



ANNUAL ENVIRONMENTAL REPORT

By

Louth County Council

To

Environmental Protection Agency

For



Waste Licence Reference: W0060-03

Reporting Period January – December 2015

WHITERIVER LANDFILL SITE, COUNTY LOUTH

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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 2015.

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	2015
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 2015 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.

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	10,970
Methane utilised in engine/s	2,113,968
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 2015 was 13,404 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 IBR0856/101, 102 and 103. 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	Easting	Northing
Groundwater Boreholes		
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

Monitoring Points	Easting	Northing
BH14	302 045	285 119
BH17	301 293	285 180
BH19	301490	285650
BH20	301 428	285 623
Surface Water Monitoring		
SW1	301 384	285 424
SW2A	301 965	285 427
SW3	301 935	285 410
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

Monitoring Points	Easting	Northing
PZ24	301 490	285 201
PZ25	301 586	285 219
PZ26 PZ54	Not available	
Noise		
N1	301 336	285348
N2	135 907	270 000
N3	301345	284 739
N4	302105	284 927
N5	302 723	285 258
N6	301409	285 598
Dust		
DG1	301 395	285 372
DG2	301 596	285 374
DG3	301 960	285 421
DG4	302 058	285 043
DG5	301 648	285584
DG6	301834	285486
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
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 downgradient 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 COD in October.

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

Table 7.3 Treated Leachate Concentrations in 2015

Parameter	Min. Conc	Max. Conc	Limit Value
Ammoniacal Nitrogen(mg/l N)	42	240	900
BOD	46	220	500
COD	682	2210	1,500
pH (pH units)	6.4	8.4	>6.0 and <9.0
Temperature (°C)	2.8	16.4	<25
Sulphate (mg/l)	38	135	250

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/	Total Alkalinity	

Quarterly		Annually	
	Odour		
	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 (GTV).

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 2015 Results from Groundwater Monitoring Boreholes

	Units	No. of Samples	Minimum	Maximum	Mean
Alkalinity	mg/lCaCO3	29	242	464	327
Aluminium	µg/l	29	<10.0	<10.0	
Ammonia	mg/l N	57	<0.020	0.73	0
Antimony	µg/l	43	<1.0	<1.0	

	Units	No. of Samples	Minimum	Maximum	Mean
Arsenic	µg/l	43	<1.0	<1.0	
Barium	µg/l	43	3.8	200	128
Beryllium	µg/l	43	<1.0	<1.0	
Boron	µg/l	43	12	150	31
Cadmium	µg/l	43	<0.020	0.15	
Calcium	mg/l Ca	43	65	140	91
Chloride	mg/l Cl	57	11	67	23
Chromium	µg/l	43	<1.0	<1.0	
Cobalt	µg/l	43	<1.0	<1.0	
Conductivity	µS/cm @ 25	57	504	879	643
Copper	µg/l	43	<1.0	20	
Cyanide		14	<0.05	0	
D.O.	% Saturation	57	11	84	47
Fluoride	mg/l	14	<0.20	0	
Iron	µg/l	43	<10.0	730	
Lead	µg/l	43	<1.0	0	
Magnesium	mg/l Mg	43	9.7	32	20
Manganese	µg/l	43	<5.0	260	
Mercury	µg/l	14	<0.020	0	
Molybdenum	(µg/l)	43	<1.0	3.2	
Nickel	µg/l	43	<1.0	2.8	
Ortho-Phosphate	mg/l P	14	<0.010	0.097	
pH		57	6.9	7.7	7
Potassium	mg/l	43	0.43	2.7	1
Residue on evaporation	mg/l	14	326	1667	647
Selenium	µg/l	43	<1.0	1.4	

	Units	No. of Samples	Minimum	Maximum	Mean
Sodium	mg/l	43	8.5	42	21
Strontium	µg/l	43	130	460	228
Sulphate		28	3	78	21
Temp	°C	57	4.7	15.3	11
Thallium	µg/l	43	<1.0	<1.0	
T.O.C.	mg/l	57	1.5	25.6	4
T.O.N	mg/l N	43	<0.20	0.7	0
Uranium	µg/l	43	<1.0	6.8	
Vanadium	µg/l	43	<1.0	1.5	
Zinc	µg/l	23	1.2	110	14

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 GTV of 0.175 mg/l N with the exception of BH11 (0.73 mg/l N) in October. 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 3 of the 4 sampling dates.

Electrical Conductivity values were all below the WTL of 800 µS/cm throughout the year except for BH12 in August and October (max 830 µS/cm). BH12 does not exceed the IGTV of 1000 µS/cm and GTV of 800-1875 µS/cm.

Chloride levels exceeded the WTL of 20 mg/l in upgradient BH1 throughout the year. Concentrations ranged from 33 to 47 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 (52 mg/l) in January. The results were all below the GTV of 187.5 mg/l.

Chloride WTL level has been exceeded in BH20 throughout the monitoring period ranging from 52 to 67 mg/l Cl. .

Dissolved oxygen ranges from 11 to 84% O₂.

All boreholes were below WTL for TOC of 10 mg/l except BH12 in January (25.6 mg/l) and in April (13.9 mg/l).

7.5 Annual Monitoring Parameters

7.1.1 Upgradient Annual Results

Annual analysis was undertaken at one location upgradient of the site (BH2A) on the 16th of April 2015 as per licence requirement.

Aluminium, antimony arsenic, boron, cadmium, calcium, chromium, cobalt, copper, fluoride, lead, magnesium, mercury, molybdenum, nickel, potassium, selenium, sodium, and sulphate were below the WTL, IGW, DWR and GWR 2010 were applicable in all upgradient boreholes.

Barium exceeded the IGW in BH1 (160 µg/l). A cyanide concentration of <0.05 mg/l was detected in all upgradient boreholes. This concentration is the lowest limit of detection for the methodology used for cyanide; therefore this could be lower than the WTL and IGW of 0.01 mg/l. The results are below the DWR of 0.05 mg/l. Iron (730 µg/l), manganese (150 µg/l) and zinc (110 µg/l) concentrations exceeded the IGW at BH4.

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 (0.035 mg/l) was above the WTL and IGW of 0.03 mg/l.

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

- Strontium concentrations ranged from 130 to 280 µg/l,
- Uranium concentrations ranged from <1.0 to 2.3 µg/l,
- Total Oxidised Nitrogen (TON) concentrations ranged from <0.20 to 0.53 mg/l, and
- Alkalinity concentrations ranged from 258 to 316 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.

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.

7.1.2 Downgradient Annual Results

Annual analysis for metals and non-metals were undertaken at two locations downgradient of the site (BH9 and BH14) as per licence requirement.

Aluminium, antimony, arsenic, boron, cadmium, calcium, chromium, cobalt, copper, fluoride, iron, lead, magnesium, mercury, molybdenum, nickel, potassium, selenium, sodium and Zinc were below the WTL, IGTV, DWR and GWR 2010 were applicable in all upgradient boreholes.

Barium exceeded the IGTV in a number of the downgradient boreholes ranging from 150 to 200 µg/l. A cyanide concentration of <0.05 mg/l were detected in all downgradient 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 concentrations exceeded the IGTV at BH6 (210 µg/l), BH12 (260 µg/l) and BH13 (110 µg/l). Sulphate concentrations exceeded the IGTV at BH9 (54 mg/l) and BH10 (78 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. BH13 (0.097 mg/l) was 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 160 to 460 µg/l,
- Uranium concentrations ranged from <1.0 to 6.8 µg/l,
- TON concentrations ranged from <0.20 to 0.70 mg/l, and
- Alkalinity concentrations ranged from 242 to 403 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.

Pesticide and herbicide and semi volatile organic compound parameters were below the IGTV for those comparable or were below the lower detection limit for the analytical methodology used analysis. Volatiles organic compound parameters were either below the IGTV for those comparable or were below the lower detection limit for the analytical methodology used.

7.6 Surface Water

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

As required under the Waste Licence, surface water monitoring was undertaken at the station locations as set out in Table D.1.1 of the waste licence. Schedule D of the waste

licence requires the monitoring of certain parameters on either a monthly, quarterly or annual basis; the frequencies of the monitoring of surface water parameters are shown in Table 7.6 below.

Table 7.6 Surface Water Parameters Monitoring Frequencies

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

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

Table 7.7 provides a summary of results in 2015 from surface water locations.

Table 7.7 Summary of 2015 Results from Surface Water Locations

	Units	No. of Samples	Minimum	Maximum	Mean
Ammonia	mg/l N	10	0.05	1	0
B.O.D.	mg/l O2	10	<1.0	65	
C.O.D.	mg/l O2	10	21	204	66
Chloride	mg/l Cl	10	10	42	27
Conductivity	µS/cm @ 25	10	417	793	584

	Units	No. of Samples	Minimum	Maximum	Mean
D.O.	% Saturation	10	73	112	84
pH	0	10	7.8	8	8
Sulphate	mg/l SO4	5	18	30	25
Suspended Solids	mg/l	10	4	97	21

Surface water monitoring is undertaken at one location upstream at SW1 and two locations downstream of the site at SW2A and SW3. Chemical analyses of surface water are summarised in Appendix D.

SW1, and SW2A pH readings were within the A1 SWQS of 7.8 to 8.1.

Ammonia concentrations upstream at SW1 were above the EQS value of 0.14 mg/l N during 3 of the 4 monitoring periods with a range of 0.1 to 0.56 mg/l N. An excess of 0.1 mg/l N can indicate agricultural contamination. Downstream samples of Ammonia (SW2A) were elevated in January and April when values in the range of 0.05 to 0.6 mg/l N were recorded.

Upstream (SW1) BOD concentrations were above the EQS of 2.6 mg/l in August and October when values of 5.5 and 65 mg/l were recorded respectively. Elevated concentrations of BOD were also recorded downstream (SW2A) in April (2.7 mg/l).

COD concentrations exceeded the SWQS value of 40 mg/l upstream (SW1) in August and October when concentrations of 21 to 204 mg/l. Lower concentrations of COD were recorded downstream (<20 to 26 mg/l) from the site.

Electrical Conductivity readings were below the SWQS of 1000 µS/cm upstream and downstream during the monitoring period.

Dissolved Oxygen (DO) content ranged from 73 to 83 %O₂ upstream (SW1) and 73 to 112% O₂ downstream (SW2A)

Total Suspended Solids (TSS) concentrations exceeded the SWQS of 50 mg/l upstream in SW1 in October with a concentration of 97 mg/l.

7.1.3 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 7.9 to 8.1 which are within the A1 SWQS range of 5.5 to 8.5. The DO concentration in SW3 monitoring point ranged from 80 to 85% O₂ saturation.

Ammonia concentrations exceeded the EQS value of 0.14 mg/l N during both monitoring periods when concentrations of 0.16 and 0.77 mg/l N were recorded.

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

Electrical Conductivity in SW3 ranged from 417 to 486µS/cm, which is below the SWQS of 1000µS/cm. A Chloride concentration of 10 mg/l was recorded throughout the monitoring period which is below the SWQS of 250 mg/l.

