



ANNUAL ENVIRONMENTAL REPORT

By

Louth County Council

To

Environmental Protection Agency

For

Waste Licence Reference: W0060-03

Reporting Period January – December 2014

WHITERIVER LANDFILL SITE, COUNTY LOUTH



**WHITERIVER LANDFILL SITE
ANNUAL ENVIRONMENTAL REPORT
JANUARY – DECEMBER 2014**

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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 2014.

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.

Facility information summary is provided in Table 1.1

Table 1.1 Facility Information Summary

AER Reporting Year	2014
Licence Register Number	(W0060-03)
Name of site	Whiteriver Landfill Site
Site Location	Whiteriver & Gunstown Townland
NACE Code	3821
Class/Classes of Activity	Landfill

1.1 REPORT PERIOD

The report period for this Annual Environmental Report (AER) is from January to December 2014 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	2014
Total	80,634	82,547	70,396	84,402	53,744	75,243	89,290	84,992	Closed

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.

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.

6 SUMMARY REPORT ON EMISSIONS

6.1 EMISSIONS TO AIR

There is no continuous air emission monitoring at Whiteriver landfill site. Periodic/non-continuous monitoring is carried out on the engine/flare. This is further discussed in Section 7.7.

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 were two landfill gas flares and two engines in operation various times at Whiteriver landfill site in 2014. Based on model predications and information from the landfill gas flares and engines the estimated net emission of methane from the flare combustion process and both surface and lateral emissions from the landfill body is 116,348.0 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)	2,522,739.0
Methane flared	1,175,150.0
Methane utilised in engine/s	1,231,241.0
Net Methane Emission	116,348.0

6.2 EMISSIONS TO GROUNDWATER AND SURFACE WATER

There are no direct discharges to groundwater from Whiteriver Landfill Site. There is one licensed emissions direct to surface water from the surface water retention pond. This is further discussed in Section 7.5.4.

6.3 EMISSIONS TO WASTE WATER TREATMENT WORKS

There are no licensed emissions direct to sewer from Whiteriver Landfill Site. Treated leachate is transported off site to Drogheda wastewater treatment plant. The volume tankered during the period January to December 2014 was 25,059 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

Monitoring Points of Groundwater Boreholes	Easting	Northing
Surface Water Monitoring		
SW1	301 384	285 424
SW2A	301 965	285 427
SW3	301 935	285 410
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		

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

Table 7.2 Location of Groundwater Monitoring Boreholes

Borehole ²	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

² Private wells BH15 (Taffes), BH16 (Byrnes), and BH18 (Taffes) have been decommissioned and are no longer monitored as part of the licence requirements.

Borehole ²	Upstream/Downstream	Private Well	Overburden or 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

Periodic monitoring (non-continuous) of treated leachate quality is undertaken at the facility. Leachate values recorded in the lagoon (treated leachate) were within the emission limit values as set out in the waste licence except for Sulphate in January and April and COD in July and October.

Table 7.3 Treated Leachate Concentrations in 2014

Parameter	Min. Conc	Max. Conc	Limit Value
Ammonia (mg/N)	74	440	900
BOD (mg/l)	33	250	500
COD (mg/l)	988	2170	1,500
Sulphate (mg/l)	126	1477.8	250
Temperature (°C)	10.4	19	<25°C
pH (pH units)	6.6	8.3	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 currently at the closed site as agreed with the EPA 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

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 2014 from groundwater monitoring boreholes throughout these monitoring periods.

Table 7.5 Summary of 2014 Results from Groundwater Monitoring Boreholes

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Alkalinity	mg/lCaCO ₃	14	236	368	316	37
Aluminium	µg/l	29	<10.0	17		
Ammonia	mg/l N	59	<0.020	0.37		
Antimony	µg/l	29	<1.0	<1.0		
Arsenic	µg/l	29	<1.0	<1.0		
Barium	µg/l	29	2.9	240	137	79
Beryllium	µg/l	29	<1.0	<1.0		
Boron	µg/l	29	11	150	31	38
Cadmium	µg/l	29	<0.020	0.03	0	0
Calcium	mg/l Ca	29	68	130	94	21
Chloride	mg/l Cl	59	11	54	21	11
Chromium	µg/l	29	<1.0	<1.0		
Cobalt	µg/l	29	<1.0	<1.0		
Conductivity	µS/cm @ 25	59	537	830	663	77
Copper	µg/l	29	1.4	20	5	7
Cyanide	0	18	<0.05	<0.05		
D.O.	% Saturation	55	10	94	47	18
Fluoride	mg/l	14	0.15	0.23	0	0
Iron	µg/l	29	19	28	24	6
Lead	µg/l	29	<1.0	<1.0		
Magnesium	mg/l Mg	29	11	28	20	6
Manganese	µg/l	29	<5.0	94		
Mercury	µg/l	14	<0.050	<0.050		
Molybdenum (µg/l)	0	29	1.4	2.6	2	1
Nickel	µg/l	29	<1.0	<1.0		
Ortho-Phosphate	mg/l P	14	<0.010	0.099		

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
pH	0	59	6.9	7.7	7	0
Potassium	mg/l	29	0.77	3.1	2	1
Residue on evaporation	mg/l	14	300	4577	1207	1545
Sampling Depth	m	59	3.8	26		
Selenium	µg/l	29	<1.0	<1.0		
Sodium	mg/l	29	8.5	44	22	9
Strontium	µg/l	29	140	450	221	75
Sulphate	0	29	3.9	57.8	19	16
Suspended Solids	mg/l	15	0	0		
Temp	°C	59	2	16.1	11	2
Thallium	µg/l	29	<1.0	<1.0		
T.O.C.	mg/l	59	1.5	34.1	5	5
T.O.N	mg/l N	29	0.26	0.85	1	0
Uranium	µg/l	29	<1.0	6.5	3	2
Vanadium	µg/l	29	<1.0	<1.0		
Zinc	µg/l	29	1	56	11	16

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 BH10 (0.37 mg/l N) in July. pH values analysed during the reporting period were all within the WTL of 7.0 to 8.0 with the exception of BH12 (6.9) in April.

Electrical Conductivity values were all below the WTL of 800 µS/cm throughout the year except for BH12 (830 µS/cm) in October. BH12 does not exceed the IGV 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 36 mg/l to 40 mg/l. BH5, BH10, BH13A, and BH17 downstream of the site also exceeded the WTL level throughout the monitoring period. The highest concentration was in BH5 (48 mg/l) in April. The results were all below the ECEO of 187.5 mg/l.

Chloride WTL level has been exceeded in BH20 in 3 of the 4 monitoring dates and range from 50 to 56 mg/l Cl.

Dissolved oxygen ranges from 12% O₂ to 112% O₂.

All boreholes were below WTL for TOC of 10 mg/l except BH12 (10.2 mg/l) in April.

7.5 ANNUAL MONITORING PARAMETERS

7.5.1 Up Gradient Annual Results

Annual analysis was undertaken at one location up gradient of the site (BH2A) on the 14th of April 2014 as per licence requirement.

Aluminium, Antimony Arsenic, Boron, Cadmium, Calcium, Chromium, Colbalt, 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 up-gradient boreholes.

Barium exceeded the IGV in BH1 (170 µg/l). A cyanide concentration of <0.05 mg/l was 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 IGV 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 (0.041 mg/l) was above the WTL and IGV of 0.03 mg/l.

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

- Strontium concentrations ranged from 140 to 280 µg/l,
- Uranium concentrations ranged from 1.4 to 2.3 µg/l,
- Total Oxidised Nitrogen (TON) concentrations ranged from <0.20 to 0.47 mg/l, and
- Alkalinity concentrations ranged from 236 to 328 mg/l.

The remaining parameters were below the lower limits of detection. Analysis for Polycyclic Aromatic Hydrocarbons (total 16 EPA PAHs) was <0.344 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 was < 1 µg/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 and herbicide and semi volatile organic compound parameters were carried out in BH2A in April. The results were either below the IGTV for those comparable or were below the lower detection limit for the analytical methodology used. Volatiles organic compound parameters were either below the IGTV for those comparable or were below the lower detection limit for the analytical methodology used.

7.5.2 Down Gradient Annual Results

Annual analysis for metals and non-metals were undertaken at one location up gradient of the site (BH9 and BH14) on the 14th of April 2014 as per licence requirement.

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

Barium exceeded the IGTV in a number of the down-gradient boreholes ranging from 150 to 240 µg/l. A cyanide concentration of <0.05 mg/l were 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 IGTV of 0.01 mg/l. The results are below the DWR of 0.05 mg/l. Manganese exceeded the IGTV at BH10 (59 µg/l) and BH13 (94 µg/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. BH6 (0.031 mg/l) and BH13 (0.099 mg/l) were above the WTL and IGTV of 0.03 mg/l.

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

- Strontium concentrations from 150 to 450 µg/l,
- Uranium concentrations ranged from <1.0 to 6.5 µg/l,
- Total Oxidised Nitrogen (TON) concentrations ranged from <0.20 to 0.85 mg/l, and
- Alkalinity concentrations ranged from 292 to 368 mg/l.

The remaining parameters were below the lower limits of detection. Analysis for Polycyclic Aromatic Hydrocarbons (total 16 EPA PAHs) was <0.344 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 concentrations were < 1 µg/l. This concentration is the limit of detection for the methodology used for Phenol however this is higher than the IGV of 0.5µg/l. Pesticide and herbicide and semi volatile organic compound parameters were below the IGV for those comparable or were below the lower detection limit for the analytical methodology used analysis. Volatiles organic compound parameters were either below the IGV for those comparable or were below the lower detection limit for the analytical methodology used.

7.5.3 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 2014 from surface water locations.

Table 7.7 Summary of 2014 Results from Surface Water Locations

	Units	No. of Samples	Minimum	Maximum	Mean	Standard Deviation
Ammonia	mg/l N	11	0.014	8	1	2
B.O.D.	mg/l O₂	11	1.1	7	3	3
C.O.D.	mg/l O₂	11	20	91	42	25
Chloride	mg/l Cl	8	15	45	31	10
Conductivity	µS/cm @ 25	11	382	679	592	101
D.O.	% Saturation	8	60	77	72	6
pH	0	11	7.6	8	8	0
Sulphate	mg/l SO₄	1	10	10	10	

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 0.093 to 0.73 mg/l N. An excess of 0.1 mg/l N can indicate agricultural contamination. Downstream samples of Ammonia (SW2A) were elevated at times (0.037 to 1.3 mg/l N).

Dissolved Oxygen (DO) content ranged from 60% to 72 %O₂ in SW1 and 75% to 76% O₂ in SW2A.

In general COD showed a lower concentration down-stream (<20 mg/l to 90 mg/l) from the site than those measured in the up-stream samples (<20 mg/l to 70 mg/l) except in January indicating possible contamination up-stream of the site. BOD also showed a lower concentrations down-stream (<1.0 mg/l to 1.1 mg/l) from the site than those measured in the up-stream samples (1.4 mg/l to <10 mg/l).

Total Suspended Solids (TSS) concentrations were below the SWQS of 50 mg/l during the monitoring

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

7.5.4 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 ranged from 68 to 76% saturation.

The Ammonia concentration of 7.8 mg/l in January exceeds the SWQS category of A2 (1.5 mg/l).

The BOD concentration in the SW3 ranged from 1.0 to <2.0 mg/l during this monitoring period, below the SWQS A1 classification of 5 mg/l.

Electrical Conductivity in SW3 ranged from 382 $\mu\text{S}/\text{cm}$ to 677 $\mu\text{S}/\text{cm}$, which is below the SWQS of 1000 $\mu\text{S}/\text{cm}$. The Chloride level of 15 mg/l to 42 mg/l was below the SWQS of 250 mg/l for this monitoring period.

Total Suspended Solids concentration of <2 to <4 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 22 mg/l to 29 mg/l during this monitoring period below the SWQS classification of 40 mg/l.

7.5.5 Hydrogeological Risk Assessment

A Hydrogeological Risk Assessment was undertaken in 2015 and a conceptual site model has been developed for the site. The report found that groundwater hydrochemistry data between 2006 and 2013 confirms that the landfill does not appear to be impacting on the underlying aquifer. In the main, concentrations of indicative parameters of contamination are broadly lower or similar to up gradient concentrations and confirm that the landfill is not impacting on the underlying aquifer body. There are no sustained upward trends in contaminant export from the site.

Surface water hydrochemistry indicates that the landfill is not impacting on the quality of the adjacent stream which flows into White river. Down gradient sampling locations recorded concentrations of selected parameters lower or similar to up gradient sampling locations which are attributed to an up gradient agricultural source. Leachate appears to be contained within the landfill. No evidence of leachate penetrating the engineered liner or natural clay layer is evident.

7.6 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 at a number of locations during the year. The maximum levels were 5.8 % v/v at PZ46 in March.

Two engines have been installed at the facility to generate power to the national grid. These were commissioned in June 2014. The two enclosed gas flares with a combined capacity of 2,600m³/hr remain on site.

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

7.7 MONITORING OF EMISSIONS FROM LANDFILL GAS FLARE/ENGINES

Air emission 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, VOC, HC, HF and SO₂ emissions from both flares were within the emission limit values specified in Waste licence W060-03.

