



ANNUAL ENVIRONMENTAL REPORT

By

Louth County Council

To

Environmental Protection Agency

For

Waste Licence Reference: W0060-03

Reporting Period January – December 2013

WHITERIVER LANDFILL SITE, COUNTY LOUTH

Whiteriver Landfill Site

Annual Environmental Report January - December 2013

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1 INTRODUCTION

Louth County Council holds a Waste Licence from the Environmental Protection Agency to operate Whiteriver landfill Site. This report provides a review of all data collected and the environmental aspects of operations at the site for the year 2013.

The site is located 1 km north of the main R169 Collon Rd at its junction with Whiteriver Cross, Co Louth. The facility is located in a rural setting at grid references O301450E 285625N in the townlands of Whiteriver. The northern and western boundaries adjoin two minor roads which serve scattered dwellings, whilst agricultural grazing lands adjoin the southern and eastern boundaries. The main access to the site is situated on the north western site boundary, immediately off the principle approach road. Louth County Council is the sole landowners of the site on which the landfilling activity is based.

The current waste licence (W0060-03) was issued on the 24th March 2010. The site ceased to accept municipal solid waste on the 30th of August 2013 and Incinerator Bottom ash on the 20th of December 2013. The site is now closed.

1.1 REPORT PERIOD

The report period for this Annual Environmental Report (AER) is from January to December 2013 and relates to the waste licence (W0060-03).

2 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

In accordance with Condition 5 of the waste licence only those waste types and quantities of waste listed in the Schedule shall be disposed of at the facility unless the prior agreement of the Agency has been obtained. The maximum annual tonnage of individual waste types for disposal is listed in the Schedule of the Waste Licence and total is as follows;

Table 2.1 Maximum Annual Tonnage

Total (Tonnes per annum)	(W0060-03)
Total	96,000

* As from September 2003

The licence waste disposal activities in accordance with the Third Schedule of the waste

Management Act, 1996 are restricted to those listed as follows:

- Class 1:** Deposit on, in or under land (including landfill).
- Class 4:** Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
- Class 5:** Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
- Class 6:** Biological treatment not referred to elsewhere in this Schedule which results in Final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule.
- Class 7:** Physio-chemical treatment not referred to elsewhere in this Schedule (including evaporation, drying and calcination), which results in Final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule.
- Class 12:** Repacking prior to submission to any activity referred to in a preceding paragraph of this schedule.
- Class 13:** Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste is produced.

The licence waste disposal activities (W0060-03), in accordance with the Fourth Schedule of the Waste Management Act, 1996 are restricted to those listed as follows;

Class 2 Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes): This activity is limited to the use of compost or similar material in the restoration of the landfill.

Class 4 Recycling or reclamation of other inorganic materials: This activity is limited to the use of soil, subsoil and construction and demolition waste for daily cover, engineering works and the restoration of cells at the facility.

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

Class 10 The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system: This activity is limited to the use of various suitable wastes as daily or intermediate cover and in the restoration of the landfill, subject to the agreement of the Agency.

Class 13 Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced: This activity is limited to the storage of soil, subsoil and construction and demolitions wastes at the facility prior to recovery / reuse at the facility.

3 QUANTITY AND COMPOSITION OF WASTE RECEIVED AND DISPOSED OF DURING THE REPORTING PERIOD AND EACH PREVIOUS YEAR

The quantities of waste accepted for disposal at the facility on a yearly basis are shown in Table 3.1.

Table 3.1 Waste Quantities Accepted (tonnes)¹

Waste	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total	25,110	20,940	20,000	15,066	31,500	37,146	25,776	36,006	60,833
Waste	2005	2006	2007	2008	2010	2011	2012	2013	
Total	80,634	82,547	70,396	84,402	53,744	75,243	89,290	84,992	

Waste data figures are currently derived from weighbridge readings. Records of quantities, EWC code and type of waste accepted for disposal and recovery at the facility are maintained at the landfill site. These figures for 2013 are shown in Table 3.2 and Table 3.3.

Table 3.2 Quantities Waste disposed of at the landfill (Tonnes) 2013²

Waste description	Quantity waste recovered at the landfill (tonnes)	EWC code	Quantity waste recovered at the landfill (tonnes)
Bottom ash and slag other than those mentioned in 19 01 11	Incinerator Bottom ash	19 01 12	32,732
Screenings	Sewage screenings	19 08 01	475
Sludges from treatment of urban waste water	Water treatment sludges	19 08 02	1,005
Mixed municipal waste	Mixed municipal waste	20 03 01	18,250
Street-cleaning residues	Road sweepings	20 03 03	1,243
Bulky waste	Bulky waste from clearing out houses	20 03 07	677
Total			54,381

¹ Figures for 1996 to 2000 are the estimated annual waste inputs (tonnes). Waste data figures were estimated by means of assessment based on the category of vehicle depositing waste at the site.

² National Waste Report 2013 Survey Part 2 – Landfill Data

Table 3.3 Quantities Waste recovered at the landfill (Tonnes) 2013

Waste description	Quantity waste recovered at the landfill (tonnes)	EWC code	Quantity waste recovered at the landfill (tonnes)
Mixture of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	C&D used to haul roads	17 01 07	5,340
Soil and stones other than those mentioned in 17 05 03	soils used as cover	17 05 04	5,805
Non-composted fraction of municipal and similar wastes	Wood chip. Screened oversize material from composting of green waste	19 05 01	1,340
Wood other than that mentioned in 19 12 06	Wood chip	19 12 07	1,742
Other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11	C&D Fines for cover material	19 12 12	16,385
Total			30,611

4 CALCULATED REMAINING CAPACITY OF THE FACILITY AND YEAR IN WHICH FINAL CAPACITY IS EXPECTED TO BE REACHED

The site is now closed.

5 METHODS OF DEPOSITION OF WASTE

The site is now closed. Waste was filled in Phase 5, Cell 1A and 1B during 2013.

6 SUMMARY REPORT ON EMISSIONS

6.1 EMISSIONS TO AIR

In accordance with The PRTR Regulations releases of pollutants and off site transfers of waste by facilities operating in relevant industrial sectors are to be reported by the EPA to the European E-PRTR website where the facility exceeds specified thresholds. This has been completed for Whiteriver landfill site and included in Appendix B.

There are two landfill gas flares in operation at Whiteriver landfill site. Based on model predications and information from the landfill gas flares the estimated net emission of methane from the flare combustion process and both surface and lateral emissions from the landfill body is 117,418.0 kg/year as shown on Table 6.1.

Other emissions include:

- Carbon dioxide (CO₂)
- 1,1,1-trichloroethane
- Hydro-fluorocarbons (HFCs)
- Chlorofluorocarbons

Table 6.1 Net Methane Emission

Quantities of Methane Flared and / or Utilised	T (Total) kg/Year
Total estimated methane generation (as per site model)	2,707,365.0
Methane flared	2,589,947.0
Methane utilised in engine/s	0.0
Net Methane Emission	117,418.0

6.2 EMISSIONS TO GROUNDWATER AND SURFACE WATER

There are no direct discharges to groundwater or surface water.

6.3 EMISSIONS TO WASTE WATER TREATMENT WORKS

The volume of leachate transported off site to Drogheda wastewater treatment plant during the period January to December 2013 was 25,864 m³.

7 SUMMARY OF RESULTS AND INTERPRETATION OF ENVIRONMENTAL MONITORING

7.1 MONITORING LOCATIONS

Monitoring was carried out at locations and at frequencies as specified in Schedule D of the waste licence (W0060-03). Monitoring points are labelled and permanent access to all monitoring points is maintained. BH13A was re drilled and BH20 was installed as a groundwater water borehole to detect leakages of the lagoon in June 2006. Private wells BH15 (Taffes), BH16 (Byrnes), and BH18 (Taffes) have been decommissioned and are no longer monitored as part of the licence requirements.

Monitoring points are detailed in Drawings No.IBL0069/101D, 102A and Drawing IBR0138/100 Landfill Gas piezometer. The monitoring point grid references for those available are detailed in Table 7.1. The locations of groundwater monitoring boreholes are shown in Table 7.2.

Table 7.1 Grid References of Monitoring Points

Monitoring Points of Groundwater Boreholes	Easting	Northing
BH1	301 385	285 310
BH2	301 259	285 380
BH3	301 384	285 501
BH4	301 405	285 648
BH5A	301737	285541
BH6	301 856	285 480
BH7	301 740	285 438
BH8	301 588	285 302
BH9	301 944	285 348
BH10	301 824	285 117
BH11	302 045	285 105
BH12	301 943	285 356
BH13(redrilled)	301 824	285 126
BH14	302 045	285 119
BH17	301 293	285 180
BH19	301490	285650
BH20	301 428	285 623
Surface Water Monitoring		
SW1	301 384	285 424
SW2A	301 965	285 427
SW3	301 935	285 410

Monitoring Points of Groundwater Boreholes	Easting	Northing
Gas Piezometers		
PZ1	301 438	285 596
PZ2	301 454	285 614
PZ3	301 496	285 628
PZ4	301 542	285 624
PZ5	301 600	285 610
PZ6	301 603	285 552
PZ7	301 603	285 512
PZ8	301 601	285 463
PZ9	301 594	285 401
PZ11	301 383	285 333
PZ12	301 382	285 381
PZ13	301 382	285 441
PZ14	301 383	285 498
PZ15	301 385	285 563
PZ16	301 410	285 579
PZ21	301 385	285 289
PZ22	301 377	285 205
PZ23	301 459	285 200
PZ24	301 490	285 201
PZ25	301 586	285 219
PZ26 PZ54	Not available	
Noise		
N1	301 336	285348
N2	135 907	270 000
N3	301345	284 739
N4	302105	284 927
N5	302 723	285 258
N6	301409	285 598
Dust		
DG1	301 395	285 372
DG2	301 596	285 374
DG3	301 960	285 421
DG4	302 058	285 043
DG5	301 648	285584
DG6	301834	285486

Monitoring Points of Groundwater Boreholes	Easting	Northing
Leachate		
L1	301 427	285 625
L2	301 405	285 495

Table 7.2 Location of Groundwater Monitoring Boreholes

Borehole ³	Upstream/Downstream	Private Well	Overburden or Bedrock
BH1	Upstream		Overburden
BH2A	Upstream	Crawleys Private Well	Bedrock
BH3	Upstream		Bedrock
BH4	Upstream		Bedrock
BH5	Downstream		Overburden
BH6	Downstream		Bedrock
BH9	Downstream		Bedrock
BH10	Downstream		Overburden
BH11	Downstream		Overburden
BH12	Downstream		Overburden
BH13A	Downstream		Bedrock
BH14	Downstream		Bedrock
BH17	Downstream	Holcrofts Private Well	Domestic
BH19	Upstream	McGranes Private Well	Agricultural water supply
BH20	Upstream landfill down gradient of leachate lagoon		Overburden

7.2 TREATED LEACHATE QUALITY

Leachate values recorded in the lagoon (treated leachate) were within the emission limit values as set out in the waste licence except for Sulphate and COD in April, July and October.

³ Private wells BH15 (Taffes), BH16 (Byrnes), and BH18 (Taffes) have been decommissioned and are no longer monitored as part of the licence requirements.

Table 7.3 Treated Leachate Concentrations in 2013

Parameter	Min. Conc	Max. Conc	Limit Value
Ammonia (mg/N)	421.6	726.35	900
BOD (mg/l)	40.4	100	500
COD (mg/l)	1140	2,388	1,500
Sulphate (mg/l)	42.5	344.1	250
Temperature (°C)	9	19.5	<25°C
pH (pH units)	7.8	8.5	6 – 9

7.3 GROUNDWATER

As required under the Waste Licence, groundwater monitoring was undertaken at the borehole locations as set out in the current waste licence. The Schedules of the waste licence requires the monitoring of certain parameters on either a monthly, quarterly or annual basis; the frequencies of the monitoring of groundwater parameters are shown in Table 7.4.

Boreholes BH1, BH3 BH4, BH5A are located within the site boundary, whilst BH6 is located approximately 240m from the eastern boundary of the site. BH2A (Crawleys) is a private well located upstream of the facility. BH9, BH10, BH11, BH12, BH13A and BH14 were installed further downstream of the extension to the existing site. Monitoring is also undertaken at two private wells. These private wells are boreholes BH17 (Holcrofts) and BH19 (McGranes, Agricultural Water Supply).

Table 7.4 Groundwater Parameters Monitoring Frequencies as per W0060-03

Monthly	Quarterly	Annually
Groundwater Level	Chloride	Metals /Non Metals List I and II Substances
	Dissolved Oxygen	Cyanide Residue on evaporation
	pH	Fluoride
	Total Oxidised Carbon	Total Oxidised Nitrogen
	Visual Inspection/ Odour	Total Alkalinity
	Ammoniacal Nitrogen	Orthophosphate
	Electrical Conductivity	Mercury
	Temperature	Sulphate

The results contained in this report are assessed as follows:

- Whiteriver Trigger Levels (WTL) agreed with the EPA (21 December 2004, 60-2/GEN09EM),
- EPA Interim guideline values (IGV),

- SI No 278 of 2007 EC (Drinking water) Regulations (DWR), and
- SI No 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010 as amended (GWR 2010).

The results are presented graphically and in table format in Appendix C. The majority of parameters were below the recommended limits.

Parameters that are indicative of possible leachate contamination include Ammonia, Conductivity, Iron, Chloride and heavy metals.

Table 7.5 provides a summary of results in 2013 from groundwater monitoring boreholes throughout these monitoring periods.

Table 7.5 Summary of 2013 Results from Groundwater Monitoring Boreholes

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Alkalinity	mg/lCaCO ₃	15	210	400	307	43
Aluminium	µg/l	15	<5	17.21	15	3
Ammonia	mg/l N	58	<5	0.45		
Antimony	µg/l	15	<0.5	<0.5		
Arsenic	µg/l	15	<0.5	2.41	1	1
Barium	µg/l	15	0.62	318.97	128	103
Beryllium	µg/l	15	<0.5	<0.5		
Boron	µg/l	15	10.06	168.06	30	44
Cadmium	µg/l	15	<0.1	<0.1		
Calcium	mg/l Ca	15	50.93	168.97	89	29
Chloride	mg/l Cl	58	11	64.16	22	11
Chromium	µg/l	15	0.5	1.03		
Cobalt	µg/l	15	<0.5	0.84		
Coliform Bacteria	No/ml	7	0	61	9	23
Conductivity	µS/cm @ 25	58	536	906	662	85
Copper	µg/l	15	0.55	20.29	3	6
Cyanide	0	16	26	26	26	
D.O.	% Saturation	57	13	115	53	25
E_Coli	no/100ml	7	0	0		
Fluoride	mg/l	15	0.09	0.19	0	0
Iron	µg/l	15	12.92	66.95	29	19
Lead	µg/l	15	<10	0.54		
Magnesium	mg/l Mg	15	11.27	46.52	22	9
Manganese	µg/l	15	1.24	1779.98	214	523
Mercury	µg/l	15	<0.05	<0.05		
Molybdenum (µg/l)	0	15	0.56	2.69	1	1
Nickel	µg/l	15	0.51	5.17	2	2
Ortho-Phosphate	mg/l P	15	0	0.099	0	0
pH	0	58	6	7.8	7	0
Potassium	mg/l	15	0.78	4.7	2	1
Residue on evap	mg/l	15	319	6134	954	1459
Selenium	µg/l	15	<0.5	<0.5		

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Sodium	mg/l	15	8.7	42.13	20	8
Strontium	µg/l	15	151.01	478.17	238	78
Sulphate	0	15	3.48	39.98	15	11
Temp	°C	58	0.5	16	10	3
Thallium	µg/l	15	<0.1	<0.1		
T.O.C.	mg/l	58	0.031	10.8	3	2
T.O.N	mg/l N	14	0.01	0.75	0	0
Uranium	µg/l	15	0.78	5.61	3	2
Vanadium	µg/l	15	<0.5	0.97	1	0
Zinc	µg/l	15	0.75	811.05	59	208

7.4 QUARTERLY MONITORING PARAMETERS

All Ammonia concentrations during the reporting period were within the WTL agreed with the EPA of 0.2 mg/l N and the ECEO of 0.175 mg/l N with the exception of BH2A (0.22 mg/l N) in October, BH9 (0.35 mg/l N) in October, BH10 (0.203 mg/l and 0.21 mg/l N) in April and October, BH11 (0.42 mg/l N) in October and BH17 (0.45 mg/l N and 0.21 mg/l N) in August and October. These have reduced to below the WTL and ECEO in January, 2014.

pH values analysed during the reporting period were all within the WTL of 7.0 to 8.0 with the exception of BH12 (6.0) in October.

Electrical Conductivity values were all below the WTL of 800 µS/cm throughout the year except for BH12 (range 855-906 µS/cm). BH12 does not exceed the IGW of 1000 µS/cm and ECEO of 800-1875 µS/cm.

Chloride levels exceeded the WTL of 20 mg/l in up-gradient BH1 throughout the year. Concentrations ranged from 34 mg/l to 46 mg/l. BH5, BH10, BH13A, and BH17 downstream of the site also exceeded the WTL level throughout the monitoring period. Concentrations ranged from 21 to 41 mg/l Cl. The highest concentration was in BH5 in January. This reduced to 35 mg/l in April. The results were all below the ECEO of 187.5 mg/l.

Chloride WTL level has been exceeded in BH20 throughout the monitoring period and range from 41 to 65 mg/l Cl.

Dissolved oxygen ranges from 13% O₂ to 115% O₂.

All boreholes were below WTL for TOC of 10 mg/l except BH20 (10.8 mg/l) in August.

7.5 ANNUAL MONITORING PARAMETERS

7.5.1 Up Gradient Annual Results

Annual analysis for metals and non-metals were undertaken at one location up gradient of the site (BH2A) on the 9th of April 2013 as per licence requirement.

Aluminium, Antimony Arsenic, Boron, Cadmium, Calcium, Chromium, Copper, Fluoride, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Sodium, Sulphate, and Zinc were below the WTL, IGW, DWR and GWR 2010 were applicable in all up-gradient boreholes.

Barium exceeded the IGW in BH1 (178.4µg/l). A cyanide concentration of <0.05 mg/l were detected in all up-gradient boreholes. This concentration is the lowest limit of detection for the methodology used for cyanide; therefore this could be lower than the WTL and IGW of 0.01 mg/l. The results are below the DWR of 0.05 mg/l.

Orthophosphate forms are produced by natural processes, but major man-influenced sources include: partially treated and untreated sewage, runoff from agricultural sites and application of some lawn fertilisers. BH3 was above the WTL and IGW of 0.03 mg/l.

Concentrations above the limit of detection were measured for the following parameters:

- Strontium concentrations ranging from 151.01 µg/l to 286.38 µg/l,
- Uranium concentrations ranging from 0.78 to 2.37 µg/l,
- Total Oxidised Nitrogen (TON) concentrations ranging from 0.19 mg/l to 0.75 mg/l, and
- Alkalinity concentrations ranging from 282 mg/l to 308 mg/l.

The remaining parameters were below the lower limits of detection.

Analysis for Polycyclic Aromatic Hydrocarbons (total 16 EPA PAHs) was <0.247 µg/l. All parameters measured were less than the limits of detection. For the purposes of determining compliance with the DWR of 0.1µg/l for PAH only four are considered – benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene. Concentrations were as follows:

- benzo(b)fluoranthene <0.023 µg/l,
- benzo(k)fluoranthene <0.027 µg/l,
- benzo(ghi)perylene <0.016 µg/l, and
- Indeno (1, 2, 3-cd) pyrene <0.014 µg/l.

Phenol concentration was also analysed at BH2A and is <0.025 mg/l. This concentration is the limit of detection for the methodology used for Phenol however this is higher than the IGW of 0.5µg/l.

Pesticide and herbicide and semi volatile organic compound parameters were carried out in BH2A in April. The results were either below the IGW for those comparable or were below the lower detection limit for the analytical methodology used analysis.

Volatiles organic compound parameters were either below the IGW for those comparable or were below the lower detection limit for the analytical methodology used. The following parameters were detected above the detection limit:

BH2A

- o-Xylene ($\mu\text{g/l}$) 0.1 - (IGV 10 $\mu\text{g/l}$)

7.5.2 Down Gradient Annual Results

Annual analysis for List I and II substances, metals and non-metals were undertaken at two locations down gradient of the site (BH5A, BH6).

Aluminium, Antimony Arsenic Boron, Cadmium, Calcium, Chromium, Copper, Fluoride, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Sodium, Sulphate, and Zinc were below the WTL, IGV, DWR and GWR 2010 were applicable in all down-gradient boreholes

Barium exceeded the IGV in BH6, BH9, BH10, BH11, and BH12. A cyanide concentration of <0.05 mg/l was detected in all down-gradient boreholes. This concentration is the lowest limit of detection for the methodology used for cyanide; therefore this could be lower than the WTL and IGV of 0.01 mg/l. The results were below the DWR of 0.05 mg/l.

Orthophosphate forms are produced by natural processes, but major man-influenced sources include: partially treated and untreated sewage, runoff from agricultural sites and application of some lawn fertilisers. BH13A is above the WTL and IGV of 0.03 mg/l.

Concentrations above the limit of detection were measured for the following parameters:

- Cobalt concentrations ranging from <0.5 $\mu\text{g/l}$ to 0.84 $\mu\text{g/l}$,
- Strontium concentrations ranging from 197.5 $\mu\text{g/l}$ to 261.25 $\mu\text{g/l}$,
- Uranium concentrations ranging from 1.21 to 5.61 $\mu\text{g/l}^4$,
- Vanadium concentrations ranging from <0.5 to 0.97 $\mu\text{g/l}$,
- Total Oxidised Nitrogen (TON) concentrations ranging from 0.01 mg/l to 0.54 mg/l, and
- Alkalinity concentrations ranging from 282 mg/l to 400 mg/l.

The remaining parameters were below the lower limits of detection.

Analysis for Polycyclic Aromatic Hydrocarbons (total 16 EPA PAHs) was <0.247 $\mu\text{g/l}$. All parameters measured were less than the limits of detection. For the purposes of determining compliance with the DWR of 0.1 $\mu\text{g/l}$ for PAH only four are considered – benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene. Concentrations were as follows:

⁴ World Health Organisation (2011) Guidelines for Drinking-water Quality, Fourth Edition. Table A3.3 Guideline values for chemicals that are of health significance in drinking-water. Uranium 30 $\mu\text{g/l}$

-
- benzo(b)fluoranthene <0.023 µg/l,
 - benzo(k)fluoranthene <0.027 µg/l,
 - benzo(ghi)perylene <0.016 µg/l, and
 - indeno(1,2,3-cd)pyrene <0.014 µg/l,

Phenol concentration was also analysed at BH9 and is <0.025 mg/l. This concentration is the limit of detection for the methodology used for Phenol however this is higher than the IGTV of 0.5µg/l.

Pesticide, herbicide and semi volatile organic compound parameters analysis were carried out in BH9 and BH14 in April. The results were either below the IGTV for those comparable or were below the lower detection limit for the analytical methodology used analysis.