A COD concentration of 10 mg/l below the SWQS classification of 40 mg/l was recorded throughout the monitoring period.

7.7 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 upgradient 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. Downgradient sampling locations recorded concentrations of selected parameters lower or similar to upgradient sampling locations which are attributed to an upgradient agricultural source. Leachate appears to be contained within the landfill. No evidence of leachate penetrating the engineered liner or natural clay layer is evident.

7.8 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 except PZ5 (0.2%) in May and P16 (0.2%) in June.

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 (PZ1, PZ5, PZ16, PZ28, PZ42, PZ46 and PZ49). The maximum level was 4.2 % v/v at PZ46 in September.

Carbon dioxide was detected in a few boundary monitoring locations, similar to previous monitoring reports. These exceedances are not considered to be due to migration of landfill gas.

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.

7.9 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.

7.10 Noise Monitoring

The measurements were completed on Tuesday 22nd and Wednesday 23rd of March 2016 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: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) 2016

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

NSL 1:	Daytime: LAeq (T 15 min) 54-58dBA; Evening time: LAeq (T 15 min) constant at 57dBA; Night time: LAeq (T 15 min) 46-48dBA
NSL 2:	Daytime: LAeq (T 15 min) 45-50dBA; Evening time: LAeq (T 15 min) constant at 60dBA; Night time: LAeq (T 15 min) 35-40dBA
NSL 3:	Daytime: LAeq (T 15 min) 53-58dBA; Evening time: LAeq (T 15 min) constant at 61dBA; Night time: LAeq (T 15 min) 40-51dBA
NSL 4:	Daytime: LAeq (T 15 min) 70-71dBA; Evening time: LAeq (T 15 min) constant at 66dBA;

Night time: LAeq (T 15 min) 61-66dBA

NSL 5: Daytime: LAeq (T 15 min) 52-63dBA;

Evening time: LAeq (T 15 min) constant at 45dBA;

Night time: LAeq (T 15 min) 41-48dBA

NSL 6: Daytime: LAeq (T 15 min) 48-64dBA;

Evening time: LAeq (T 15 min) constant at 39dBA;

Night time: LAeq (T 15 min) 41-43dBA

The noise report states that the findings of this report cannot be attributed to landfill activities since the site has not been in operation since 1999. Traffic was found to be the predominant source of noise at all locations. The findings show that during the night-time measurements and during lulls in traffic noise, there was no noise audible from the landfill site. Hence it is considered to be in compliance with NG4 and the requirements of Waste Licence W0033.

7.11 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 three occasions during 2015.

Table 7.8 Results from Dust Monitoring Analysis, Whiteriver Landfill Site

Sampling Point	DG1	DG2	DG3	DG4
January	237.7	202.2	93.4	265.0
August	110.5	53.4	51.0	295.1
December	30.0	110.8	93.3	93.3

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.

7.12 Meteorological Monitoring

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

7.13 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.

7.14 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.

7.15 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 30th September 2015. The biological assessment indicated unpolluted conditions (Q4) at both of the sites monitored. This is consistent with the 2013 results. 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	Annual Total 2015	+/- % compared to previous reporting year
Light fuel oil (Diesel)	litres	1,998,000	1,400	1,100	-21
Electricity used	kWh	212,000	120,000	50,000	-58
Water	m ³		110	55	

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. There is no further proposed development for the facility in 2016.

10 Volume of Leachate Produced and Volume of Leachate Tinkered Off Site

The volume of leachate transported off site to Drogheda wastewater treatment plant during the period January to December 2015 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 14,639 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 2015

Month	Weight Volume (m ³)
January	1,701.8
February	1,191.4
March	728.52
April	1,226.02
May	1,225.86
June	668.72
July	445.16
August	531.98
September	907.22
October	500.78
November	1,487.9
December	2,788.35
Total	13,404

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

There is no further proposed development for the facility in 2016.

12 Site Survey Showing Existing Levels of the Facility at the End of the Reporting Period

A topographical survey was carried out in June 2015. This is available for inspection on site.

13 Estimated Annual Quantity 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 approximately 660 m³/hr in 2015.

There are two landfill gas flares and two engines installed at Whiteriver landfill site. The two engines are now running continuous with flare(s) providing backup when required.

The EPA landfill gas survey was also completed for 2015. The average flow rate and methane content for the engines in 2015 is provided in Table 13.1 below.

Table 13.1 Average flow rate and methane content for the engines

Engine	Average flow rate m ³ /hr	Methane content %
Engine 1	497	48
Engine 2	331	48

14 Estimated Annual 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 13,404 m³. A water balance calculation has been undertaken. This estimates the annual leachate production to be approximately 14,639 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 14,639 m³. The actual quantity of leachate tankered from the site was 13,404 m³.

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

The objective for the site for 2016 is to ensure the site complies with the waste licence conditions.

18 Full Title and a Written Summary of Any Procedures Developed by the Licensee in the Year, which Relates to the Facility Operation

As part of the Environmental Management System (EMS) procedures have been developed for the site. 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 is available for inspection on site. There were no changes to the procedures during 2016.

19 Reported Incidents and Complaint Summaries, Correspondence to/from EPA

Incidents were reported for 2015 in relation to a carbon dioxide levels in perimeter landfill gas piezometers and surface VOC emissions. Quarterly incidents were due to the presence of chloride in groundwater which did not cause a significant environmental issue. No complaints were received in 2015.

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 2015.

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.

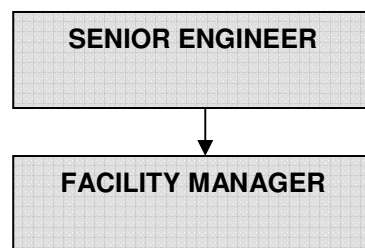


Figure 21.1 Management Structure at Whiteriver Landfill Site

22 Other Information

22.1 Report on Training of Staff Training

No staff training was undertaken in 2015. The site is 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)

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. The level of financial cover has been agreed with the Agency; however the method of putting in place the financial provision has yet to be agreed. No reply from the EPA has been received to date.

22.5 Report on Waste Recovery

No wastes were recovered on site. The site is 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.

This Plan will set the key objectives and targets for the Region to be achieved over the next 6 years. The Plan was launched on May 14th 2015.

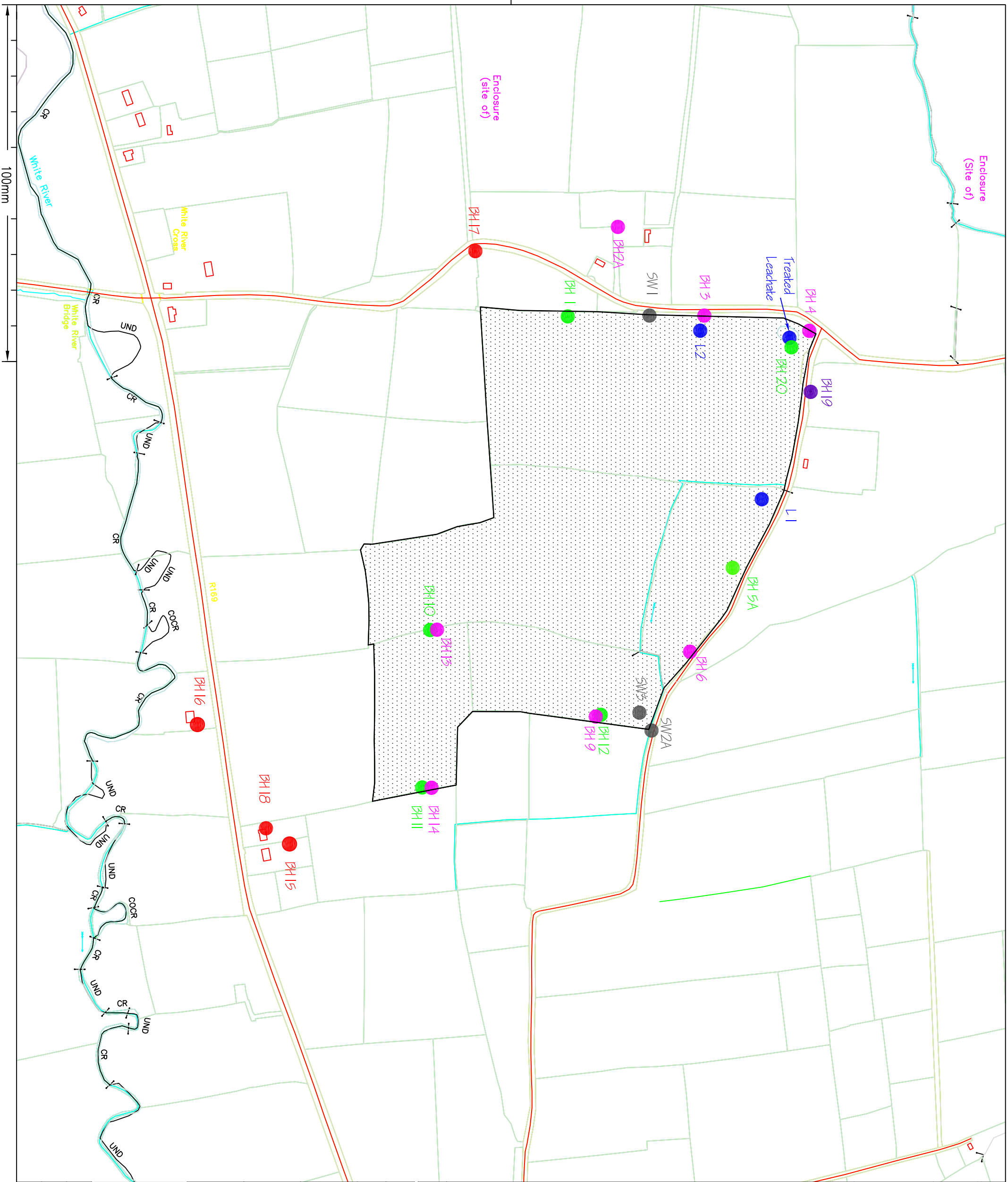
Whiteriver landfill site is listed under local authority landfill capacity closed in the region.