Air emission monitoring was also undertaken on the landfill gas engines. TPM, NO_x as NO₂, CO, TOC, HC, HF and SO₂ emissions from both engines were within the emission limit values specified in Waste licence W060-03.

7.8 NOISE MONITORING

The measurements were completed on Monday 1st and Tuesday 2nd of December 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) 63-52dBA; Evening time: LAeq (T 15 min) 51-49dBA; Night time: LAeq (T 15 min) 39-38dBA
NSL 2:	Daytime: LAeq (T 15 min) 54-52dBA; Evening time: LAeq (T 15 min) 51dBA; Night time: LAeq (T 15 min) 40-37dBA
NSL 3:	Daytime: LAeq (T 15 min) 59-57dBA; Evening time: LAeq (T 15 min) 57-56dBA; Night time: LAeq (T 15 min) 44-42dBA
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) 52-47dBA; Evening time: LAeq (T 15 min) 52-50dBA; Night time: LAeq (T 15 min) 43-38dBA

NSL 6: Daytime: LAeq (T 15 min) 60-43dBA;
 Evening time: LAeq (T 15 min) 59-49dBA;
 Night time: LAeq (T 15 min) 45-40dBA
 Flares: Daytime: LAeq (T 15 min) 58-57dBA;
 Night time: LAeq (T 15 min) 59-58dBA

The noise report indicates that since the cessation of the site as a landfill site in 2013 noise associated with landfill activities is minimal. The main source of operational noise relates to flares which operate on a 24-hour basis and occasional removal of leachate (during the day time period) for treatment at Drogheda WWTP. The flare/engines are barely audible and are considered to be unobtrusive during the extremely quiet night time period at Locations N2 and N5.

Third Octave Band analysis shows there was no tonal noise detected at any of the locations.

7.9 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. Dust monitoring was carried out on two occasions during 2014 (15th January and 14th October).

Table 7.8 Results from Dust Monitoring Analysis, Whiteriver Landfill Site

Sampling Point	DG1	DG2	DG3	DG4
January	131.1	140.7	264.9	152.3
October	33.4	6.1	151.2	24.9

As observed in Table 7.8 the dust monitoring results show that Whiteriver Landfill Site is compliant with the conditions of the Waste Licence, with no exceedances above the limit of 350 mg/m²/day recorded.

7.10 METEOROLOGICAL MONITORING

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

7.11 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.

7.12 ODOUR MONITORING

Total Volatile Organic compound monitoring has been undertaken at the site on a bi annual 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 have been submitted to EPA.

7.13 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 2013. 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	Unit	Annual Total 2013	Annual Total 2014	+/- % compared to previous reporting year
Light fuel oil (Diesel)	kWh	1,998,000	1,400	-99
Electricity used	kWh	212,000	120,000	-43
Water	m ³		110	

9 PROPOSED DEVELOPMENT OF THE FACILITY AND TIMESCALE OF SUCH DEVELOPMENT

The site is now closed. Restoration of the site was completed in 2014. Landfill gas engines have been operational since July 2014. The site is currently exporting 0.8 to 1MW to the grid. It is proposed to plant another 10,000 trees on the undeveloped Phase 6 of the landfill (6,000 trees were planted on the site in 2013) however to date approval to plant has not been granted by Dept Agriculture, Food and the Marine.

There is no further proposed development for the facility in 2015.

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 2014 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 15,626 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 2014

Month	Weight Volume (m ³)
January	3103
February	5808
March	2992
April	2423
May	1791
June	1124
July	693
August	1246
September	905
October	608
November	2810
December	1556
Total	25,059

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 site has been fully restored. This was completed in 2014.

11.2 TIMESCALE FOR DEVELOPMENT WORKS PROPOSED DURING THE COMING YEAR

It is proposed to plant another 10,000 trees on the undeveloped Phase 6 of the landfill however to date approval to plant has not been granted by Dept Agriculture, Food and the Marine

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

A topographical survey was carried out in June 2014. 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 782 m³/hr in 2014.

There were two landfill gas flares and two engines in operation at various times at Whiteriver landfill site in 2014. The two engines are now running continuous with flare(s) providing backup when required

The EPA landfill gas survey was also completed for 2014. The average flow rate and methane content for the engines in 2014 is provided in Table 13.1 below.

Table 13.1 Engines

Engine	Average flow rate m ³ /hr	Methane content %
Engine 1	536	51
Engine 2	356	51

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 2014 was 25,059 m³. A water balance calculation has been undertaken. This estimates the annual leachate production to be approximately 15,626 m³ as discussed in Section 10.

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

Two engines (0.80 Mw and 0.60 Mw) have been installed at the facility to generate power to the national grid. These were commissioned in June 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 15,626 2 m³. The difference in actual and predicted quantities month to month may be partly due to operation during capping works at the site.

17 SCHEDULE OF ENVIRONMENTAL OBJECTIVES AND TARGETS FOR THE FORTHCOMING YEAR

17.1 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. *Two engines* (0.80 Mw and 0.60 Mw) have been installed at the facility to generate power to the national grid. These were commissioned in June 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. Not applicable. The site is now closed.
- EMP No:8 Minimise the release of landfill gases. Final capping works has been undertaken. This was completed in June 2014.
- EMP No:10 Meet the requirements of the new Environmental Objectives (Groundwater) Regulations 2010. A Hydro geological risk assessment was undertaken in 2014/2015 on foot of a technical amendment to the waste license (EPS Ref W0060-03), issued to Louth County Council (LCC) as per a notification issued by the EPA. Please refer to section 7.5.5 of this report. .
- 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. It is proposed to plant another 10,000 trees on the undeveloped Phase 6 of the landfill however to date approval to plant has not been granted by Dept Agriculture, Food and the Marine.

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 2014.

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

One complaint was received in 2014. This related to odour. Restoration works have now been completed on the site. There were no incidents reported for 2014.

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 and has been restored.

Odour and dust monitoring is currently still being undertaken at the facility. Total Volatile Organic compound monitoring was undertaken at the site on a bi annual basis in 2014.

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.

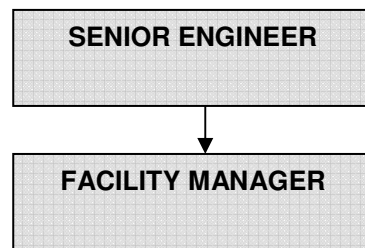


Figure 21.1 Management Structure at Whiteriver Landfill Site

22 OTHER INFORMATION

22.1 REPORT ON TRAINING OF STAFF TRAINING

No staff training was undertaken in 2014. Site in now closed.

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

No wastes were recovered on site. The site in now closed.

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

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.

The Regions initial task is to prepare a new Waste Plan which is scheduled for completion in early 2015. This Plan will set the key objectives and targets for the Region to be achieved over the next 6 years.

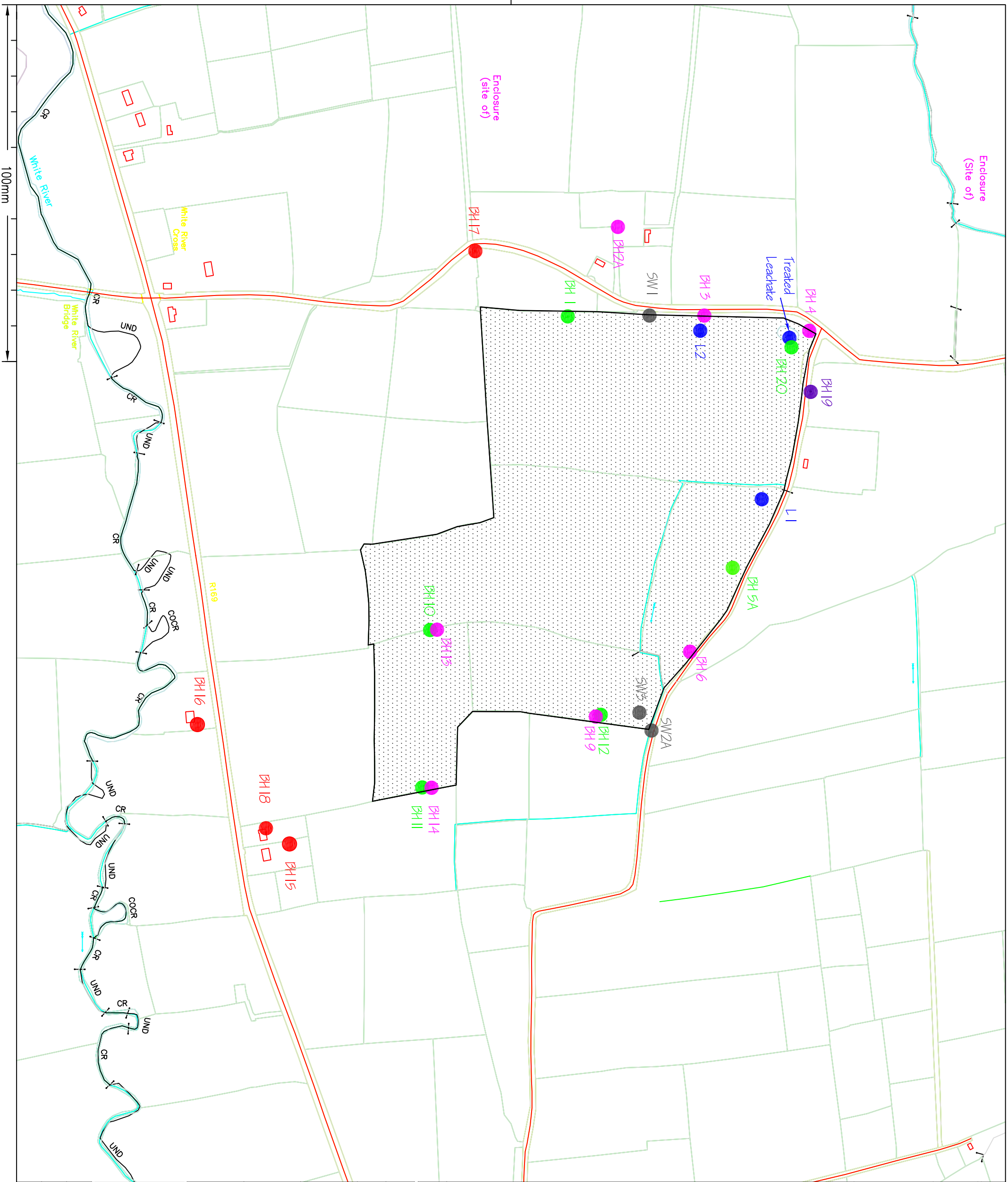
At present a Draft Waste Plan has been prepared. Whiteriver landfill site is listed under local authority landfill capacity closed in the region since 2000.

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

The site in now closed.

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	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

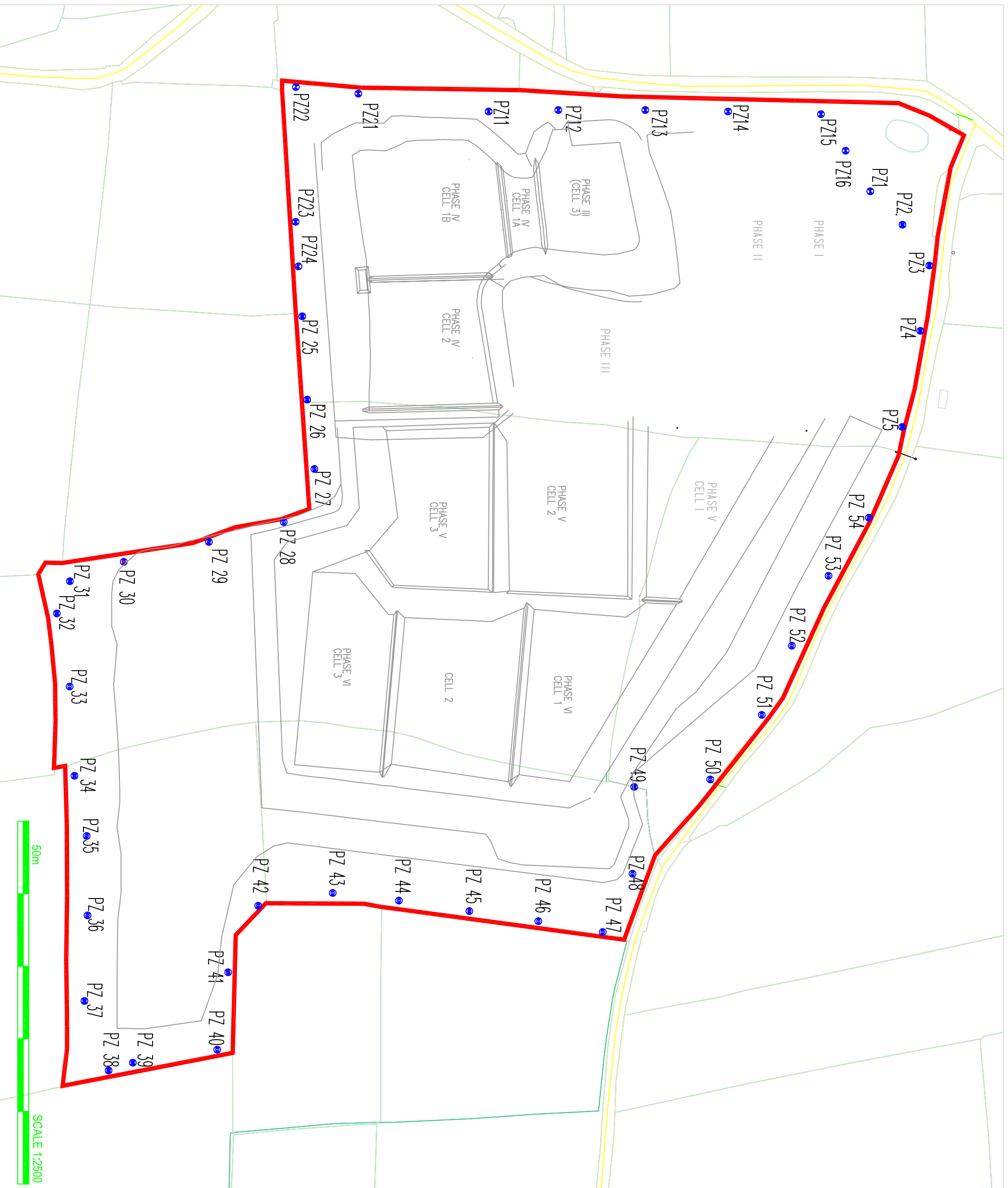
PROJECT
WHITERIVER LANDFILL SITE

TITLE
MONITORING BOREHOLES

RPS Consulting Engineers

TEL: 074 91 61927 WWW.RPSGROUP.COM/IRELAND FAX: 074 91 61928
 THE ENTERPRISE FOUND BUSINESS CENTRE, BALLINAMINE, LETTERKENNY, CO. DUBLIN 14

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



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.
3. Issue of Drawings:
Hard copies, dwf and pdf will form a controlled issue of the drawing. All other formats (img, 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.