Volatiles organic compound parameters were either below the IGTV for those comparable or were below the lower detection limit for the analytical methodology used. The following parameters were detected above the detection limit. There are no drinking water standards in Ireland for these substances. Those parameters comparable with WHO guideline values are referenced:

BH14

- 1,1,1,2-Tetrachloroethane (µg/l) 7.5
- 1,2,4-Trimethylbenzene (µg/l) 0.2
- 1,3,5-Trimethylbenzene (µg/l) 0.012
- 1,3-Dichlorobenzene (µg/l) 0.1
- 1,4-Dichlorobenzene (µg/l) 0.1⁵
- 4-Chlorotoluene (µg/l) 0.002
- 4-Isopropyltoluene (µg/l) 0.002
- n-Butylbenzene (µg/l) 0.1⁵
- Styrene (µg/l)0.1⁵

⁵ World Health Organisation (2011) Guidelines for Drinking-water Quality, Fourth Edition. No health-based guideline values are given for trimethylbenzene. No guideline value proposed for 1,1-Dichloroethane. Table A3.3 Guideline values for chemicals that are of health significance in drinking-water. 1,2 Dichlorobenzene - 1000µg/l, 1,4 Dichlorobenzene 300 µg/l, Styrene - 20 µg/l, Chloroform - 300µg/l, Bromoform - 100 µg/l, Dibromochloromethane – 100 µg/l, Bromodichloromethane – 60µg/l.

- Chloroform ($\mu\text{g/l}$) 23.9⁵
- Bromoform ($\mu\text{g/l}$) 0.5⁵
- Dibromochloromethane ($\mu\text{g/l}$) 7.2⁵
- Bromodichloromethane ($\mu\text{g/l}$) 16.6⁵

BH9

- 1,3-Dichlorobenzene ($\mu\text{g/l}$) 0.1

Chloroform, bromodichloromethane, dibromochloromethane and bromo-form are disinfection by-products commonly produced during the chlorination of water and wastewater. The DWR parametric value for Total Trihalomethanes is 100 $\mu\text{g/l}$.

7.6 SURFACE WATER

Whiteriver landfill site is situated on a plateau and is located in a sub-catchment of one of the main tributaries of the White River. The White River is located approximately 4km south west of the site and it is this river, which is the main receptor for any potential surface water contamination from the site.

As required under the Waste Licence, surface water monitoring was undertaken at the station locations as set out in Table D.1.1 of the waste licence. Schedule D of the waste licence requires the monitoring of certain parameters on either a monthly, quarterly or annual basis; the frequencies of the monitoring of surface water parameters are shown in Table 7.6 below.

Table 7.6 Surface Water Parameters Monitoring Frequencies

Quarterly	Annually
Ammoniacal Nitrogen	Metals / non metals
Biological Oxygen Demand	Mercury
Chemical Oxygen Demand	Sulphate
Chloride	Total Alkalinity
Dissolved Oxygen	Orthophosphate
Electrical Conductivity	TON
Ph	
Total Suspended Solids	
Temperature	

The results contained in this report were assessed against the EC (Drinking water) Regulations 2007, SI .no 106 of 2007 (DWR) and European Communities Environmental Objectives (Surface Water) Regulations 2009 Environmental quality standard (EQS) and the Surface Water Quality Standards (SWQS) laid out in the European Communities Quality of Surface Water Intended for the Abstraction of Drinking Water Regulations 1989. These results are presented in table format in Appendix D.

Table 7.7 provides a summary of results in 2013 from surface water locations.

Table 7.7 Summary of 2013 Results from Surface Water Locations

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Alkalinity	mg/l CaCO ₃	3	110	328	245	118
Aluminium	µg/l	3	6.61	11.61	9.59	2.63
Ammonia	mg/l N	9	0.09	1.28	0.60	0.46
Antimony	µg/l	3	<0.5	1.33		
Arsenic	µg/l	3	1.35	1.98	1.64	0.32
Barium	µg/l	3	74.97	99.23	86.18	12.23
Beryllium	µg/l	3	<0.5	<0.5		
B.O.D.	mg/l O ₂	9	1.15	9.4	3.15	2.57
Boron	µg/l	3	<10	21.81		
Cadmium	µg/l	3	<0.1	<0.1		
Calcium	mg/l Ca	3	70.9	100.24	89.70	16.32
C.O.D.	mg/l O ₂	9	15	84	37	24
Chloride	mg/l Cl	9	28	52.91	37.11	8.36
Chromium	µg/l	3	<0.5	<0.5		
Cobalt	µg/l	3	<0.5	1.05		
Conductivity	µS/cm @ 25	9	502	725	616	73
Copper	µg/l	3	0.83	2.08	1.38	0.64
D.O.	% Saturation	9	47	116	86	21
Iron	µg/l	3	20.85	121.2	73.6	50.37
Lead	µg/l	3	<0.5	<0.5	<0.5	<0.5
Magnesium	mg/l Mg	3	7.81	13.33	11.30	3.04
Manganese	µg/l	3	137.9	949.3	436.9	445.8
Mercury	µg/l	3	<0.05	<0.05	<0.05	<0.05
Molybdenum (µg/l)	0	3	<0.5	1.76		
Nickel	µg/l	3	1.52	3.54	2.28	1.10
Ortho-Phosphate	mg/l P	3	0.009	0.583	0.218	0.317
pH	0	9	7.5	8.2	7.8	0.2
Potassium	mg/l	3	4.06	9.86	6.44	3.04
Selenium	µg/l	3	<0.5	<0.5		
Sodium	mg/l	3	15.97	30.16	23.57	7.15
Strontium	µg/l	3	167.78	191.03	179.03	11.64
Sulphate	mg/l SO ₄	3	23.04	64.51	39.79	21.85
Suspended Solids	mg/l	3	4	12	8	6
Temp	°C	9	5	11.6	7.6	2.9
Thallium	µg/l	3	<0.1	<0.1		
T.O.N	mg/l N	3	0.31	1.19	0.77	0.44
Total Suspended Solids	mg/l	6	3	144	37	53
Uranium	µg/l	3	0.64	1.26	0.98	0.32
Vanadium	µg/l	3	<0.5	<0.5		
Zinc	µg/l	3	1.43	3.83	2.83	1.25

Surface water monitoring is undertaken at one location upstream at SW1 and one location downstream of the site at SW2A. Chemical analyses of surface water are summarised in Appendix D.

SW1 and SW2A pH readings were within the A1 SWQS of 5.5 to 8.5.

Ammonia concentrations at SW1 ranged from 0.09 mg/l N to 1.22 mg/l N. An excess of 0.1 mg/l N can indicate agricultural contamination. Downstream samples of Ammonia (SW2A) were elevated at times (0.25 mg/l N to 0.314 mg/l N).

Dissolved Oxygen (DO) content ranged from 75% to 104 %O₂ in SW1 and 92% to 116% O₂ in SW2A.

COD showed a lower concentration down-stream (16 mg/l to 36 mg/l) from the site than those measured in the up-stream samples (38 mg/l to 84 mg/l) indicating possible contamination up-stream of the site. BOD also showed a lower concentration down-stream (1.7 mg/l to 2.3 mg/l) from the site than those measured in the up-stream samples (2.6 mg/l to 9.4 mg/l).

Total Suspended Solids (TSS) exceeded the SWQS of 50 mg/l during the monitoring period at SW1 in April.

Electrical Conductivity readings were below the SWQS of 1000µS/cm at both locations during the monitoring period.

Annual Results SW1

Aluminium, Antimony Arsenic, Barium, Boron, Cadmium Chromium, Copper, Iron Lead, Mercury, Nickel, Sulphate and Zinc were below the SWQS, DWR or EQS.

Manganese fits into the A2 SWQS classification of 300µg/l with a concentration of 137.9 µg/l. Ortho-phosphate (0.583 mg/l) exceeded the EQS.

Other parameters were Total Alkalinity (296 mg/l), Calcium (97.96 mg/l), Cobalt (0.5µg/l), Magnesium (13.33 mg/l), Potassium (9.86 mg/l), Strontium (178.2 µg/l), Uranium (0.64 µg/l), and TON (1.19 mg/l).

Other parameters measured were below the lower limits of detection.

Annual Results SW2A

Aluminium, Antimony Arsenic, Barium, Boron, Cadmium Chromium, Copper, Iron Lead, Mercury Nickel, Sulphate and Zinc were below the SWQS, DWR or EQS.

Manganese fits into the A2 SWQS classification of 300µg/l with a concentration of 223.3 µg/l. This concentration was higher than the upstream value. Ortho-phosphate (0.061 mg/l) exceeded the EQS.

Other parameters were Total Alkalinity (328 mg/l), Calcium (100.24 mg/l), Magnesium (12.77 mg/l), Potassium (5.4 mg/l), Strontium (191.0 µg/l), Uranium (1.26 µg/l), and TON (0.8 mg/l). Other parameters measured were below the lower limits of detection.

7.6.1 Lagoon/Surface Water Retention Pond

The surface water retention pond, SW3 is located on the eastern boundary of the site and discharges to the stream running along the northern boundary of the site.

SW3 pH readings of 7.5 to 7.9 which were within the A1 SWQS of 5.5 to 8.5. The DO concentration in SW3 monitoring point was 47 % to 94% saturation.

The Ammonia concentration of <0.63 mg/l to 1.28 mg/l for SW3 were within the SWQS category of A2 (1.5 mg/l).

The BOD concentration in the SW3 ranged from 1.15 mg/l to 2.0 mg/l during this monitoring period, below the SWQS A1 classification of 5 mg/l.

Electrical Conductivity in SW3 ranged from 502 µS/cm to 680 µS/cm, which is below the SWQS of 1000µS/cm. The Chloride level of 30 mg/l to 42 mg/l was below the SWQS of 250 mg/l for this monitoring period.

Total Suspended Solids concentration of 3 mg/l to 28 mg/l were below the SWQS limit of 50 mg/l and the surface water discharge limit of 35 mg/l as per Schedule C4 of the waste licence.

The COD level in SW3 ranged from 15 mg/l to 29 mg/l during this monitoring period below and equal to the SWQS classification of 40 mg/l.

Annual Results

Aluminium, Antimony Arsenic, Barium, Boron, Cadmium Chromium, Copper, Iron Lead, Mercury Nickel, Ortho-phosphate, Sulphate and Zinc were below the SWQS, DWR or EQS.

Manganese fits into the A3 SWQS classification of 1000 µg/l with a concentration of 949.3 µg/l.

Other parameters were Total Alkalinity (110 mg/l), Calcium (70.9 mg/l), Cobalt (1.05 µg/l), Magnesium (7.81 mg/l), Molybdenum (1.76 µg/l), Potassium (4.06 mg/l), Strontium (167.7 µg/l), Uranium (1.05 µg/l), and TON (0.31 mg/l). Other parameters measured were below the lower limits of detection.

7.7 GAS MONITORING

As required under the Waste Licence, landfill gas monitoring has been undertaken at the borehole locations as set out in current waste licence.

Schedule D of the waste licence requires the licensee to conduct monthly monitoring on the perimeter and in the waste of the landfill site. The trigger level for landfill gas emissions are Methane, greater than or equal to 1.0% v/v and Carbon dioxide, greater than or equal to 1.5% v/v. Landfill gas is monitored using a GA2000 infra-red analyser. These results are presented in Appendix E.

Results were below the trigger limit for Methane of 1% v/v for all perimeter locations (not in waste) during the year. From the results it can be seen that no methane was recorded in piezometers around the perimeter of the site.

Carbon dioxide levels around the perimeter of the site exceeded the licence requirements of 1.5% v/v during the year. Exceedances were recorded in PZ3-PZ5, PZ22, PZ28, PZ30, PZ34, PZ46, PZ48 and PZ49. The maximum levels were 5.1 % v/v at PZ46 in December.

There are two enclosed gas flares at Whiteriver Landfill Site with a combined capacity of 2,600m³/hr. Landfill gas is currently been flared through the 2,000 m³/hr flare. Two engines have been installed at the facility to generate power to the national grid. These have been commissioned but are not yet connected to the grid. This is expected to be undertaken in April, 2014.

A permanent gas monitoring system has been installed in the site building. No exceedances have been recorded.

7.8 MONITORING OF EMISSIONS FROM LANDFILL GAS FLARE

Flue gas monitoring was undertaken on the permanent landfill gas flares. All monitoring was carried out in accordance with Environmental Protection Agency Office of Environmental Enforcement (OEE) Air Emission Monitoring Guidance Note 2 (AG2). NO_x as NO₂, CO, TOC, HCL and HF emissions from both flares were within the emission limit values specified in Waste licence W060-03.

7.9 NOISE MONITORING

The measurements were completed on Thursday and Friday 6th – 7th March 2014 in accordance with the following environmental noise standards:

- ISO 1996: 2007 Acoustics – Description and Measurement of Environmental Noise, Parts 1-4
- EPA Guidance Note for Noise (NG4) 2012

The ranges of noise levels at each noise sensitive location during respective measuring periods were as follows:

NSL 1: Daytime: LAeq (T 15 min) 60dBA;
Evening time: LAeq (T 15 min) 47dBA;
Night time: LAeq (T 15 min) 46-41dBA

NSL 2: Daytime: LAeq (T 15 min) 61-58dBA;
Evening time: LAeq (T 15 min) 54dBA;
Night time: LAeq (T 15 min) 49-48dBA

NSL 3: Daytime: LAeq (T 15 min) 61-58dBA;
Evening time: LAeq (T 15 min) 59dBA;
Night time: LAeq (T 15 min) 52-45dBA

NSL 4: Daytime: LAeq (T 15 min) 74-65dBA;
Evening time: LAeq (T 15 min) 68dBA;
Night time: LAeq (T 15 min) 64-62dBA

- NSL 5: Daytime: LAeq (T 15 min) 57-55dBA;
Evening time: LAeq (T 15 min) 49dBA;
Night time: LAeq (T 15 min) 49-48dBA
- NSL 6: Daytime: LAeq (T 15 min) 66-63dBA;
Evening time: LAeq (T 15 min) 51dBA;
Night time: LAeq (T 15 min) 45dBA
Flares: Daytime: LAeq (T 15 min) 58-57dBA;
Night time: LAeq (T 15 min) 56-55dBA

The report found that concluded that all noise sensitive locations (N1 – N6) are not adversely effected by noise arising from landfill operations. Road traffic noise was the dominant noise source at Location 4. There is no specific waste licence requirement to monitor for noise at the flares. However, measurements show that it is not adversely impacting on noise levels N1-N6.

While daytime LAeq and DEN values are shown to exceed the requirements at all Locations a more accurate representation of noise levels arising from landfill operations as experienced during the survey is provided by the LA90. The current report therefore shows noise levels directly associated with landfill operations (and in the absence of traffic noise external to the landfill site) to be in compliance with the requirement of the licence.

7.10 DUST MONITORING

Table 7.8 details the results of the four dust monitors installed on the site. The waste licence requires dust deposition limits to be no more than 350 mg/m²/day.

Table 7.8 Results from Dust Monitoring Analysis, Whiteriver Landfill Site

Sampling Point	DG1	DG2	DG3	DG4	DG5	DG6
January	60.81	36.17	231.19	36.7	47.71	216.51
February	39.84	228.57	155.17	137.87	71.82	24.11
March	215.98	289.38	287.28	148.88	114.81	255.3
April	No result	No result	No result	No result	No result	No result
May	43.51	71.3	121.62	200.78	56.09	181.91
June	188.72	284.66	184.01	143.12	No result	No result
July	148.5	204.7	9.9	165.9	101.8	94.9
August	64.5	281.6	67.1	201.5	111.8	151.4

Sampling Point	DG1	DG2	DG3	DG4	DG5	DG6
September	196.3	216.4	81.1	177.3	92.2	66.6
October	160.2	136.1	231.8	136.7	147.7	216.8
November	139.8	228.5	155.1	137.8	171.8	124.4
December	215.8	189.4	187.4	148.8	118.1	155.3

There were no results for the month of April due to an oversight whereby sample containers were not put out. There were no results for DG5 and DG6 in June as they were vandalised. From Table 7.8 it can be seen that dust monitoring results were in compliance with the limit throughout the year.

7.11 METEOROLOGICAL MONITORING

Meteorological data is monitored in accordance with Schedule of the licence. This information is available on site.

7.12 SLOPE STABILITY ASSESSMENT

A slope stability assessment was undertaken in 2013. The analysis for the final waste slopes suggests that the factors of safety for the filling of waste are satisfactory. This report is available on site.

7.13 ODOUR MONITORING

Total Volatile Organic compound monitoring has been undertaken at the site on a quarterly basis. Based on these reports a number of the recommendations have been carried out to reduce the landfill gas leakage from the site and therefore reducing odour. These reports were included in quarterly monitoring reports.

7.14 ECOLOGY MONITORING

Biological sampling and a water quality assessment in accordance with EPA Q-rating methodology was undertaken at two locations on the White River adjacent to the landfill site on 11th September 2011. The biological assessment indicated unpolluted conditions (Q4) at both of the sites monitored. The report concluded that the biological monitoring data contain no evidence of an impact on the White River from the landfill.

8 RESOURCES AND ENERGY CONSUMPTION SUMMARY

Consumption of resources for the reporting period is shown in Table 8.1 below.

Table 8.1 Consumption of Resources

Parameters	Annual Total	Unit
Light fuel oil (Diesel)	1,998,000	kWh
Electricity	212,000	kWh

9 PROPOSED DEVELOPMENT OF THE FACILITY AND TIMESCALE OF SUCH DEVELOPMENT

The site is now closed. Development of the facility will be as follows:

- Reduce pressure on non-renewable fossil fuels used to generate electricity. Generation of electricity to the grid due to commence in April 2014.
- Minimise the release of landfill gases. Capping of the entire site is currently being undertaken. This is expected to be complete in June 2014.

10 VOLUME OF LEACHATE PRODUCED AND VOLUME OF LEACHATE TANKERED OFF SITE

The volume of leachate transported off site to Drogheda wastewater treatment plant during the period January to December 2013 is provided in Table 10.1. A water balance calculation has been undertaken and is included in Appendix F using rainfall data from metrological station on site. This estimates the annual leachate production to be approximately 22,012 m³. This is based on using worst case scenario for infiltration on temporarily capped /restored area of 30% and 10% for restored areas.

Table 10.1 Volume of Leachate Transported Off Site in 2013

Month	Weight Volume (m ³)
January	4,792.58
February	3,390.48
March	3,395.68
April	2,054.30
May	1,605.02
June	1,383.38
July	909.28
August	988.58
September	653.92
October	2,985.14
November	2,214.10
December	1,490.98
Total	25,863.44

11 REPORT ON DEVELOPMENT WORKS UNDERTAKEN DURING THE REPORTING PERIOD, AND A TIMESCALE FOR THOSE PROPOSED DURING THE COMING YEAR

11.1 RESTORATION OF COMPLETED CELLS/PHASES

The following Cells/Phases have been restored to date;

- Phase I to IV
- Phase V Cell 3 a,b
- Phase V Cell 2 (4000m²)

11.2 TIMESCALE FOR DEVELOPMENT WORKS PROPOSED DURING THE COMING YEAR

The remaining area of Phase 5 will be capped by June 2014. Phase 6 (undeveloped phase) will be regraded and seeded

12 SITE SURVEY SHOWING EXISTING LEVELS OF THE FACILITY AT THE END OF THE REPORTING PERIOD

A topographical survey was carried out in June 2013. This is available for inspection on site.

13 ESTIMATED ANNUAL AND CUMULATIVE QUANTITIES OF LANDFILL GAS (LFG) EMITTED FROM THE SITE

The gas yield figures provided in Appendix G were calculated using Gassim Model 2.0. As can be seen from the data landfill gas production is calculated to be 850 m³/hr in 2014.

The EPA landfill gas survey was also completed for 2013. The average flow rate for the flare in 2013 was 1,118 m³/hr and the average methane content was 41% v/v.

14 ESTIMATED ANNUAL AND CUMULATIVE QUANTITY OF INDIRECT EMISSIONS TO GROUNDWATER

The site has been developed on a containment basis, hence controlling potential discharge to groundwater. The risk of leakage is mitigated by the following;

- The relative thickness of the low permeability boulder clays constitutes a natural effective barrier to downward groundwater migration.
- Groundwater resources within the granular horizons are confined under subartesian pressure with a net upward groundwater movement.
- Leachate levels are maintained below licence limits on site.
- Leachate is pumped from the cells, to treatment lagoon and tankered off site for treatment.

There were no direct discharges to groundwater or surface water. The volume of leachate transported off site to Drogheda wastewater treatment plant during the period January to December 2013 was 25,864 m³. A water balance calculation has been undertaken. This estimates the annual leachate production to be approximately 22,012 m³ as discussed in Section 10.

15 ASSESSMENT OF THE FEASIBILITY OF THE UTILISATION OF LANDFILL GAS AS AN ENERGY RESOURCE

Two 0.65 Mw engines have been installed at the facility to generate power to the national grid. These have been commissioned but are not yet connected to the grid. This is expected to be undertaken in April 2014.

16 MONTHLY WATER BALANCE CALCULATION AND INTERPRETATION

A water balance calculation has been undertaken and is included in Appendix F. This estimates the annual leachate production to be approximately 22,012 m³. The difference in actual and predicted quantities month to month may be partly due to the absorptive capacity of the waste, which determined the speed of percolation of rainwater through the wastes, actual rainfall was used for all areas and using worst case scenario for infiltration.

17 SCHEDULE OF ENVIRONMENTAL OBJECTIVES AND TARGETS FOR THE FORTHCOMING YEAR

17.1 SCHEDULE OF ENVIRONMENTAL OBJECTIVES AND TARGETS FOR THE FORTHCOMING YEAR

Objectives, targets and timescales for Whiteriver Landfill Site have been completed as part of the ISO14001 Environmental Management System. These are as follows:

- Reduce pressure on non-renewable fossil fuels used to generate electricity. Generation of electricity to the grid due to commence in April 2014.
- Minimise the release of landfill gases. Final capping works are being undertaken and this will be completed in June 2014.
- Update Closure, Restoration, Aftercare Management Plan (CRAMP) and agree with EPA

17.2 REPORT ON THE PROGRESS TOWARDS ACHIEVEMENT OF THE ENVIRONMENTAL OBJECTIVES AND TARGETS CONTAINED IN THE PREVIOUS YEARS REPORT

Objectives, targets and timescales for Whiteriver Landfill Site were reviewed as part of the ISO14001 Environmental Management System as follows:

- EMP No: 1 Reduce pressure on non-renewable fossil fuels used to generate electricity. Project currently underway. Two 0.65 Mw generators have been installed. These have been commissioned but are not yet connected to the grid. This is expected to be undertaken in April 2014. .
- EMP No: 7 Comply with the relevant requirements of the Landfill Directive (1993/31/EC). Objective and Target has been compiled to reduce BMW to landfill. The total reported for 2013 was 21.72 % this was within the target limit of 47%. The site is now closed.
- EMP No: 8 Minimise the release of landfill gases. Final capping works are being undertaken and this will be completed in June 2014.
- EMP No: 10 Meet the requirements of the new Environmental Objectives (Groundwater) Regulations 2010.
- EMP No: 11 Enhance the Biodiversity of the site post closure. Greenbelt contractor was hired and works commenced Feb 2013. 6,000 trees were planted on the site in 2013.