22.7 Statement on the Achievement of the Waste Acceptance and Treatment Obligations

The site is 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
- BH119 Agricultural water supply

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

DRAWN BY	DATE	CHECK BY	DATE	APPROVED BY	DATE
RP	NOV '06	AMcG	NOV '06		NOV '06

PLOT SCALE 1:5000 SCHEDULES SHEET SIZE A3

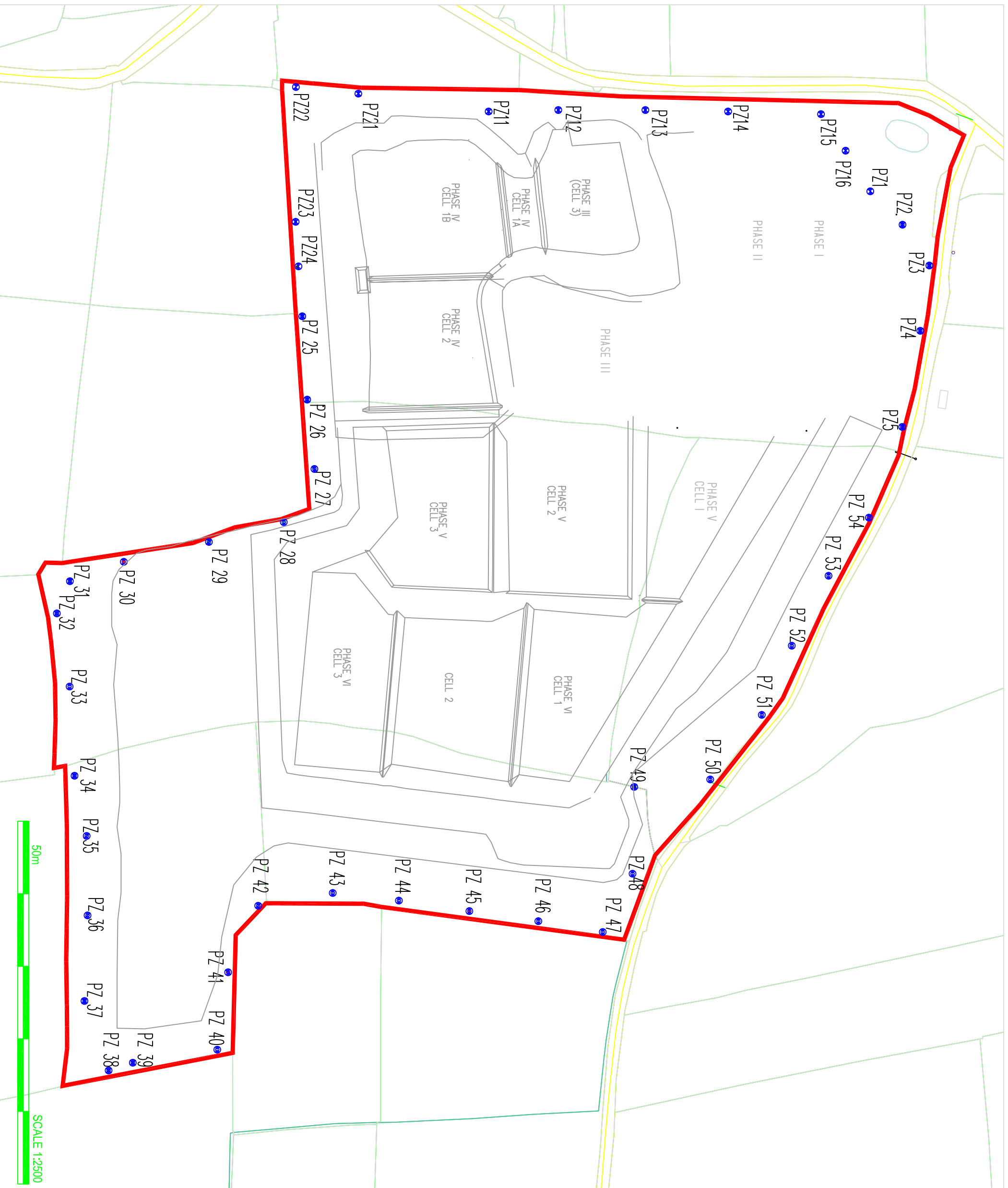
CLIENT
LOUTH COUNTY COUNCIL

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, BALLINACRE, LETTERKENNY, CO. DUBLIN 14

ARCHITECT	DWG. STATUS
IBL0069/101	PRELIM
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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5. KEYS:
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PZ 27 Landfill Gas Piezometer

Rev	amendments	drawn date	checked date

RPS
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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	Rev
IBR0138/100	0

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

Appendix B

PRTR Reporting



| PRTR# : W0060 | Facility Name : Whiteriver Landfill Site | Filename : W0060_2015(1).xls | Return Year : 2015 |

[Guidance to completing the PRTR workbook](#)

PRTR Returns Workbook

Version 1.1.19

REFERENCE YEAR	2015
-----------------------	------

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	GBNIIENB
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Damien Holmes
AER Returns Contact Email Address	damien.holmes@louthcoco.ie
AER Returns Contact Position	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	2
Number of Operating Hours in Year	8760
Number of Employees	2
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

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

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

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

4. WASTE IMPORTED/ACCEPTED ONTO SITE

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

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

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR# : W0060 | Facility Name : Whiteriver Landfill Site | Filename : W0060_2015(1).xls | Return Year : 2015 |

08/04/2016 14:26

Please enter all quantities on this sheet in Tonnes

3

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	19 07 03	No		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

Appendix C

Groundwater Monitoring Results

PARAMETERS		Whiteriver Landfill Site GROUNDWATER QUALITY RESULTS																													
		Monitoring Point:																													
		UPSTREAM OVERBURDEN																													
		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	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	19-Jan-15	16-Apr-15	05-Aug-15	19-Oct-15	
Alkalinity	mg/CaCO3	NAC		216				272							290				284					284				258			
Aluminium	µg/l														<5				<5					<10.0				<10.0			
Ammonia	mg/l N	0.2	<0.03	0.03	<0.03	0.09	0.03	0.23	<0.03	0.03	0.03	<0.03	<0.03	0.04	<0.03	0.03	<0.03	0.05	<0.03	0.02	<0.03	0.03	0.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.033	
Antimony	µg/l														<0.5				<0.5					<1.0				<1.0			
Arsenic	µg/l														<0.5				<0.5					<1.0				<1.0			
Barium	µg/l														153.6				178.4					170				160			
Beryllium	µg/l														<0.5				<0.5					<1.0				<1.0			
B.O.D.	mg/l O2			<50																											
Boron	µg/l	1000						11.9			13.9				12.3				12.48					16				15			
Cadmium	µg/l	5		<0.1				<0.1			<0.1				<0.1				<0.1				<0.020				<0.020				
Calcium	mg/l Ca	200		101.49				99.77							100.79				109.97					110				99			
C.O.D.	mg/l O2									6.8																					
Chloride	mg/l Cl	20	28	31	33	27	31	38	41	32	30	36	39	34	30	33	33	30	26	35.1	46	34	36	40	36	39	33	39	46	47	
Chromium	µg/l	30		6.2				<1							<0.5				0.51				<1.0				<1.0				
Cobalt	µg/l														<0.5				<0.5					<1.0				<1.0			
Coliform Bacteria	No/ml		411	1																											
Conductivity	µs/cm @ 25	800	650	647	646	636	637	660	661	578	643	690	632	716	660	657	730	735	647	675	705	672	668	669	673	654	600	616	664	636	
Copper	µg/l	30		2.3				1.4				1.1			<0.5				1.07				<1.0				<1.0				
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05				<0.05				<0.05				<0.05				
D.O.	% Saturation		10	51	50	44	24	45	nm	46	56	42	30	35	44	36	43	44	46	40	26	35	37	29	42	40	32	24	28	34	
E. Coli	no/100ml		19	0																											
Fluoride	mg/l	1		<0.150				0.15				<0.150			<0.150				0.12					0.17				<0.20			
Iron	µg/l			572.7				314.9				97			<10				<10				<10.0				<10.0				
Lead	µg/l	10		2				<1				<0.5			<0.5				<0.5				<1.0				<1.0				
Magnesium	mg/l Mg	50		10.11				9.95				10.38			9.76				11.27				11				9.7				
Manganese	µg/l			64.3				38.9				60.5			2.1				1.24				<5.0				<5.0				
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05				<0.05				<0.050				<0.020				
Molybdenum (µg/l)															<0.5				<0.5				<1.0				<1.0				
Nickel	µg/l	20		2.7				1.3				<0.5			<0.5				<0.5				<1.0				<1.0				
Ortho-Phosphate	mg/l P	0.03		0.05				0.03				<0.02			<0.02				0.004				<0.010				<0.010				
pH		>7 or <8	7.3	7.2	7.2	7.4	7.3	7.2	7.2	7.3	7.5	7.4	7.2	7.4	7.4	7.3	7.2	7.2	6.9	7.3	7.2	7.2	7.3	7.1	7.2	7.2	7.2	7.3	7.2	7.2	
Potassium	mg/l	5		<1				<1				0.48			0.46				0.78				0.77				0.43				
Residue on evap	mg/l			545				420				392			366				412				400				400				
Sampling Depth	m		6.8	6.9	6.8	6.8	6.7	6.7	6.9	7		6.7	7.1	7.2	7	6.9	6.8	6.9	6.8	6.63	6.8	7	6.8	6.8	6.9	6.1	6.9	6.7	6.9	7	
Selenium	µg/l														<0.5				<0.5				<1.0				<1.0				
Silver	µg/l														<0.5				nm												
Sodium	mg/l	150		23.43				20.82				20.31			16.54				19.77				21				20				
Strontium	µg/l														144.19				151.01				140				130				
Sulphate	µg/l	50		22.6				21.1				19.2			18.2				15.86				16.4				13				
Suspended Solids	mg/l																														
Temp	°C		10.3	11	11	11	9	10.5	10	13	10.4	10	12.7	12	10	9	11	11	8	9.6	13.7		10	10.3	11	10.5	10.1	9.2	12.9	13.1	
Thallium	µg/l														<0.1				<0.1				<1.0				<1.0				
Time			12.4	12.15		12.1	12.35	12.35	11.1	12:35	11:55	11:45	11:05	11:00	11:30	11:35	11:30	11:22	11:20	11:45	10:40	10:45	10:50	0.4861111	11:10	11:00	10:55	11:00	11:00	10:40	
Tin	µg/l														2.8				nm												
T.O.C.	mg/l	10	4.5	2.2	3.4	4	2.9	1.9	1.6	3.5	3.3	2.5	2.4	4	1.7	70.3	<1.5	3.8	2	1.09	1.5	<1.5	1.9	<1.5	3.2	2.1	<1.5	2.3	1.7	2.2	
T.O.N	mg/l N			1.82				1.1				1.23			1.06				0.75				0.43				<0.20				
Total Suspended Solids	mg/l																														
Uranium	µg/l														0.64				0.78				<1.0				<1.0				
Vanadium	µg/l														<0.5				<0.5				<1.0				<1.0				
Zinc	µg/l	100		8.7				17.3				19.4			6.1				14.51				20				6.2				
Water Level m OD	119.94		113.14	113.04	113.14	113.14	113.24	113.24	113.04	112.94	119.94	113.24	112.84	112.74	112.94	113.04	113.14	113.04	113.14	113.31	113.14	112.94	113.14	113.14	113.04	113.84	113.04	113.24	113.04	112.94	