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PZ27 Landfill Gas Piezometer

Rev	amendments	drawn date	checked date

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

Client: LOUTH COUNTY COUNCIL

Project: Whiteriver Landfill Site

Title: Landfill Gas Piezometer

Drawing Status	Sheet Size	Drawing Scale
Preliminary	A3	1:2500

Drawing Number: IBR0138/100 Rev: 0

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

APPENDIX B

PRTR REPORTING



Environmental Protection Agency

[Guidance to completing the PRTR workbook](#)

AER Returns Workbook

Version 1.1:18

REFERENCE YEAR	2014
-----------------------	------

1. FACILITY IDENTIFICATION

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

Classes of Activity

No.	class name
-	Refer to PRTR class activities below

Address 1	Whiteriver & Gunstown Townland
Address 2	Dunleer
Address 3	
Address 4	
	Louth
Country	Ireland
Coordinates of Location	-6.52774 53.6647
River Basin District	GBNIENB
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	Executive Scientist
AER Returns Contact Telephone Number	042 9392920
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	2
User Feedback/Comments	Row 11 Releases to Air The figure for 1,1,1 Trichloroetane has decreased in the model predictions to 16.5kg. It is expected this is due to the site being closed and accepting no more waste in 2014 and that it is all capped since mid 2014. Row 12 HCFC'S also experienced a similar drop. Row 21 CFC also experienced a similar drop.
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)?	
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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_2014(1).xls | Return Year : 2014 |

03/04/2015 09:31

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	0.0	0.0	0.0
01	Methane (CH4)	C	OTH	Flare monitoring data	0.0	1180000.0	0.0	1180000.0
55	1,1,1-trichloroethane	C	OTH	Gassim model	0.0	116348.0	0.0	116348.0
04	Hydro-fluorocarbons (HFCs)	C	OTH	Gassim model	0.0	16.5	0.0	16.5
					0.0	18.2	0.0	18.2

* 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	0.0	0.0	0.0
					0.0	18.2	0.0	18.2

* 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)	2522739.0	C	OTH	Gassim model and on site records	N/A
Methane flared	1175150.0	M	OTH	Records - gas survey report	0.0 (Total Flaring Capacity)
Methane utilised in engine/s	1231241.0	M	OTH	Records - gas survey report	0.0 (Total Utilising Capacity)
Net methane emission (as reported in Section A above)	116348.0	C	OTH	Balance	N/A

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR# : W0060 | Facility Name : Whiteriver Landfill Site | Filename : W0060_2014(1).xls | Return Year : 2014 |

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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	Haz Waste : Address of Next Destination Facility	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		Haz Waste : Name and Licence/Permit No of Recover/Disposer	Non Haz Waste: Address of Recover/Disposer		
Within the Country	19 07 03	No	25059.0	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	Whiteriver 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 ug/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
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		
Colbalt	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/1 CaCO3 Hard Water 6.0< pH < 9.0 Water hardness > 100 mg/1 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									
Sodium	mg/l	150	150	150	200	200			
Strontium									
Sulphate	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 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	Date	Date	
Units																										
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	14-Apr-14	15-Jul-14	14-Oct-14
Aluminium	µg/l							324				288				340				296				312		
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	<0.03	0.14	<0.03	0.094	0.09	0.22	<0.020	0.029	0.039	0.033
Antimony	µg/l															<0.5				<0.5				<1.0		
Arsenic	µg/l															<0.5				<0.5				<1.0		
Barium	µg/l							<1								0.6				0.62				<1.0		
Beryllium	µg/l															<0.5				<0.5				<1.0		
B.O.D.	mg/l O2			<50																						
Boron	µg/l	1000						12.5				15.3			14.1				11					15		
Cadmium	µg/l	5		<0.1				<0.1				<0.1			<0.1				<0.1				<0.020			
Calcium	mg/l Ca	200		63.64				63.33				69.74			65.21				62.35					68		
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	17	17	14	16
Chromium	µg/l	30		6.2				<1				<0.5			<0.5				<0.5				<1.0			
Cobalt	µg/l															<0.5				<0.5			<1.0			
Coliform Bacteria	no/100ml		4	9	130	34	0	7	18					20	0				1	1	61					nm
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	615	612	610	613
Copper	µg/l	30		1.2				1.6				1.5			0.7				1.32					4.3		
Cyanide	mg/l	0.01		<0.05				<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	29	19	40	27
E. Coli	no/100ml		0	0	0	0	0	0	0					1	0				0	0	0					nm
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150			1		0.11				0.17		
Iron	µg/l			101.8				<10				<10			<10				37.66					28		
Lead	µg/l	10		<1				<1				<0.5			<0.5				<0.5				<1.0			
Magnesium	mg/l Mg	50		30.62				31.3				34.16			31.42				30.6					28		
Manganese	µg/l			4.6				2.5				2.9			2.5				5				<5.0			
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05				<0.05				<0.050			
Molybdenum (µg/l)																<0.5				<0.5			<1.0			
Nickel	µg/l	20		<1				<1				<0.5			<0.5				0.51				<1.0			
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02				0.005				<0.010			
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	7.5	7.6	7.6	7.5	7.5	7.1	7.5	7.4	7.4	7.5	7.4	7.4	7.5
Potassium	mg/l	5		1				1.06				1.13			1.16				1.29					1.4		
Residue on evaporation	mg/l			354				332				322			337				338					369		
Sampling Depth	m		nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	0	nm	nm	nm	nm	nm	nm	nm	nm
Selenium	µg/l														<0.5				<0.5				<1.0			
Silver	µg/l														nm				nm							
Sodium	mg/l	150		20.75				19.78				21.1			20.11				18.87					21		
Strontium	µg/l														226.68				222.14					220		
Sulphate	µg/l	50		4.4				4.9				4.8			5.1				5.86					4.9		
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	6.2	10.7	13.8	13
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	10:30	10:30	10:45	10:30
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	<1.5	2.4	<1.5
T.O.N	mg/l N			0.32				0.26				0.46			0.37				0.21				0.47			
Total Suspended Solids	mg/l																									
Uranium	µg/l															1.81				1.86				1.9		
Vanadium	µg/l														<0.5				<0.5				<1.0			
Zinc	µg/l	100		2				2.6				4.9			1.9				2.74				2.8			

Whiteriver Landfill Site																									
GROUNDWATER QUALITY RESULTS																									
Monitoring Point:																									
BH3																									
UPSTREAM 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	Date	Date
			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	14-Apr-14	15-Jul-14	14-Oct-14
Alkalinity	mg/lCaCO3	NAC	328				308				308			320					308				328		
Aluminium	µg/l													<5					<5				<10.0		
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	<0.03	0.17	0.04	0.008	0.03	0.06	<0.020	<0.020	0.029	0.036	
Antimony	µg/l													<0.5					<0.5				<1.0		
Arsenic	µg/l													0.69					0.62				<1.0		
Barium	µg/l													67					69.7				70		
Beryllium	µg/l													<0.5					<0.5				<1.0		
B.O.D.	mg/l O2		<50																						
Boron	µg/l	1000					17.6				18			18.8					16				18		
Cadmium	µg/l	5	0.2				<0.1				<0.1			<0.1					<0.1				0.02		
Calcium	mg/l Ca	200	102.59				78.89				72.76			73.59					73.05				78		
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	15	13	15
Chromium	µg/l	30	4.8				<1				<0.5			<0.5					0.54				<1.0		
Cobalt	µg/l													<0.5					<0.5				<1.0		
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	618	618	624
Copper	µg/l	30	4.5				<1				<0.5			2.7					0.64				<1.0		
Cyanide	µg/l	0.01	<0.05				<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	30	35	
E. Coli	no/100ml		<10																						
Fluoride	mg/l	1	<0.150				<0.150				<0.150			<0.150					0.12				0.15		
Iron	µg/l		186.8				<10				31.7			<10					<10				<10.0		
Lead	µg/l	10	<1				<1				<0.5			<0.5					<0.5				<1.0		
Magnesium	mg/l Mg	50	27.77				26.64				25.92			25.74					25.33				22		
Manganese	µg/l		791.9				17.3				9.7			10.9					7.68				14		
Mercury	µg/l	1	<0.1				<0.1				<0.05			<0.05					<0.05				<0.050		
Molybdenum (µg/l)														<0.5					<0.5				<1.0		
Nickel	µg/l	20	2.8				<1				<0.5			1.1					<0.5				<1.0		
Ortho-Phosphate	mg/l P	0.03	0.04				0.04				0.04			0.05					0.042				0.041		
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	7.5	7.5	7.2		7.6	7.5	7.4	7.5	7.5	7.4	7.5
Potassium	mg/l	5	1.25				1.4				1.38			1.6					1.7				2		
Residue on evaporation	mg/l		495				357				348			370					352				363		
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	nm	nm	nm	nm
Selenium	µg/l													<0.5					<0.5				<1.0		
Silver	µg/l													nm					nm						
Sodium	mg/l	150	22.77				21.71				20.6			21.03					20.37				23		
Strontium	µg/l													280.04					286.38				280		
Sulphate	µg/l	50	51.3				17.6				4.9			4.6					5.43				5.3		
Suspended Solids	mg/l																								
Temp	°C		11	12	12	8.2	10.3	10	13	10.3	11	13.7	12	10	10	11	10	10	13.5	12.3	10	11.1	11	11	
Thallium	µg/l										<0.1								<0.1				<1.0		
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	11:50	11:15	11:05
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	<1.5	<1.5	<1.5		0.26	<1.5	<1.5	<1.5	<1.5	2.8	1.5
T.O.N	mg/l N		0.24				0.21				0.28			0.2					0.19				0.31		
Total Suspended Solids	mg/l																								
Uranium	µg/l													2.23					2.37				2.3		
Vanadium	µg/l													<0.5					<0.5				<1.0		
Zinc	µg/l	100	11.9				10.7				13			14.2					3.11				7.6		

PARAMETERS		Whiteriver Landfill Site																								
		GROUNDWATER QUALITY																								
Monitoring Point:		RESULTS																								
		BH5A																								
		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	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	14-Apr-14	15-Jul-14	14-Oct-14
Aluminium	µg/l			270				240				192				232				210			274			
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	<0.020	<0.020	
Antimony	µg/l															<5				<5			<10.0			
Arsenic	µg/l															<0.5				<0.5			<1.0			
Barium	µg/l															81.4				91.8			94			
Beryllium	µg/l															<0.5				<0.5			<1.0			
B.O.D.	mg/l O2			<50																						
Boron	µg/l	1000						17				21.5				15.9				14			13			
Cadmium	µg/l	5		0.1				<0.1				<0.1				<0.1				<0.1			<0.020			
Calcium	mg/l Ca	200		114.58				103.29				87.15				74.9				74.89			87			
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	48	28	33
Chromium	µg/l	30		11.9				4.6				0.6				<0.5				<0.5			<1.0			
Cobalt	µg/l															<0.5				<0.5			<1.0			
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	630	608	630
Copper	µg/l	30		15.2				6.2				1.3				2.5				1.71			2			
Cyanide	µg/l	0.01		<0.05				<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	53	46	50
E. Coli	no/100ml		1	<10																						
Fluoride	mg/l	1		0.19				0.23				0.19				0.19				0.19			0.23			
Iron	µg/l			6848.9				3272.3				312.1				<10				<10			<10.0			
Lead	µg/l	10		14.4				5.2				<0.5				<0.5				<0.5			<1.0			
Magnesium	mg/l Mg	50		17.1				15.01				12.9				10.81				11.66			12			
Manganese	µg/l			592.7				263.2				12.3				<1				<1			<5.0			
Mercury	µg/l	1		<0.1				<0.1				<0.05				<0.05				<0.05			<0.050			
Molybdenum (µg/l)																0.6				<0.5			<1.0			
Nickel	µg/l	20		22.6				9.6				<0.5				0.7				1.06			<1.0			
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02				<0.02				0			<0.010			
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	7.6	7.5	7.5
Potassium	mg/l	5		1.3				1.38				1.31				1.41				1.6			1.5			
Residue on evaporation	mg/l			2103				2099				456				956				975			664			
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	6.9	6.9	6.8
Selenium	µg/l															<0.5				<0.5			<1.0			
Silver	µg/l															nm				nm						
Sodium	mg/l	150		30.55				29.11				29.31				26.89				27.31			31			
Strontium	µg/l															143.55				151.72			150			
Sulphate	µg/l	50		56.3				42				42				32.3				31.58			44			
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	10.8	10	11
Thallium	µg/l															<0.1				<0.1			<1.0			
Time			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	12:10	10:25	10:10
Tin	µg/l															2.02				nm						
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	4.6	5.1	3.8
T.O.N	mg/l N			0.16				<0.08				0.08				0.17				0.07			<0.20			
Total Suspended Solids	mg/l																									
Uranium	µg/l															0.99				0.89			<1.0			
Vanadium	µg/l															0.64				<0.5			<1.0			
Zinc	µg/l	100		32.5				17.3				4.2				3.9				4.75			11			
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	100.98	100.98	101.08