18 FULL TITLE AND A WRITTEN SUMMARY OF ANY PROCEDURES DEVELOPED BY THE LICENSEE IN THE YEAR, WHICH RELATES TO THE FACILITY OPERATION

Environmental Management Procedures have been developed as part of the ISO14001 Environmental Management System (EMS) for the purpose of maintaining and assessing the EMS. Operational procedures ensure that the routine operational tasks related to the environmental management of the facility are undertaken in a satisfactory manner as required to maintain effective control of the environmental aspects of the facility. This system is audited annually and is available for inspection on site. As part of the EMS procedures have been developed. There were no changes to the procedures during 2013.

19 REPORTED INCIDENTS AND COMPLAINTS SUMMARIES, CORRESPONDENCE TO/FROM EPA

In total 15 complaints were made in 2013 down from 156 in 2012. These mainly related to odour and are summarised in Table 19.1. These are available for inspection at Whiteriver Landfill Site.

Table 19.1 Complaints Summary

Month	Number of Complaints	Resolution Status
January	1	Closed
February	2	Closed
March	3	Closed
April	3	Closed
May	0	Closed
June	0	Closed
July	1	Closed
August	3	Closed
September	1	Closed
October	1	Closed
November	0	Closed
December	0	Closed

There were no incidents reported for 2013. A summary of non-compliances noted during Audits/Landfill Site Inspections undertaken during the reporting period by EPA are given in Table 19.2.

Table 19.2 Summary of Non Compliances and Audit Observations noted during Audits/Landfill Site Inspections undertaken during the Reporting Period by EPA

Date and Reference	Summary of Inspection Report/Audit
<p>05/11/2013</p> <p>W0060-03</p> <p>(LFG2013) JG</p>	<p>Landfill Gas Assessment Site Inspection Report Corrective Action</p> <p>The licensee should record adjustment to gas control value so that an accurate record is maintained and adjustments are recorded over time.</p>
<p>06/06/2013</p> <p>(W0060-03)</p> <p>AR13Im(e)</p> <p>Site Inspection Report</p>	<p>Site Inspection Report Inspection Corrective Action</p> <p><i>Odour & Complaints and Incidents Management.</i></p> <p>The licensee is reminded of the requirement that activities shall be carried on in a manner such that emissions including odours do not result in significant impairment of the environment beyond the facility boundary</p> <p><i>Landfill Gas</i></p> <p>The licensee shall arrange for the completion of a representative landfill gas management field drawing. This drawing shall be maintained up to date and shall be made available to Agency personnel for inspection at all reasonable times.</p> <p>The licensee shall ensure gas balancing records are downloaded promptly following each gas balancing event. These records shall be maintained onsite and shall be routinely reviewed following each balancing event to ensure appropriate operation of the gas field. Recommendations for improvement of the gas balancing records were discussed as follows: - disconnected wells shall be recorded in the gas balancing records and justification for each disconnection shall be provided. - undertake periodic monitoring at individual gas wells in addition to monitoring undertaken at manifold boxes. - a reading of gas flow shall be taken at the flare during gas balancing events. - any corrective actions identified shall be documented and close out of these actions shall be recorded.</p> <p><i>Other issues</i></p> <p>The Environmental Document Management System shall be maintained up-to-date.</p>

20 REVIEW OF NUISANCE CONTROLS

The site ceased to accept municipal solid waste on the 30th of August 2013 and Incinerator Bottom ash on the 20th of December 2013. The site is now closed. Odour and dust monitoring is still being undertaken while capping works are being progressed. As part of the ISO14001 Environmental Management System an Odour Management Plan has been developed for the facility. This was updated in 2012. Total Volatile Organic compound monitoring has been undertaken at the site on a quarterly basis in 2013.

21 REPORT ON FINANCIAL PROVISIONS MADE UNDER THIS LICENSE, MANAGEMENT AND STAFFING STRUCTURE OF THE FACILITY AND A PROGRAMME FOR PUBLIC INFORMATION

Louth County Council being a local authority is able to provide the necessary finances to ensure the proper management development and restoration of Whiteriver Landfill Site.

Overall responsibility for the ongoing operations of the landfill site is held by a Senior Engineer assigned to the Environmental Section of Louth County Council. The site ceased to accept municipal solid waste on the 30th of August 2013 and Incinerator Bottom ash on the 20th of December 2013.

Management Structure for the closed site is as follows. This is the present status although it may be changed at a future stage.

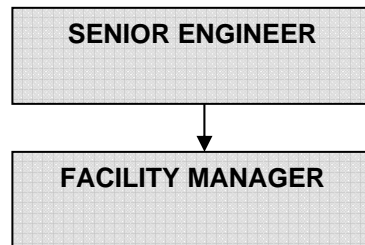


Figure 21.1 Management Structure at Whiteriver Landfill Site

22 OTHER INFORMATION

22.1 REPORT ON TRAINING OF STAFF TRAINING

No staff training was undertaken in 2012.

22.2 TANK, PIPELINE AND BUND TESTING AND INSPECTION REPORT

There are no tanks, pipeline or bund inspection undertaken on site.

22.3 UPDATES TO LANDFILL ENVIRONMENTAL MANAGEMENT PLAN (LEMP)

ISO14001 Environmental Management System was implemented in October 2009. This included a review of the Environmental Management Plan for the site. This was last reviewed in October/November 2010 and is available for inspection on site.

22.4 REVIEW OF ENVIRONMENTAL LIABILITIES

An Environmental Liabilities Risk Assessment (ELRA) has been completed for the site. This was submitted to EPA in June 2011. No reply from the EPA has been received to date.

22.5 REPORT ON WASTE RECOVERY

A report on the contribution by this facility to the achievement of the waste recovery objectives stated in Condition 2.3.2.1 and as otherwise may be stated in National and European Union waste policies has not been completed to date for the site. Louth County Council recovers construction and demolition waste arising from council project and other sources in the landfill operations. The material listed below were recovery on site as cover material and used in the construction of temporary roads in 2013.

Table 22.1 Recovered Wastes

Quantity waste recovered at the landfill (tonnes)	EWC code	Quantity waste recovered at the landfill (tonnes)
C&D	17 01 07	5,340
soils used as cover	17 05 04	5,805
Screened oversize material from composting of green waste	19 05 01	1,340
Wood chip	19 12 07	1,742
C&D Fines for cover material	19 12 12	16,385
Total		30,611

22.6 STATEMENT OF COMPLIANCE OF FACILITY WITH ANY UPDATES OF THE RELEVANT WASTE MANAGEMENT PLAN

Under the European Communities (Waste Directive) Regulations 2011, all waste management plans were to be evaluated by 31 December 2012. This evaluation process has been completed and all ten evaluations recommended the development of replacement plans.

The number of waste management planning regions has been reduced from 10 regions to 3

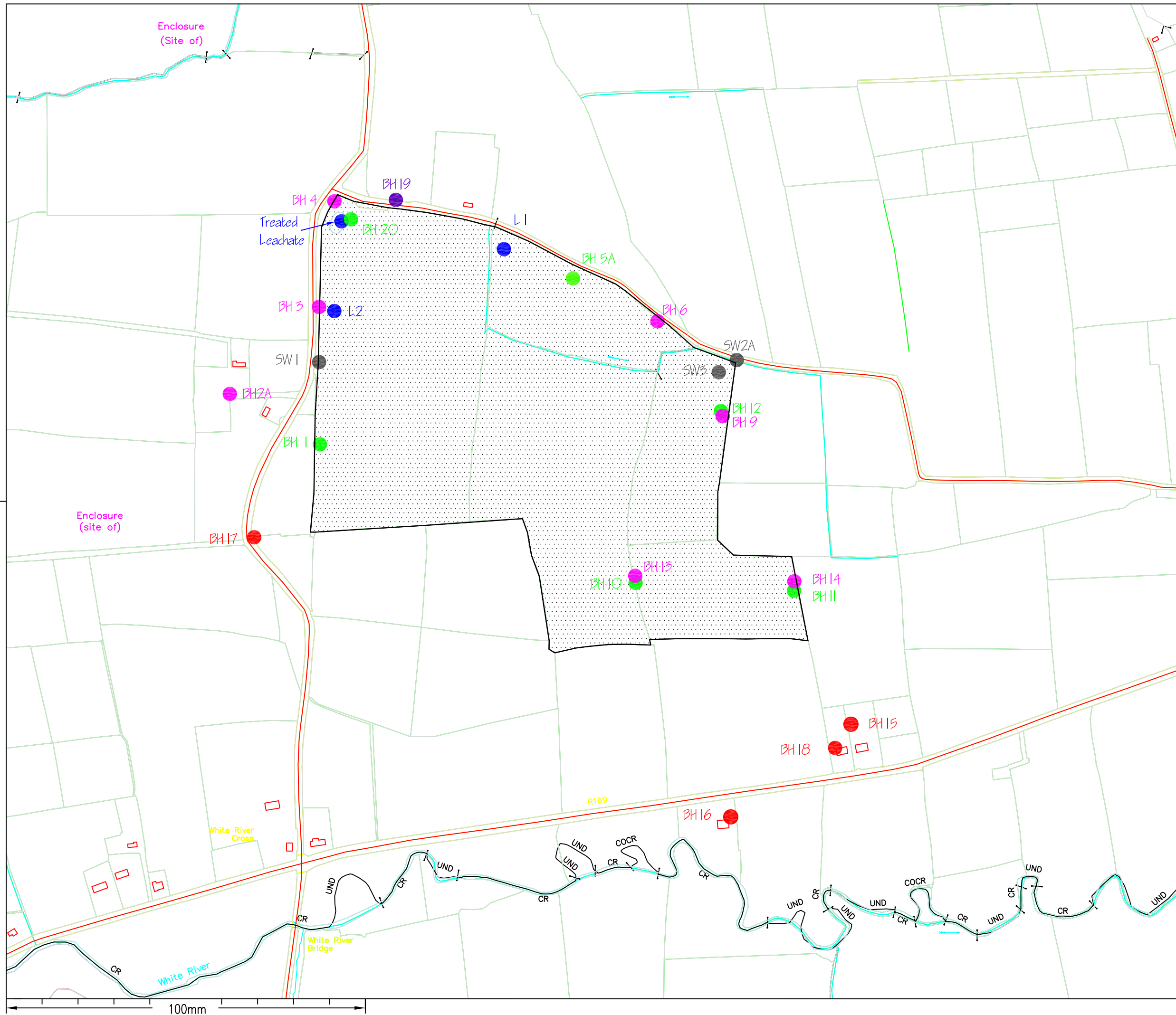
(Connacht-Ulster, Eastern-Midland, and Southern) Louth is now part of the Eastern-Midland Region of which Dublin City Council is the lead authority. Notice of the intention to commence the preparation of New Regional Waste Management Plan was given on 10th October, 2013

22.7 STATEMENT ON THE ACHIEVEMENT OF THE WASTE ACCEPTANCE AND TREATMENT OBLIGATIONS

Whiteriver landfill site has completed quarterly Biodegradable Municipal Waste Reporting Landfill Submission Report to the EPA for 2013. The total reported for 2013 was 21.72 %. This is in compliance with Condition 5.15 where the maximum of 47% by weight of municipal solid waste (MSW) accepted for disposal to the body of the landfill shall comprise biodegradable municipal waste (BMW), measured on a calendar year basis.

APPENDIX A

DRAWINGS



- NOTES**
1. VERIFYING DIMENSIONS. THE CONTRACTOR SHALL VERIFY DIMENSIONS AGAINST SUCH OTHER DRAWINGS OR SITE CONDITIONS AS PERTAIN TO THIS PART OF THE WORK.
 2. SERVICES. APPROVED OPENINGS FOR SERVICES THROUGH THE STRUCTURE ARE INCORPORATED ON THE DRAWINGS. ANY ADDITIONAL OPENINGS OF A MINOR NATURE REQUIRED BY THE MAIN CONTRACTOR OR HIS SUBCONTRACTORS MUST BE SUBMITTED ON A DRAWING FOR APPROVAL BEFORE WORK COMMENCES.
 3. DATUM
 4. KEY
 INCLUDES ORDNANCE SURVEY IRELAND DATA REPRODUCED UNDER OSI LICENCE NUMBER 2003/07CCMA/LOUTH LOCAL AUTHORITIES. UNAUTHORISED REPRODUCTION INFRINGES ORDNANCE SURVEY IRELAND AND GOVERNMENT OF IRELAND COPYRIGHT. © ORDNANCE SURVEY IRELAND, 2006.
 - BH15 Groundwater well (Domestic)
 - BH1 Groundwater monitoring boreholes (Overbunden)
 - BH4 Groundwater monitoring boreholes (Bedrock)
 - SW1 Surfacewater monitoring location points
 - L1 Leachate monitoring points
 - BH19 Agricultural water supply

D	Private well decommissioned removed.	AMB Jul '12	AMcG Jul '12
REV	DESCRIPTION	BY DATE	CHECK DATE

DRAWN BY RP	CHECK BY AMcG	APPROVED D.D
DATE NOV '06	DATE NOV '06	DATE NOV '06
PLOT SCALE 1:5000	SCHEDULES	SHEET SIZE A3

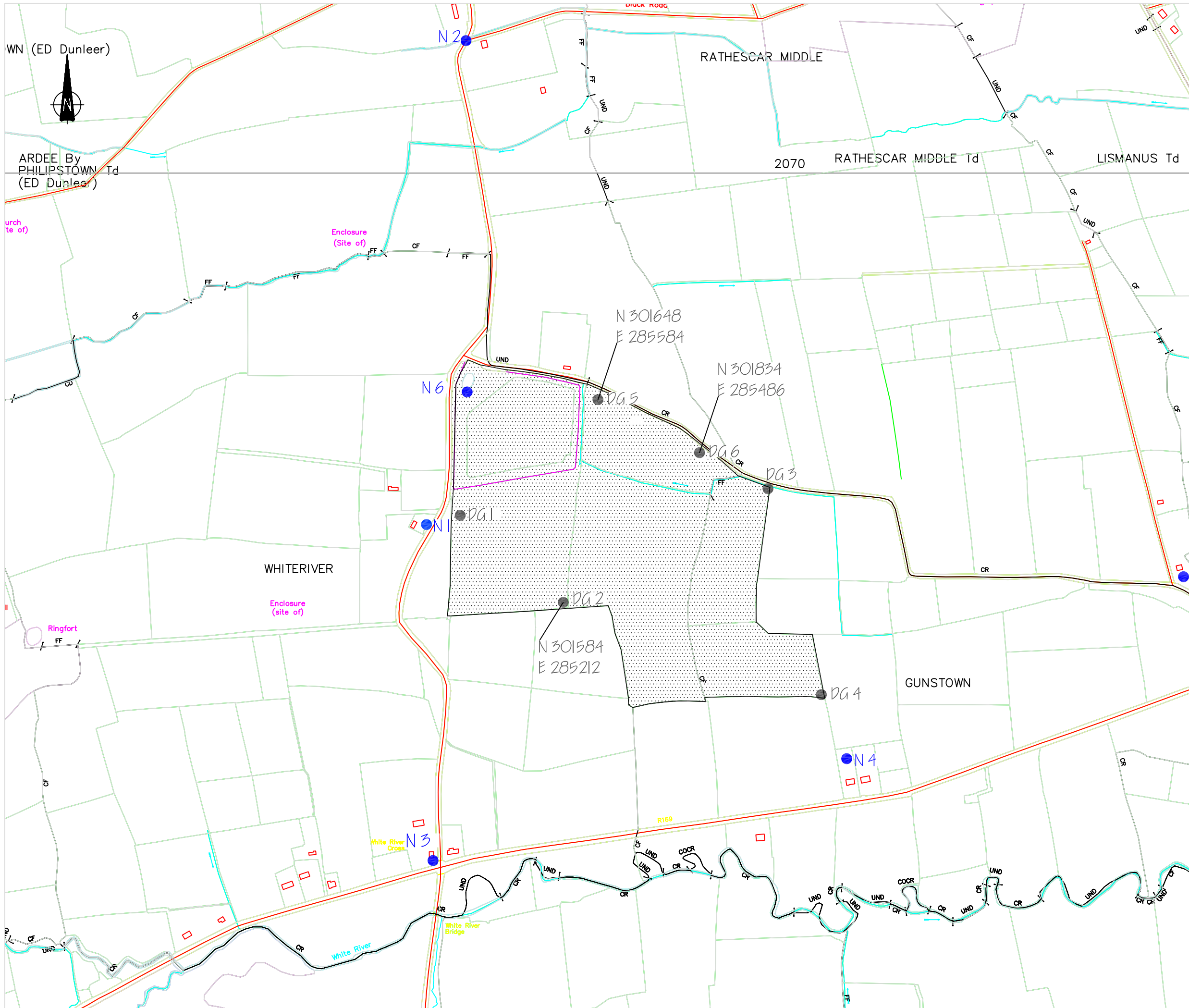
CLIENT
LOUTH COUNTY COUNCIL

PROJECT
WHITERIVER LANDFILL SITE

TITLE
MONITORING BOREHOLES

RPS Consulting Engineers
 TEL: 074 91 61927 www.rpsgroup.com/ireland FAX: 074 91 61928
 THE ENTERPRISE FUND BUSINESS CENTRE, BALLYRANE, LETTERKENNY, CO. DONEGAL

ARCHITECT	DWG. STATUS
DRAWING No. IBL0069/101	PRELIM.
REVISION A B C D	TENDER
	CONST.
	RECORD ●



NOTES

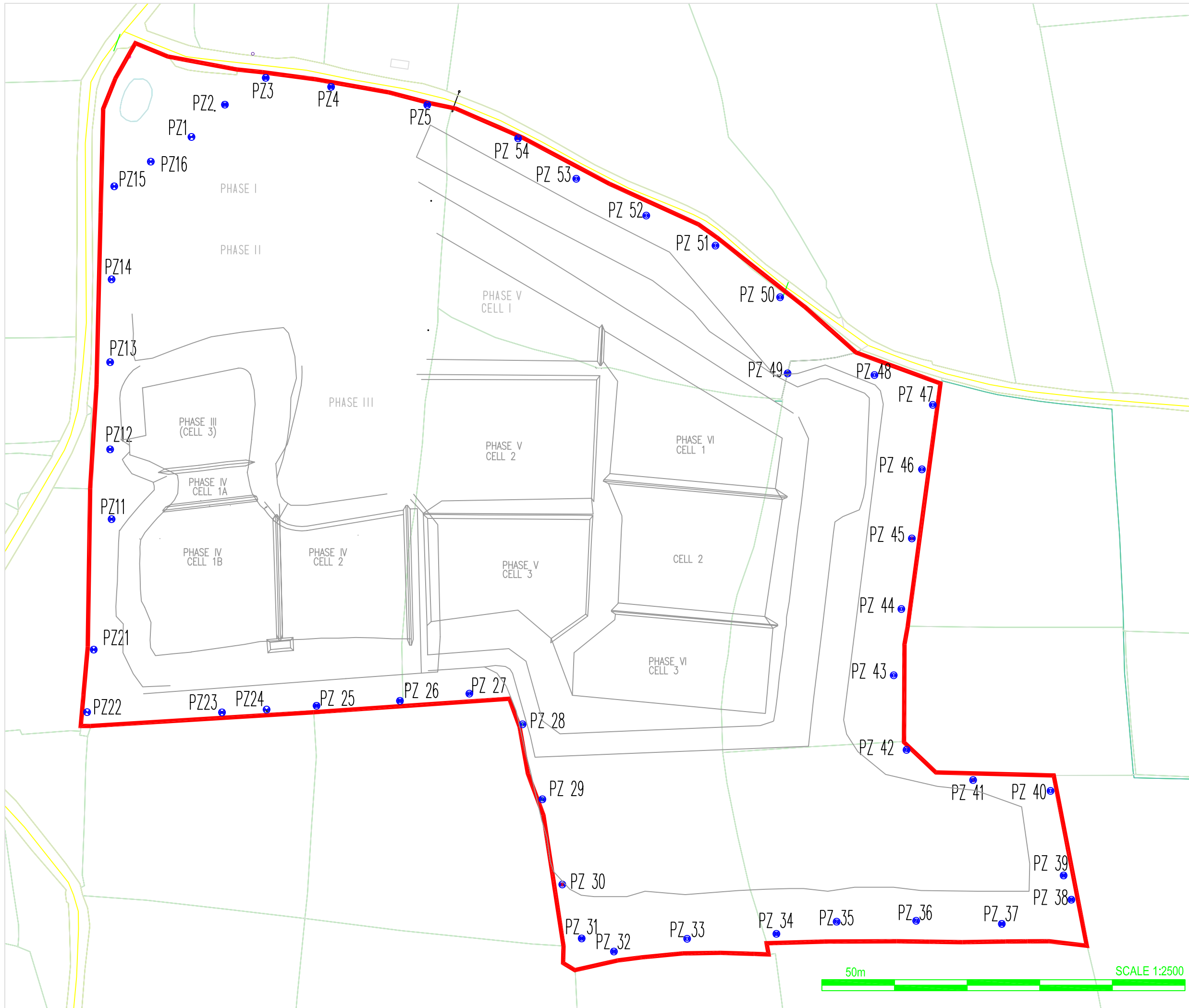
- Verifying Dimensions.
The contractor shall verify dimensions against such other drawings or site conditions as pertain to this part of the work.
- Existing Services.
Any information concerning the location of existing services indicated on this drawing is intended for general guidance only. It shall be the responsibility of the contractor to determine and verify the exact horizontal and vertical alignment of all cables, pipes, etc. (both underground and overhead) before work commences.
- Issue of Drawings.
Hard copies, dwf and pdf will form a controlled issue of the drawing. All other formats (dwg, dxf etc.) are deemed to be an uncontrolled issue and any work carried out based on these files is at the recipient's own risk. RPS will not accept any responsibility for any errors arising from the use of these files, either by human error by the recipient, listing of un-dimensioned measurements, compatibility issues with the recipient's software, and any errors arising when these files are used to aid the recipient's drawing production, or setting out on site.
- DATUM:
- Keys

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- Dust gauge location
- Noise monitoring location points

B	Added new DG location	AMB Oct '11	AMcG Oct '11
A	Insertion of the OSI reference	RP Nov '06	AMcG Nov '06
rev	amendments	drawn date	checked date

RPS	Enterprise Fund	T	+353 74 9161927
	Business Centre	F	+353 74 9161928
	Ballyraine, Letterkenny	W	www.rpsgroup.com/ireland
	Co. Donegal	E	ireland@rpsgroup.com
Client			
Louth County Council			
Project			
Whiteriver Landfill Site			
Title			
Noise and Dust Monitoring Locations			
Architect			
Drawing Status	Sheet Size	Drawing Scale	
Prelim	A3	1:7500	
Drawing Number			Rev
IBL0069/102			B
Drawn By / Date	Checked By / Date	Approved By / Date	
RP / Nov '06	AMcG / Nov '06	DD / Nov '06	



NOTES

1. Verifying Dimensions.
The contractor shall verify dimensions against such other drawings or site conditions as pertain to this part of the work.
2. Existing Services.
Any information concerning the location of existing services indicated on this drawing is intended for general guidance only. It shall be the responsibility of the contractor to determine and verify the exact horizontal and vertical alignment of all cables, pipes, etc. (both underground and overhead) before work commences.
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4. DATUM:
5. KEYS
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PZ 1 Landfill Gas Piezometer

rev	amendments	drawn date	checked date

	Enterprise Fund	T	+353 74 9161927
	Business Centre	F	+353 74 9161928
	Ballyraine, Letterkenny	W	www.rpsgroup.com/ireland
	Co. Donegal	E	ireland@rpsgroup.com