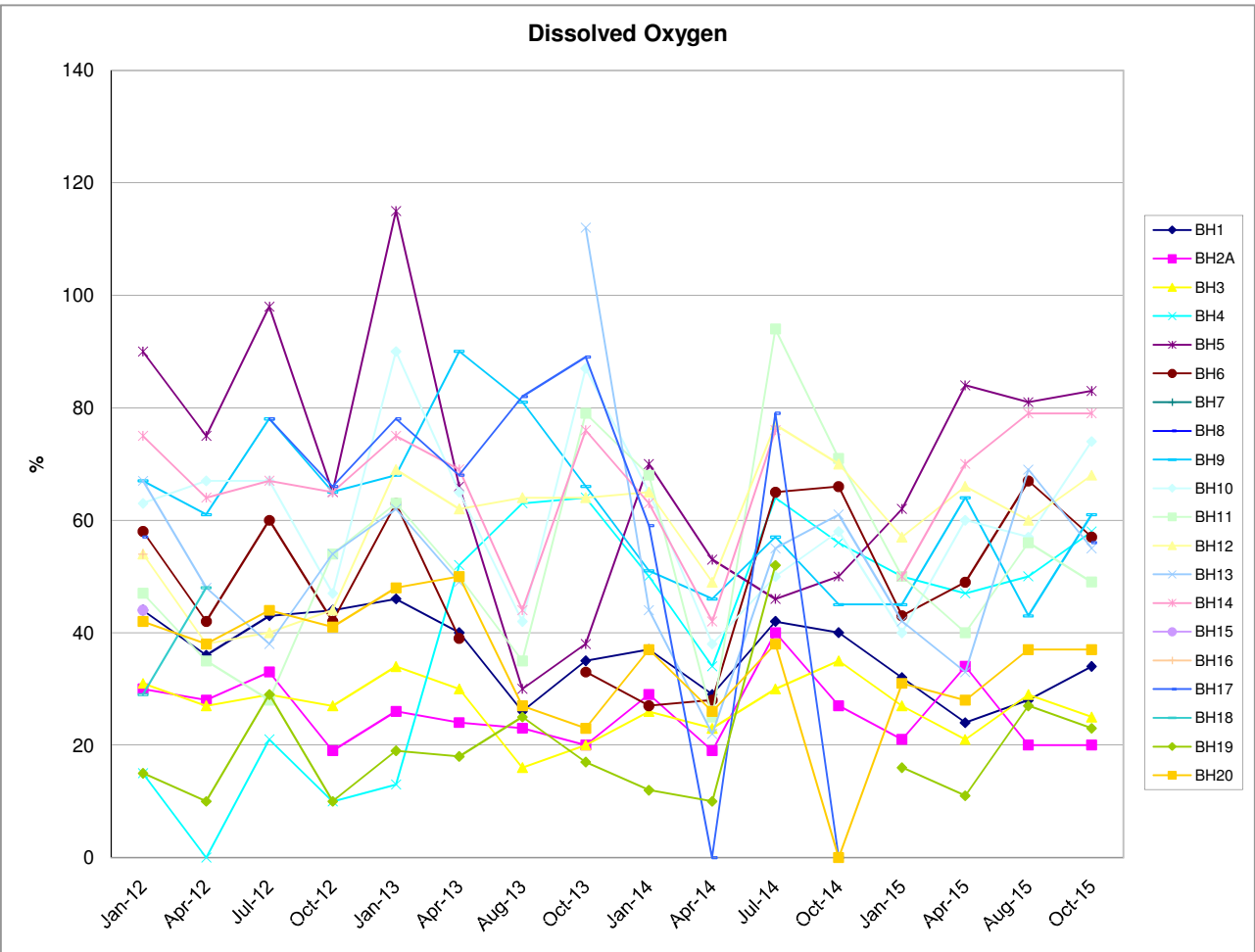
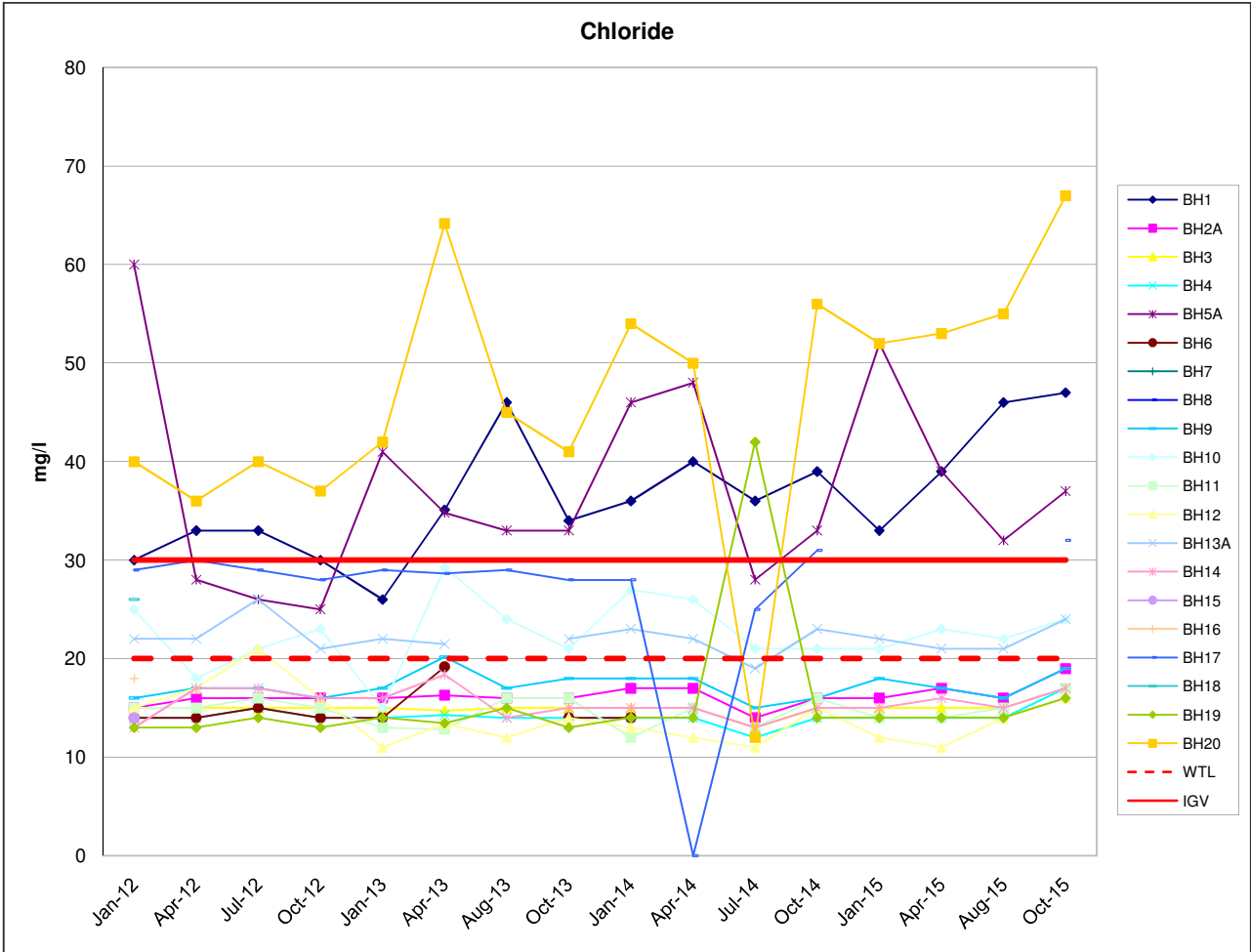
PARAMETERS		Whiteriver Landfill Site GROUNDWATER QUALITY RESULTS																													
		BH5A DOWNSTREAM OVERBURDEN																													
Monitoring Point:		Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	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	19-Jan-15	16-Apr-15	05-Aug-15	19-Oct-15
Aluminum	µg/l			270					240				192			232				210				274			242				
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	0.032	0.062	<0.020	<0.020		
Antimony	µg/l															<0.5				<0.5				<1.0			<1.0				
Arsenic	µg/l															0.5				<0.5				<1.0			<1.0				
Barium	µg/l															81.4				91.8				94			100				
Beryllium	µg/l															<0.5				<0.5				<1.0			<1.0				
B.O.D.	mg/l O2			<50																											
Boron	µg/l	1000							17				21.5			15.9				14				13			12				
Cadmium	µg/l	5		0.1					<0.1				<0.1			<0.1				<0.1				<0.020			<0.020				
Calcium	mg/l Ca	200		114.58					103.29				87.15			74.9				74.89				87			99				
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	52	39	32	37	
Chromium	µg/l	30		11.9					4.6							<0.5				<0.5				<1.0			<1.0				
Cobalt	µg/l															<0.5				<0.5				<1.0			<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	627	643	673	674	
Copper	µg/l	30		15.2					6.2				1.3			2.5				1.71				2			<1.0				
Cyanide	µg/l	0.01		<0.05					<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	62	84	81	83	
E. Coli	no/100ml		1	<10																											
Fluoride	mg/l	1		0.19					0.23				0.19			0.19				0.19				0.23			<0.20				
Iron	µg/l			6848.9					3272.3				312.1			<10				<10				<10.0			<10.0				
Lead	µg/l	10		14.4					5.2				<0.5			<0.5				<0.5				<1.0			<1.0				
Magnesium	mg/l Mg	50		17.1					15.01				12.9			10.81				11.66				12			13				
Manganese	µg/l			592.7					263.2				12.3			<1				<1				<5.0			<5.0				
Mercury	µg/l	1		<0.1					<0.1				<0.05			<0.05				<0.05				<0.050			<0.020				
Molybdenum (µg/l)																0.6				0.6				<1.0			<1.0				
Nickel	µg/l	20		22.6					9.6				<0.5			0.7				1.06				<1.0			<1.0				
Ortho-Phosphate	mg/l P	0.03		<0.02					<0.02				<0.02			<0.02				0				<0.010			<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	7.7	7.7	7.4	7.4	
Potassium	mg/l			1.3					1.38				1.31			1.41				1.6				1.5			0.76				
Residue on evaporation	mg/l			2103					2099				456			956				975				664			411				
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	6	5.8	6.2	6.3
Selenium	µg/l															<0.5				<0.5				<1.0			1.4				
Silver	µg/l															nm				nm											
Sodium	mg/l	150		30.55					29.11				29.31			26.89				27.31				31			23				
Strontium	µg/l															143.55				151.72				150			160				
Sulphate	mg/l	50		56.3					42				42			32.3				31.58				44			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	10.1	9.9	13.1	13.3	
Thallium	µg/l															<0.1				<0.1				<1.0			<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	10.05	10.20	10.50	10.25	
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	3.8	2.8	1.6	1.9	
T.O.N	mg/l N			0.16					<0.08				0.08			0.17				0.07				<0.20			0.45				
Total Suspended Solids	mg/l																														
Uranium	µg/l															0.99				0.89				<1.0			<1.0				
Vanadium	µg/l															0.64				<0.5				<1.0			<1.0				
Zinc	µg/l	100		32.5					17.3				4.2			3.9				4.75				11			4.5				
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	101.88	102.08	101.68	101.58