PARAMETERS		Whiteriver Landfill Site																								
		GROUNDWATER QUALITY																								
Monitoring Point:		RESULTS																								
		BH10																								
		DOWNSTREAM OVERBURDEN																								
		Units	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
		Trigger Level	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	14-Apr-14	15-Jul-14	14-Oct-14
Alkalinity	mg/lCaCO3	NAC		294				284				308			270					288				304		
Aluminium	µg/l														<5					<5				<10.0		
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	<0.020	0.37	<0.020
Antimony	µg/l														<0.5					<0.5				<1.0		
Arsenic	µg/l														<0.5					2.41				<1.0		
Barium	µg/l														209.3					318.97				240		
Beryllium	µg/l														<0.5					<0.5				<1.0		
B.O.D.	mg/l O2			<50																						
Boron	µg/l	1000						<10				11.2			<10					<10				11		
Cadmium	µg/l	5		<0.1				0.1				<0.1			<0.1					<0.1				<0.020		
Calcium	mg/l Ca	200		132.91				114.18				112.14			102.54					121.1				130		
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	26	21	21
Chromium	µg/l	30		6.9				5.4				1.9				<0.5								<1.0		
Cobalt	µg/l															<0.5								<1.0		
Coliform Bacteria	no/100ml		579	52																0.84						
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	717	781	754
Copper	µg/l	30		5.3				9				1.4			1.6					<0.5				<1.0		
Cyanide	µg/l	0.01		<0.05				<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	38	50	58
E. Coli	no/100ml		3	<10																						
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150					0.12				0.16		
Iron	µg/l			1576.6				4062.2				1001.3			<10					12.92				<10.0		
Lead	µg/l	10		4.8				10.1				1.3			<0.5					<0.5				<1.0		
Magnesium	mg/l Mg	50		13.19				12.43				13.17			7.91					12.6				13		
Manganese	µg/l			735.7				686.1				673.5			12.1					1779.98				59		
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05				<0.050		
Molybdenum (µg/l)															<0.5					0.82				<1.0		
Nickel	µg/l	20		6.7				10.9				0.8			<0.5					4.11				<1.0		
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02					0.002				<0.010		
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	7.2	7	7.2
Potassium	mg/l	5		1.25				1.26				1.22			1.08					1.64				1.4		
Residue on evaporation	mg/l			765				941				15250			741					542				4577		
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	4.4	4.8	4.2
Selenium	µg/l														<0.5					<0.5				<1.0		
Silver	µg/l														<0.5					nm						
Sodium	mg/l	150		15.97				11.59				12.91			8.53					12.74				14		
Strontium	µg/l														159.17					205.79				200		
Sulphate	µg/l	50		92				60.6				36.7			31.5					39.98				57.8		
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	9.8	11	11
Thallium	µg/l														<0.1					<0.1				<1.0		
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	11.30	10.55	10.50
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	12.8	34.1	2.7
T.O.N	mg/l N			0.46				0.13				0.18			1.4					0.54				0.77		
Total Suspended Solids	mg/l																									
Uranium	µg/l														0.7					2.01				1.7		
Vanadium	µg/l														<0.5					<0.5				<1.0		
Zinc	µg/l	100		11.6				19.3				3.5			1.9					0.95				2.2		
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	101.0	101.9	101.8	101.2	100.8	101.4

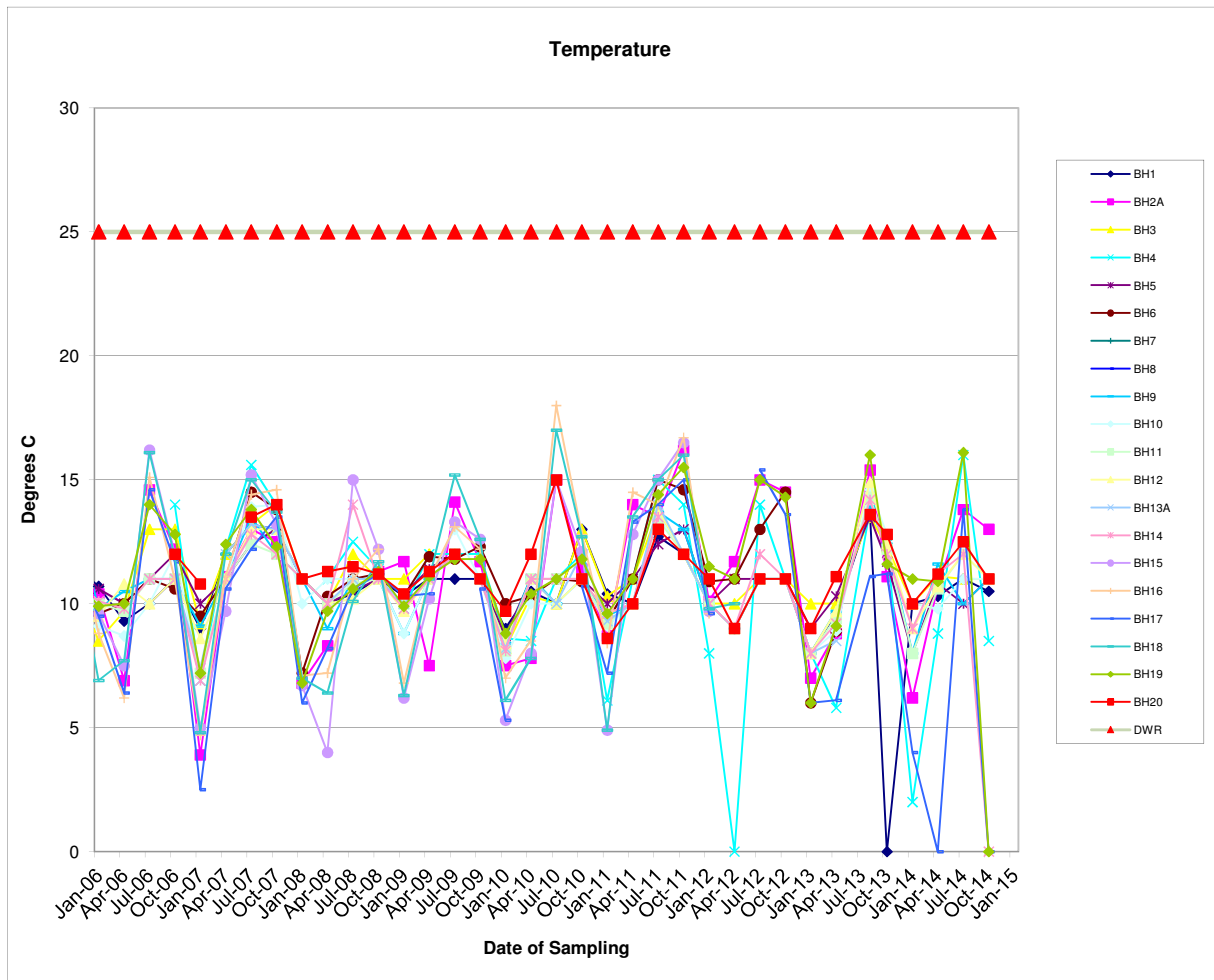
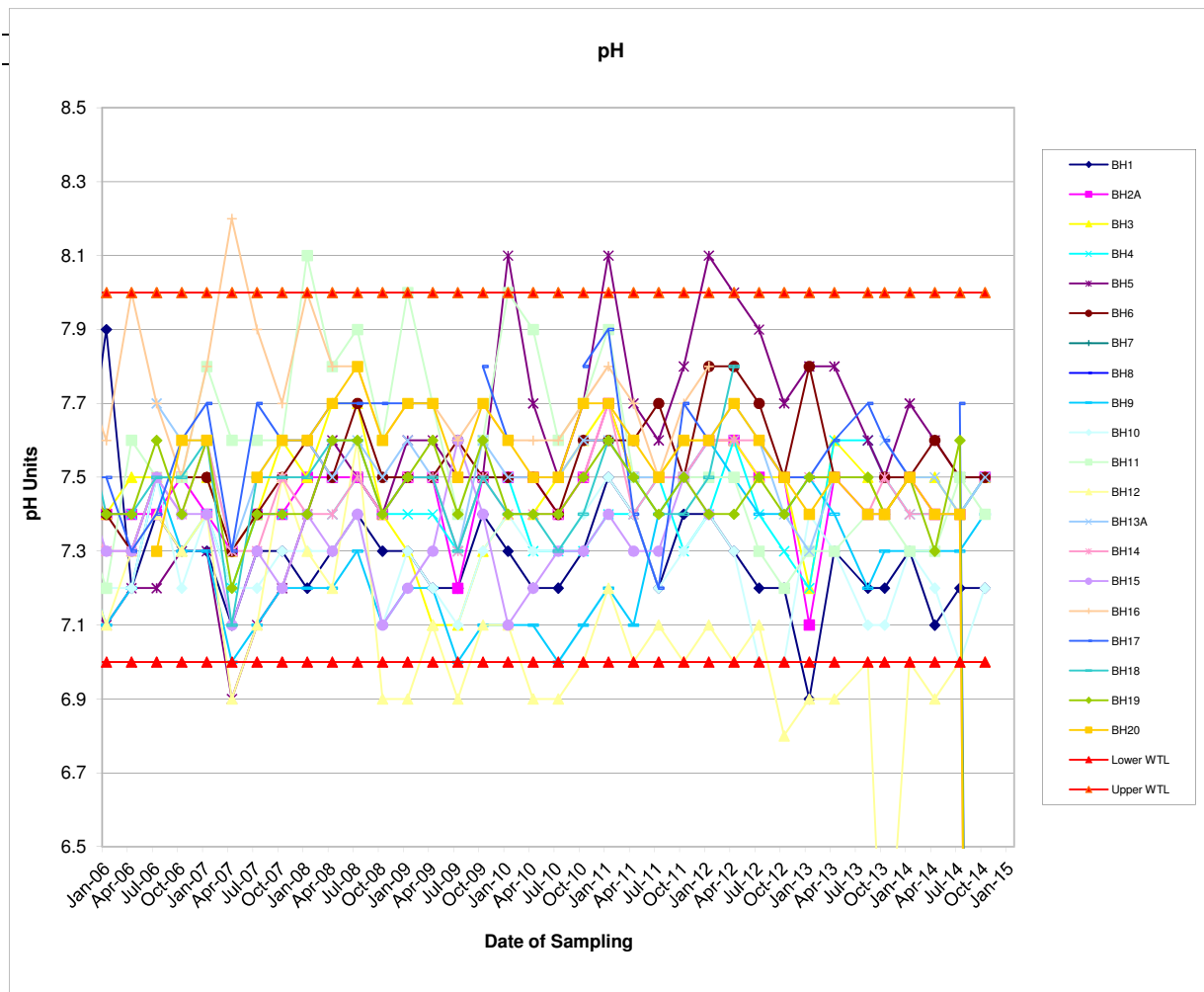
PARAMETERS		Whiteriver Landfill Site																										
		GROUNDWATER QUALITY																										
Monitoring Point:		RESULTS																										
		BH11																										
		DOWNSTREAM OVERBURDEN																										
	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	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	14-Apr-14	15-Jul-14	14-Oct-14		
Aluminium	µg/l			280				236				296			328				364					340				
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	<0.020	<0.020	<0.020			
Antimony	µg/l														<0.5				<0.5				<1.0					
Arsenic	µg/l														<0.5				<0.5				<1.0					
Barium	µg/l														141.7				222.37				170					
Beryllium	µg/l														<0.5				<0.5				<1.0					
B.O.D.	mg/l O2			<50																								
Boron	µg/l	1000						10.1				28.8			25.2				19.94				30					
Cadmium	µg/l	5		<0.1				<0.1				0.2			<0.1				<0.1				<0.020					
Calcium	mg/l Ca	200		67.21				37.04				75.87			78.74				105.54				92					
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	15	13	16		
Chromium	µg/l	30		2.1				<1				0.5			<0.5				0.56				<1.0					
Cobalt	µg/l														<0.5				<0.5				<1.0					
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	677	697	698		
Copper	µg/l	30		1.9				1.8				1.2			<0.5				0.55				<1.0					
Cyanide	µg/l	0.01		<0.05				<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	25	94	71		
E. Coli	no/100ml		0	0																								
Fluoride	mg/l	1		<0.150				0.17				<0.150			<0.150				0.19				0.16					
Iron	µg/l			119.4				147.8				801.8			<10				<10				<10.0					
Lead	µg/l	10		<1				<1				1.1			<0.5				<0.5				<1.0					
Magnesium	mg/l Mg	50		14.13				11.16				22.98			20.87				24.31				24					
Manganese	µg/l			108.7				212.9				154.1			19.7				4.31				<5.0					
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05				<0.05				<0.050					
Molybdenum (µg/l)																												
Nickel	µg/l	20		1.1				1.3				<0.5			<0.5				0.73				<1.0					
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02				0.004				<0.010					
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	7.5	7.3	7.2	7.3	7.3	7.4	7.4	7.3	7.3	7.5	7.4		
Potassium	mg/l	5		1.25				1.4				1.39			1.35				1.7				1.9					
Residue on evaporation	mg/l			376				380				464			426				655				689					
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	9.6	9.5	9.5		
Selenium	µg/l														<0.5				<0.5				<1.0					
Silver	µg/l														<0.5				nm									
Sodium	mg/l	150		46.71				72.3				32.36			24.5				22.12				29					
Strontium	µg/l														204.5				261.25				220					
Sulphate	mg/l	50		25.4				42.1				15.7			11.2				12.23				12.9					
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	10.6	12	11		
Thallium	µg/l														<0.1				<0.1				<1.0					
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	11:10	10:40	10:40		
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	2.3	4.3	2		
T.O.N	mg/l N			0.29				0.21				0.75			0.64				0.28				0.85					
Total Suspended Solids	mg/l																											
Uranium	µg/l														2.52				3.61				3					
Vanadium	µg/l														<0.5				<0.5				<1.0					
Zinc	µg/l	100		4.5				14.2				23.7			2.5				1.05				1.2					
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	86.06	86.16	86.16		