Client

LOUTH COUNTY COUNCIL

Project

Whiteriver Landfill Site

Title

Landfill Gas Piezometer

Architect

Drawing Status	Sheet Size	Drawing Scale
Preliminary	A3	1:2500

Drawing Number	Rev
IBR0138/100	0

Drawn By / Date	Checked By / Date	Approved By / Date
AMB / Mar '10	AMcG / Mar '10	DD / Mar '10

APPENDIX B

PRTR REPORTING



[Guidance to completing the PRTR workbook](#)

AER Returns Workbook

Version 1.1.17

REFERENCE YEAR	2013
-----------------------	------

1. FACILITY IDENTIFICATION

Parent Company Name	Louth County Council
Facility Name	Whiteriver Landfill Site
PRTR Identification Number	W0060
Licence Number	W0060-03

Waste or IPPC Classes of Activity

No.	class name
3.5	Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
3.1	Deposit on, in or under land (including landfill). Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.12	
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
3.4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
3.6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.
3.7	#####
4.10	The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.4	Recycling or reclamation of other inorganic materials.
4.9	Use of any waste principally as a fuel or other means to generate energy.
Address 1	Whiteriver & Gunstown Townland
Address 2	Dunleer
Address 3	Co Louth
Address 4	
	Louth
Country	Ireland
Coordinates of Location	-6.52774 53.6647
River Basin District	GBNIIENB
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Damien Holmes
AER Returns Contact Email Address	damien.holmes@louthcoco.ie
AER Returns Contact Position	Facility Manager/Executive Scientist
AER Returns Contact Telephone Number	041 6859019
AER Returns Contact Mobile Phone Number	086 6097315
AER Returns Contact Fax Number	041 6851623
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	8760
Number of Employees	7
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

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

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

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

4. WASTE IMPORTED/ACCEPTED ONTO SITE

[Guidance on waste imported/accepted onto site](#)

Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	
--	--

This question is only applicable if you are an IPPC or Quarry site

4.1 RELEASES TO AIR

[Link to previous years emissions data](#)

[PRTR# : W0060 | Facility Name : Whiteriver Landfill Site | Filename : W0060_2013 PRTR(1).xls | Return Year : 2013]

07/04/2014 14:32

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

POLLUTANT		METHOD			Please enter all quantities in this section in KGs			
No. Annex II	Name	M/C/E	Method Used		Emission Point 1	QUANTITY		
			Method Code	Designation or Description		T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
03	Carbon dioxide (CO2)	C	OTH	Gassim model	0.0	12200000.0	0.0	12200000.0
01	Methane (CH4)	C	OTH	Flare monitoring	0.0	0.0	0.0	0.0
55	1,1,1-trichloroethane	C	OTH	Gassim model	0.0	42.5	0.0	42.5
04	Hydro-fluorocarbons (HFCs)	C	OTH	Gassim model	0.0	58.6	0.0	58.6

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

SECTION B : REMAINING PRTR POLLUTANTS

POLLUTANT		METHOD			Please enter all quantities in this section in KGs			
No. Annex II	Name	M/C/E	Method Used		Emission Point 1	QUANTITY		
			Method Code	Designation or Description		T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
15	Chlorofluorocarbons (CFCs)	C	OTH	Gassim model	0.0	54.3	0.0	54.3

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

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

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

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

Additional Data Requested from Landfill operators

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

Landfill: Please enter summary data on the quantities of methane flared and / or utilised	Whiteriver Landfill Site				
	T (Total) kg/Year	M/C/E	Method Code	Designation or Description	Facility Total Capacity m3 per hour
Total estimated methane generation (as per site model)	2707365.0	C	OTH	Gassim model	N/A
Methane flared	2589947.0	M	OTH	Flare records	0.0 (Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0 (Total Utilising Capacity)
Net methane emission (as reported in Section A above)	117418.0	C	OTH	model minus flare records	N/A

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR#: W0060 | Facility Name : Whiteriver Landfill Site | Filename : W0060_2013 PRTR(1).xls | Return Year : 2013 |

07/04/2014 14:32

Please enter all quantities on this sheet in Tonnes

3

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non-Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	19 07 03	No	25863.0	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	EPS ,.	Marsh Road,Drogheda,Co. Louth,.,Ireland		

* Select a row by double-clicking the Description of Waste then click the delete button


[Link to previous years waste data](#)

[Link to previous years waste summary data & percentage change](#)

[Link to Waste Guidance](#)

APPENDIX C

GROUNDWATER MONITORING RESULTS

									
PARAMETERS	UNITS	Whitriver Trigger Limits (WTL)	S.I. No. 9/2010 — European Communities Environmental Objectives (Groundwater)	EPA Interim guideline values (IGV)	EC (Drinking water) Regulations 2007 (SI .no 278 of 2007)	EC (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989 S.I. No.294/1989	WFD Surface Water (ug/l)	European Communities Environmental Objectives (Surface Water) Regulations 2009 Environmental quality standard (EQS) as	
								AA-EQS	EQS-MAC
Alkalinity	mg/l CaCO3			NAC					
Aluminium	µg/l		150	0.2 mg/l	200				
Ammonia	mg/l N	0.2 mg/l N	65-175 µg/l N-	0.15 mg/l (0.11 mg/l N)	0.3 mg/l (0.23 mg/l N)	A1- 0.2 or 0.16 mg/l N) (A2- 1.5) (A3- 4)		0.065 good 0.040 high	0.140 good 0.090 high
Antimony	µg/l				5		0.4		
Arsenic	µg/l		7.5		10		1	25	25
Barium	mg/l			0.1		(A1- 0.1) (A2- 1)	75		
Beryllium	µg/l								
B.O.D.	mg/l					(A1- 5) (A2- 5), (A3- 7)		1.50 good 1.30 high	2.60 good 2.20 high
Boron	µg/l	1000	750	1000	1000	2000	6.5		
Cadmium	µg/l	5	3.75	5	5	5		≤ 0.08 to 0.25 depending on water	≤ 0.45 to 1.5 depending on water hardness
Calcium	mg/l Ca	200		200					
C.O.D.	mg/l					40			
Chloride	mg/l Cl	20	24-187.5	30	250	250			
Chromium	µg/l	30	37.5	30	50	50	0.3		
Cobalt	µg/l						0.2		
Coliform Bacteria	No/100 ml				0				
Conductivity	µS/cm @20	800	800-1875	1000	2500	1000			
Copper	µg/l	30	1500	0.03 mg/l	2000	(A1- 0.05) (A2- 0.1) (A3- 1) mg/l	0.5	5 or 30	5 or 30
Cyanide	µg/l	0.01	37.5	0.01 mg/l	50	50		10	10
D.O	% Sat			NAC		>60% (A1), >50% (A2), >30% (A3)		lower limit 95%ile >80% saturation, upper limit 95%ile <120%	
E Coli	No/100 ml			0	0	(A1- 1000) (A2- 5000) (A3- 40000)			
Fluoride	mg/l	1		1	0.8	(A1- 1) (A2- 1.7)	1000	500	500
Iron	µg/l			200	200	(A1- 200) (A2- 2000)			
Lead	µg/l	10	18.75	10	25	50		7.2 AA EQS	
Magnesium	mg/l Mg	50		50					
Manganese	µg/l			50	50	(A1- 50) (A2- 300) (A3- 1000)			
Mercury	µg/l	1	0.75	1	1	1		0.05	0.05
Molybdenum	µg/l		35				4.3		
Nickel	µg/l	20	15	20	20			20 AA EQS	
o-Phosphate	mg/l P	0.03		0.03				0.035 good 0.025 high	0.075 good 0.045 high
pH		>7 or <8		6.5 - 9.5	6.5 - 9.5	(A1- 5.5-8.5) (A2- 5.5-9.0)		Soft Water 4.5< pH < 9.0 Water hardness 100 mg/l CaCO3 Hard Water 6.0< pH < 9.0 Water hardness > 100 mg/l CaCO3 8 AA EQS 46 MAC EQS	
Phenol	mg/l			0.0005		(A1- 0.5) (A2- 5) (A3- 100)			
Potassium	mg/l	5		5					
Selenium	µg/l				10		5.3		
Silver	mg/l								
Sodium	mg/l	150	150	150	200	200			
Strontium	mg/l SO4	50	187.5		250				
Total Dissolved Solids	mg/l			1000					
Temperature	degrees C			25		25			
Thallium									
Tin							0.2		
T.O.C.	mg/l	10		NAC	No abnormal change				
T.O.N	mg/l N			NAC					
Nitrate	mg/l		37.5	25	50	Nitrates 50			
Nitrite	mg/l		375	0.1	0.5				
Nitrites	mg/l								
Total S Solids	mg/l					50			
Uranium	µg/l								
Vanadium	µg/l						0.9		
Zinc	µg/l	100		100		(A1- 3000) (A2- 5000)	2.3	8 or 50 or 100 AA EQS	

AA-EQS means that for each representative monitoring point within the waterbody, the arithmetic mean of the concentrations measured over a twelve month monitoring period does not exceed the standard.
EQS-MAC means that the measured concentration at any representative monitoring point within the water body must not exceed the standard.

PARAMETERS		Whiteriver Landfill Site																							
		GROUNDWATER QUALITY																							
Monitoring Point:		RESULTS																							
		BH1																							
		UPSTREAM OVERBURDEN																							
	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
Alkalinity	mg/l CaCO3	NAC	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14		
Aluminium	µg/l			216				272								290					284				
Ammonia	mg/l N	0.2	<0.03	0.03	<0.03	0.09	0.03	0.23	<0.03	0.03	0.03	<0.03	<0.03	0.04	<0.03	0.03	<0.03	0.05	<0.03	0.02	<0.03	0.03	0.1		
Antimony	µg/l															<0.5				<0.5					
Arsenic	µg/l															<0.5				<0.5					
Barium	µg/l															153.6				178.4					
Beryllium	µg/l															<0.5				<0.5					
B.O.D.	mg/l O2			<50																					
Boron	µg/l	1000						11.9				13.9			12.3					12.48					
Cadmium	µg/l	5		<0.1				<0.1				<0.1			<0.1					<0.1					
Calcium	mg/l Ca	200		101.49				99.77				97.49			100.79					109.97					
C.O.D.	mg/l O2										6.8														
Chloride	mg/l Cl	20	28	31	33	27	31	38	41	32	30	36	39	34	30	33	33	30	26	35.1	46	34	36		
Chromium	µg/l	30		6.2				<1								<0.5				0.51					
Cobalt	µg/l															<0.5				<0.5					
Coliform Bacteria	No/ml		411	1																					
Conductivity	µS/cm @ 25	800	650	647	646	636	637	660	661	578	643	690	632	716	660	657	730	735	647	675	705	672	668		
Copper	µg/l	30		2.3				1.4				1.1			<0.5					1.07					
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05					<0.05					
D.O.	% Saturation		10	51	50	44	24	45	nm	46	56	42	30	35	44	36	43	44	46	40	26	35	37		
E. Coli	no/100ml		19	0																					
Fluoride	mg/l	1		<0.150				0.15				<0.150			<0.150					0.12					
Iron	µg/l			572.7				314.9				97								<10					
Lead	µg/l	10		2				<1				<0.5			<0.5					<0.5					
Magnesium	mg/l Mg	50		10.11				9.95				10.38			9.76					11.27					
Manganese	µg/l			64.3				38.9				60.5			2.1					1.24					
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05					
Molybdenum (µg/l)																<0.5				<0.5					
Nickel	µg/l	20		2.7				1.3				<0.5			<0.5					<0.5					
Ortho-Phosphate	mg/l P	0.03		0.05				0.03				<0.02			<0.02					0.004					
pH		>7 or <8	7.3	7.2	7.2	7.4	7.3	7.2	7.2	7.3	7.5	7.4	7.2	7.4	7.4	7.3	7.2	7.2	6.9	7.3	7.2	7.2	7.3		
Potassium	mg/l	5		<1				<1				0.48			0.46					0.78					
Residue on evap	mg/l			545				420				392			366					412					
Sampling Depth	m		6.8	6.9	6.8	6.8	6.7	6.7	6.9	7		6.7	7.1	7.2	7	6.9	6.8	6.9	6.8	6.63	6.8	7	6.8		
Selenium	µg/l														<0.5					<0.5					
Silver	µg/l														<0.5					nm					
Sodium	mg/l	150		23.43				20.82				20.31			16.54					19.77					
Strontium	µg/l														144.19					151.01					
Sulphate	µg/l	50		22.6				21.1				19.2			18.2					15.86					
Suspended Solids	mg/l																								
Temp	°C		10.3	11	11	11	9	10.5	10	13	10.4	10	12.7	12	10	9	11	11	8	9.6	13.7	12:00	10		
Thallium	µg/l															<0.1				<0.1					
Time			12.4	12.15		12.1	12.35	12.35	11.1	12.35	11.55	11:45	11:05	11:00	11:30	11:35	11:30	11:22	11:20	11:45	10:40	10:45	10:50		
Tin	µg/l														2.8					nm					
T.O.C.	mg/l	10	4.5	2.2	3.4	4	2.9	1.9	1.6	3.5	3.3	2.5	2.4	4	1.7	70.3	<1.5	3.8	2	1.09	1.5	<1.5	1.9		
T.O.N	mg/l N			1.82				1.1				1.23			1.06					0.75					
Total Suspended Solids	mg/l																								
Uranium	µg/l														0.64					0.78					
Vanadium	µg/l														<0.5					<0.5					
Zinc	µg/l	100		8.7				17.3				19.4			6.1					14.51					
Water Level m OD	119.94		113.14	113.04	113.14	113.14	113.24	113.24	113.04	112.94	119.94	113.24	112.84	112.74	112.94	113.04	113.14	113.04	113.14	113.31	113.14	112.94	113.14		

PARAMETERS		Whiteriver Landfill Site GROUNDWATER QUALITY RESULTS																						
		BH2A UPSTREAM BEDROCK CRAWLEYS PRIVATE WELL- POTABLE SOURCE																						
Monitoring Point:		Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
Units			13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14	
Alkalinity	mg/lCaCO3	NAC		282				324				288			340					296				
Aluminium	µg/l														<5					<5				
Ammonia	mg/l N	0.2	<0.03	<0.03	<0.03	0.05	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.14	<0.03	0.094	0.09	0.22	<0.020		
Antimony	µg/l														<0.5				<0.5					
Arsenic	µg/l														<0.5				<0.5					
Barium	µg/l							<1							0.6				0.62					
Beryllium	µg/l														<0.5				<0.5					
B.O.D.	mg/l O2			<50																				
Boron	µg/l	1000						12.5				15.3			14.1				11					
Cadmium	µg/l	5		<0.1				<0.1				<0.1			<0.1				<0.1					
Calcium	mg/l Ca	200		63.64				63.33				69.74			65.21				62.35					
C.O.D.	mg/l O2										nm													
Chloride	mg/l Cl	20	16	16	16	16	16	16	17	17	16	16	15	16	15	16	16	16	16	16.29	16	16	15	
Chromium	µg/l	30		6.2				<1							<0.5				<0.5					
Cobalt	µg/l														<0.5				<0.5					
Coliform Bacteria	no/100ml		4	9	130	34	0	7	18					20	0				1	1	61			
Conductivity	µS/cm @ 25	800	607	603	609	611	616	615	610	549	627	608	610	657	632	614	674	644	611	609	614	613	625	
Copper	µg/l	30		1.2				1.6				1.5			0.7				1.32					
Cyanide	mg/l	0.01		<0.05				<0.05				<0.05			<0.05				<0.05					
D.O.	% Saturation		30	25	23	33	31	54	25	20	43	26	37	33	30	28	33	19	26	24	23	20	26	
E. Coli	no/100ml		0	0	0	0	0	0	0					1	0				0	0	0			
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150		1		0.11					
Iron	µg/l			101.8				<10				<10			<10				37.66					
Lead	µg/l	10		<1				<1				<0.5			<0.5				<0.5					
Magnesium	mg/l Mg	50		30.62				31.3				34.16			31.42				30.6					
Manganese	µg/l			4.6				2.5				2.9			2.5				5					
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05				<0.05					
Molybdenum (µg/l)															<0.5				<0.5					
Nickel	µg/l	20		<1				<1				<0.5			<0.5				0.51					
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02				0.005					
pH		>7 or <8	7.5	7.4	7.2	7.5	7.5	7.5	7.4	7.5	7.7	7.5	7.5	7.6	7.6	7.5	7.5	7.5	7.1	7.5	7.4	7.4	7.5	
Potassium	mg/l	5		1				1.06				1.13			1.16				1.29					
Residue on evaporation	mg/l			354				332				322			337				338					
Sampling Depth	m		nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	0	nm	nm	nm	nm	
Selenium	µg/l														<0.5				<0.5					
Silver	µg/l														nm				nm					
Sodium	mg/l	150		20.75				19.78				21.1			20.11				18.87					
Strontium	µg/l														226.68				222.14					
Sulphate		50		4.4				4.9				4.8			5.1				5.86					
Suspended Solids	mg/l																							
Temp	°C		10.2	10.8	14.1	11.7	7.5	7.8	15	11.4	8.7	14	13.5	16.2	10.1	11.7	15	14.5	7	8.8	15.4	11.1	10	
Thallium	µg/l														<0.1				<0.1					
Time			12	12.1		12.15	11.4	11.55	10.25	12:20	12:35	10:45	10:10	10:20	10:30	10:25	10:45	11:00	10:25	10:10	nt	11:10	10:55	
Tin	µg/l														<1				nm					
T.O.C.	mg/l	10	<1.5	3.3	<3.0	<3.0	2.1	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	4.2	<1.5	77	<1.5	<1.5	<1.5	0.031	<1.5	1.5	<1.5	
T.O.N	mg/l N			0.32				0.26				0.46			0.37				0.21					
Total Suspended Solids	mg/l																							
Uranium	µg/l														1.81				1.86					
Vanadium	µg/l														<0.5				<0.5					
Zinc	µg/l	100		2				2.6				4.9			1.9				2.74					

Whiteriver Landfill Site																							
GROUNDWATER QUALITY																							
RESULTS																							
B#3																							
UPSTREAM BEDROCK																							
PARAMETERS	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Monitoring Point:			21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14	Date
Alkalinity	mg/CaCO3	NAC	328				308				308				320				308				
Aluminium	µg/l														<5				<5				
Ammonia	mg/l N	0.2	<0.03	<0.03	0.07	0.03	0.06	<0.03	0.03	0.03	<0.03	<0.03	<0.03	<0.03	0.09	<0.03	0.17	0.04	0.008	0.03	0.06	<0.020	
Antimony	µg/l														<0.5				<0.5				
Arsenic	µg/l														0.69				0.62				
Barium	µg/l														67				69.7				
Beryllium	µg/l														<0.5				<0.5				
B.O.D.	mg/l O2		<50																				
Boron	µg/l	1000					17.6				18				18.8				16				
Cadmium	µg/l	5	0.2				<0.1				<0.1				<0.1				<0.1				
Calcium	mg/l Ca	200	102.59				78.89				72.76				73.59				73.05				
C.O.D.	mg/l O2									0.0													
Chloride	mg/l Cl	20	37	40	33	23	17	15	15	15	15	14	15	15	15	15	15	15	14.71	15	15	15	
Chromium	µg/l	30	4.8				<1				<0.5				<0.5				0.54				
Cobalt	µg/l														<0.5				<0.5				
Coliform Bacteria	no/100ml		8164																				
Conductivity	µS/cm @ 25	800	767	801	797	696	649	623	559	634	616	621	709	638	626	686	716	619	617	622	620	625	
Copper	µg/l	30	4.5				<1				<0.5				2.7				0.64				
Cyanide	µg/l	0.01	<0.05				<0.05				<0.05				<0.05				<0.05				
D.O.	% Saturation		96	82	36	24	43	nm	40	42	28	26	27	31	27	29	27	34	30	16	20	26	
E. Coli	no/100ml		<10																				
Fluoride	mg/l	1	<0.150				<0.150				<0.150				<0.150				0.12				
Iron	µg/l		186.8				<10				31.7				<10				<10				
Lead	µg/l	10	<1				<1				<0.5				<0.5				<0.5				
Magnesium	mg/l Mg	50	27.77				26.64				25.92				25.74				25.33				
Manganese	µg/l		791.9				17.3				9.7				10.9				7.68				
Mercury	µg/l	1	<0.1				<0.1				<0.05				<0.05				<0.05				
Molybdenum (µg/l)															<0.5				<0.5				
Nickel	µg/l	20	2.8				<1				<0.5				1.1				<0.5				
Ortho-Phosphate	mg/l P	0.03	0.04				0.04				0.04				0.05				0.042				
pH		>7 or <8	7.3	7.1	7.3	7.4	7.4	7.5	7.6	7.7	7.5	7.5	7.6	7.6	7.6	7.5	7.5	7.2	7.6	7.5	7.4	7.5	
Potassium	mg/l	5	1.25				1.4				1.38				1.6				1.7				
Residue on evaporation	mg/l		495				357				348				370				352				
Sampling Depth	m		8.8	9.3	2.8	0.5	0	nm	0		nm	nm	nm	nm	nm	nm	0	nm	nm	nm	nm		
Selenium	µg/l														<0.5				<0.5				
Silver	µg/l														nm				nm				
Sodium	mg/l	150	22.77				21.71				20.6				21.03				20.37				
Strontium	µg/l														280.04				286.38				
Sulphate	µg/l	50	51.3				17.6				4.9				4.6				5.43				
Suspended Solids	mg/l																						
Temp	°C		11	12	12	8.2	10.3	10	13	10.3	11	13.7	12	10	10	11	11	10	10	13.5	12.3	10	
Thallium	µg/l														<0.1				<0.1				
Time			12.3		12.3	12.55	12.5	11.15	12:45	12:05	11:50	11:10	11:05	11:35	11:40	11:35	11:30	11:25	11:50	10:45	10:50	10:55	
Tin	µg/l														<1				nm				
T.O.C.	mg/l	10	7.9	6.3	4.6	2.7	<1.5	<1.5	<1.5	2.5	<1.5	<1.5	8.5	<1.5	80.5	<1.5	<1.5	<1.5	0.26	<1.5	<1.5	<1.5	
T.O.N	mg/l N		0.24				0.21				0.28				0.2				0.19				
Total Suspended Solids	mg/l																						
Uranium	µg/l														2.23				2.37				
Vanadium	µg/l														<0.5				<0.5				
Zinc	µg/l	100	11.9				10.7				13				14.2				3.11				