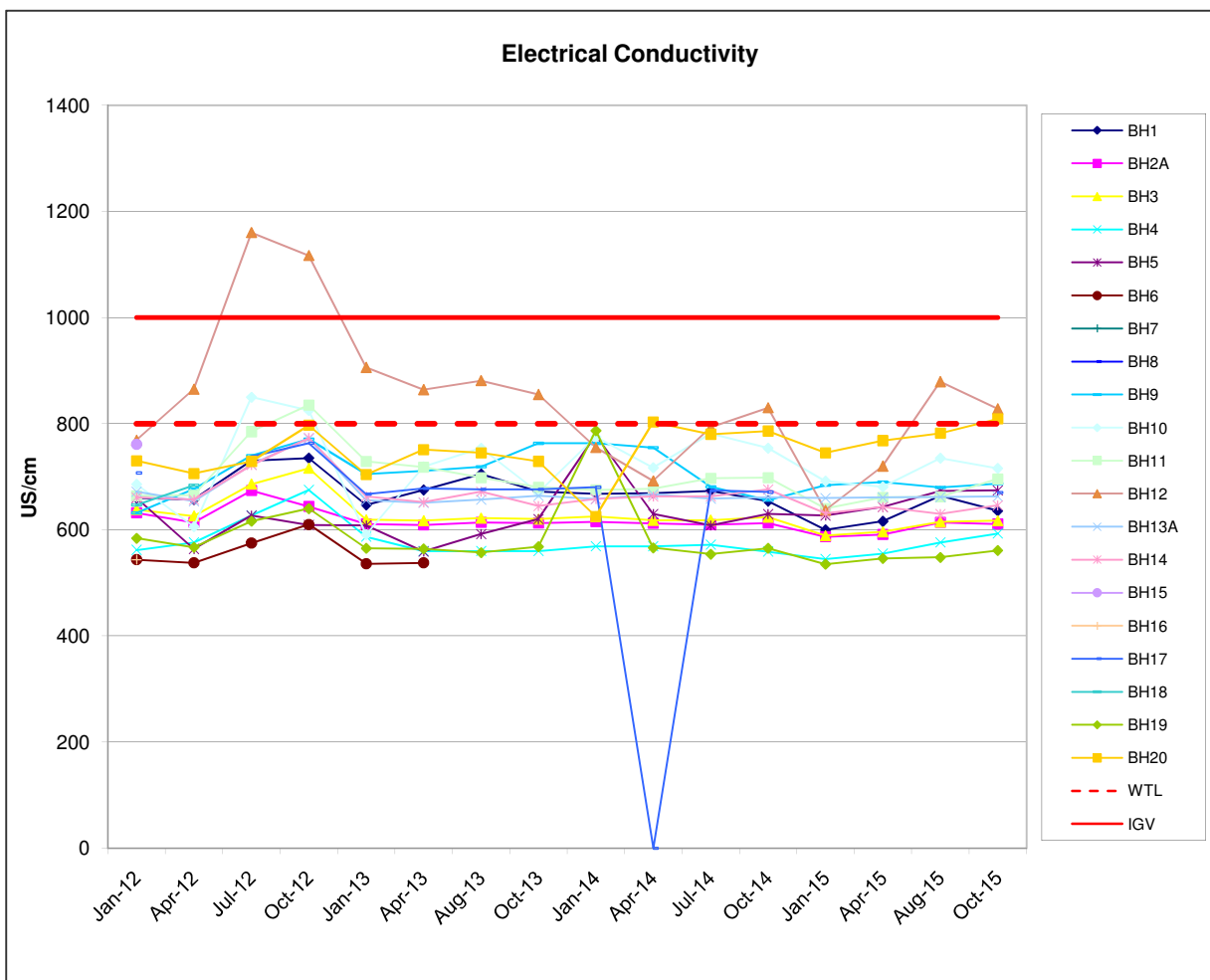
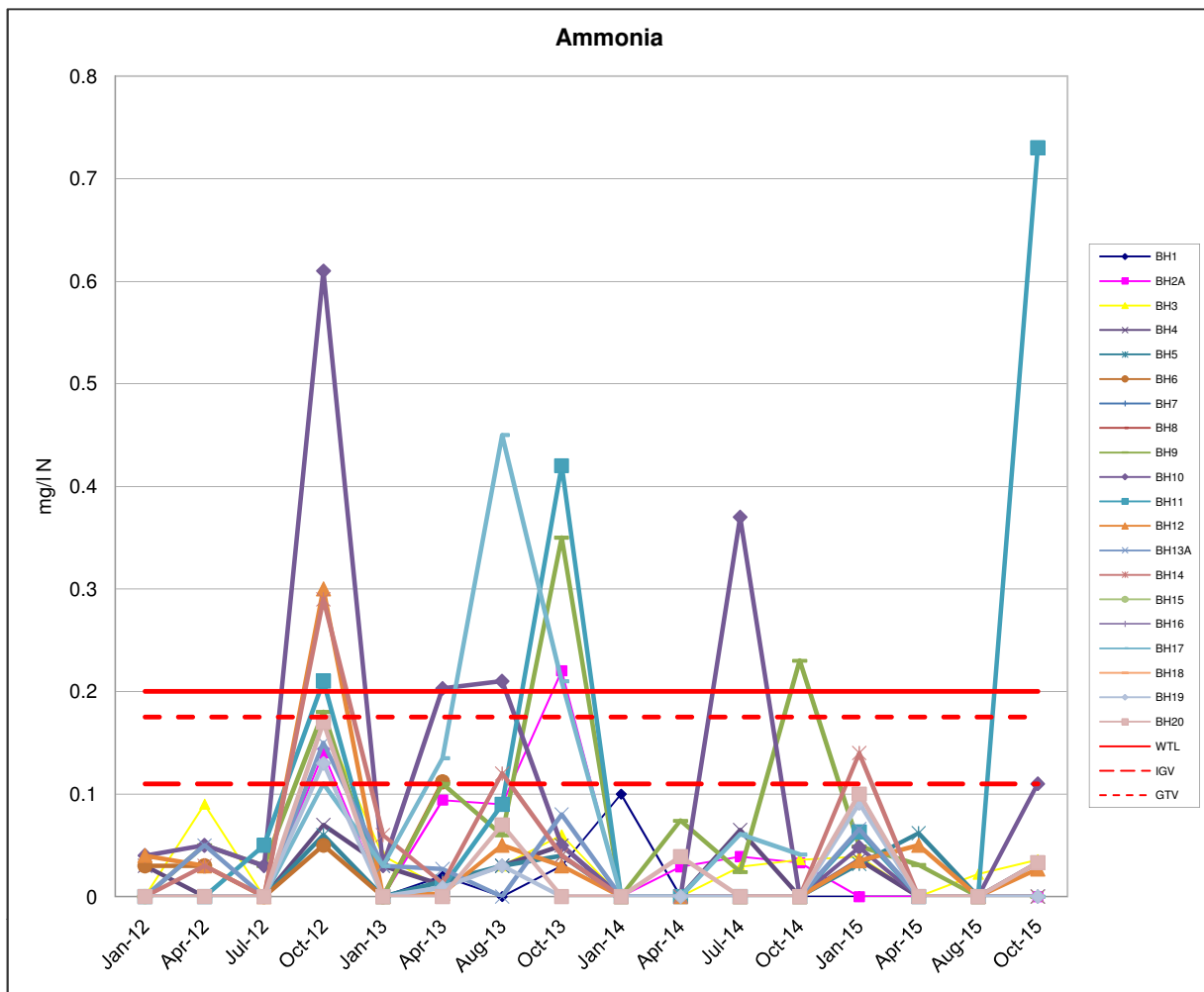
Whiteriver Landfill Site																																
GROUNDWATER QUALITY																																
RESULTS																																
BHS																																
DOWNSTREAM BEDROCK																																
PARAMETERS	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date				
Monitoring Point:																																
Alkalinity	mg/ICaCO3	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	19-Jan-15	16-Apr-15	05-Aug-15	19-Oct-15		
				250				141				208			260				282					332			273					
Aluminium	µg/l														<5				17.21					<10.0			<10.0					
Ammonia	mg/l N	0.2	<0.03	<0.03	<0.03	0.28	<0.03	<0.03	<0.03	<0.03	<0.03	0.06	0.03	<0.03	0.03	0.03	<0.03	0.05	<0.03	0.112		0.03	<0.020	<0.020	<0.020	0.046	0.064	<0.020	<0.020			
Antimony	µg/l														<0.5				<0.5					<1.0			<1.0					
Arsenic	µg/l														0.73				0.63					<1.0			<1.0					
Barium	µg/l														209.3				230.06					230			200					
Beryllium	µg/l														<0.5				<0.5					<1.0			<1.0					
B.O.D.	mg/l O2			54.2																												
Boron	µg/l	1000						32.5				61.3			60.3				34.15					55			51					
Cadmium	µg/l	5		<0.1				<0.1				<0.1			<0.1				<0.1					0.02			0.15					
Calcium	mg/l Ca	200		75.21				40.67				66.84			74.69				71.28								74					
C.O.D.	mg/l O2										13.4																					
Chloride	mg/l Cl	20	32	16	9	10	13	7	8	9	7	13	16	16	14	14	15	14	19.17			14	14	15	12	15	14	15	17			
Chromium	µg/l	30		5.3				1.9				2.1			<0.5				<0.5					<1.0			<1.0					
Cobalt	µg/l														<0.5				<0.5					<1.0			<1.0					
Coliform Bacteria	no/100ml		>2420	98																												
Conductivity	µS/cm @ 25	800	422	536	263	638	240	301	273	262	281	464	528	584	544	538	575	610	536	538		536	550	537	538	543	504	520	536	539		
Copper	µg/l	30		3.6				6.1				3.1			<0.5				1.26					<1.0			<1.0					
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05				<0.05					<0.05			<0.05					
D.O.	% Saturation		72	28	78	48	75	24	32	37	45	35	59	43	58	42	60	42	63	39		33	27	28	65	66	43	49	67	57		
E. Coli	no/100ml		58	<10																												
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150				0.14					0.17			<0.20					
Iron	µg/l			871.5				1694				1983			<10				25.33					<10.0			<10.0					
Lead	µg/l	10		3.9				6.9				1.8			<0.5				0.54					<1.0			<1.0					
Magnesium	mg/l Mg	50		16.65				8.86				15.58			16.46				15.39					18			17					
Manganese	µg/l			121.8				425.7				59.7			252.3				84.97					<5.0			210					
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05				<0.05					<0.050			<0.020					
Molybdenum (µg/l)	µg/l														0.8				0.58					<1.0			3.2					
Nickel	µg/l	20		2.9				3.6				16.7			0.6				0.65					<1.0			<1.0					
Ortho-Phosphate	mg/l P	0.03		0.02				0.03				0.03			0.04				0.027					0.031			0.027					
pH		>7 or <8	7.5	7.5	7.6	7.5	7.5	7.5	7.4	7.6	7.6	7.6	7.7	7.5	7.8	7.8	7.7	7.5	7.8	7.5		7.5	7.5	7.6	7.5	7.5	7.5	7.5	7.6	7.5		
Potassium	mg/l	5		1.98				2.67				6.2			2.18				2.66					2.1			1.7					
Residue on evaporation	mg/l			1077				580				378			370				1006					465			373					
Sampling Depth	m		13.3	13.1		13.8	13.9	13.3			13.9				13.8				13.9					0	nm	nm	nm	nm	nm	nm		
Selenium	µg/l														<0.5				<0.5					<1.0			<1.0					
Silver	µg/l														nm				nm													
Sodium	mg/l	150		16.29				7.98				21.44			14.82				13.48					16			16					
Strontium	µg/l														199.45				187.5					190			190					
Sulphate	µg/l	50		10.5				6				8.9			10.4				11.04					9.6			3					
Suspended Solids	mg/l																															
Temp	°C		10.3	11.9	11.8	12.3	10	10.3	11	10.9	9.3	11	15	14.6	10.9	11	13	14.5	6	8.9				11.6	9	9.8	14	11	8.5	10.2	14.6	13
Thallium	µg/l														<0.1				<0.1					<1.0			<1.0					
Time			12.4	13.4		12.5	12.35	13.2	11.3	13.15	13.45	12.20	12:00	12:25	11:20	11:20	11:30	12:00	11:15	13:00				12:20	11:45	11:50	11:25	11:45	11:45	11:25	12:30	11:20
Tin	µg/l														<1				nm													
T.O.C.	mg/l	10	5.6	4	5.3	8.2	43.3	19.8	47.1	36.2	5.9	3.4	12.3	4	3.3	68	2.2	2.4	3.4	1.3				5.7	9.4	3.1	6.4	4.2	3.9	2.1	3.6	2.5
T.O.N	mg/l N			0.28				0.33				0.31			0.14				0.04						0.64			<0.20				
Total Suspended Solids	mg/l																															
Uranium	µg/l														0.95				1.26								1					
Vanadium	µg/l														<0.5				0.97					<1.0			1.5					
Zinc	µg/l	100		8.4				14.6				12.2			10.4				13.5					<1.0			21					
Water Level m OD	105.01		91.71	91.91		91.21	91.11	91.71		91.11		91.21		91.11	105.01	105.01										#VALUE!	79.01	#VALUE!				