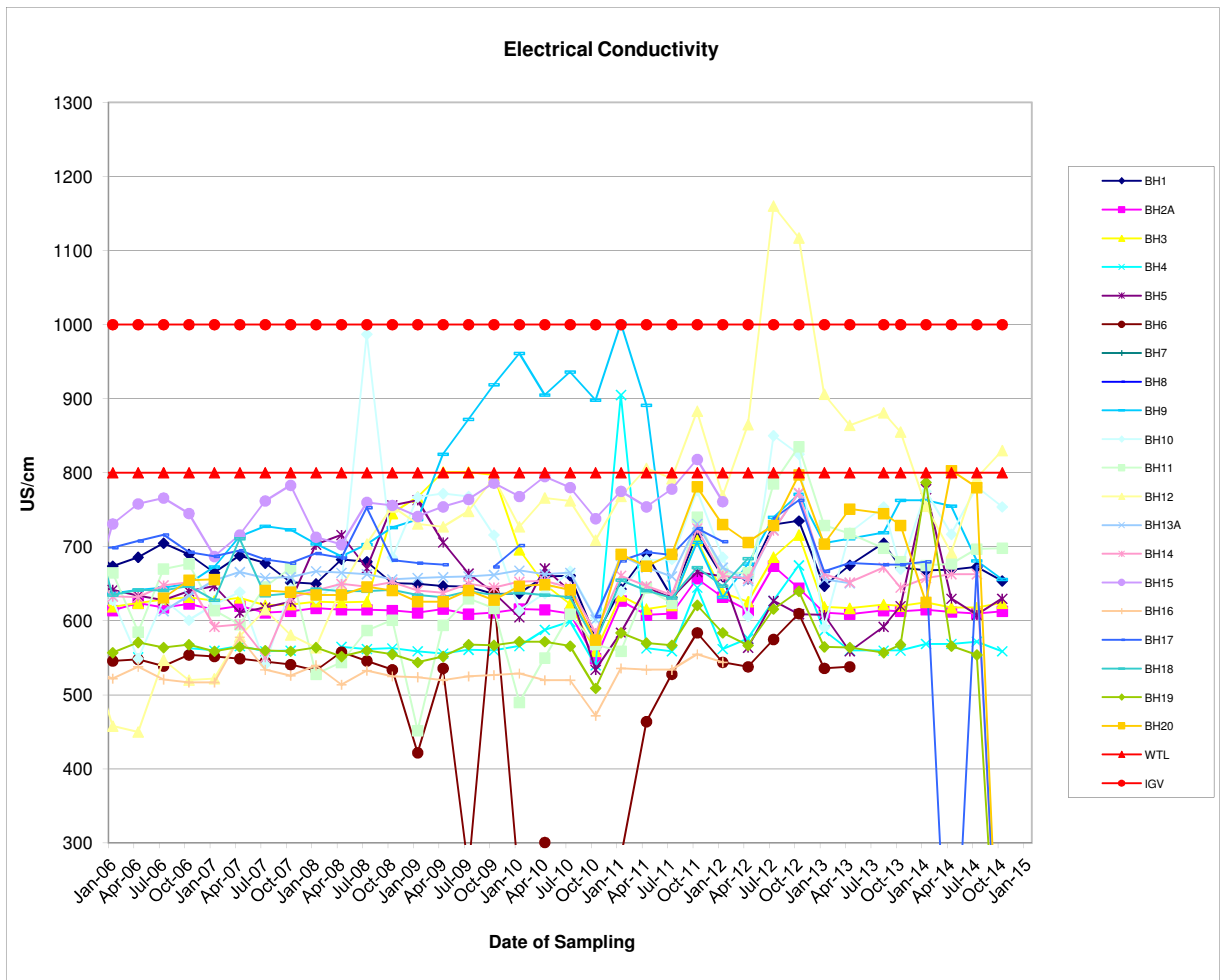
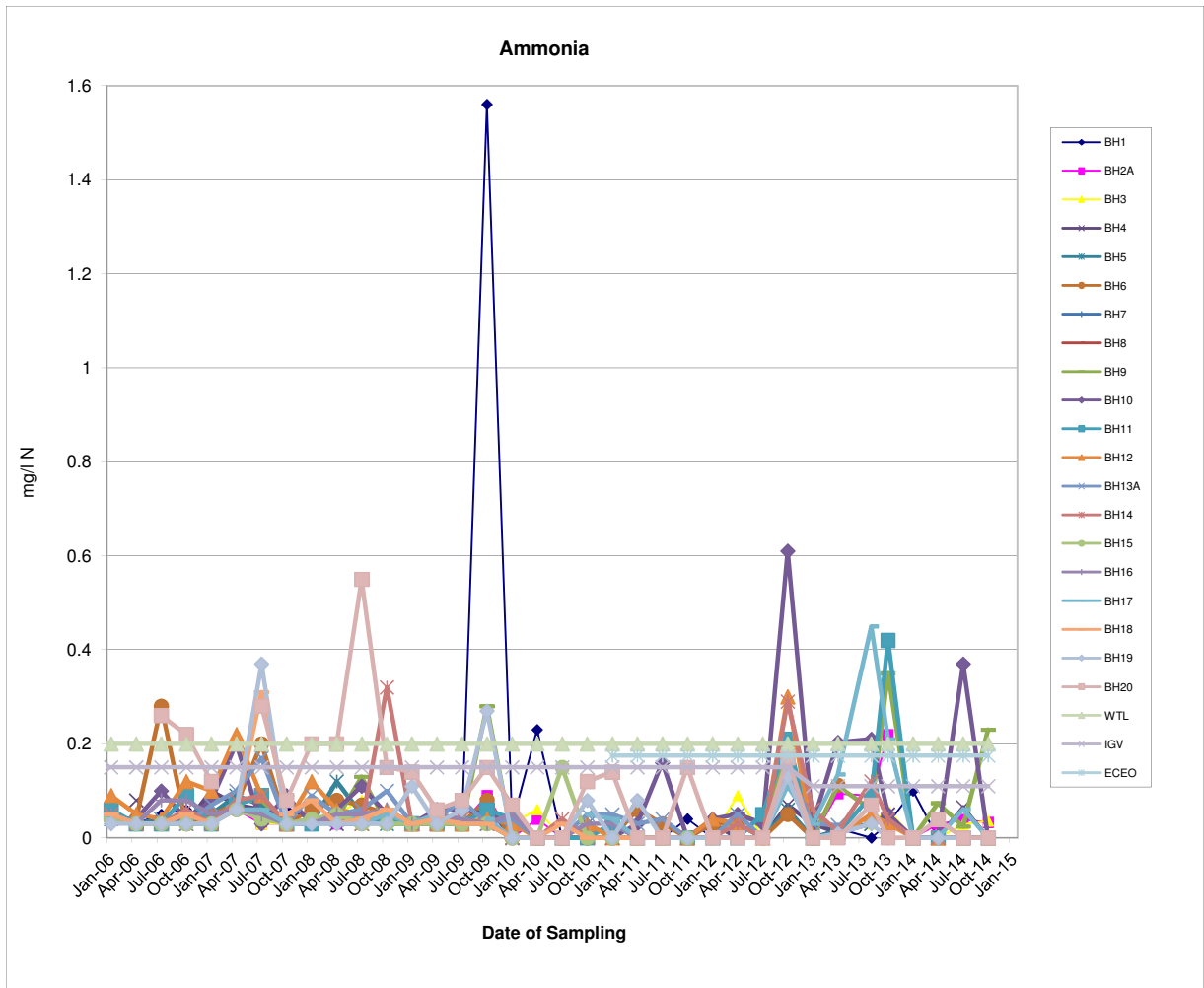
PARAMETERS		Whiteriver Landfill Site																								
		GROUNDWATER QUALITY																								
Monitoring Point:		RESULTS																								
		BH12																								
		DOWNSTREAM OVERBURDEN																								
Units		Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	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	14-Apr-14	15-Jul-14	14-Oct-14
Aluminium	µg/l			348				396				324				408				400				352		
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	<0.020	<0.020	<0.020
Antimony	µg/l															<5				<5				<10.0		
Arsenic	µg/l															<0.5				<0.5				<1.0		
Barium	µg/l															0.52				0.62				<1.0		
Beryllium	µg/l															242				263.31				190		
B.O.D.	mg/l O2			<50												<0.5				<0.5				<1.0		
Boron	µg/l	1000						<10				10.9				10.1				<10				<10.0		
Cadmium	µg/l	5		0.3				0.2				0.4				<0.1				<0.1				0.02		
Calcium	mg/l Ca	200		135.76				143.83				141.79				139.21				168.97				130		
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	12	11	15
Chromium	µg/l	30		5.5				1.1				1.9				<0.5				1.03				<1.0		
Cobalt	µg/l															<0.5				<0.5				<1.0		
Coliform Bacteria	no/100ml		>2420	135																						
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	692	793	830
Copper	µg/l	30		5.5				2.6				1.9				2.2				1.71				2.2		
Cyanide	µg/l	0.01		<0.05				<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	49	77	70
E. Coli	no/100ml		0	<10																						
Fluoride	mg/l	1		<0.150				<0.150				<0.150				<0.150				0.18				0.19		
Iron	µg/l			912.8				565.4				878.5				<10				<10				<10.0		
Lead	µg/l	10		1.6				<1				<0.5				<0.5				<0.5				<1.0		
Magnesium	mg/l Mg	50		11.74				12.99				14.32				16.44				15.53				12		
Manganese	µg/l			773.5				606.6				3463.8				3.1				118.7				<5.0		
Mercury	µg/l	1		<0.1				<0.1				<0.05				<0.05				<0.05				<0.050		
Molybdenum (µg/l)																<0.5				<0.5				<1.0		
Nickel	µg/l	20		6.2				2.9				3.6				1				1.84				<1.0		
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02				<0.02				0.002				<0.010		
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	6.9	7	7
Potassium	mg/l	5		<1				<1				0.74				1.06				0.99				0.8		
Residue on evaporation	mg/l			655				519				1005				1081				1189				2732		
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	5.3	5.1	6
Selenium	µg/l															<0.5				<0.5				<1.0		
Silver	µg/l															nm				nm						
Sodium	mg/l	150		6.92				7.01				9.04				10.39				8.7				8.5		
Strontium	µg/l															247.23				256.24				180		
Sulphate		50		31.3				34				44.8				55.6				28.06				28		
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	10.7	12	11
Thallium	µg/l															<0.1				<0.1				<1.0		
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	10:35	10:33	10:15
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	10.2	7.4	4.6
T.O.N	mg/l N			0.13				<0.08				<0.08				1.25				0.06				0.27		
Total Suspended Solids	mg/l																									
Uranium	µg/l															1.25				1.21				<1.0		
Vanadium	µg/l															<0.5				<0.5				<1.0		
Zinc	µg/l	100		19.9				18.1				31.2				5.2				5.92				3.3		
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	98.08	98.28	97.38