PARAMETERS		Whiteriver Landfill Site GROUNDWATER QUALITY RESULTS																						
		BH4 UPSTREAM BEDROCK																						
Monitoring Point:		Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
Units			13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14	
Alkalinity	mg/CaCO3	NAC		284				282				278			272				282					
Aluminium	µg/l														<5				<5					
Ammonia	mg/l N	0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	0.07	0.03	0.011	0.03	0.05	<0.020	
Antimony	µg/l														<0.5				<0.5					
Arsenic	µg/l														<0.5				<0.5					
Barium	µg/l														7.1				5.02					
Beryllium	µg/l														<0.5				<0.5					
B.O.D.	mg/l O2			<50																				
Boron	µg/l	1000						11				12.4			11.5				<10					
Cadmium	µg/l	5		<0.1				<0.1				<0.1			<0.1				<0.1					
Calcium	mg/l Ca	200		74.07				77.68				76.57			75.9				76.7					
C.O.D.	mg/l O2									nm														
Chloride	mg/l Cl	20	13	13	14	13	14	13	14	14	21	14	13	16	14	14	15	14	14	14.29	14	14	14	
Chromium	µg/l	30		3.1				<1				<0.5			<0.5				<0.5					
Cobalt	µg/l														<0.5				<0.5					
Coliform Bacteria	no/100ml		0	0																				
Conductivity	µS/cm @ 25	800	559	556	561	560	566	588	599	540	905	563	559	645	562	576	627	675	587	560	560	560	569	
Copper	µg/l	30		2.9				11.3				<0.5			<0.5				<0.5					
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05				<0.05					
D.O.	% Saturation		25	29	25	27	21	24	nm	14	29	16	23	40	15	nm	21	10	13	52	63	64	50	
E. Coli	no/100ml		0	0																				
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150				0.11					
Iron	µg/l			77.8				1284.2				337.8			123.7				66.95					
Lead	µg/l	10		<1				8.7				<0.5			<0.5				<0.5					
Magnesium	mg/l Mg	50		19.45				20.56				20.99			20.01				20.8					
Manganese	µg/l			1.5				21.2				17.3			39.3				102.8					
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05				<0.05					
Molybdenum (µg/l)															<0.5				<0.5					
Nickel	µg/l	20		<1				1.1				<0.5			<0.5				<0.5					
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02				0					
pH		>7 or <8	7.4	7.4	7.3	7.5	7.5	7.3	7.3	7.4	7.4	7.4	7.5	7.3	7.4	7.6	7.4	7.3	7.2	7.6	7.6	7.5	7.4	
Potassium	mg/l	5		<1				<1				0.91			0.98				1.22					
Residue on evaporation	mg/l			314				340				303			303				340					
Sampling Depth	m		nm	nm	nm	0	0	nm	nm	0		nm	nm	nm	nm	nm	nm	0	nm	nm	nm	nm	nm	
Selenium	µg/l														<0.5				<0.5					
Silver	µg/l														nm				nm					
Sodium	mg/l	150		16.74				16.19				16.25			15.65				16.03					
Strontium	µg/l														201.78				195.79					
Sulphate	µg/l	50		4				21.7				3.7			4.8				3.86					
Suspended Solids	mg/l																							
Temp	°C		9.8	12	12	12	8.6	8.5	11	12	6.1	11	15	14	8	nm	14	11	8	5.8	13.8	12.4	2	
Thallium	µg/l														<0.1				<0.1					
Time			12:55	12:4		13:2	13:2	14	11:55	13:00	12:20	12:10	10:55	11:55	12:00	nt	11:45	11:50	11:40	12:05	10:55	10:30	11:40	
Tin	µg/l														<1				nm					
T.O.C.	mg/l	10	<1.5	5.5	<3.0	<3.0	<1.5	<1.5	<1.5	<1.5	2.9	<1.5	1.6	5.5	3.9	69.7	<1.5	1.7	1.6	0.186	<1.5	<1.5	<1.5	
T.O.N	mg/l N			0.55				<0.08				0.59			0.5				0.48					
Total Suspended Solids	mg/l																							
Uranium	µg/l														1.29				1.27					
Vanadium	µg/l														<0.5				<0.5					
Zinc	µg/l	100		44.4				323.3				10.3			34.1				16.68					


Whiteriver Landfill Site																								
GROUNDWATER QUALITY																								
RESULTS																								
BH5A																								
DOWNSTREAM OVERBURDEN																								
Monitoring Point:	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
Alkalinity	mg/lCaCO3	NAC	13-Jan-09	21-Apr-09 270	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10 240	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11 192	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12 232	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13 210	08-Aug-13	17-Oct-13	14-Jan-14	
Aluminium	µg/l															<5				<5				
Ammonia	mg/l N	0.2	<0.03	0.05	<0.03	0.08	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.06	<0.03	0.015	0.03	0.04	<0.020	
Antimony	µg/l															<0.5				<0.5				
Arsenic	µg/l															0.5				<0.5				
Barium	µg/l															81.4				91.8				
Beryllium	µg/l															<0.5				<0.5				
B.O.D.	mg/l O2			<50																				
Boron	µg/l	1000						17				21.5				15.9				14				
Cadmium	µg/l	5		0.1				<0.1				<0.1				<0.1				<0.1				
Calcium	mg/l Ca	200		114.58				103.29				87.15				74.9				74.89				
C.O.D.	mg/l O2									7.8														
Chloride	mg/l Cl	20	74	57	40	25	46	54	49	30	48	57	44	42	60	28	26	25	41	34.81	33	33	46	
Chromium	µg/l	30		11.9				4.6				0.6				<0.5				<0.5				
Cobalt	µg/l															<0.5				<0.5				
Coliform Bacteria	no/100ml		18	41																				
Conductivity	µS/cm @ 25	800	763	706	664	638	605	671	640	534	584	645	631	666	660	564	627	609	608	559	592	620	778	
Copper	µg/l	30		15.2				6.2				1.3				2.5				1.71				
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05				<0.05				<0.05				
D.O.	% Saturation		21	52	69	36	92	81	nm	56	97	53	37	54	90	75	98	65	115	66	30	38	70	
E. Coli	no/100ml		1	<10																				
Fluoride	mg/l	1		0.19				0.23				0.19				0.19				0.19				
Iron	µg/l			6848.9				3272.3				312.1				<10				<10				
Lead	µg/l	10		14.4				5.2				<0.5				<0.5				<0.5				
Magnesium	mg/l Mg	50		17.1				15.01				12.9				10.81				11.66				
Manganese	µg/l			592.7				263.2				12.3				<1				<1				
Mercury	µg/l	1		<0.1				<0.1				<0.05				<0.05				<0.05				
Molybdenum (µg/l)																0.6				<0.5				
Nickel	µg/l	20		22.6				9.6				<0.5				0.7				1.06				
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02				<0.02				0				
pH		>7 or <8	7.6	7.6	7.5	7.5	8.1	7.7	7.5	7.7	8.1	7.7	7.6	7.8	8.1	8	7.9	7.7	7.8	7.8	7.6	7.5	7.7	
Potassium	mg/l	5		1.3				1.38				1.31				1.41				1.6				
Residue on evaporation	mg/l			2103				2099				456				956				975				
Sampling Depth	m		7.5	7.7	7.8	7.2	7.8	7.9	8.1	8		7.9	8.2	8.1	7.4	3.5	7.7	7.6	7.5	7.43	7.5	7.3	7.1	
Selenium	µg/l															<0.5				<0.5				
Silver	µg/l															nm				nm				
Sodium	mg/l	150		30.55				29.11				29.31				26.89				27.31				
Strontium	µg/l															143.55				151.72				
Sulphate	µg/l	50		56.3				42				42				32.3				31.58				
Suspended Solids	mg/l																							
Temp	°C		10.4	11.4	12	11	8.7	11	11	11	10.0	11	12.4	13	10	11	11	11	9	10.3	13.5	11.7	8	
Thallium	µg/l															<0.1				<0.1				
Tin	µg/l		13.45	14.05			13.1	12	13.2	10.15	12:10	12.55	12:10	11:15	11:15	11:45	12:00	11:10	12:00	11:05	11:15	10:30	11:15	11:20
T.O.C.	mg/l	10	4.1	2.9	4.3	4.4	5.7	3.4	3.9	4.9	5.3	3.5	3.2	11.5	5.4	67	4.4	4.7	7.8	2.86	2.5	4.1	4.5	
T.O.N	mg/l N			0.16				<0.08				0.08				0.17				0.07				
Total Suspended Solids	mg/l																							
Uranium	µg/l															0.99				0.89				
Vanadium	µg/l															0.64				<0.5				
Zinc	µg/l	100		32.5				17.3				4.2				3.9				4.75				
Water Level m OD	107.88		100.38	100.18	100.08	100.68	100.08	99.98	99.78	99.88	107.88	99.98	99.68	99.78	100.48	104.38	100.18	100.28	100.38	100.45	100.38	100.58	100.78	

Whiteriver Landfill Site																							
GROUNDWATER QUALITY																							
RESULTS																							
Monitoring Point:																							
BH6																							
DOWNSTREAM BEDROCK																							
	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Alkalinity	mg/lCaCO3	NAC	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14
Aluminium	µg/l			250				141				208			260					282			
Ammonia	mg/l N	0.2	<0.03	<0.03	<0.03	0.28	<0.03	<0.03	<0.03	<0.03	<0.03	0.06	0.03	<0.03	0.03	<0.03	0.05	<0.03	<0.03	0.112		0.03	<0.020
Antimony	µg/l														<0.5					<0.5			
Arsenic	µg/l														0.73					0.63			
Barium	µg/l														209.3					230.06			
Beryllium	µg/l														<0.5					<0.5			
B.O.D.	mg/l O2			54.2																			
Boron	µg/l	1000						32.5				61.3			60.3					34.15			
Cadmium	µg/l	5		<0.1				<0.1				<0.1			<0.1					<0.1			
Calcium	mg/l Ca	200		75.21				40.67				66.84			74.69					71.28			
C.O.D.	mg/l O2									13.4													
Chloride	mg/l Cl	20	32	16	9	10	13	7	8	9	7	13	16	16	14	14	15	14	14	19.17		14	14
Chromium	µg/l	30		5.3				1.9				2.1			<0.5					<0.5			
Cobalt	µg/l														<0.5					<0.5			
Coliform Bacteria	no/100ml		>2420	98																			
Conductivity	µS/cm @ 25	800	422	536	263	638	240	301	273	262	281	464	528	584	544	538	575	610	536	538		536	550
Copper	µg/l	30		3.6				6.1				3.1			<0.5					1.26			
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05					<0.05			
D.O.	% Saturation		72	28	78	48	75	24	32	37	45	35	59	43	58	42	60	42	63	39		33	27
E. Coli	no/100ml		58	<10																			
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150					0.14			
Iron	µg/l		871.5					1694				1983			<10					25.33			
Lead	µg/l	10		3.9				6.9				1.8			<0.5					0.54			
Magnesium	mg/l Mg	50		16.65				8.96				15.58			16.46					15.39			
Manganese	µg/l			121.8				425.7				59.7			252.3					84.97			
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05			
Molybdenum (µg/l)															0.8					0.58			
Nickel	µg/l	20		2.9				3.6				16.7			0.6					0.65			
Ortho-Phosphate	mg/l P	0.03		0.02				0.03				0.03			0.04					0.027			
pH		>7 or <8	7.5	7.5	7.6	7.5	7.5	7.5	7.4	7.6	7.6	7.6	7.7	7.5	7.8	7.8	7.7	7.5	7.8	7.5		7.5	7.5
Potassium	mg/l	5		1.98				2.67				6.2			2.18					2.66			
Residue on evaporation	mg/l			1077				580				378			370					1006			
Sampling Depth	m		13.3	13.1		13.8	13.9	13.3			13.9				13.8		13.9			0	nm	nm	nm
Selenium	µg/l														<0.5					<0.5			
Silver	µg/l														nm					nm			
Sodium	mg/l	150		16.29				7.98				21.44			14.82					13.48			
Strontium	µg/l														199.45					187.5			
Sulphate		50		10.5				6				8.9			10.4					11.04			
Suspended Solids	mg/l																						
Temp	°C		10.3	11.9	11.8	12.3	10	10.3	11	10.9	9.3	11	15	14.6	10.9	11	13	14.5	6	8.9		11.6	9
Thallium	µg/l														<0.1					<0.1			
Time			12.4	13.4		12.5	12.35	13.2		11.3	13.15	13.45	12:20	12:00	12:25	11:20	11:30	12:00	11:15	13:00		12:20	11:45
Tin	µg/l														<1					nm			
T.O.C.	mg/l	10	5.6	4	5.3	8.2	43.3	19.8	47.1	36.2	5.9	3.4	12.3	4	3.3	68	2.2	2.4	3.4	1.3		5.7	9.4
T.O.N	mg/l N			0.28				0.33				0.31			0.14					0.04			
Total Suspended Solids	mg/l																						
Uranium	µg/l														0.95					1.26			
Vanadium	µg/l														<0.5					0.97			
Zinc	µg/l	100		8.4				14.6				12.2			10.4					13.5			
Water Level m OD	105.01		91.71	91.91		91.21	91.11	91.71		91.11		91.21		91.11	105.01	105.01							

Whiteriver Landfill Site																							
GROUNDWATER QUALITY																							
RESULTS																							
BHQ																							
DOWNSTREAM BEDROCK																							
	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Alkalinity	mg/l CaCO3	NAC	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14
Aluminium	µg/l			440				440							336					328			
Ammonia	mg/l N	0.2	<0.03	<0.03	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	0.03	0.18	<0.03	0.11	0.06	0.35	<0.020	
Antimony	µg/l														<0.5					<0.5			
Arsenic	µg/l														0.56					0.57			
Barium	µg/l														163					169.16			
Beryllium	µg/l														<0.5					<0.5			
B.O.D.	mg/l O2			<50																			
Boron	µg/l	1000							17.3						37.3							17.26	
Cadmium	µg/l	5		<0.1					<0.1						<0.1							<0.1	
Calcium	mg/l Ca	200		139.46					151.69						148.74							107.6	
C.O.D.	mg/l O2									23.3					148.74							107.6	
Chloride	mg/l Cl	20	15	14	15	15	16	16	17	19	19	19	15	16	16	17	17	16	17	20.18	17	18	18
Chromium	µg/l	30		5.4					<1						1.8					<0.5		0.54	
Cobalt	µg/l																			<0.5			
Coliform Bacteria	no/100ml		105	31																			
Conductivity	µS/cm @ 25	800	737	825	872	919	961	905	936	898	1002	891	625	706	632	677	740	771	705	711	719	763	763
Copper	µg/l	30		1.5					1.2						1					<0.5			
Cyanide	µg/l	0.01		<0.05					<0.05						<0.05					<0.05			
D.O.	% Saturation		36	85	59	47	54	68	nm	62	65	35	67	54	67	61	78	65	68	90	81	66	51
E. Coli	no/100ml		0	20																			
Fluoride	mg/l	1		<0.150					<0.150						<0.150							0.12	
Iron	µg/l			1215.8					6454.7						1116.4							<10	
Lead	µg/l	10		<1					<1						1.1					<0.5		<0.5	
Magnesium	mg/l Mg	50		18.92					21.98						27.48					18		20.44	
Manganese	µg/l			217					941.6						199.3					3.1		<1	
Mercury	µg/l	1		<0.1					<0.1						<0.05					<0.05		<0.05	
Molybdenum (µg/l)																				<0.5		<0.5	
Nickel	µg/l	20		1.6					<1						2					<0.5		<0.5	
Ortho-Phosphate	mg/l P	0.03		<0.02					<0.02						<0.02					0.002		0.002	
pH		>7 or <8	7.2	7.2	7	7.1	7.1	7.1	7.1	7	7.1	7.2	7.1	7.4	7.5	7.6	7.5	7.4	7.4	7.5	7.4	7.2	7.3
Potassium	mg/l	5		<1					<1						3.39					1.2		1.99	
Residue on evaporation	mg/l			605					604						754					486		702	
Sampling Depth	m		23	23.2	23.1	23	22.9	23	23	22.9		23.1	23.3	23.3	23.4	22.9	23	22.8	22.7	22.56	22.8	22.8	22.6
Selenium	µg/l														<0.5					<0.5		<0.5	
Silver	µg/l														nm					nm		nm	
Sodium	mg/l	150		14.63					14.25						23.78					15.24		15.15	
Strontium	µg/l																			213.38		232.5	
Sulphate	µg/l	50		32.4					46.9						35.5					13.7		18.84	
Suspended Solids	mg/l																						
Temp	°C		8.8	11	12	11	8.4	11.1	10	11	9.5	10	13.7	13	10	9	11	11	8	9.7	13.9	12.4	8
Thallium	µg/l														<0.1					<0.1		<0.1	
Time			10:25	10:55		10:5	11:25	9:45	10:3	11:30	11:15	11:10	10:30	10:45	11:00	10:50	10:45	11:00	10:40	10:40	10:23	11:05	11:05
Tin	µg/l														<1					nm		nm	
T.O.C.	mg/l	10	2.8	6.5	4.9	5.4	9	5.6	4.3	4.6	5.7	8.4	3.5	6.5	1.7	83.3	<1.5	<1.5	2.3	1.13	1.6	2.7	3
T.O.N	mg/l N			0.08					<0.08						0.21					0.1		0.1	
Total Suspended Solids	mg/l																						
Uranium	µg/l														1.61							2.43	
Vanadium	µg/l														<0.5							<0.5	
Zinc	µg/l	100		3.7					7.2						3.5					4.2		0.75	
Water Level m OD		103.47	80.47	80.27	80.37	80.47	80.57	80.47	80.47	80.57	103.47	80.37	80.17	80.17	80.07	80.57	80.47	80.67	80.77	80.91	80.67	80.67	80.87

Whiteriver Landfill Site																							
GROUNDWATER QUALITY																							
RESULTS																							
BH10																							
DOWNSTREAM OVERBURDEN																							
	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Alkalinity	mg/lCaCO3	NAC	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14
Aluminium	µg/l			294				284				308			270					288			
Ammonia	mg/l N	0.2	<0.03	0.06	0.06	0.06	0.04	<0.03	<0.03	<0.03	<0.03	0.03	0.16	<0.03	0.04	0.05	0.03	0.61	0.03	0.203	0.21	0.05	<0.020
Antimony	µg/l														<0.5					<0.5			
Arsenic	µg/l														<0.5					2.41			
Barium	µg/l														209.3					318.97			
Beryllium	µg/l														<0.5					<0.5			
B.O.D.	mg/l O2			<50																			
Boron	µg/l	1000						<10				11.2			<10					<10			
Cadmium	µg/l	5		<0.1				0.1				<0.1			<0.1					<0.1			
Calcium	mg/l Ca	200		132.91				114.18				112.14			102.54					121.1			
C.O.D.	mg/l O2									3.0													
Chloride	mg/l Cl	20	23	24	18	21	16	17	22	27	27	35	25	24	25	18	21	23	15	29.25	24	21	27
Chromium	µg/l	30		6.9				5.4				1.9			<0.5					0.67			
Cobalt	µg/l														<0.5					0.84			
Coliform Bacteria	no/100ml		579	52																			
Conductivity	µS/cm @ 25	800	767	772	768	716	614	637	667	604	640	682	683	776	686	606	850	825	591	719	754	670	775
Copper	µg/l	30		5.3				9				1.4			1.6					<0.5			
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05					<0.05			
D.O.	% Saturation		22	67	44	54	61	45	nm	53	74	66	51	70	63	67	67	47	90	65	42	87	65
E. Coli	no/100ml		3	<10																			
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150					0.12			
Iron	µg/l			1576.6				4062.2				1001.3								12.92			
Lead	µg/l	10		4.8				10.1				1.3			<0.5					<0.5			
Magnesium	mg/l Mg	50		13.19				12.43				13.17			7.91					12.6			
Manganese	µg/l			735.7				686.1				673.5			12.1					1779.98			
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05			
Molybdenum (µg/l)															<0.5					0.82			
Nickel	µg/l	20		6.7				10.9				0.8			<0.5					4.11			
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02					0.002			
pH		>7 or <8	7.3	7.2	7.1	7.3	7.4	7.3	7.3	7.4	7.5	7.4	7.2	7.3	7.4	7.3	7	7	7.4	7.3	7.1	7.1	7.3
Potassium	mg/l	5		1.25				1.26				1.22			1.08					1.64			
Residue on evaporation	mg/l			765				941				15250			741					542			
Sampling Depth	m		1.8	2.3	1.8	3.6	1.7	2.9	3.3	4		4.1	4.5	4	3.8	3.7	3.6	4.6	3.1	4.62	4.6	3.7	3.8
Selenium	µg/l														<0.5					<0.5			
Silver	µg/l														<0.5					nm			
Sodium	mg/l	150		15.97				11.59				12.91			8.53					12.74			
Strontium	µg/l														159.17					205.79			
Sulphate	µg/l	50		92				60.6				36.7			31.5					39.98			
Suspended Solids	mg/l																						
Temp	°C		8.8	11	13	11	7.8	10	10	11	9.1	10	13.6	12	10	9	11	11	8	8.9	14.6	12.8	10
Thallium	µg/l														<0.1					<0.1			
Time			11.3	11.55		11.55	10.3	12.15	10.5	0.451389	10.30	10.40	10.05	10:35	10:40	10:15	10:20	10:35	10:20	10:15	10:03	10:35	10:40
Tin	µg/l														2.63					nm			
T.O.C.	mg/l	10	3.7	4.7	7.3	3.6	6.6	3.7	1.8	5.1	9.3	14.6	3.2	6.6	12.2	70	2.7	21.3	5.4	1.88	2.7	5.4	3.8
T.O.N	mg/l N			0.46				0.13				0.18			1.4					0.54			
Total Suspended Solids	mg/l																						
Uranium	µg/l														0.7					2.01			
Vanadium	µg/l														<0.5					<0.5			
Zinc	µg/l	100		11.6				19.3				3.5			1.9					0.95			
Water Level m OD	105.6		103.8	103.3	103.8	102	103.9	102.7	102.3	101.6	105.6	101.5	101.1	101.6	101.8	101.9	102.0	101.0	102.5	101.0	101.9	101.8	