PARAMETERS		Whiteriver Landfill Site GROUNDWATER QUALITY RESULTS BHQ DOWNSTREAM BEDROCK																												
Monitoring Point:																														
Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date			
Alkalinity	mg/l CaCO3	NAC	440				440					408				336									366					
Aluminium	µg/l														<5										368			<10.0		
Ammonia	mg/l N	0.2	<0.03	<0.03	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	0.03	0.18	<0.03	0.11	0.06	0.35	<0.020	0.074	0.024	0.23	0.049	0.031	<0.020	<0.020
Antimony	µg/l														<0.5										<1.0			<1.0		
Arsenic	µg/l														0.56										<1.0			<1.0		
Barium	µg/l														163										210			180		
Beryllium	µg/l														<0.5										<1.0			<1.0		
B.O.D.	mg/l O2			<50																										
Boron	µg/l	1000						17.3				37.3			19.2										23			20		
Cadmium	µg/l	5		<0.1				<0.1				<0.1			<0.1									<0.020			<0.020			
Calcium	mg/l Ca	200		139.46				151.69				148.74			102.87										120			110		
C.O.D.	mg/l O2										23.3																			
Chloride	mg/l Cl	20	15	14	15	15	16	16	17	19	19	19	15	16	16	17	17	16	17	20.18	17	18	18	18	15	16	18	17	16	19
Chromium	µg/l	30		5.4				<1							1.8										<1.0			<1.0		
Cobalt	µg/l															<0.5									<1.0			<1.0		
Coliform Bacteria	no/100ml		105	31																										
Conductivity	µS/cm @ 25	800	737	825	872	919	961	905	936	898	1002	891	625	706	632	677	740	771	705	711	719	763	763	755	681	656	684	690	680	687
Copper	µg/l	30		1.5				1.2				1				1.5									<1.0			<1.0		
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05									<0.05			<0.05			
D.O.	% Saturation		36	85	59	47	54	68	nm	62	65	35	67	54	67	61	78	65	68	90	81	66	51	46	57	45	45	64	43	61
E. Coli	no/100ml		0	20																										
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150					0.12					0.22			<0.20		
Iron	µg/l			1215.8				6454.7				1116.4			<10					<10				<10.0			<10.0			
Lead	µg/l	10		<1				<1							<1					<1.1				<1.0			<1.0			
Magnesium	mg/l Mg	50		18.92				21.98				27.48			18					20.44				24			21			
Manganese	µg/l			217				941.6				199.3			3.1					<1				<5.0			7.4			
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05					<0.05				<0.050			<0.020			
Molybdenum (µg/l)															<0.5					<0.5				<1.0			<1.0			
Nickel	µg/l	20		1.6				<1				2								<0.5				<1.0			<1.0			
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02			<0.02					0.002				0.01			<0.010			
pH		>7 or <8	7.2	7.2	7	7.1	7.1	7.1	7	7.1	7.2	7.1	7.4	7.5	7.6	7.5	7.4	7.4	7.5	7.4	7.2	7.3	7.3	7.3	7.3	7.4	7.3	7.4	7.3	7.3
Potassium	mg/l			<1				<1				3.39			1.2					1.99				1.8			1.2			
Residue on evaporation	mg/l	5		605				604				754			486					702				638			428			
Sampling Depth	m		23	23.2	23.1	23	22.9	23	23	22.9		23.1	23.3	23.3	23.4	22.9	23	22.8	22.7	22.56	22.8	22.8	22.6	22.7	22.7	23.6	22.5	22.5	22.6	22.6
Selenium	µg/l														<0.5					<0.5				<1.0			<1.0			
Silver	µg/l														nm					nm										
Sodium	mg/l	150		14.63				14.25				23.78			15.24					15.15				19			15			
Strontium	µg/l														213.38					232.5				250			230			
Sulphate	µg/l	50		32.4				46.9				35.5			13.7					18.84				27.4			54			
Suspended Solids	mg/l																													
Temp	°C		8.8	11	12	11	8.4	11.1	10	11	9.5	10	13.7	13	10	9	11	11	8	9.7	13.9	12.4	8	11.6	10	11	9.3	10.1	13.6	13.9
Thallium	µg/l														<0.1					<0.1				<1.0			<1.0			
Time			10.25	10.55		10.5	11.25	9.45	10.3	11.30	11.15	11:10	10:30	10:45	11:00	10:50	10:45	11:00	10:40	10:40	10:23	11:05	11:05	10:40	10:30	10:20	11:55	10:10	10:40	10:15
Tin	µg/l														<1					nm										
T.O.C.	mg/l	10	2.8	6.5	4.9	5.4	9	5.6	4.3	4.6	5.7	8.4	3.5	6.5	1.7	83.3	<1.5	<1.5	2.3	1.13	1.6	2.7	3	2.2	4.1	2.1	2.1	2.5	1.5	2.4
T.O.N	mg/l N			0.08				<0.08				0.08			0.21					0.1				<0.20			<0.20			
Total Suspended Solids	mg/l																													
Uranium	µg/l														1.61					2.43				2.9			2.2			
Vanadium	µg/l														<0.5					<0.5				<1.0			<1.0			
Zinc	µg/l	100		3.7				7.2				3.5			4.2					0.75				<1.0			3.3			
Water Level m OD	103.47		80.47	80.27	80.37	80.47	80.57	80.47	80.47	80.57	103.47	80.37	80.17	80.17	80.07	80.57	80.47	80.67	80.77	80.91	80.67	80.67	80.87	80.77	80.77	79.87	80.97	80.97	80.87	80.87

PARAMETERS <i>Monitoring Point:</i>	Whiteriver Landfill Site GROUNDWATER QUALITY RESULTS BH13A																														
	DOWNSTREAM BEDROCK																														
	Units	Trigger Level	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	
Alkalinity	mg/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	19-Jan-15	16-Apr-15	05-Aug-15	19-Oct-15	
Aluminium	µg/l			332				344				264			320	<5	<0.03	0.05	0.03	0.04	0.027		0.08	<0.020	<0.020	<0.020	<0.020	0.066	<0.020	<0.020	<0.020
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													
Antimony	µg/l														<0.5	<0.5	<0.5	<0.5	<0.5												
Arsenic	µg/l														<0.5	<0.5	<0.5	<0.5	<0.5												
Barium	µg/l														48.9				61.09												
Beryllium	µg/l														<0.5				<0.5												
B.O.D.	mg/l O2			<50																											
Boron	µg/l	1000										20.7			19.8				19.5												
Cadmium	µg/l	5		<0.1								<0.1			<0.1				<0.1												
Calcium	mg/l Ca	200		79.9								76.87			75.45				77.57												
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	22	21	21	24	
Chromium	µg/l	30		2.6											<0.5				0.53												
Cobalt	µg/l														<0.5				<0.5												
Coliform Bacteria	no/100ml		54	5																											
Conductivity	µS/cm @ 25	800	658	659	660	662	668	663	665	602	688	672	660	672	654	723	772	656		651		664	666	667	663	661	627	632	643	650	
Copper	µg/l	30		2				1				1.9			0.5				<0.5												
Cyanide	µg/l	0.01		<0.05				<0.05				<0.05			<0.05				<0.05												
D.O.	% Saturation		<10	42	40	35	32	36	nm	41	39	38	51	67	48	38	54	62	49			112	44	22	55	61	42	33	69	55	
E. Coli	no/100ml		0	0																											
Fluoride	mg/l	1		<0.150				<0.150				<0.150			<0.150				0.13												
Iron	µg/l			156.6				230.4				691.2			<10				<10												
Lead	µg/l	10		<1				<1				0.6			<0.5				<0.5												
Magnesium	mg/l Mg	50		23.96				25.53				25.36			26.14				24.5												
Manganese	µg/l			264.5				330.4				235.5			225.4				169.66												
Mercury	µg/l	1		<0.1				<0.1				<0.05			<0.05				<0.05												
Molybdenum (µg/l)															1.2				1.07												
Nickel	µg/l	20		<1				<1				<0.5			<0.5				0.62												
Ortho-Phosphate	mg/l P	0.03		0.1				0.09				0.08			0.11				0.099												
pH		>7 or <8	7.6	7.5	7.3	7.6	7.5	7.5	7.5	7.6	7.6	7.5	7.5	7.6	7.7	7.6	7.4	7.3	7.5			7.6	7.5	7.5	7.4	7.5	7.5	7.6	7.5	7.5	
Potassium	mg/l			1.33				1.38				1.3			1.49				1.74												
Residue on evaporation	mg/l	5		409				421				524			414				417												
Sampling Depth	m		25.4	25.5	25.5	25.4	25.4	25.4	25.5	25.4		25.6	25.7		25.6	25.4	25.5	25.2	25.2	25.05		25.2	21.1	25.2	25.1	25.1	25	25.1	25.1	25.1	
Selenium	µg/l														<0.5				<0.5												
Silver	µg/l																														
Sodium	mg/l	150		27.71				26.21				25.36			26.08				25.97												
Strontium	µg/l														241.3				241.97												
Sulphate	µg/l	50		11.6				13				14			10.7				10.835												
Suspended Solids	mg/l																														
Temp	°C		10	11	12	11	8.2	11	10	12	9.3	10	14		10	9	11	11	8	8.5		12	8	11.1	12	11	8.2	7.9	13.8	14.4	
Thallium	µg/l														<0.1				<0.1												
Time			11.2	11.45		11.35	10.45	12	10.55		10.10	10.35	10.00		10.30	10.20	10.15	10.25	10.15	10.20		10.38	10.35	11.20	11.00	10.55	10.40	10.50	10.25	10.05	
Tin	µg/l														<1				nm												
T.O.C.	mg/l	10	<1.5	1.8	<3.0	<3.0	3.3	<1.5	2.6	<1.5	2.7	<1.5	1.6	<1.5	78.6	<1.5	<1.5	1.7	0.832		1.6	1.8	5.3	3.6	2.2	3.8	2.3	1.5	<1.5		
T.O.N	mg/l N			<0.08				<0.08				<0.08			<0.08				0.03												
Total Suspended Solids	mg/l																														
Uranium	µg/l														5.26				5.3												
Vanadium	µg/l														<0.5				<0.5												
Zinc	µg/l	100		10.8				12.3				5.1			2.1				1.15												
Water Level m OD	106.01		80.61	80.51	80.51	80.61	80.61	80.61	80.51	80.61	106.01	80.41	80.31	106.01	80.41	80.61	80.51	80.81	80.81	80.81		80.81	84.91	80.81	80.91	80.91	81.01	80.91	80.91	80.91	