PARAMETERS		Whiteriver Landfill Site																								
		GROUNDWATER QUALITY																								
Monitoring Point:		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	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	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	14-Apr-14	15-Jul-14	14-Oct-14
Aluminium	µg/l			332				344				264														
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	<0.020	<0.020	
Antimony	µg/l																									
Arsenic	µg/l																									
Barium	µg/l																									
Beryllium	µg/l																									
B.O.D.	mg/l O2			<50																						
Boron	µg/l	1000						20.7				19.8														
Cadmium	µg/l	5		<0.1				<0.1				<0.1														
Calcium	mg/l Ca	200		79.9				76.87				75.45														
C.O.D.	mg/l O2																									
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	22	19	23
Chromium	µg/l	30		2.6				<1				1								0.53						
Cobalt	µg/l																									
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	667	663	661
Copper	µg/l	30		2				1				1.9														
Cyanide	µg/l	0.01		<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	22	55	61
E Coli	no/100ml		0	0																						
Fluoride	mg/l	1		<0.150				<0.150				<0.150														
Iron	µg/l			156.6				230.4				691.2														
Lead	µg/l	10		<1				<1				0.6														
Magnesium	mg/l Mg	50		23.96				25.53				25.36														
Manganese	µg/l			264.5				330.4				235.5														
Mercury	µg/l	1		<0.1				<0.1				<0.05														
Molybdenum (µg/l)																										
Nickel	µg/l	20		<1				<1				<0.5														
Ortho-Phosphate	mg/l P	0.03		0.1				0.09				0.08														
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	7.5	7.4	7.5
Potassium	mg/l	5		1.33				1.38				1.3														
Residue on evaporation	mg/l			409				421				524														
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	25.2	25.1	25.1
Selenium	µg/l																									
Silver	µg/l																									
Sodium	mg/l	150		27.71				26.21				25.36														
Strontium	µg/l																									
Sulphate	µg/l	50		11.6				13				14														
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	11.1	12	11
Thallium	µg/l																									
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	11:20	11:00	10:55
Tin	µg/l																									
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	5.3	3.6	2.2
T.O.N	mg/l N			<0.08				<0.08				<0.08														
Total Suspended Solids	mg/l																									
Uranium	µg/l															5.26										
Vanadium	µg/l															<0.5										
Zinc	µg/l	100		10.8				12.3				5.1			2.1											
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	80.96		80.81	84.91	80.81	80.91	80.91

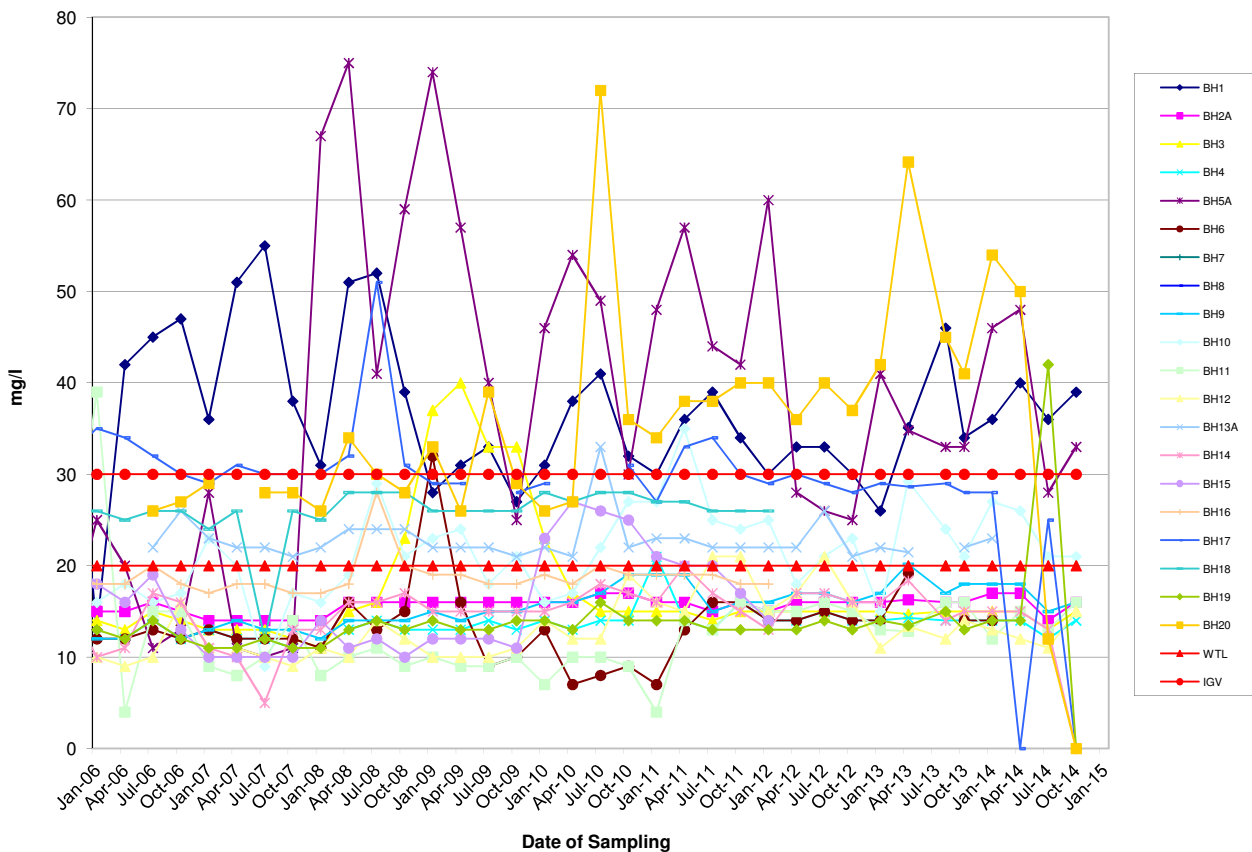
Whiteriver Landfill Site																										
GROUNDWATER QUALITY																										
PARAMETERS	RESULTS																									
Monitoring Point:	BH17																									
DOWNSTREAM DOMESTIC HOLCROFT'S PRIVATE WELLS -POTABLE SOURCE																										
	Trigger Lev	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	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	14-Apr-14	15-Jul-14	14-Oct-14
Alkalinity	mg/l 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		0.061	0.041	
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							61.09				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		25	31
Chromium	µg/l	30	50	<1								<0.5			<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	nm
Conductivity	S/cm @ 25	800	2500	678	676		673	702		606	681	693	689	725	707	684	738	763	667	678	676	676	680		674	671
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						77
D.O.	% Saturation			68	59		61	79		67	68	53	32	74	57	48	78	66	78	68	82	89	59		79	
Faecal coliforms	no/100ml		0	1	0		0	0		<1			0	0	0				0	0	0				0	nm
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	7.5		7.7	7.5
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	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		13.8	12.0
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		13:20	10:50
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		2.9	<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	Date	Date	Date	
Units																										
Alkalinity	mg/CaCO ₃	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	14-Apr-14	15-Jul-14	14-Oct-14
Aluminium	µg/l			280				298				198			284				276				304			
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	<0.020	<0.020	
Antimony	µg/l														<0.5				<0.5				<1.0			
Arsenic	µg/l														0.7				0.63				<1.0			
Barium	µg/l														2.2				4.02				2.9			
Beryllium	µg/l														<0.5				<0.5				<1.0			
B.O.D.	mg/l O ₂			<50																						
Boron	µg/l	1000						25.1				12.7			12				10.06				13			
Cadmium	µg/l	5		<0.1				0.1				<0.1			<0.1				<0.1				<0.020			
Calcium	mg/l Ca	200		75.01				74.6				74.85			73.95				74.67				76			
C.O.D.	mg/l O ₂											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	14	42	14
Chromium	µg/l	30		1.4				<1				<0.5			<0.5				<0.5				<1.0			
Cobalt	µg/l														<0.5				<0.5				<1.0			
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	566	554	565
Copper	µg/l	30		33.8				49.4				13.6			17.2				20.29				20			
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05				<0.05				<0.05			27
D.O.	% Saturation		27	38	49	47	21	20	nm	34	28	29	24	20	15	10	29	10	26	18	25	17	37	10	52	
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				0.16			
Iron	µg/l			1138.4				38393.4				64.2			23.8				<10				<10.0			
Lead	µg/l	10		1.4				6.3				<0.5			<0.5				<0.5				<1.0			
Magnesium	mg/l Mg	50		19.95				21.28				22.46			20.73				21				21			
Manganese	µg/l			22.2				868.2				5.3			<1				<1				<5.0			
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05				<0.05				<0.050			
Molybdenum (µg/l)															<0.5				<0.5				<1.0			
Nickel	µg/l	20		4				<1				<0.5			<0.5				0.55				<1.0			
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02				0.009				<0.010			
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	7.3	7.6	7.6
Potassium	mg/l	5		<1				1.11				0.94			1.01				1.37				1.4			
Residue on evaporation	mg/l			334				277				273			306				319				332			
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	nm	6.7	nm	nm	nm
Selenium	µg/l											<0.5			<0.5				<0.5				<1.0			
Silver	µg/l														nm				nm							
Sodium	mg/l	150		15.76				24.04				16.75			16.09				16.12				17			
Strontium	µg/l														198.24				198.19				190			
Sulphate	µg/l	50		3.9				4				3.6			3.3				3.48				3.9			
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	10.9	16.1	11.0
Thallium	µg/l											<0.1							<0.1				<1.0			
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	11:10	12:00	12:15
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	<1.5	4.3	1.5
T.O.N	mg/l N			0.73				0.46				0.62			0.48				0.54				0.61			
Total Suspended Solids	mg/l																									
Uranium	µg/l														1.17				1.37				1.3			
Vanadium	µg/l											<0.5			<0.5				<0.5				<1.0			
Zinc	µg/l	100		25.4				785.9				10.5			2.9				1.44				1			

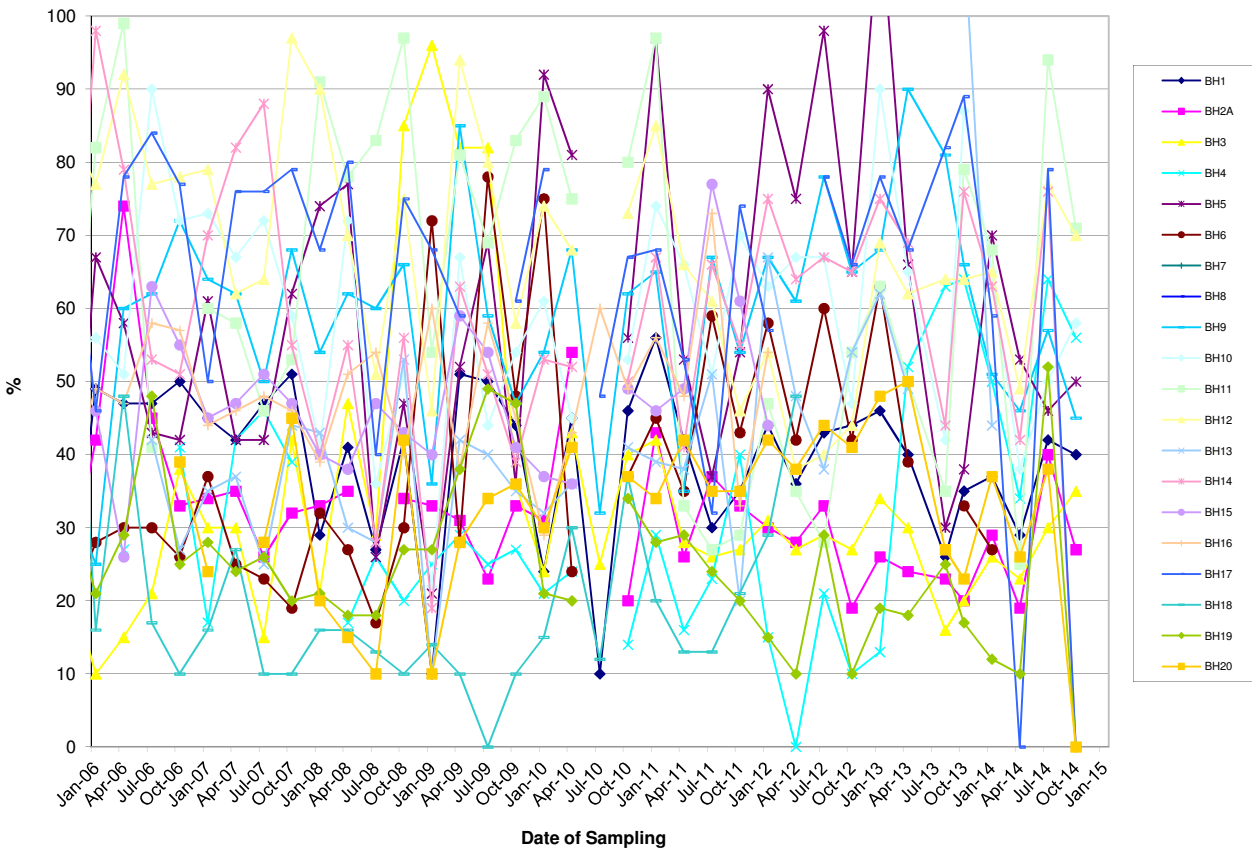




Chloride



Dissolved Oxygen



APPENDIX D

SURFACE WATER MONITORING RESULTS



Whiteriver Landfill Site

SURFACE WATER QUALITY

PARAMETERS

RESULTS

Monitoring Point:

SW1

		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units	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	11-Jun-14	15-Jul-14	14-Oct-14
Alkalinity	mg/lCaCO3		352				280				296						
Aluminium	µg/l						15.2				10.55						
Ammonia	mg/l N	1.33	6.33		0.48	1.84	0.32	1.24	2.69	0.16	1.225		0.09	0.56	0.093	0.73	0.13
Antimony	µg/l						<0.5				<0.5						
Arsenic	µg/l						1.48				1.98						
Barium	µg/l						105.8				74.97						
Beryllium	µg/l						<0.5				<0.5						
B.O.D.	mg/l O2		31.5		13.1	174.7	4.9	15.5	9.5	2.6	4.97		9.4	1.4	7	<10	1.5
Boron	µg/l		28.1				20.1				<10						
Cadmium	µg/l		<0.1				<0.1				<0.1						
Calcium	mg/l Ca	4.0	108.39				91.46				97.96						
C.O.D.	mg/l O2		162		78	266	46	155	60	38	68		84	<20	57	70	20
Chloride	mg/l Cl	30	60		40	36	28	23	27	28	35.55		31	25		30	26
Chromium	µg/l		0.8				<0.5				<0.5						
Cobalt	µg/l						<0.5				0.5						
Coliform Bacteria	no/100ml																
Conductivity	µS/cm @ 25	640	879		632	675	604	582	745	583	725		609	587	540	670	652
Copper	µg/l		5.3				2.1				0.83						
Cyanide	mg/l																
D.O.	% Saturation	94	58		78	51	77	43	75	104	78		75	72		60	71
E_Coli	no/100ml																
Fluoride	mg/l																
Iron	µg/l		962.8				98				121.2						
Lead	µg/l		1.5				<0.5				<0.5						
Magnesium	mg/l Mg		17.87				10.17				13.33						
Manganese	µg/l		644.8				108.8				137.9						
Mercury	µg/l		<0.05				<0.05				<0.05						
Molybdenum (µg/l)							<0.5				<0.5						
Nickel	µg/l		2.1				1.5				1.78						
Ortho-Phosphate	mg/l P		1.45				0.14				0.583						
pH		7.9	7.9		7.6	7.4	8.2	7.6	7.9	7.8	7.9		7.5	7.8	7.6	7.7	7.9
Potassium	mg/l		51.45				8.15				9.86						
Residue on evaporation																	
Sampling Depth	m																
Selenium	µg/l						<0.5				<0.5						
Silver	µg/l						nm				nm						
Sodium	mg/l		28.55				15.26				30.16						
Strontium	µg/l						151.61				178.29						
Sulphate	mg/l SO4		23.1				22.9				23.04					10	
Suspended Solids	mg/l												12	<4			<4
Temp	°C	4.1	12.8		16.7	9.6	9.9	15.8	14.2	5	6.2		11.4	3.8	8	nm	13
Thallium	µg/l						<0.1				<0.1						
Time		12:50	10:35		10:00	13:05	10:00	10:15	10:45	09:50	11:00		10:45	10:20		nt	10:15
Tin	µg/l						<1				nm						
T.O.C.	mg/l																
T.O.N	mg/l N		0.17				1.77				1.19						
Total Suspended Solids	mg/l	6	12		30	11	66	54	93	25	144						
Uranium	µg/l						0.55				0.64						
Vanadium	µg/l						0.51				<0.5						
Zinc	µg/l		18.1				2.5				3.23						

Dry



Whiteriver Landfill Site

SURFACE WATER QUALITY

PARAMETERS


RESULTS

Monitoring Point:

SW2A

		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units	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	11-Jun-14	15-Jul-14	14-Oct-14	
Alkalinity	mg/lCaCO3		300				220				328							
Aluminium	µg/l						13.9				11.61							
Ammonia	mg/l N	1.23	1.31		0.1	0.03	0.05	5.84	0.16	0.41	0.314		0.25	1.3	0.037	0.054	0.046	
Antimony	µg/l						<0.5				<0.5							
Arsenic	µg/l						1.35				1.59							
Barium	µg/l						86.2				99.23							
Beryllium	µg/l						<0.5				<0.5							
B.O.D.	mg/l O2		7.6		5.3	22.6	3.3	6.7	2.1	2.3	1.795		2.1	1.1	<2	<1.0	<1.0	
Boron	µg/l		26.2				19.7				11.86							
Cadmium	µg/l		<0.1				<0.1				<0.1							
Calcium	mg/l Ca	2.4	105.18				90.03				100.24							
C.O.D.	mg/l O2		80		36	59	23	68	24	29	16		36	91	34	30	<20	
Chloride	mg/l Cl	70	120		48	47	37	35	31	37	52.91		46	45		35	31	
Chromium	µg/l		1.1				<0.5				<0.5							
Cobalt	µg/l						<0.5				<0.5							
Coliform Bacteria	no/100ml																	
Conductivity	µS/cm @ 25	762	953		615	664	626	676	705	619	701		564	662	530	679	668	
Copper	µg/l		4.2				2				1.24							
Cyanide	mg/l																	
D.O.	% Saturation	96	96		93	67	88	85	66	101	116		92	75		77	76	
E. Coli	no/100ml																	
Fluoride	mg/l																	
Iron	µg/l		858.1				58.9				78.71							
Lead	µg/l		1.8				<0.5				<0.5							
Magnesium	mg/l Mg		14.13				10.73				12.77							
Manganese	µg/l		266.7				134.2				223.38							
Mercury	µg/l		<0.05				<0.05				<0.05							
Molybdenum (µg/l)							0.9				<0.5							
Nickel	µg/l		1.8				1.6				1.52							
Ortho-Phosphate	mg/l P		0.34				0.04				0.061							
pH		8.0	8.1		8.1	7.8	8.3	7.7	7.7	7.7	8.2		7.8	7.9	7.9	7.8	7.9	
Potassium	mg/l		22.4				5.04				5.4							
Residue on evaporation																		
Sampling Depth	m																	
Selenium	µg/l						<0.5				<0.5							
Silver	µg/l						nm				nm							
Sodium	mg/l		56.89				20.34				24.57							
Strontium	µg/l						170.5				191.03							
Sulphate	mg/l SO4		47.2				55				31.83							
Suspended Solids	mg/l												4	9	<2	<4	<4	
Temp	°C	4.1	14.9		16.6	9.5	10.4	16.1	13.5	5	6.1		11.6	3.7		nm	13	
Thallium	µg/l						<0.1				<0.1							
Time		13:15	12:35		12:15	11:45	11:05	11:45	11:35	11:50	11:15		11:25	11:15		nt	11:15	
Tin	µg/l						<1				nm							
T.O.C.	mg/l																	
T.O.N	mg/l N		1.61				1.42				0.8							
Total Suspended Solids	mg/l	6	7		40	10	19	10	7	11	13							
Uranium	µg/l						1.24				1.26							
Vanadium	µg/l						<0.5				<0.5							
Zinc	µg/l		9.2				2.4				3.83							

Dry

	Whiteriver Landfill Site																	
	SURFACE WATER QUALITY																	
PARAMETERS	RESULTS																	
Monitoring Point:	SW3																	
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units	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	11-Jun-14	15-Jul-14	14-Oct-14	
Alkalinity	mg/lCaCO3						135				110							
Aluminium	µg/l						15.8				6.61							
Ammonia	mg/l N	5.38			0.04	<0.03	0.04	0.55	0.13	1.28	1.022		0.63	7.8	0.014		0.058	
Antimony	µg/l						0.56				1.33							
Arsenic	µg/l						2.06				1.35							
Barium	µg/l						66.1				84.34							
Beryllium	µg/l						<0.5				<0.5							
B.O.D.	mg/l O2				<1.5	<1.5	3.7	3.8	<1.5	2	1.15		2	1.7	<2		<1.0	
Boron	µg/l						30.3				21.81							
Cadmium	µg/l						<0.1				<0.1							
Calcium	mg/l Ca	5.5					69.86				70.9							
C.O.D.	mg/l O2				13	14	25	32	12	20	15		29	26	29		22	
Chloride	mg/l Cl	46			18	21	22	27	19	32	29.55		42	42			15	
Chromium	µg/l						<0.5				<0.5							
Cobalt	µg/l						<0.5				1.05							
Coliform Bacteria	no/100ml																	
Conductivity	µS/cm @ 25	815			599	506	515	518	601	563	502		680	677	382		462	
Copper	µg/l						2.3				2.08							
Cyanide	mg/l																	
D.O.	% Saturation	89			nm	86	77	112	62	94	47		66	68			76	
E Coli	no/100ml																	
Fluoride	mg/l																	
Iron	µg/l						20				20.85							
Lead	µg/l						<0.5				<0.5							
Magnesium	mg/l Mg						9.01				7.81							
Manganese	µg/l						68.7				949.3							
Mercury	µg/l						<0.05				<0.05							
Molybdenum (µg/l)							2.2				1.76							
Nickel	µg/l						2				3.54							
Ortho-Phosphate	mg/l P						<0.02				0.009							
pH		7.9			7.8	8	8.2	8.2	8.2	7.9	7.7		7.5	7.8	7.8		7.7	
Potassium	mg/l						3.23				4.06							
Residue on evaporation																		
Sampling Depth	m																	
Selenium	µg/l						<0.5				<0.5							
Silver	µg/l						nm				nm							
Sodium	mg/l						18.75				15.97							
Strontium	µg/l						171.79				167.78							
Sulphate	mg/l SO4						103.8				64.51							
Suspended Solids	mg/l												<4	<4	<2		<4	
Temp	°C	6.8			14	7	10	17	11	7	5.3		11	2			11.5	
Thallium	µg/l						<0.1				<0.1							
Time		14.20			13:25	12:30	11:15	11:00	11:10	10:55	12:00		12:00	11:10			10:30	
Tin	µg/l						<1				nm							
T.O.C.	mg/l																	
T.O.N	mg/l N						0.14				0.31							
Total Suspended Solids	mg/l	15			<5	8	5	<5	<5	28	3							
Uranium	µg/l						1.07				1.05							
Vanadium	µg/l						<0.5				<0.5							
Zinc	µg/l						2.3				1.43							