PARAMETERS		Whiteriver Landfill Site GROUNDWATER QUALITY RESULTS																						
		BH11 DOWNSREAM OVERBURDEN																						
Monitoring Point:		Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
	Units		13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14	
Alkalinity	mg/lCaCO3	NAC		280				236				296			328					364				
Aluminium	µg/l														<5					<5				
Ammonia	mg/l N	0.2	<0.03	<0.03	<0.03	0.04	0.04	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	0.05	0.21	<0.03	0.009	0.09	0.42	<0.020		
Antimony	µg/l														<0.5					<0.5				
Arsenic	µg/l														<0.5					<0.5				
Barium	µg/l														141.7					222.37				
Beryllium	µg/l														<0.5					<0.5				
B.O.D.	mg/l O2			<50																				
Boron	µg/l	1000						10.1				28.8			25.2					19.94				
Cadmium	µg/l	5		<0.1				<0.1				0.2			<0.1					<0.1				
Calcium	mg/l Ca	200		67.21				37.04				75.87			78.74					105.54				
C.O.D.	mg/l O2										9.4													
Chloride	mg/l Cl	20	10	9	9	10	7	10	10	9	4	14	13	16	15	15	16	15	13	12.82	16	16	12	
Chromium	µg/l	30		2.1					<1			0.5				<0.5				0.56				
Cobalt	µg/l															<0.5				<0.5				
Coliform Bacteria	no/100ml		51	7																				
Conductivity	µS/cm @ 25	800	452	594	630	617	490	550	609	568	559	644	624	740	664	665	785	835	729	718	698	680	675	
Copper	µg/l	30		1.9				1.8				1.2			<0.5					0.55				
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05					<0.05				
D.O.	% Saturation		54	81	69	83	89	75	nm	80	97	33	27	29	47	35	28	54	63	50	35	79	68	
E. Coli	no/100ml		0	0																				
Fluoride	mg/l	1		<0.150				0.17				<0.150			<0.150					0.19				
Iron	µg/l		119.4					147.8				801.8								<10				
Lead	µg/l	10		<1				<1				1.1			<0.5					<0.5				
Magnesium	mg/l Mg	50		14.13				11.16				22.98			20.87					24.31				
Manganese	µg/l			108.7				212.9				154.1			19.7					4.31				
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05				
Molybdenum (µg/l)															0.8					0.56				
Nickel	µg/l	20		1.1				1.3				<0.5			<0.5					0.73				
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02					0.004				
pH		>7 or <8	8	7.7	7.4	7.6	8	7.9	7.6	7.7	7.9	7.5	7.5	7.5	7.5	7.3	7.2	7.3	7.3	7.3	7.4	7.4	7.3	
Potassium	mg/l	5		1.25				1.4				1.39			1.35					1.7				
Residue on evaporation	mg/l			376				380				464			426					655				
Sampling Depth	m		9.3	9.4	9.2	9.1	9.1	9.3	9.3	9.3		9.2	9.2	9.4	9.7	9.1	9.3	9.4	9.5	9.26	9.4	9.4	9.3	
Selenium	µg/l														<0.5					<0.5				
Silver	µg/l														<0.5					nm				
Sodium	mg/l	150		46.71				72.3				32.36			24.5					22.12				
Strontium	µg/l														204.5					261.25				
Sulphate	µg/l	50		25.4				42.1				15.7			11.2					12.23				
Suspended Solids	mg/l																							
Temp	°C		10	11	12	11	8.1	11	11	11	9.2	10	13.4	12	10	9	11	11	8	9.4	14.3	12.2	8	
Thallium	µg/l														<0.1					<0.1				
Time			11.1	11.25		11.1	11.1	11.45	10.4	11:00	11:00	10:55	10:15	10:25	10:55	10:30	10:35	10:40	10:35	10:30	10:10	10:30	10:30	
Tin	µg/l														<1					nm				
T.O.C.	mg/l	10	2.3	2.9	4.5	3.2	6.3	3	1.7	2.4	6.3	1.8	2.9	7.6	1.9	83.6	1.5	2.8	3.3	1.48	2.6	2.4	3.1	
T.O.N	mg/l N			0.29				0.21				0.75			0.64					0.28				
Total Suspended Solids	mg/l																							
Uranium	µg/l														2.52					3.61				
Vanadium	µg/l														<0.5					<0.5				
Zinc	µg/l	100		4.5				14.2				23.7			2.5					1.05				
Water Level m OD	95.66		86.36	86.26	86.46	86.56	86.56	86.36	86.36	86.36	95.66	86.46	86.46	86.26	85.96	86.56	86.36	86.26	86.16	86.4	86.26	86.26	86.36	

		Whiteriver Landfill Site																							
		GROUNDWATER QUALITY RESULTS																							
PARAMETERS		BH12																							
Monitoring Point:		DOWNSREAM OVERBURDEN																							
	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
Alkalinity	mg/l CaCO3	NAC	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	26-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14		
Aluminium	µg/l			348				396				324			408					400					
Ammonia	mg/l N	0.2	<0.03	0.03	<0.03	<0.03	0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	0.04	0.03	<0.03	0.3	<0.03	0.003	0.05	0.03	<0.020		
Antimony	µg/l														<0.5					<0.5					
Arsenic	µg/l														0.52					0.62					
Barium	µg/l														242					263.31					
Beryllium	µg/l														<0.5					<0.5					
B.O.D.	mg/l O2			<50																					
Boron	µg/l	1000						<10				10.9			10.1					<10					
Cadmium	µg/l	5		0.3				0.2				0.4			<0.1					<0.1					
Calcium	mg/l Ca	200		135.76				143.83				141.79			139.21					168.97					
C.O.D.	mg/l O2										5.7														
Chloride	mg/l Cl	20	10	10	10	11	14	12	12	19	16	15	21	21	15	17	21	16	11	13.37	12	14	13		
Chromium	µg/l	30		5.5				1.1				1.9			<0.5					1.03					
Cobalt	µg/l														<0.5					<0.5					
Coliform Bacteria	no/100ml		>2420	135											nm										
Conductivity	µS/cm @ 25	800	731	727	748	793	727	766	762	709	768	806	792	883	769	865	1160	1117	906	864	881	855	755		
Copper	µg/l	30		5.5				2.6				1.9			2.2					1.71					
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05					<0.05					
D.O.	% Saturation		46	94	80	58	74	68	nm	73	85	66	61	46	54	38	40	44	69	62	64	64	65		
E. Coli	no/100ml		0	<10											nm										
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150					0.18					
Iron	µg/l			912.8				565.4				878.5			<10					<10					
Lead	µg/l	10		1.6				<1				<0.5			<0.5					<0.5					
Magnesium	mg/l Mg	50		11.74				12.99				14.32			16.44					15.53					
Manganese	µg/l			773.5				606.6				3463.8			3.1					118.7					
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05					
Molybdenum (µg/l)															<0.5					<0.5					
Nickel	µg/l	20		6.2				2.9				3.6			1					1.84					
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02					0.002					
pH		>7 or <8	6.9	7.1	6.9	7.1	7.1	6.9	6.9	7	7.2	7	7.1	7	7.1	7	7.1	6.8	6.9	6.9	7	6	7		
Potassium	mg/l	5		<1				<1				0.74			1.06					0.99					
Residue on evaporation	mg/l			655				519				1005			1081					1189					
Sampling Depth	m		5.6	5.7	5.4	5.5	5.5	5.6	5.7	5.7		5.7	5.8	5.6	5.7	5.1	5.3	6.3	5.4	5.27	5.4	5.1	5.2		
Selenium	µg/l														<0.5					<0.5					
Silver	µg/l														nm					nm					
Sodium	mg/l	150		6.92				7.01				9.04			10.39					8.7					
Strontium	µg/l														247.23					256.24					
Sulphate	µg/l	50		31.3				34				44.8			55.6					28.06					
Suspended Solids	mg/l																								
Temp	°C		9.7	11	12	11	8.4	11	10	11	9.6	10	13.8	12	10	9	11	11	8	9.7	14.9	12.4	9		
Thallium	µg/l														<0.1					<0.1					
Time			10.4	10.5		10.35	11.4	10	12.25	11:45	11:30	11:15	10:35	10:50	11:10	10:55	10:50	10:55	10:45	10:45	10:20	11:10	11:00		
Tin	µg/l														<1					nm					
T.O.C.	mg/l	10	6.8	6.3	8.3	5.6	7.8	4.3	3.7	6.9	8.3	18.1	4.9	7.3	10.4	109	4.5	6	7.3	5.12	4.6	5.5	8.4		
T.O.N	mg/l N			0.13				<0.08				<0.08			1.25					0.06					
Total Suspended Solids	mg/l																								
Uranium	µg/l														1.25					1.21					
Vanadium	µg/l														<0.5					<0.5					
Zinc	µg/l	100		19.9				18.1				31.2			5.2					5.92					
Water Level m OD	103.38		97.78	97.68	97.98	97.88	97.88	97.78	97.68	97.68	103.38	97.68	97.58	97.78	97.68	98.28	98.08	97.08	97.98	98.11	97.98	98.28	98.18		

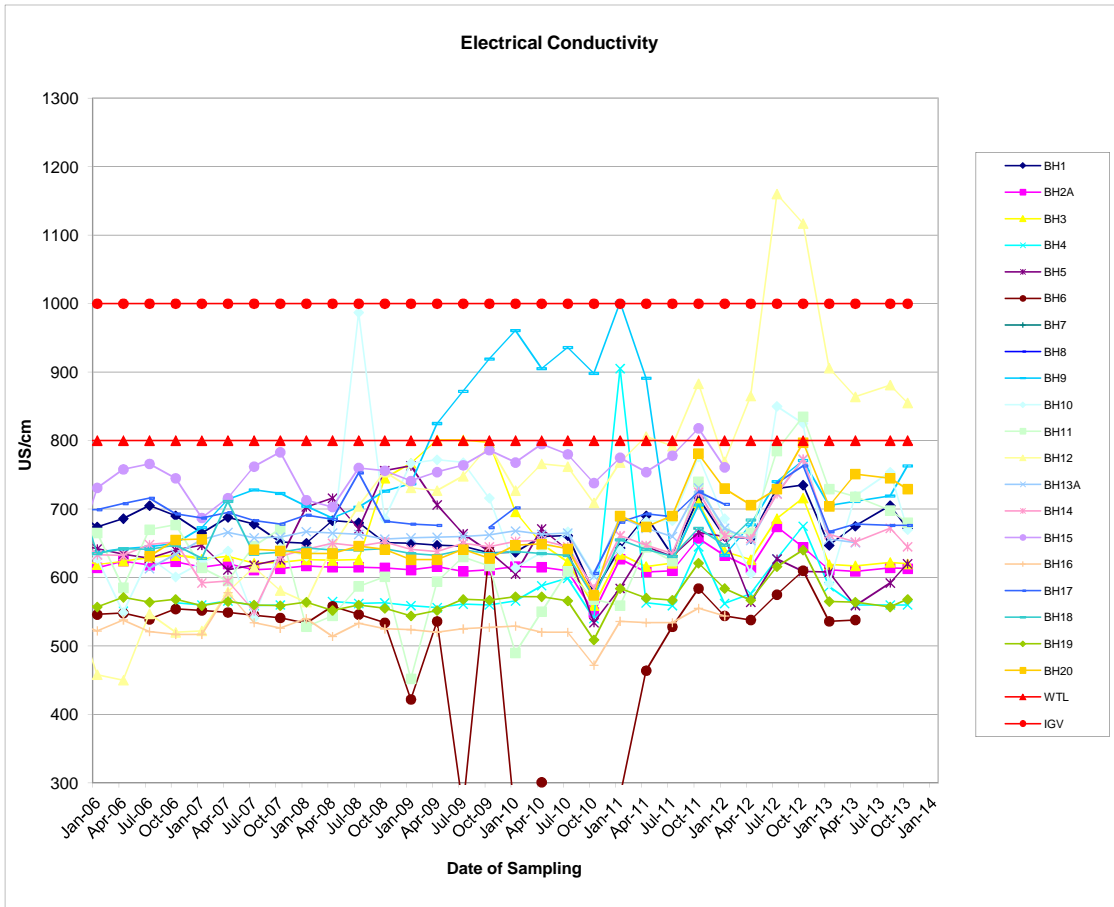
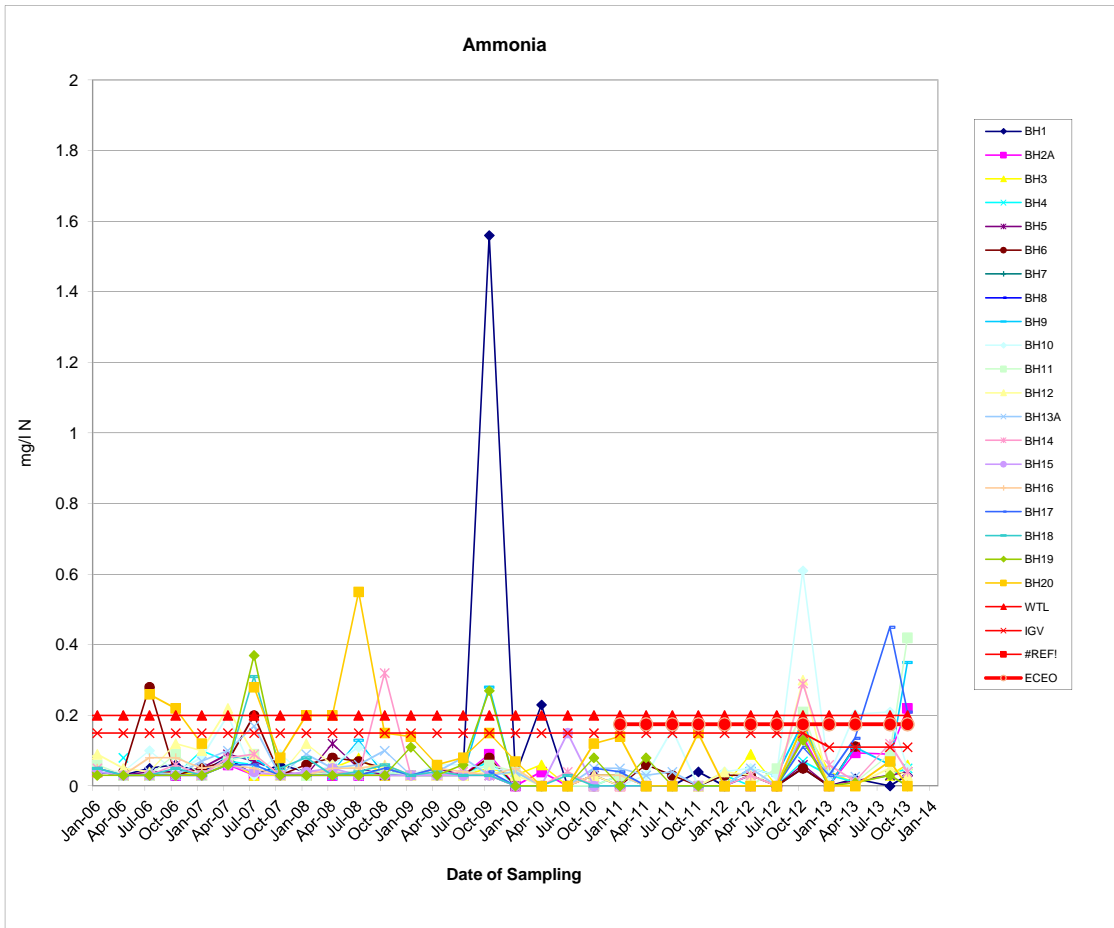
Whiteriver Landfill Site																							
GROUNDWATER QUALITY																							
RESULTS																							
BH13A																							
DOWNSTREAM BEDROCK																							
	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Alkalinity	mg/lCaCO3	NAC	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	10-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14
Aluminium	µg/l			332				344							320					304			
Ammonia	mg/l N	0.2	0.03	0.04	0.08	0.03	0.04	<0.03	0.04	0.05	0.05	0.03	0.04		<0.03	0.05	<0.03	0.15	0.03	0.027		0.08	<0.020
Antimony	µg/l														<0.5					<0.5			
Arsenic	µg/l														<0.5					<0.5			
Barium	µg/l														48.9					61.09			
Beryllium	µg/l														<0.5					<0.5			
B.O.D.	mg/l O2			<50																			
Boron	µg/l	1000						20.7				19.8			19.5					18.4			
Cadmium	µg/l	5		<0.1				<0.1				<0.1			<0.1					<0.1			
Calcium	mg/l Ca	200		79.9				76.87				75.45			77.57					78.02			
C.O.D.	mg/l O2									25.6													
Chloride	mg/l Cl	20	22	22	22	21	22	21	33	22	23	23	22		22	22	26	21	22	21.47		22	23
Chromium	µg/l	30		2.6				<1				1			<0.5					0.53			
Cobalt	µg/l														<0.5					<0.5			
Coliform Bacteria	no/100ml		54	5																			
Conductivity	µS/cm @ 25	800	658	659	660	662	668	663	665	602	688	672	660		672	654	723	772	656	651		664	666
Copper	µg/l	30		2				1				1.9			0.5					<0.5			
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05					<0.05			
D.O.	% Saturation		<10	42	40	35	32	36	nm	41	39	38	51		67	48	38	54	62	49		112	44
E. Coli	no/100ml		0	0																			
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150					0.13			
Iron	µg/l			156.6				230.4				691.2			<10					<10			
Lead	µg/l	10		<1				<1				0.6			<0.5					<0.5			
Magnesium	mg/l Mg	50		23.96				25.53				25.36			26.14					24.5			
Manganese	µg/l			264.5				330.4				235.5			225.4					169.66			
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05			
Molybdenum (µg/l)															1.2					1.07			
Nickel	µg/l	20		<1				<1				<0.5			<0.5					0.62			
Ortho-Phosphate	mg/l P	0.03		0.1				0.09				0.08			0.11					0.099			
pH		>7 or <8	7.6	7.5	7.3	7.6	7.5	7.5	7.5	7.6	7.6	7.5	7.5		7.6	7.7	7.6	7.4	7.3	7.5		7.6	7.5
Potassium	mg/l	5		1.33				1.38				1.3			1.49					1.74			
Residue on evaporation	mg/l			409				421				524			414					417			
Sampling Depth	m		25.4	25.5	25.5	25.4	25.4	25.4	25.5	25.4		25.6	25.7		25.6	25.4	25.5	25.2	25.2	25.05		25.2	21.1
Selenium	µg/l														<0.5					<0.5			
Silver	µg/l														nm					nm			
Sodium	mg/l	150		27.71				26.21				25.36			26.08					25.97			
Strontium	µg/l														241.3					241.97			
Sulphate	µg/l	50		11.6				13				14			10.7					10.835			
Suspended Solids	mg/l																						
Temp	°C		10	11	12	11	8.2	11	10	12	9.3	10	14		10	9	11	11	8	8.5		12	8
Thallium	µg/l														<0.1					<0.1			
Time			11.2	11.45		11.35	10.45	12	10.55		10.10	10.35	10.00		10.30	10.20	10.15	10.25	10.15	10.20		10.38	10.35
Tin	µg/l														<1					nm			
T.O.C.	mg/l	10	<1.5	1.8	<3.0	<3.0	3.3	<1.5	2.6	<1.5	2.7	<1.5	1.6		<1.5	78.6	<1.5	<1.5	1.7	0.832		1.6	1.8
T.O.N	mg/l N			<0.08				<0.08				<0.08			<0.08					0.03			
Total Suspended Solids	mg/l																						
Uranium	µg/l														5.26					5.3			
Vanadium	µg/l														<0.5					<0.5			
Zinc	µg/l	100		10.8				12.3				5.1			2.1					1.15			
Water Level m OD	106.01		80.61	80.51	80.51	80.61	80.61	80.61	80.51	80.61	106.01	80.41	80.31	106.01	80.41	80.61	80.51	80.81	80.81	80.81		80.81	84.91