PARAMETERS		Whiteriver Landfill Site																													
		GROUNDWATER QUALITY																													
Monitoring Point:		RESULTS																													
		BH20																													
		UPSTREAM OF LANDFILL, DOWN GRADIENT OF LEACHATE LAGOON, OVERBURDEN																													
Units		Trigger levels	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	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	19-Jan-15	16-Apr-15	05-Aug-15	19-Oct-15	
Aluminium	µg/l			304				328							312																
Ammonia	mg/l N	0.2	0.14	0.06	0.08	0.56	0.07	<0.03	0.05	0.12	0.14	<0.03	<0.03	0.15	<0.03	<0.03	<0.03	0.17	<0.03	0	0.07	<0.03	<0.020	0.039	<0.020	<0.020	0.1	<0.020	<0.020	0.033	
Antimony	µg/l															<0.5				<0.5					<1.0				<1.0		
Arsenic	µg/l															0.72				0.7					<1.0				<1.0		
Barium	µg/l															125.5				144.69					150				160		
Beryllium	µg/l															<0.5				<0.5					<1.0				<1.0		
B.O.D.	mg/l O2			259.5																											
Boron	µg/l	1000						240.2							252.1					210.1					168.06				150		
Cadmium	µg/l	5		0.5				<0.1							<0.1					<0.1					<0.020				<0.020		
Calcium	mg/l Ca	200		147.7				83.48							70.07					68.63					75.55				84		
C.O.D.	mg/l O2																														
Chloride	mg/l Cl	20	33	26	39	29	26	27	72	36	34					36	40	37	42	64.16	45	41	15	50	12	56	52	53	55	67	
Chromium	µg/l	30		18.1				8.2								5.8				<0.5					<1.0				<1.0		
Cobalt	µg/l															<0.5				<0.5					<1.0				<1.0		
Coliform Bacteria	no/100ml		1	<10						33																					
Conductivity	µS/cm @ 25	800	626	626	641	628	647	649	642	574	690	674	690	781	730	706	729	797	704	751	745	729	625	803	780	786	745	768	782	809	
Copper	µg/l	30		40.6				12.3							3					1					0.83				<1.0		
Cyanide	µg/l	0.01		<0.05				<0.05							<0.05					<0.05					<0.05		40		<0.05		
D.O.	% Saturation		<10	28	34	36	30	41	nm	37	34	42	35	35	42	38	44	41	48	50	27	23	26	26	38		31	28	37	37	
E. Coli	no/100ml		0	<10						<1																					
Fluoride	mg/l	1		0.24				0.28							0.21					0.2					0.19				<0.20		
Iron	µg/l			18638.3				6302.7							3243.2					<10					18.81				<10.0		
Lead	µg/l	10		40				8.9							1.5					<0.5					<0.5				<1.0		
Magnesium	mg/l Mg	50		39.73				31.25							28.46					26.88					28.73				32		
Manganese	µg/l			2272.6				943.9							69.3					<1					<5.0				<5.0		
Mercury	µg/l	1		<0.1				<0.1							<0.05					<0.05					<0.050				<0.020		
Molybdenum (µg/l)																3.8				3.8					2.69				2.4		
Nickel	µg/l	20		51.1				15.4							2.7					0.7					0.75				<1.0		
Ortho-Phosphate	mg/l P	0.03		<0.02				0.02							0.03					0.02					0.019				<0.010		
pH		>7 or <8	7.7	7.7	7.5	7.7	7.6	7.5	7.5	7.7	7.7	7.6	7.5	7.6	7.6	7.7	7.6	7.5	7.4	7.5	7.4	7.4	7.5	7.4	7.4	7.5	7.4	7.4	7.5	7.4	
Potassium	mg/l	5		3.39				3.02							3.54					3.18					4.7				2.7		
Residue on evaporation	mg/l			9814				8666							3390					1642					6134				1667		
Sampling Depth	m		10.9	5.4	11.7	11.1	10.2	10.1	10.1	9.9					10	10	10	9.6	9.5	9.7	9.6	10.5	9.14	6.8	6.6	nm	6.4	6.4	6.3	6.3	6.4
Selenium	µg/l															<0.5				<0.5					<1.0				<1.0		
Silver	µg/l															nm				nm					nm						
Sodium	mg/l	150		44.29				44.22							46.74					43.12					42.13				42		
Strontium	µg/l															447.74				478.17					450				460		
Sulphate	µg/l	50		18.6				20							19.5					19.9					19.66				19		
Suspended Solids	mg/l																														
Temp	°C		10.4	11.3	12	11	9.7	12	15	11	8.6	10	13	12	11	9	11	11	9	11.1	13.6	12.8	10	11.2	12.5	11	10.9	10.2	13	14.2	
Thallium	µg/l															<0.1				<0.1					<0.1				<1.0		
Time			12	13.2		13.3	13.1	13	11.25	12.25	14	13.45	11.20	12.00	11.20	11.30	11.20	11:35	11:30	12.00	11:00	10:50	10:55	12.00	11:20	11:15	12:15	11:20	11:15	10:35	
Tin	µg/l															2.77				nm											
T.O.C.	mg/l	10	<1.5	3.4	<3.0	<3.0	28.6	2.6	12.4	7	6.7	13.7	12.7	4.5	3.1	95.8	<1.5	2.2	6	1.21	10.8	2.9	<1.5	7	3.1	5.2	8.1	4.5	2.3	2.9	
T.O.N	mg/l N			<0.08				0.24							0.14					0.21					0.01				0.28		
Total Suspended Solids	mg/l																														
Uranium	µg/l															4.15				5.61					6.5				6.8		
Vanadium	µg/l															0.98				0.83					<1.0				<1.0		
Zinc	µg/l	100		88.6				27.1							8.5					4.2					5.08				4.9		





Appendix D

Surface Water Monitoring Results



SURFACE WATER QUALITY

RESULTS

PARAMETERS	Units	SW1																			
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Monitoring Point:		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	19-Jan-15	16-Apr-15	05-Aug-15	19-Oct-15
Alkalinity	mg/l CaCO3		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	0.52	0.56	0.35	0.1
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	1.5	2.5	5.5	65
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	21	<20	56	204
Chloride	mg/l Cl	30	60		40	36	28	23	27	28	35.55		31	25		30	26	23	26	42	41
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	542	610	698	793
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	73	83	80	83
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								0.2		
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	7.8	7.8	7.9	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			18		
Suspended Solids	mg/l												12	<4		<4	4	<4	11	97	
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	1.2	11	15.4	12.6
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	10:15	10:15	10:20	10:20
Tin	µg/l						<1				nm										
T.O.C.	mg/l																				
T.O.N	mg/l N		0.17				1.77				1.19							0.82			
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

RESULTS

Monitoring Point:	Units	SW2A																				
		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		300				220															
Aluminium	µg/l						13.9															
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	0.6	0.36	0.05	0.092
Antimony	µg/l						<0.5															
Arsenic	µg/l						1.35				1.59											
Barium	µg/l						86.2				99.23											
Beryllium	µg/l						<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	<1.0	2.7	1.5	<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	<20	<20	26	24
Chloride	mg/l Cl	70	120		48	47	37	35	31	37	52.91			46	45		35	31	28	32	25	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	570	605	473	645
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	73	112	84	87
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									0.11		
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	7.8	8.1	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									27		
Suspended Solids	mg/l													4	9	<2	<4	<4	<4	<4	6	6
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	6.2	10.7	14.8	12.2
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	10:40	11:00	12:10	nt
Tin	µg/l						<1				nm											
T.O.C.	mg/l																					
T.O.N	mg/l N		1.61				1.42				0.8									0.67		
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

RESULTS

Monitoring Point:	Units	SW3																			
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Alkalinity	mg/lCaCO3						135														
Aluminium	µg/l						15.8														
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	0.77	0.16		
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	<1.0	<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	<20	<20		
Chloride	mg/l Cl	46			18	21	22	27	19	32	29.55		42	42			15	10	10		
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	486	417		
Copper	µg/l						2.3				2.08										
Cyanide	mg/l																				
D.O.	% Saturation	89			nm	86	77	112	62	94	47		66	68			76	85	80		
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								<0.010		
pH		7.9			7.8	8	8.2	8.2	8.2	7.9	7.7		7.5	7.8	7.8		7.7	8.1	7.9		
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								30		
Suspended Solids	mg/l												<4	<4	<2		<4	4	<4		
Temp	°C	6.8			14	7	10	17	11	7	5.3		11	2			<4	1.9	10.6		
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	12:30	10:55		
Tin	µg/l						<1				nm										
T.O.C.	mg/l																				
T.O.N	mg/l N						0.14				0.31								<0.20		
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