Dry

APPENDIX E

GAS MONITORING RESULTS

	27/01/2014			12/02/2014			25/03/2014			25/04/2014			08/05/2014			10/06/2014			09/10/2014			18/11/2014			09/12/2014			09/10/2014			18/11/2014			09/12/2014		
	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2			
P21	0	3.1	16.2	0	3	16.3	0	3.2	16.5	0	2.1	18.2	0	2.2	19	0	1.8	20.1	0	1.9	18.2	0	2.6	17.5	0	2.5	17.2	0	1.9	18.2	0	2.6	17.5	0	2.5	17.2
P22	0	0.9	19.4	0	0.8	19.5	0	0.8	19.4	0	0.6	19.8	0	0.6	19.4	0	0.4	20.2	0	0.6	19.8	0	0.5	20	0	0.6	19.5	0	0.6	19.8	0	0.5	20	0	0.6	19.5
P23	0	1.1	19.1	0	1	19.1	0	1	19.1	0	0.9	19.2	0	0.8	19.6	0	0.6	20.2	0	1	19.2	0	1	19.1	0	0.8	19.2	0	1	19.2	0	1	19.1	0	0.8	19.2
P24	0	1.1	19.6	0	1.1	19.4	0	1	19.5	0	0.4	20.1	0	0.2	20.2	0	0.2	20.2	0	0.4	20.1	0	1.1	19.4	0	1	19.5	0	0.4	20.1	0	1.1	19.4	0	1	19.5
P25	0	3	15.5	0	2.9	16.1	0	3.1	16.2	0	2.2	18.8	0	2	19.2	0	2.1	19.4	0	2.3	18.8	0	2.7	16.1	0	2.4	17.1	0	2.3	18.8	0	2.7	16.1	0	2.4	17.1
P254	0	0.8	20.4	0	0.9	20.4	0	0.8	20.4	0	0.6	20.6	0	0.4	20.6	0	0.4	20.6	0	0.6	20.6	0	0.9	20.4	0	0.8	20.4	0	0.6	20.6	0	0.9	20.4	0	0.8	20.4
P253	0	1.1	19.6	0	1.2	19.4	0	1.1	19.6	0	0.8	19.8	0	0.6	20.2	0	0.4	20.2	0	0.8	19.8	0	1.1	19.2	0	1	19.2	0	0.8	19.8	0	1.1	19.2	0	1	19.2
P252	0	0.6	21.1	0	0.6	21.1	0	0.4	21.1	0	0.4	20	0	0.4	20.2	0	0.4	20	0	0.4	20	0	0.6	21.1	0	0.4	21.1	0	0.4	20	0	0.6	21.1	0	0.4	21.1
P251	0	0.2	21.5	0	0.1	21.5	0	0.2	21.5	0	0.4	20.2	0	0.2	20	0	0.4	20.2	0	0.2	20	0	0.2	20.8	0	0.1	20.8	0	0.2	20	0	0.2	20.8	0	0.1	20.8
P250	0	1.1	21.4	0	1	20.9	0	1.1	21	0	0.9	20.6	0	0.8	20.4	0	0.6	20.2	0	0.8	20.6	0	1	20.9	0	1.1	21	0	0.8	20.6	0	1	20.9	0	1.1	21
P249	0	2.7	18.6	0	2.9	18.8	0	2.5	19.1	0	1.3	19.8	0	1.2	19.8	0	1.3	19.9	0	2.8	19	0	2.2	19.1	0	1.3	19.9	0	2.8	19	0	2.2	19.1	0	1.3	19.9
P248	0	1.9	20.8	0	1.9	20.8	0	1.8	20.4	0	1.5	19.4	0	1.6	19.2	0	1.4	19.1	0	1.5	19.4	0	1.8	21	0	1.6	19.9	0	1.5	19.4	0	1.8	21	0	1.6	19.9
P247	0	1.2	20.9	0	1.2	20.9	0	1.1	20.6	0	1.1	20.4	0	1	20.2	0	0.8	20.6	0	1.1	20.4	0	1.2	20.9	0	1	20.6	0	1.1	20.4	0	1.2	20.9	0	1	20.6
P246	0	6.6	13.8	0	5.4	14.6	0	5.8	15.2	0	4.5	15.2	0	3.6	16.4	0	3.4	17.2	0	4.1	16	0	5.4	14.6	0	4.3	16.2	0	4.1	16	0	5.4	14.6	0	4.3	16.2
P245	0	1.3	20.8	0	1.2	20.6	0	1	20.6	0	1.1	20.1	0	0.8	20.6	0	0.6	20.4	0	1.1	20.1	0	1.2	20.6	0	0.9	20.3	0	1.1	20.1	0	1.2	20.6	0	0.9	20.3
P244	0	0.1	22.2	0	0.1	22.2	0	0.2	21.8	0	0.1	20.2	0	0.2	20.8	0	0.2	21	0	0.1	20.2	0	0.1	22.2	0	0.2	21.8	0	0.1	20.2	0	0.1	22.2	0	0.2	21.8
P243	0	0.8	21.8	0	0.6	21.8	0	0.6	21.8	0	0.4	20.2	0	0.2	20.1	0	0.4	20.1	0	0.4	20.2	0	0.6	21.8	0	0.5	20.8	0	0.4	20.2	0	0.6	21.8	0	0.5	20.8
P242	0	1.3	21.1	0	1.3	21.1	0	1.1	20.6	0	1.2	20	0	1.1	19.9	0	1.2	20.1	0	1.1	19.9	0	1.3	21.1	0	0.9	20.6	0	1.1	19.9	0	1.3	21.1	0	0.9	20.6
P241	0	0.7	21.8	0	0.8	21.8	0	0.8	21.8	0	0.5	20.1	0	0.5	20.3	0	0.4	20.3	0	0.5	20.1	0	0.8	21.8	0	0.8	21.8	0	0.5	20.1	0	0.8	21.8	0	0.8	21.8
P240	0	1	21.6	0	1	21.6	0	0.8	21.6	0	0.8	20.1	0	0.6	20.1	0	0.8	19.8	0	0.8	20.1	0	0.6	20	0	0.8	21.6	0	0.8	20.1	0	0.6	20	0	0.8	21.6
P239	0	0.7	22.1	0	0.7	22.1	0	0.7	22.1	0	0.6	21	0	0.4	20.5	0	0.4	20.2	0	0.6	21	0	0.7	22.1	0	0.6	20.8	0	0.6	21	0	0.7	22.1	0	0.6	20.8
P238	0	0.3	22.4	0	0.3	22.4	0	0.3	22.4	0	0.2	20.6	0	0.4	19.9	0	0.2	19.9	0	0.3	20.5	0	0.3	22.4	0	0.3	22.4	0	0.3	20.5	0	0.3	22.4	0	0.3	22.4
P237	0	0.2	22.5	0	0.2	22.5	0	0.2	22.5	0	0.2	21.1	0	0.2	21.1	0	0.2	20.8	0	0.2	21.1	0	0.2	22.5	0	0.1	21.1	0	0.2	21.1	0	0.2	22.5	0	0.1	21.1
P236	0	1.3	17.9	0	1.1	18.1	0	1.1	18.1	0	1.2	19.2	0	1.1	20	0	1.1	20.2	0	1.2	19.2	0	1.1	18.1	0	1.1	18.1	0	1.2	19.2	0	1.1	18.1	0	1.1	18.1
P235	0	0.3	22.5	0	0.3	22.5	0	0.3	21.8	0	0.4	20.8	0	0.6	20.8	0	0.4	20.8	0	0.4	20.8	0	0.3	22.5	0	0.3	21.8	0	0.4	20.8	0	0.3	22.5	0	0.3	21.8
P234	0	0.9	21.6	0	0.9	21.6	0	0.9	21.6	0	0.8	20.8	0	0.6	20.8	0	0.6	20.8	0	0.8	20.8	0	0.9	21.6	0	0.9	21.6	0	0.8	20.8	0	0.9	21.6	0	0.9	21.6
P233	0	0.2	20.6	0	0.2	20.6	0	0.2	20.2	0	0.4	20.6	0	0.4	20.6	0	0.4	20.6	0	0.4	20.6	0	0.2	20.6	0	0.2	20.2	0	0.4	20.6	0	0.2	20.6	0	0.2	20.2
P232	0	1.2	22	0	1.1	22	0	1	22	0	1	21.2	0	1.1	20.6	0	1.2	20.4	0	1	21.2	0	1.1	22	0	0.6	21.1	0	1	21.2	0	1.1	22	0	0.6	21.1
P231	0	0.6	22.2	0	0.6	21.8	0	0.4	21.8	0	0.6	21.2	0	0.4	20.5	0	0.6	20.5	0	0.6	21.2	0	0.6	21.8	0	0.4	21.8	0	0.6	21.2	0	0.6	21.8	0	0.4	21.8
P230					Full of water						1	20.1		0.8	20.4		0.6	20.2		1	20.1		Full of water		Full of water		1	20.1		Full of water		Full of water		1	20.1	
P229	0	0.5	22.2	0	0.5	22.2	0	0.5	22.2	0	0.6	21.1	0	0.6	21.1	0	0.6	20.6	0	0.8	20.8	0	0.6	21	0	0.4	21.2	0	0.8	20.8	0	0.6	21	0	0.4	21.2
P228	0	3.2	17.5	0	3.4	17.6	0	3.1	18.2	0	2.4	19.2	0	2.2	19.4	0	2.1	19.6	0	2.4	19.2	0	3.4	17.6	0	2.9	19.1	0	2.4	19.2	0	3.4	17.6	0	2.9	19.1
P227	0	0.2	22.5	0	0.2	22.5	0	0.2	22.5	0	0.2	21.2	0	0.4	20.3	0	0.4	20.3	0	0.2	21.2	0	0.2	22.5	0	0.2	22.5	0	0.2	21.2	0	0.2	22.5	0	0.2	22.5
P226	0	2.3	21	0	2.2	21.2	0	1.8	20	0	1.4	20.1	0	1.6	19.9	0	1.4	20	0	1.4	20.1	0	2.2	21.2	0	1.7	19.8	0	1.4	20.1	0	2.2	21.2	0	1.7	19.8
P225	0	0.2	22.6	0	0.2	22.6	0	0.2	22.6	0	0.2	21.2	0	0.4	20.1	0	0.1	20.8	0	0.4	20.6	0	0.3	21.1	0	0.1	22.6	0	0.4	20.6	0	0.3	21.1	0	0.1	22.6
P224	0	0.2	22.3	0	0.2	22.3	0	0.2	22.3	0	0.2	21.2	0	0.2	21.2	0	0.4	20	0	0.2	21.2	0	0.2	22.3	0	0.1	22.3	0	0.2	21.2	0	0.2	22.3	0	0.1	22.3
P223	0	0.4	22.3	0	0.4	22.3	0	0.4	22.3	0	0.4	21.2	0	0.4	21.2	0	0.4	21.2	0	0.4	21.2	0	0.4	22.3	0	0.4										

APPENDIX F

WATER BALANCE CALCULATION

MONTHLY WATER BALANCE CALCULATION 2014

	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	leachate lagoon	1,600		102			5, Cell 1- 5, Cell 2	25,962	791	163	1,2,3,4,5(3a,b),	103844	1055	2009	2009	0.00	0.00	2009	2009	3103
February	leachate lagoon	1,600		89			5, Cell 1- 5, Cell 2	25,962	689	142	1,2,3,4,5(3a,b),	103844	919	1750	3759	0.00	0.00	3759	1750	5808
March	leachate lagoon	1,600		54			5, Cell 1- 5, Cell 2	25,962	418	86	1,2,3,4,5(3a,b),	103844	558	1062	4821	0.00	0.00	4821	1062	2992
April	leachate lagoon	1,600		34			5, Cell 1- 5, Cell 2	25,962	266	55	1,2,3,4,5(3a,b),	103844	355	676	5497	0.00	0.00	5497	676	2423
May	leachate lagoon	1,600		92			5, Cell 1- 5, Cell 2	25,962	713	146	1,2,3,4,5(3a,b),	103844	950	1809	7306	0.00	0.00	7306	1809	1791
June	leachate lagoon	1,600		36			5, Cell 1- 5, Cell 2	25,962	282	58	1,2,3,4,5(3a,b),	103844	376	716	8022	0.00	0.00	8022	716	1124
July	leachate lagoon	1,600		35					0	56	Whole site	129806	454	510	8532	0.00	0.00	8532	510	693
August	leachate lagoon	1,600		173					0	277	Whole site	129806	2246	2522	11055	0.00	0.00	11055	2522	1246
September	leachate lagoon	1,600		27					0	42	Whole site	129806	344	386	11441	0.00	0.00	11441	386	905
October	leachate lagoon	1,600		90					0	144	Whole site	129806	1171	1315	12756	0.00	0.00	12756	1315	608
November	leachate lagoon	1,600		141					0	225	Whole site	129806	1829	2054	14811	0.00	0.00	14811	2054	2810
December	leachate lagoon	1,600		56					0	89	Whole site	129806	726	815	15626	0.00	0.00	15626	815	1556
Total				927			5, Cell 2	19,556	3160	1484			10982	15626		0			15626	25059

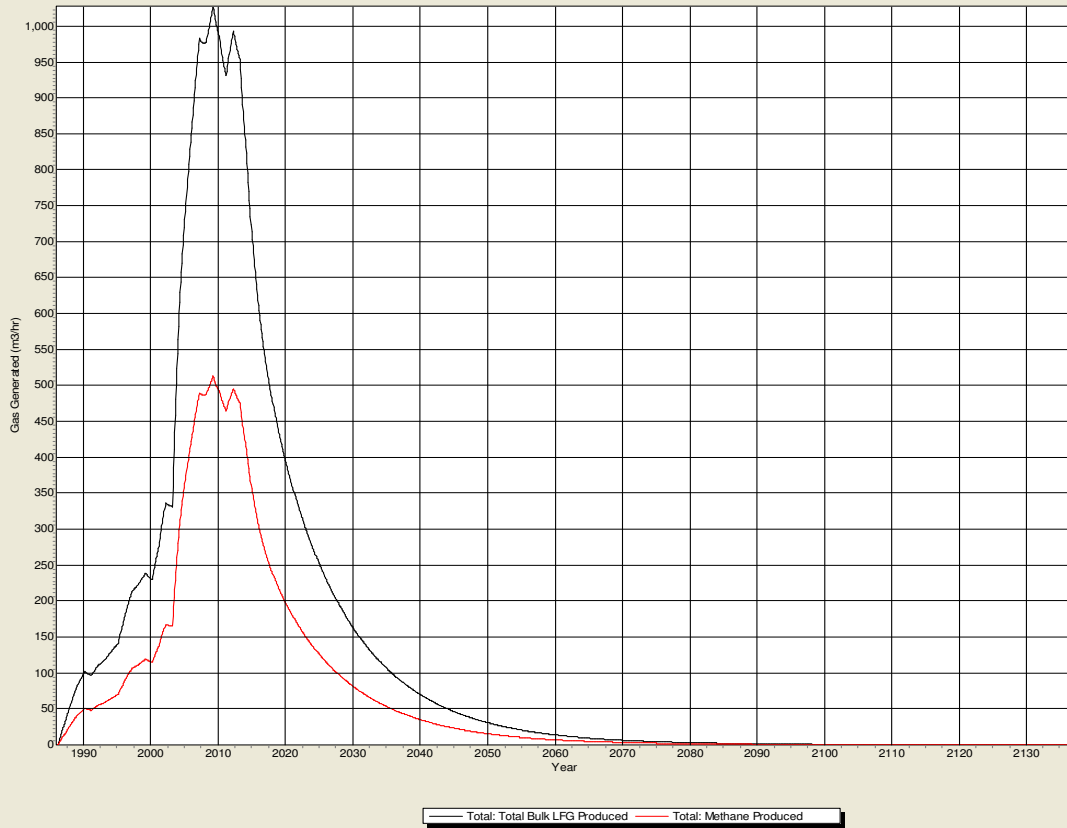
Assumptions

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
	Area of Phase 5, Cell 1B	323	m ²
	Surface Area Leachate Lagoon	1,600	m ²
Rainfall	Rainfall taken from on site	927.2	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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