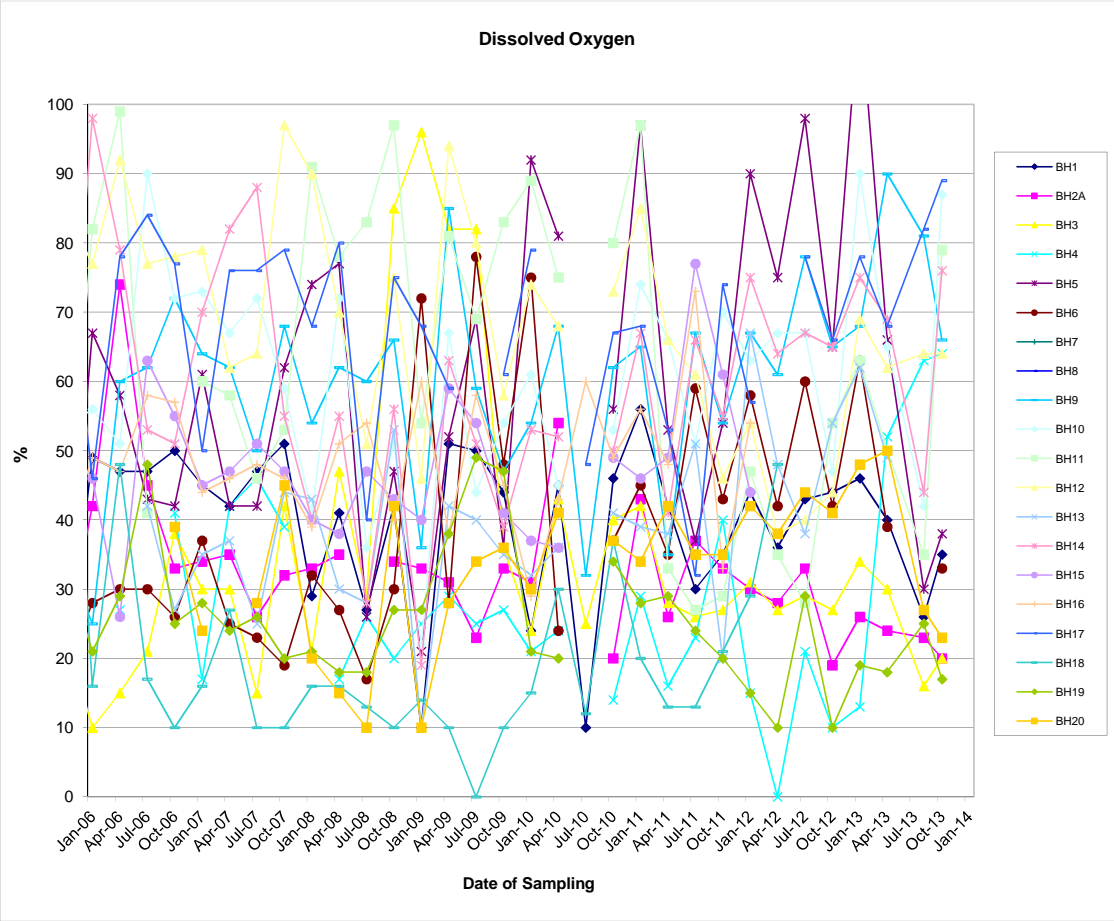
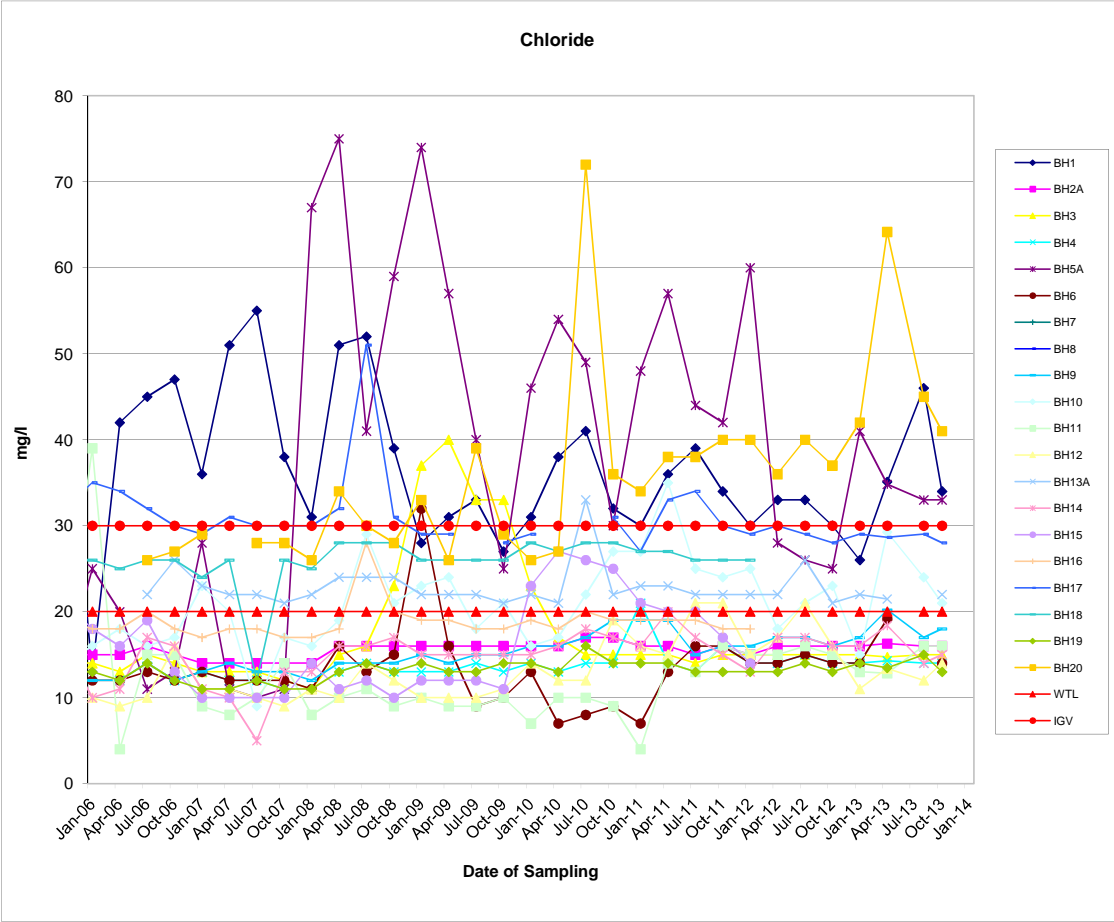
Whiteriver Landfill Site																							
GROUNDWATER QUALITY																							
RESULTS																							
BH14																							
DOWNSTREAM BEDROCK																							
	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Alkalinity	mg/lCaCO3	NAC	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14
Aluminium	µg/l			324				356							332					332			
Ammonia	mg/l N	0.2	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	0.15	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	0.29	0.06	0.013	0.12	0.04	<0.020
Antimony	µg/l														<0.5					<0.5			
Arsenic	µg/l														<0.5					0.53			
Barium	µg/l														145.4					147.41			
Beryllium	µg/l														<0.5					<0.5			
B.O.D.	mg/l O2			<50																			
Boron	µg/l	1000						30.7				29.7			36.6					30.43			
Cadmium	µg/l	5		<0.1				<0.1				<0.1			<0.1					<0.1			
Calcium	mg/l Ca	200		84.86				85.1				81.99			86.84					85.92			
C.O.D.	mg/l O2									19.0													
Chloride	mg/l Cl	20	15	15	15	15	15	16	18	17	16	20	17	15	13	17	17	16	16	18.38	14	15	15
Chromium	µg/l	30		5				<1				2.7			<0.5					0.65			
Cobalt	µg/l														<0.5					<0.5			
Coliform Bacteria	no/100ml		56	173																			
Conductivity	µS/cm @ 25	800	641	638	650	645	653	654	645	584	661	647	635	725	661	657	722	773	663	652	672	645	658
Copper	µg/l	30		1.2				<1				1.9			1					1.15			
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05					<0.05			
D.O.	% Saturation		19	63	51	39	53	52	nm	50	67	41	66	55	75	64	67	65	75	69	44	76	63
E. Coli	no/100ml		0	<10																			
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150					0.15			
Iron	µg/l		74.9					<10				2070.3								18.47			
Lead	µg/l	10		<1				<1				1.5			<0.5					<0.5			
Magnesium	mg/l Mg	50		21.33				24.12				26			20.71					21.86			
Manganese	µg/l			326.6				324.7				111.3			2.3					6.22			
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05			
Molybdenum (µg/l)															1.8					1.71			
Nickel	µg/l	20		<1				<1				1.6			<0.5					0.99			
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			0.02					0.017			
pH		>7 or <8	7.5	7.5	7.3	7.5	7.4	7.4	7.4	7.5	7.7	7.4	7.5	7.5	7.6	7.6	7.6	7.5	7.5	7.5	7.4	7.5	7.4
Potassium	mg/l	5		1.2				1.34				1.53			1.62					2.02			
Residue on evaporation	mg/l			396				388				565			494					535			
Sampling Depth	m		18.7	18.9	18.9	18.8	18.7	18.8	18.8	18.8		19	19.1	19.2	19.2	18.8	18.9	18.7	18.6	18.48	18.7	18.7	18.5
Selenium	µg/l														<0.5					<0.5			
Silver	µg/l														nm					nm			
Sodium	mg/l	150		23.15				24.79				22.69			26.84					25.55			
Strontium	µg/l														226.93					234.58			
Sulphate	µg/l	50		8.4				9.9				8.6			11.3					12.09			
Suspended Solids	mg/l																						
Temp	°C		9.8	11	12	11	8.1	11	11	11	9.6	10	13.5	nm	10	9	12	11	8	9.2	14.2	12	9
Thallium	µg/l														<0.1					<0.1			
Time			10:55	11:1		11:2	10:55	11:2	10:35	11:15	10:45	10:50	10:20	10:20	10:45	10:35	10:30	10:50	10:30	10:35	10:15	10:25	10:25
Tin	µg/l														<1					nm			
T.O.C.	mg/l	10	2.1	1.6	3.4	<3.0	1.6	<1.5	<1.5	<1.5	4.6	<1.5	2.3	3.6	2.2	82	<1.5	2	<1.5	0.834	<1.5	2.3	1.8
T.O.N	mg/l N			0.2				0.13				<0.08			0.16					0.14			
Total Suspended Solids	mg/l																						
Uranium	µg/l														5.67					4.9			
Vanadium	µg/l														<0.5					<0.5			
Zinc	µg/l	100		4.9				5.3				4.8			2.6					2.77			
Water Level m OD	98.98		80.28	80.08	80.08	80.18	80.28	80.18	80.18	80.18	98.98	79.98	79.88	79.78	79.78	80.18	80.08	80.28	80.38	80.50	80.28	80.28	80.48

PARAMETERS	Whiteriver Landfill Site																							
	GROUNDWATER QUALITY																							
	RESULTS																							
	BH17 DOWNSTREAM DOMESTIC HOLCROFT'S PRIVATE WELLS -POTABLE SOURCE																							
Monitoring Point:	Trigger Lev	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
Units			13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14	
Alkalinity	mg/CaCO ₃	NAC	0.2			286						296			320					328				
Aluminium	µg/l														<5					<5				
Ammonia	mg/l N	0.2	0.3	<0.03	0.05		0.03	<0.03		0.05	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	0.11	0.03	0.135	0.45	0.21	<0.020		
Antimony	µg/l														<0.5					<0.5				
Arsenic	µg/l														<0.5					<0.5				
Barium	µg/l														12.2					12.67				
Beryllium	µg/l														<0.5					<0.5				
B.O.D.	mg/l O ₂				<50																			
Boron	µg/l	1000	1000										16.1			15.8						11.13		
Cadmium	µg/l	5	5		<0.1								<0.1			<0.1				<0.1				
Calcium	mg/l Ca	200			57.33										53.79					50.93				
C.O.D.	mg/l O ₂												nm											
Chloride	mg/l Cl	20	250	29	29		28	29		31	27	33	34	30	29	30	29	28	29	28.64	29	28	28	
Chromium	µg/l	30	50		<1										<0.5					<0.5				
Cobalt	µg/l														0.9					<0.5				
Total Bact coliforms	no/100ml		0	2420	>2420		613	0		4			0	0	0				0	0	0	0	0	
Conductivity	S/cm @ 25	800	2500	678	676		673	702		606	681	693	689	725	707	684	738	763	667	678	676	676		
Copper	µg/l	30	2000		3.7							3.4			1.1					3.74				
Cyanide	mg/l	0.01	0.05		<0.05							<0.05			<0.05					<0.05				
D.O.	% Saturation			68	59		61	79		67	68	53	32	74	57	48	78	66	78	68	82	89	59	
Faecal coliforms	no/100ml		0	1	0		0	0		<1			0	0	0				0	0	0	0	0	
Fluoride	mg/l	1	0.8		<0.150							<0.150			<0.150		0			0.09				
Iron	µg/l		200		320.2							304.8			37.5					19.5				
Lead	µg/l	10	25		<1							2.2			<0.5					<0.5				
Magnesium	mg/l Mg	50			44.21							45.96			46.35					46.52				
Manganese	µg/l		50		179.5							237.6			204					71.7				
Mercury	µg/l	1	1		<0.1							<0.05			<0.05					<0.05				
Molybdenum	µg/l														<0.5					<0.5				
Nickel	µg/l	20	20		<1							1.8			2.6					5.17				
Ortho-Phosphate	mg/l P	0.03			<0.02							<0.02			<0.02					0.002				
pH		>7 or <8	6.5 - 9.5	7.7	7.7		7.8	7.6		7.8	7.9	7.4	7.2	7.7	7.6	7.8	7.6	7.5	7.5	7.6	7.7	7.6		
Potassium	mg/l	5			1.23							1.26			1.39					1.53				
Residue on evap	mg/l				395							379			357					391				
Depth	m		/	nm	nm		nm	nm		nm		13.3	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	
Selenium	µg/l														<0.5					<0.5				
Silver	µg/l														nm					nm				
Sodium	mg/l	150	200		19.91							20.88			19.9					19.12				
Strontium	µg/l														264.9					269.21				
Sulphate	µg/l	50	250		4.4							16.4			8.9					11.15				
Suspended Solids	mg/l																							
Temp	°C			10.3	10.4		10.6	5.3		10.7	7.2	13.3	14	15	9.6	10	15.4	13.6	6	6.1	11.1	11.2	4	
Thallium	µg/l														<0.1					<0.1				
Time				11.4	11.4		11.55	11.2		11:55	12:00	11:05	10:25	11:30	11:00	10:45	09:30	13:15	10:50	10:40	13:10	13:25	12:55	
Tin	µg/l														<1					nm				
T.O.C.	mg/l	10	NAC	<1.5	<1.5		<3.0	1.5		<1.5	2.5	<1.5	2	3.2	<1.5	81.1	nm	<1.5	<1.5	0.473	<1.5	1.7	<1.5	
T.O.N	mg/l N				<0.08							<0.08			<0.08									
Total Suspended Solids	mg/l																							
Uranium	µg/l														2.72					2.9				
Vanadium	µg/l														<0.5					<0.5				
Zinc	µg/l	100			15.5							324.4			188.3					811.05				

PARAMETERS		Whiteriver Landfill Site GROUNDWATER QUALITY RESULTS																					
		BH19 UPSTREAM AGRICULTURAL WATER SUPPLY ONLY																					
Monitoring Point:		Trigger Lev	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
Units																							
Alkalinity	mg/l CaCO3	NAC	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14
				280				298				198				284					276		
Aluminium	µg/l														<5					<5			
Ammonia	mg/l N	0.2	0.11	<0.03	0.06	0.15	<0.03	<0.03	<0.03	0.08	<0.03	0.08	<0.03	<0.03	<0.03	<0.03	<0.03	0.13	<0.03	0.009	0.03	<0.03	<0.020
Antimony	µg/l														<0.5					<0.5			
Arsenic	µg/l														0.7					0.63			
Barium	µg/l														2.2					4.02			
Beryllium	µg/l														<0.5					<0.5			
B.O.D.	mg/l O2			<50																			
Boron	µg/l	1000						25.1				12.7			12					10.06			
Cadmium	µg/l	5		<0.1				0.1				<0.1			<0.1					<0.1			
Calcium	mg/l Ca	200		75.01				74.6				74.85			73.95					74.67			
C.O.D.	mg/l O2										0.0												
Chloride	mg/l Cl	20	14	13	13	14	14	13	16	14	14	14	13	13	13	13	14	13	16	13.46	15	13	54
Chromium	µg/l	30		1.4				<1				<0.5			<0.5					<0.5			
Cobalt	µg/l														<0.5					<0.5			
Coliform Bacteria	no/100ml		129	10					2	nm							34	1					
Conductivity	µS/cm @ 25	800	544	552	568	567	572	572	566	509	584	570	567	621	584	567	616	640	611	564	557	568	787
Copper	µg/l	30		33.8				49.4				13.6			17.2					20.29			
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05					<0.05			
D.O.	% Saturation		27	38	49	47	21	20	nm	34	28	29	24	20	15	10	29	10	26	18	25	17	37
E. Coli	no/100ml		8	0					0	nm								0	0				
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150		0			0.12			
Iron	µg/l			1138.4				38393.4				64.2			23.8					<10			
Lead	µg/l	10		1.4				6.3				<0.5			<0.5					<0.5			
Magnesium	mg/l Mg	50		19.95				21.28				22.46			20.73					21			
Manganese	µg/l			22.2				868.2				5.3			<1					<1			
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05			
Molybdenum (µg/l)															<0.5					<0.5			
Nickel	µg/l	20		4				<1				<0.5			<0.5					0.55			
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02					0.009			
pH		>7 or <8	7.5	7.6		7.6	7.4	7.4	7.4	7.5	7.6	7.5	7.4	7.5	7.4	7.4	7.5	7.4	7.1	7.5	7.5	7.4	7.5
Potassium	mg/l	5		<1				1.11				0.94			1.01					1.37			
Residue on evaporation	mg/l			334				277				273			306					319			
Sampling Depth	m		nm	7.2	9.6	3.2	nm	1	0.4	0		11	nm	5	nm	0	0	nm	0	nm	nm	6.7	
Selenium	µg/l														<0.5					<0.5			
Silver	µg/l														nm					nm			
Sodium	mg/l	150		15.76				24.04				16.75			16.09					16.12			
Strontium	µg/l														197.24					198.19			
Sulphate	µg/l	50		3.9				4				3.6			3.3					3.48			
Suspended Solids	mg/l																						
Temp	°C		9.9	11.1		11.8	8.8	10.4	11	11.8	9.6	11	14.4	15.5	11.5	11	15	14.3	7	9.1	16	11.6	11
Thallium	µg/l														<0.1					<0.1			
Time			13:15	12:55		13:1	13:1	13:5	12:1	13:30	14:00	12:45	12:50	12:50	12:45	13:00	12:30	12:25	10:25	11:30	12:05	12:45	11:35
Tin	µg/l														1.89					nm			
T.O.C.	mg/l	10	1.5	<1.5		<3.0	1.6	<1.5	<1.5	<1.5	1.9	<1.5	<1.5	2.5	<1.5	70.5	<1.5	<1.5	<1.5	0.166	<1.5	1.5	6.6
T.O.N	mg/l N			0.73				0.46				0.62			0.48					0.54			
Total Suspended Solids	mg/l																						
Uranium	µg/l														1.17					1.37			
Vanadium	µg/l														<0.5					<0.5			
Zinc	µg/l	100		25.4				785.9				10.5			2.9					1.44			

PARAMETERS		Whiteriver Landfill Site																						
		GROUNDWATER QUALITY RESULTS																						
Monitoring Point:		BH20																						
		UPSTREAM OF LANDFILL, DOWN GRADIENT OF LEACHATE LAGOON, OVERBURDEN																						
	Units	Trigger levels	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
Alkalinity	mg/l/CaCO3	NAC	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14	
Aluminium	µg/l			304				328				312			344					320				
Ammonia	mg/l N	0.2	0.14	0.06	0.08	0.56	0.07	<0.03	0.05	0.12	0.14	<0.03	<0.03	0.15	<0.03	<0.03	0.17	<0.03	0	0.07	<0.03	<0.020		
Antimony	µg/l														<0.5					<0.5				
Arsenic	µg/l														0.72					0.7				
Barium	µg/l														125.5					144.69				
Beryllium	µg/l														<0.5					<0.5				
B.O.D.	mg/l O2			259.5																				
Boron	µg/l	1000						240.2				252.1			210.1					168.06				
Cadmium	µg/l	5		0.5				<0.1				<0.1			<0.1					<0.1				
Calcium	mg/l Ca	200		147.7				83.48				70.07			68.63					75.55				
C.O.D.	mg/l O2										nm													
Chloride	mg/l Cl	20	33	26	39	29	26	27	72	36	34	38	38	40	40	36	40	37	42	64.16	45	41	15	
Chromium	µg/l	30		18.1				8.2				5.8			<0.5					0.5				
Cobalt	µg/l														<0.5					<0.5				
Coliform Bacteria	no/100ml		1	<10						33														
Conductivity	µS/cm @ 25	800	626	626	641	628	647	649	642	574	690	674	690	781	730	706	729	797	704	751	745	729	625	
Copper	µg/l	30		40.6				12.3				3			1					0.83				
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05					<0.05				
D.O.	% Saturation		<10	28	34	36	30	41	nm	37	34	42	35	35	42	38	44	41	48	50	27	23	26	
E. Coli	no/100ml		0	<10						<1														
Fluoride	mg/l	1		0.24				0.28				0.21			0.2					0.19				
Iron	µg/l			18638.3				6302.7				3243.2			<10					18.81				
Lead	µg/l	10		40				8.9				1.5			<0.5					<0.5				
Magnesium	mg/l Mg	50		39.73				31.25				28.46			26.88					28.73				
Manganese	µg/l			2272.6				943.9				69.3			<1					<1				
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05				
Molybdenum (µg/l)															3.8					2.69				
Nickel	µg/l	20		51.1				15.4				2.7			0.7					0.75				
Ortho-Phosphate	mg/l P	0.03		<0.02				0.02				0.03			0.02					0.019				
pH		>7 or <8	7.7	7.7	7.5	7.7	7.6	7.5	7.5	7.7	7.7	7.6	7.5	7.6	7.7	7.6	7.5	7.4	7.5	7.4	7.4	7.4	7.5	
Potassium	mg/l	5		3.39				3.02				3.54			3.18					4.7				
Residue on evaporation	mg/l			9814				8666				3390			1642					6134				
Sampling Depth	m		10.9	5.4	11.7	11.1	10.2	10.1	10.1	9.9		10	10	9.6	9.5	9.7	9.6	10.5		9.14	6.8	6.6	nm	
Selenium	µg/l														<0.5					<0.5				
Silver	µg/l														nm					nm				
Sodium	mg/l	150		44.29				44.22				46.74			43.12					42.13				
Strontium	µg/l														447.74					478.17				
Sulphate	µg/l	50		18.6				20				19.5			19.9					19.66				
Suspended Solids	mg/l																							
Temp	°C		10.4	11.3	12	11	9.7	12	15	11	8.6	10	13	12	11	9	11	11	9	11.1	13.6	12.8	10	
Thallium	µg/l														<0.1					<0.1				
Time			12	13.2		13.3	13.1	13	11.25	12:25	14.00	13:45	11:20	12:00	11:20	11:30	11:20	11:35	11:30	12:00	11:00	10:50	10:55	
Tin	µg/l														2.77					nm				
T.O.C.	mg/l	10	<1.5	3.4	<3.0	<3.0	28.6	2.6	12.4	7	6.7	13.7	12.7	4.5	3.1	95.8	<1.5	2.2	6	1.21	10.8	2.9	<1.5	
T.O.N	mg/l N			<0.08				0.24				0.14			0.21					0.01				
Total Suspended Solids	mg/l																							
Uranium	µg/l														4.15					5.61				
Vanadium	µg/l														0.98					0.83				
Zinc	µg/l	100		88.6				27.1				8.5			4.2					5.08				





APPENDIX D

SURFACE WATER MONITORING RESULTS



Whiteriver Landfill Site

SURFACE WATER QUALITY

RESULTS

PARAMETERS	Units	SW3																						
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Monitoring Point:		07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	21-Jan-10	14-Apr-10	06-Jul-10	11-Oct-10	18-Jan-11	05-Apr-11	19-Jul-11	11-Oct-11	10-Jan-12	25-Apr-12	18-Jul-12	10-Oct-12	09-Jan-13	09-Apr-13	08-Aug-13	17-Oct-13	14-Jan-14	
Alkalinity	mg/l CaCO3							148		290						135				110				
Aluminium	µg/l									<5						15.8				6.61				
Ammonia	mg/l N				0.56	0.72	0.12	0.44		0.03	5.38			0.04	<0.03	0.04	0.55	0.13	1.28	1.022		0.63	7.8	
Antimony	µg/l									<0.5						0.56				1.33				
Arsenic	µg/l									<0.5						2.06				1.35				
Barium	µg/l									153.6						66.1				84.34				
Beryllium	µg/l									<0.5						<0.5				<0.5				
B.O.D.	mg/l O2				<2.0	<1.5	4.6	<1.5						<1.5	<1.5	3.7	3.8	<1.5	2	1.15		2	1.7	
Boron	µg/l							39.8		12.3						30.3				21.81				
Cadmium	µg/l							<0.1		<0.1						<0.1				<0.1				
Calcium	mg/l Ca							72.78		100.79	5.5					69.86				70.9				
C.O.D.	mg/l O2				32	<10	38	<10						13	14	25	32	12	20	15		29	26	
Chloride	mg/l Cl				22	28	30	20		33	46				18	21	22	27	19	32	29.55		42	42
Chromium	µg/l							<1		<0.5						<0.5				<0.5				
Cobalt	µg/l									<0.5						<0.5				1.05				
Coliform Bacteria	no/100ml																							
Conductivity	µS/cm @ 25				550	547	598	524		657	815				599	506	515	518	601	563	502		680	677
Copper	µg/l							2.4		<0.5						2.3				2.08				
Cyanide	mg/l									<0.05														
D.O.	% Saturation				85	67	87	98		36	89				nm	86	77	112	62	94	47		66	68
E. Coli	no/100ml																							
Fluoride	mg/l									<0.150														
Iron	µg/l							48.4		<10						20				20.85				
Lead	µg/l							<1		<0.5						<0.5				<0.5				
Magnesium	mg/l Mg							9.76		9.76						9.01				7.81				
Manganese	µg/l							45.7		2.1						68.7				949.3				
Mercury	µg/l							<0.1		<0.05						<0.05				<0.05				
Molybdenum (µg/l)										<0.5						2.2				1.76				
Nickel	µg/l							3.2		<0.5						2				3.54				
Ortho-Phosphate	mg/l P							<0.02		<0.02						<0.02				0.009				
pH					7.8	8	7.9	7.9		7.3	7.9				7.8	8	8.2	8.2	8.2	7.9	7.7		7.5	7.8
Potassium	mg/l							2.55		0.46						3.23				4.06				
Residue on evaporation										366														
Sampling Depth	m									6.9														
Selenium	µg/l									<0.5						<0.5				<0.5				
Silver	µg/l									<0.5						nm				nm				
Sodium	mg/l							16.95		16.54						18.75				15.97				
Strontium	µg/l									144.190						171.79				167.78				
Sulphate	mg/l SO4							94.2		18.2						103.8				64.51				
Suspended Solids	mg/l																					<4	<4	
Temp	°C				17.6	13	5.5	8.3		9.0	6.8			14	7	10	17	11	7	5.3		11	2	
Thallium	µg/l									<0.1						<0.1				<0.1				
Time						13.3	13.2	14.2		11:35	14.20				13:25	12:30	11:15	11:00	11:10	10:55	12:00		12:00	11:10
Tin	µg/l									2.80						<1				nm				
T.O.C.	mg/l									70.3														
T.O.N	mg/l N							0.58		1.06						0.14				0.31				
Total Suspended Solids	mg/l				14	<5	42	<5				15		<5	8	5	<5	<5	28	3				
Uranium	µg/l									0.64						1.07				1.05				
Vanadium	µg/l									<0.5						<0.5				<0.5				
Zinc	µg/l							2.4		6.1						2.3				1.43				

