geosock
	End Cap
	Gas Valve
m	Gravel Pack
m	Bentonite Pellets
m	Bentonite Grout
	Flush Cover – 6" / 8"
	Raised Cover
	Padlock

Water Strike	4.5 m	m	m	m	Overnight
Duration	mins	mins	mins	mins	
Depth to water					
Depth cased	10.5				
Depth of hole	11.5				

Drill Casing

Size (mm)	From (m)	To (m)

** Trial pits, standing time, delays, bad access, etc...

Open Hole Drilling

Diameter (mm)	From (m)	To (m)	Type

Client: Tanya Ruddy

Driller: Peter Murray

5005

JS DRILLING
Geological & Environmental Drilling Contractors

MOBILE: 0877433451
FAX: 0567793887
E-MAIL: jim@jsdrilling.ie
WEBSITE: www.jsdrilling.ie
VAT. NO: IE 6431197 F

JS DRILLING LTD
20 THE BELFRY
CHAPEL LANE
THOMASTOWN
CO. KILKENNY

Borehole Log

Location: Powerstown	Site: Land Fill
Client: Fehiley Timoney & Co	Borehole No: BH 9
Date: 6-2-2014	Sheet: 1 of 1
Ground Level: m (Ordnance datum)	Engineer: Tanya Ruddy
Weather: ~~Fine~~ / Drizzling / Raining / Stormy / Snow	
Rig Type: JCB	

Depth to base of strata (m)	Description of Strata						
	soft firm stiff	loose med.d. dense	colour	clayey silty sandy	fine med. coarse	soil name	gravel, cobbles, sand bands, etc
0 – 1.5						Made Ground	
1.5 – 7.5						sandy gravel	
7.5 – 8						Rock	
End of days boring							Time

Samples / Tests

No.	Type	Depth (m) From	Depth (m) To	Remarks
1		3	4	Sandy gravel
~~2~~		~~3~~	~~4~~	

U – Undisturbed D – Disturbed B – Bulk W – Water S – S.P.T. C – C.P.T.

Installations

mm	Well Casing Diameter
m	Plain Casing
m	Slotted Casing
m	Geosock
	End Cap
	Gas Valve
m	Gravel Pack
m	Bentonite Pellets
m	Bentonite Grout
	Flush Cover – 6" / 8"
	Raised Cover
	Padlock

Water Strike	3 m	m	m	m	Overnight
Duration	mins	mins	mins	mins	
Depth to water					
Depth cased					
Depth of hole					

Drill Casing

Size (mm)	From (m)	To (m)

Trial pits, standing time, delays, bad access, etc...

Open Hole Drilling

Diameter (mm)	From (m)	To (m)	Type

Client: Tanya Ruddy

Driller: Peter Murray 5004