Dry

APPENDIX E

GAS MONITORING RESULTS

Pz number	Date	CH4	CO2	O2	Date	CH4	CO2	O2	Peak Cl	Date	CH4	CO2	O2	Date	CH4	CO2	O2	Date	CH4	CO2	O2	Date	CH4	CO2	O2
PZ1 WHIT		0	0.1	23.2		0	0	21	0		0	0.1	23.2		0	0	23.2		0	0	21		0	0	21.1
PZ2 WHIT		0	0.6	19.4		0	0.3	20.8	0		0	0.6	19.4		0	0.5	19.5		0	0.3	20.8		0	0.6	19.4
PZ3 WHIT		0	1.2	19.2		0	1.7	19.8	0		0	1.2	19.2		0	1.1	19.1		0	1.4	20		0	1.2	19.2
PZ4 WHIT		0	1.4	20.1		0	0.4	20.8	0		0	1.8	20.1		0	1.2	20		0	0.4	20.8		0	1.5	20.9
PZ5 WHIT		0	0.3	19.8		0	1.8	19.9	0		0	0.2	19.8		0	0.3	19.8		0	1.4	20		0	0.2	19.8
PZ54 WHI		0	0.6	19.5		0	0.2	20.8	0		0	0.6	19.5		0	0.6	19.5		0	0.2	20.8		0	0.5	9.8
PZ53 WHI		0	0.9	19.2		0	1.1	19	0		0	0.8	19.8		0	0.9	19.2		0	1.1	19		0	0.8	19.8
PZ52 WHI		0	0.2	20.1		0	0.5	20.3	0		0	0.2	20.1		0	0.2	20.1		0	0.5	20.3		0	0.2	20.1
PZ51 WHI		0	0.3	20		0	0.2	20.8	0		0	0.3	20		0	0.2	19.8		0	0.2	20.8		0	0.3	20
PZ50 WHI		0	0.3	20		0	0.8	20.2	0		0	0.3	20		0	0.3	20		0	0.8	20.2		0	0.3	20
PZ49 WHI		0	0.9	19.7		0	1.1	19.6	0		0	1	19.7		0	0.9	19.7		0	1.1	19.6		0	1	19.7
PZ48 WHI		0	0.2	20.1		0	1.3	20	0		0	0.2	20.1		0	0.2	20.1		0	1.3	20		0	0.2	20.1
PZ47 WHI		0	0.6	19.9		0	1.2	19.9	0		0	0.6	19.3		0	0.6	19.9		0	1.2	19.9		0	0.6	19.3
PZ46 WHI		0	4.1	17.4		0	2.8	19.2	0		0	2.8	19.1		0	3.5	18.4		0	2.1	19.8		0	2.8	19.1
PZ45 WHI		0	1.3	18.4		0	1	20	0		0	1.3	18.4		0	1.1	19.5		0	1	20		0	1.3	18.4
PZ44 WHI		0	0.2	20.2		0	0.3	20.6	0		0	0.2	20.2		0	0.2	20.2		0	0.3	20.6		0	0.2	20.2
PZ43 WHI		0	1.3	19.6		0	0.7	20.2	0		0	1.3	19.6		0	1.3	19.6		0	0.7	20.2		0	1.3	19.6
PZ42 WHI		0	0.9	19.8		0	0.6	20.5	0		0	1.1	19.8		0	0.8	20		0	0.6	20.5		0	1.1	19.8
PZ42 WHI		0	0.5	20.1		0	0.6	20.2	0		0	0.1	20		0	0.5	20.1		0	0.6	20.2		0	0.1	20
PZ41 WHI		0	0.6	19.6		0	0.9	19.9	0		0	0.5	19.6		0	0.6	19.6		0	0.8	20		0	0.5	19.6
PZ40 WHI		0	0.1	20		0	0.1	20.9	0		0	0.1	20		0	0.1	20		0	0.1	20.9		0	0.1	20
PZ39 WHI	28/01/2013	0	0.4	19.9	06/02/2013	0	0.4	20.6	0	27/03/2013	0	0.4	19.9	28/04/2013	0	0.4	19.9	06/05/2013	0	0.4	20.6	27/06/2013	0	0.3	19.9
PZ38 WHI		0	0.1	20.1		0	0.3	20.6	0		0	0.1	20.1		0	0.1	20.1		0	0.3	20.6		0	0.1	20.1
PZ37 WHI		0	0.1	20.2		0	0.2	20.9	0		0	0.1	20.2		0	0.1	20.2		0	0.2	20.9		0	0.1	20.2
PZ36 WHI		0	0.5	19.4		0	0.5	20.5	0		0	0.5	19.4		0	0.5	19.4		0	0.5	20.5		0	0.5	19.4
PZ35 WHI		0	0.2	20		0	0.3	20.8	0		0	0.2	20		0	0.2	20		0	0.3	20.8		0	0.2	20
PZ34 WHI		0	1.1	19		0	2.1	17.6	0		0	1.1	19		0	1.1	19		0	2.1	17.6		0	1.1	19
PZ33 WHI		0	0.2	19.9		0	0.4	20.3	0		0	0.2	19.9		0	0.2	19.9		0	0.4	20.3		0	0.1	20
PZ33 WHI		0	1.3	19.2							0	0.9	19.9		0	1.3	19.2						0	0.9	19.9
PZ32 WHI		0	0.9	19.8		0	1.2	20.4	0		0	0.5	19.8		0	0.9	19.8		0	1.2	20.4		0	0.5	19.8
PZ31 WHI		0	1.4	18.8		0	0.5	20.5	0		0	1.4	18.8		0	1.4	18.8		0	0.5	20.5		0	1.4	18.8
PZ30 WHI		0	1.7	18		0	0.6	20.3	0		0	1.5	18		0	1.5	18.5		0	0.6	20.3		0	1.5	18
PZ29 WHI		0	0.2	20		0	0.3	20.8	0		0	0.2	20		0	0.1	20.1		0	0.3	20.8		0	0.1	20
PZ28 WHI		0	2.3	18.2		0	3.1	19.4	0		0	2.3	18.2		0	2.3	18.2		0	3.1	19.4		0	1.5	21.6
PZ27 WHI		0	0.1	20.1		0	0	21	0		0	0.1	20.1		0	0.1	20.1		0	0	21		0	0.1	20.1
PZ25 WHI		0	0.1	20.2		0	0.2	20.9	0		0	0.1	20.2		0	0.1	20.2		0	0.2	20.9		0	0	20.2
PZ24 WHI		0	0.2	19.9		0	0	21	0		0	0.2	19.9		0	0.2	19.9		0	0	21		0	0.2	19.9
PZ23 WHI		0	0.5	19.7		0	0.3	20.7	0		0	0.5	19.7		0	0.5	19.7		0	0.3	20.7		0	0.5	19.7
PZ22 WHI		0	1.4	19.1		0	1.5	18.7	0		0	1.4	19.1		0	1.4	19.1		0	1.3	19.1		0	1.4	19.1
PZ21 WHI		0	0.1	20.1		0	0	20.9	0		0	0.1	20.1		0	0.1	20.1		0	0	20.9		0	0.1	20.1
PZ11 WHI		0	0.1	20.2		0	0	21	0		0	0.1	20.2		0	0.1	20.2		0	0	20.9		0	0.1	20.2
PZ12 WHI		0	0.1	20.2		0	0	21	0		0	0.1	20.2		0	0.1	20.2		0	0	21		0	0.1	20.2
PZ13 WHI		0	0.1	20.2		0	0	21	0		0	0	20.2		0	0.1	20.2		0	0	21		0	0	20.2
PZ14 WHI		0	0.1	20.2		0	0	21	0		0	0.1	20.2		0	0.1	20.2		0	0	20.9		0	0	21
PZ15 WHI		0	0.1	20.2		0	0	21	0		0	0.1	20.2		0	0.1	20.2		0	0	21		0	0	20.8
PZ16 WHI		0	0.1	20.2		0	0	21	0		0	0.1	20.2		0	0.1	20.2		0	0	21		0	0	20.8

Pz number	Date	CH4	CO2	O2	Date	CH4	CO2	O2	Date	CH4	CO2	O2	Date	CH4	CO2	O2	Date	CH4	CO2	O2	Date	CH4	CO2	O2
PZ1 WHIT		0	0.1	23.2		0	0	20.9		0	0	21		0	0.9	20.4		0	1.2	20.2		0	1.3	20.1
PZ2 WHIT		0	0.6	19.4		0	0.4	19.6		0	0.3	20.8		0	0.6	20.5		0	0.7	20.3		0	0.9	19.9
PZ3 WHIT		0	1.2	19.2		0	1	19.5		0	1.7	19.8		0	1.1	19.8		0	1	20.1		0	1	19.9
PZ4 WHIT		0	1.3	20.3		0	1	19.8		0	0.4	20.8		0	0.8	20.8		0	0.9	19.6		0	1.2	19.6
PZ5 WHIT		0	0.3	19.8		0	0.3	19.8		0	2.7	18.9		0	2.7	19.2		0	2.7	19.1		0	2.5	18.6
PZ54 WHI		0	0.5	19.6		0	0.6	19.5		0	0.2	20.8		0	0.2	19.9		0	0.5	20.1		0	0.7	20
PZ53 WHI		0	0.9	19.2		0	0.9	19.2		0	1.1	19		0	1	19.6		0	1	20		0	1	19.9
PZ52 WHI		0	0.2	20.1		0	0.2	20.1		0	0.5	20.3		0	0.6	20.3		0	0.5	21.1		0	0.6	21.1
PZ51 WHI		0	0.3	20		0	0.2	19.8		0	0.1	20.8		0	0.1	20.8		0	0.1	21.1		0	0.2	21.5
PZ50 WHI		0	0.1	20.1		0	0.3	20		0	0.8	20.2		0	1.1	21.4		0	1	21		0	1.1	21.4
PZ49 WHI		0	0.9	19.7		0	0.9	19.7		0	1	19.9		0	1.4	19.2		0	1.8	18.6		0	2.5	18.6
PZ48 WHI		0	0.2	20.1		0	0.2	20.1		0	1.3	20		0	1.6	20		0	1.5	9.8		0	1.9	20.8
PZ47 WHI		0	0.6	19.9		0	0.4	19.3		0	1.2	19.9		0	1.2	19.9		0	1	21.2		0	1.2	20.9
PZ46 WHI		0	4.2	17.5		0	3.8	18.2		0	4.1	18		0	4.5	15.8		0	4.7	15.8		0	5.1	15.2
PZ45 WHI		0	1.3	18.4		0	1.1	19.5		0	1	20		0	1.2	20.2		0	1.3	20.2		0	1.3	20.8
PZ44 WHI		0	0.2	20.2		0	0.2	20.2		0	0.3	20.6		0	0.1	20.6		0	0	21.8		0	0.1	22.2
PZ43 WHI		0	1.3	19.6		0	1.3	19.6		0	0.7	20.2		0	0.8	21.4		0	0.6	21.5		0	0.7	21.8
PZ42 WHI		0	0.9	19.8		0	0.8	20		0	0.6	20.5		0	1.3	21.1		0	1.2	21.2		0	1.3	21.1
PZ42 WHI		0	0.5	20.1		0	0.5	20.1		0	0.6	20.2		0	1.3	21.1		0	1.1	20.8		0	0.7	21.2
PZ41 WHI		0	0.6	19.6		0	0.6	19.6		0	0.9	19.9		0	0.7	21.8		0	0.6	21.2		0	1	21.6
PZ40 WHI		0	0.1	20		0	0.1	20		0	0.1	20.9		0	1	21.6		0	0.8	20.8		0	0.8	21.8
PZ39 WHI	19/07/2013	0	0.4	19.9	23/08/2013	0	0.4	19.9	06/09/2013	0	0.3	20.6	16/10/2013	0	0.7	22.1	05/11/2013	0	0.7	22.1	20/12/2013	0	0.3	22.4
PZ38 WHI		0	0.1	20.1		0	0.1	20.1		0	0.3	20.6		0	0.3	21.4		0	0.2	21.8		0	0.2	21.8
PZ37 WHI		0	0.1	20.2		0	0.1	20.2		0	0.2	20.9		0	0.2	21		0	0.1	21.1		0	0.2	22.5
PZ36 WHI		0	0.5	19.4		0	0.5	19.4		0	0.5	20.5		0	1.3	19.1		0	1.2	19.6		0	1.3	17.9
PZ35 WHI		0	0.2	20		0	0.1	20		0	0.3	20.8		0	0.3	20.8		0	0.2	21		0	0.3	22.5
PZ34 WHI		0	1.1	19		0	1.1	19		0	2	17.8		0	0.9	21.6		0	0.8	20.8		0	0.9	21.6
PZ33 WHI		0	0.1	20.1		0	0.1	20.1		0	0.4	20.3		0	0.2	20.6		0	0.2	20.4		0	0.2	20.6
PZ33 WHI		0	1.3	19.2		0	1.3	19.2																
PZ32 WHI		0	0.9	19.8		0	0.7	20.1		0	1.2	20.4		0	1.2	21		0	1.1	20.6		0	1.2	22
PZ31 WHI		0	1.4	18.8		0	1.4	18.8		0	0.5	20.5		0	0.6	22.2		0	0.4	21.1		0	0.6	22.2
PZ30 WHI		0	1.7	18		0	1.5	18.5		0	0.6	20.3		Full of water				Full of water				Full of water		
PZ29 WHI		0	0.2	20		0	0.1	20.1		0	0.3	20.8		0	0.5	22.2		0	0.5	21.6		0	0.5	22.2
PZ28 WHI		0	2.1	18.3		0	2.3	18.2		0	2.8	19		0	3.2	18.5		0	2.8	19		0	3	17.2
PZ27 WHI		0	0.1	20.1		0	0.1	20.1		0	0	21		0	0.2	21		0	0.1	21.2		0	0.2	21.2
PZ25 WHI		0	0.1	20.2		0	0.1	20.2		0	0.2	20.9		0	0.2	21.6		0	0.1	20.7		0	0.2	22.6
PZ24 WHI		0	0.2	19.9		0	0.1	20.2		0	0	21		0	0.2	21.1		0	0.1	20.9		0	0.2	22.3
PZ23 WHI		0	0.4	19.7		0	0.5	19.7		0	0.2	20.8		0	0.4	21.3		0	0.5	20.8		0	0.4	22.3
PZ22 WHI		0	1.4	19.1		0	1.3	19.4		0	1.4	18.8		0	0.9	21.6		0	0.8	20.4		0	0.9	21.6
PZ21 WHI		0	0.1	20.1		0	0.1	20.1		0	0	20.9		0	0.2	20.8		0	0.2	20.6		0	0.2	22.5
PZ11 WHI		0	0.1	20.2		0	0.1	20.2		0	0	21		0	1.2	19.7		0	1.3	19.6		0	1.4	19.5
PZ12 WHI		0	0.1	20.2		0	0.1	20.2		0	0	21		0	0.8	19.2		0	0.9	19.2		0	0.6	20.1
PZ13 WHI		0	0.1	20.2		0	0.1	20.2		0	0	21		0	0.2	21		0	0.1	21		0	0.1	21
PZ14 WHI		0	0.1	20.2		0	0.1	20.2		0	0	21		0	0.2	20.8		0	0.1	20.8		0	0.2	22.5
PZ15 WHI		0	0.1	20.2		0	0.1	20.2		0	0	21		0	0.4	21.9		0	0.4	21.9		0	0.2	21
PZ16 WHI		0	0.1	20.2		0	0.1	20.2		0	0	21		0	0.8	20.8		0	0.9	19.9		0	1.2	19.5

APPENDIX F

MONTHLY WATER BALANCE CALCULATION

MONTHLY WATER BALANCE CALCULATION 2013

	Active Phase	Active Area A(m2)	Waste Input t/month	Rainfall mm	Active Area Infiltration AR(A)(m3)	Liquid Waste LW(m3) Excess Water From Sludge	Temp Restored area	Temp Restored area(Temp) RCA(m2)	Restored area(Temp) infiltration IRCA(m3)	Leachate Lagoon AR(l)	Permanently Restored area	Permanently Restored area	Restored area RCA(m2)	Total Water	Cumulative Water	Absorptive Capacity aW(m3)	Cumulative Absorptive Capacity	Cumulative Leachate	Leachate produced Lo(m3)	Leachate tankered to WWTP
January	5, Cell 1 ,leachate lagoon	12,006	9404	127.2	1527	103	5, Cell 2	15,556	594	204	1,2,3,4,5(3a,b),	103844	1321	3748	3748	564.26	564.26	3184	3184	4,792.58
February	5, Cell 1 ,leachate lagoon	12,006	4469	54.4	653	107	5, Cell 2	15,556	254	87	1,2,3,4,5(3a,b),	103844	565	1666	5414	268.14	832.40	4582	1398	3,390.48
March	5, Cell 1 ,leachate lagoon	12,006	3063	76.5	918	141	5, Cell 2	15,556	357	122	1,2,3,4,5(3a,b),	103844	794	2333	7747	183.79	1016.19	6731	2149	3,395.68
April	5, Cell 1 ,leachate lagoon	12,006	6101	51.2	615	167	5, Cell 2	15,556	239	82	1,2,3,4,5(3a,b),	103844	532	1634	9382	366.06	1382.25	7999	1268	2,054.30
May	5, Cell 1 ,leachate lagoon	12,006	7116	59.2	711	153	5, Cell 2	15,556	276	95	1,2,3,4,5(3a,b),	103844	615	1850	11231	426.95	1809.19	9422	1423	1,605.02
June	5, Cell 1 ,leachate lagoon	12,006	6620	49.2	591	107	5, Cell 2	15,556	230	79	1,2,3,4,5(3a,b),	103844	511	1517	12749	397.19	2206.38	10542	1120	1,383.38
July	5, Cell 1 ,leachate lagoon	12,006	5443	49.4	593	122	5, Cell 2	15,556	231	79	1,2,3,4,5(3a,b),	103844	513	1538	14286	326.60	2532.98	11753	1211	909.28
August	5, Cell 1 ,leachate lagoon	12,006	4415	45.8	550	105	5, Cell 2	15,556	214	73	1,2,3,4,5(3a,b),	103844	476	1417	15704	264.89	2797.87	12906	1153	988.58
September	5, Cell 1 ,leachate lagoon	12,006	2319	34.4	413	0	5, Cell 2	15,556	161	55	1,2,3,4,5(3a,b),	103844	357	986	16689	139.15	2937.02	13752	847	653.92
October	5, Cell 1 ,leachate lagoon	12,006	702	156.9	1884	0	5, Cell 2	15,556	732	251	1,2,3,4,5(3a,b),	103844	1629	4496	21186	42.12	2979.14	18207	4454	2,985.14
November	5, Cell 1 ,leachate lagoon	12,006	2313	28.8	346	0	5, Cell 2	15,556	134	46	1,2,3,4,5(3a,b),	103844	299	825	22011	138.78	3117.92	18893	687	2,214.10
December	5, Cell 1 ,leachate lagoon	12,006	1410	111.8	1342	0	5, Cell 2	15,556	522	179	1,2,3,4,5(3a,b),	103844	1161	3204	25215	84.60	3202.52	22012	3119	1,490.98
Total			53375	844.8	10143	1005			3943	1352			8773	25215		3203			22012	25,863.44

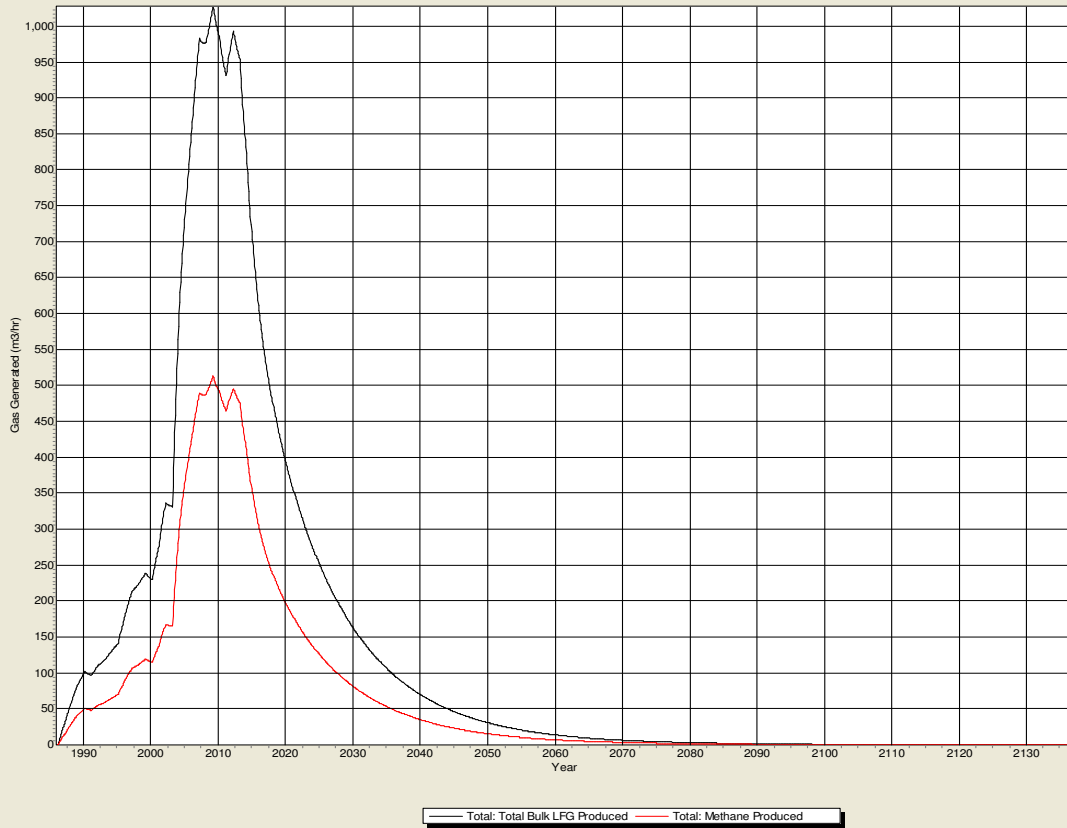
Assumptions

IRCA	Temporarily capped/restored area infiltration of rainfall estimated %	30%	%
	Permanent capped/restored area infiltration of rainfall estimated %	10%	%
Absorptive Capacity	waste density of 0.8 tonnes/m3. Estimated absorptive capacity (water per tonne waste before leachate is produced) t/m3	0.06	t/m3
Landfill areas/cells	Area of landfill site restored (1,2)		
	Area of Phase 3	41,000	m ²
	Area of Phase 1,2 and 3 remaining to be temp capped	11,500	m ²
	Area of Phase 4, Cell 1A	7,000	m ²
	Area of Phase 4, Cell 1	2,190	m ²
	Area of Phase 4, Cell 2	15,000	m ²
	Area of Phase 5, Cell 3A	8,000	m ²
	Area of Phase 5, Cell 3B	7,974	m ²
	Area of Phase 5, Cell 2A	7,180	m ²
	Area of Phase 5, Cell 2B	13,761	m ²
	Area of Phase 5, Cell 1A	5,795	m ²
	Area of Phase 5, Cell 1B	10,083	m ²
	Surface Area Leachate Lagoon	323	m ²
		1,600	m ²
Rainfall	Rainfall taken from on site	844.8	mm

APPENDIX G

ESTIMATED ANNUAL GAS YIELD

Total: Total Bulk LFG Produced / Total: Methane Produced
Total: Total Bulk LFG Produced, Total: Methane Produced at 95%



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