	20/01/2015			06/02/2015			06/03/2015			02/04/2015		
	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2
PZ1	0	2.1	18.5	0	2.1	18.2	0	1.8	19.1	0	2.2	18.7
PZ2	0	0.4	20	0	0.6	19.6	0	0.4	19.6	0	0.4	19.8
PZ3	0	0.6	19.6	0	0.8	19.4	0	1.1	19.2	0	0.6	19.6
PZ4	0	0.8	19.8	0	1.2	19.6	0	0.6	19.8	0	1.1	19.8
PZ5	0	2.2	18.5	0	2.2	18.2	0	1.8	19.2	0	2	18.6
PZ54	0	0.6	19.8	0	1.1	2.6	0	0.4	19.8	0	1	19.8
PZ53	0	0.9	19.8	0	0.8	19.6	0	0.6	19.6	0	0.6	19.8
PZ52	0	0.6	20.8	0	0.4	20.2	0	0.4	19.8	0	0.4	20.2
PZ51	0	0.4	19.9	0	0.6	21.1	0	0.4	19.5	0	0.2	20.2
PZ50	0	1	20.2	0	0.8	20.6	0	0.6	20.2	0	0.6	20.4
PZ49	0	2.1	19.2	0	2.2	19.1	0	1.2	20.1	0	1.8	19.2
PZ48	0	1.4	18.9	0	1.5	20.4	0	1.6	18.9	0	1.3	19.9
PZ47	0	0.8	21.1	0	1.1	20.4	0	1.2	21.1	0	1	20
PZ46	0	3.8	15.6	0	4.1	16.1	0	3.6	16.6	0	3.6	17.6
PZ45	0	0.6	20.2	0	1.1	19.9	0	1.2	19.8	0	1.2	19.4
PZ44	0	0.4	20.9	0	0.2	22.2	0	0.2	19.8	0	0.2	22.2
PZ43	0	0.4	20.8	0	0.4	20.8	0	0.6	19.8	0	0.3	20.8
PZ42	0	0.8	21	0	1.2	21.1	0	1	20.2	0	1.3	20
PZ41	0	0.6	21.8	0	0.6	21.8	0	0.4	19.8	0	0.4	21.8
PZ40	0	0.4	21.4	0	0.4	20.1	0	0.6	19.6	0	0.3	20.1
PZ39	0	0.6	20.8	0	0.6	21.1	0	0.4	20.6	0	0.3	21.1
PZ38	0	0.4	21.6	0	0.4	21.4	0	0.2	20.2	0	0.3	21.1
PZ37	0	0.4	20.4	0	0.4	21.5	0	0.2	21.1	0	0.3	21.1
PZ36	0	1	19.2	0	1	19.1	0	1	19.4	0	0.8	19.2
PZ35	0	0.4	21.2	0	0.4	21.1	0	0.2	21	0	0.3	21.1
PZ34	0	0.8	21.2	0	0.8	20.8	0	0.6	20.6	0	0.8	20.8
PZ33	0	0.4	21	0	0.4	20.2	0	0.2	21	0	0.3	20.6
PZ32	0	0.4	21.2	0	1	21.2	0	0.2	20.6	0	1.2	20.1
PZ31	0	0.4	21.2	0	0.4	20.6	0	0.2	21.2	0	0.3	21.1
PZ30	0	0.4	20.6	0	0.4	20.2	0	0.8	30.2	0	0.3	21.1
PZ29	0	0.4	21.2	0	0.4	2.04	0	0.6	21	0	0.3	20.4
PZ28	0	2.2	19	0	2.8	18.1	0	1.6	19.4	0	2.6	17.8
PZ27	0	0.4	21.8	0	0.4	20.5	0	0.4	20.6	0	0.3	20.2
PZ26	0	1.4	18.9	0	1.5	20.2	0	1.5	20.2	0	1.4	20.2
PZ25	0	0.2	21.8	0	0.2	20.8	0	0.2	21.2	0	0.3	21
PZ24	0	0.2	22	0	0.4	22.3	0	0.2	21.2	0	0.3	21.1
PZ23	0	0.4	22.3	0	0.2	21.1	0	0.6	20.2	0	0.3	21.1
PZ22	0	0.6	21	0	0.6	19.2	0	0.3	20.7	0	0.4	21
PZ21	0	0.2	21.6	0	0.2	22.5	0	0.2	20.6	0	0.3	21.1
PZ11	0	1.2	20.4	0	1.1	20.1	0	1.2	21.2	0	1.2	19.8
PZ12	0	0.4	20.6	0	1	20.8	0	0.8	21.2	0	1.1	19.8
PZ13	0	0.2	20.6	0	0.2	21.1	0	0.2	21.2	0	0.3	21.1
PZ14	0	0.4	20.1	0	0.2	22.3	0	0.4	21	0	0.2	21.1
PZ15	0	0.4	20.2	0	0.2	21.9	0	0.4	21	0	0.2	21.1
PZ16	0	1.4	20	0	1.2	19.9	0	2	19.8	0	1.1	20

	14/05/2015			30/06/2015			14/07/2015			12/08/2015		
	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2
PZ1	0	2.2	18.5	0	2.1	18.6	0	2	18.6	0	1.9	19
PZ2	0	0.3	21.1	0	0.2	20.6	0	0	20.6	0	0.2	21.1
PZ3	0	0.6	19.6	0	0.4	19.7	0	0.2	19.8	0	0	21.1
PZ4	0	1	20.1	0	1.1	20.1	0	1.2	20	0	1.2	20.2
PZ5	0.2	2.1	17.9	0	2.2	18.1	0	2.2	18.2	0	2.3	18.2
PZ54	0	0.9	18.4	0	0.8	19.1	0	0.4	19.6	0	0.4	19.6
PZ53	0	0.5	18.6	0	0.4	19.1	0	0.2	19.6	0	0.2	20.6
PZ52	0	0.2	21.6	0	0.2	20.4	0	0.2	20.2	0	0.2	20.4
PZ51	0	0.3	21.1	0	0.2	21	0	0.2	20.8	0	0.2	21
PZ50	0	0.8	19.8	0	0.6	19.8	0	0.4	20	0	0.4	20
PZ49	0	1.6	18.8	0	1.4	19.2	0	1.2	20.1	0	1.2	19.6
PZ48	0	1.2	18.6	0	1.2	19.2	0	1.1	18.8	0	1.3	19.2
PZ47	0	0.6	20.4	0	0.4	20.6	0	0.2	20.2	0	0.2	21
PZ46	0	3.4	16.8	0	3.2	17.2	0	3.4	17.8	0	3.1	17.6
PZ45	0	1.1	18.9	0	1	19.4	0	1.1	19.6	0	1.8	19.8
PZ44	0	0.3	21.1	0	0.4	20.2	0	0.2	20.2	0	0.2	20.4
PZ43	0	0.3	20.8	0	0.3	20.8	0	0.2	20.6	0	0.2	20.6
PZ42	0	1.6	19.6	0	1.5	19.8	0	1.4	19.6	0	1.4	19.2
PZ41	0	0.6	20.6	0	0.5	20.2	0	0.2	20.2	0	0.2	20.2
PZ40	0	0.3	20.6	0	0.2	20.2	0	0.2	20.2	0	0.2	20.2
PZ39	0	0.2	20.8	0	0.2	20.6	0	0.2	20.4	0	0.2	20.6
PZ38	0	0.2	21	0	0.3	20.3	0	0.2	20.2	0	0.2	20.4
PZ37	0	0.3	21.1	0	0.3	21.1	0	0.2	20.6	0	0.2	21.1
PZ36	0	0.6	18.6	0	0.4	19.1	0	0.4	19.4	0	0.4	20
PZ35	0	0.4	20.4	0	0.4	20.4	0	0.2	20.8	0	0.4	20.2
PZ34	0	0.6	21	0	0.8	20.2	0	0.6	20.2	0	0.9	20.2
PZ33	0	0.3	20.6	0	0.3	20.6	0	0.2	20.4	0	0.2	20.4
PZ32	0	1.1	19.9	0	1.2	19.2	0	1.4	19	0	1.6	18.6
PZ31	0	0.3	21.1	0	0.2	21.1	0	0.2	20.8	0	0.2	21.1
PZ30	0	0.3	21.1	0	0.3	21.1	0	0.2	20.6	0	0.2	21.1
PZ29	0	0.3	20.4	0	0.2	20.4	0	0.2	20.4	0	0.2	20.4
PZ28	0	2.2	18	0	2.3	18.4	0	2.4	18.2	0	2.2	18.6
PZ27	0	0.4	20.2	0	0.3	19.9	0	0.2	20	0	0.2	20.6
PZ26	0	1.3	19.8	0	1.4	19.2	0	1.5	19.4	0	1.3	19.8
PZ25	0	0.4	20.4	0	0.3	20.4	0	0.2	20.4	0	0.2	20.8
PZ24	0	0.2	21.2	0	0.2	21.2	0	0.2	20.8	0	0.2	21
PZ23	0	0.3	21.1	0	0.3	21.1	0	0.2	20.8	0	0.2	21.1
PZ22	0	0.4	20.8	0	0.5	20	0	0.5	19.8	0	0.4	20
PZ21	0	0.3	21.1	0	0.3	21.1	0	0.2	20.6	0	0.2	21.1
PZ11	0	1.1	19.6	0	1	19.8	0	1.1	19.6	0	1.1	19.8
PZ12	0	1	19.6	0	1.1	19.4	0	1.1	19.4	0	1.1	19.4
PZ13	0	0.3	21.1	0	0.2	21.1	0	0.2	20.8	0	0.2	21.1
PZ14	0	0.2	21.1	0	0.3	21.1	0	0.2	21.1	0	0.2	20.6
PZ15	0	0.3	20.6	0	0.2	21	0	0.2	21	0	0.2	21
PZ16	0.3	1.2	20.1	0.2	1.3	19.8	0	1.1	20	0.2	1.1	19.6
										0.2	1.1	19.6

	17/09/2015			13/10/2015			30/11/2015			21/12/2015		
	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2	CH4	CO2	O2
PZ1	0	1.9	19.2	0	1.7	19.3	0	1.4	19.6	0	1.6	19.2
PZ2	0	0.2	20.4	0	0.2	20.2	0	0.2	20.4	0	0.4	20.2
PZ3	0	0.8	19.6	0	0.7	19.7	0	0.6	19.8	0	0.4	19.6
PZ4	0	1.3	19.4	0	1.1	19.8	0	1.2	19.6	0	1.2	19.4
PZ5	0	2.4	18	0	2.5	18.2	0	2.6	18.4	0	2.6	18.4
PZ54	0	1.2	19.8	0	1.1	19.7	0	1.2	19.2	0	1.2	19.4
PZ53	0	0.8	19.6	0	0.6	19.6	0	0.4	20.2	0	0.2	19.8
PZ52	0	0.4	20.2	0	0.2	20.2	0	0.2	20.2	0	0.1	20.2
PZ51	0	0.4	21.1	0	0.2	20.6	0	0.2	20.4	0	0.1	20.4
PZ50	0	0.9	20.1	0	0.8	20.2	0	0.6	19.8	0	0.8	19.6
PZ49	0	2.3	19.2	0	2.2	19.2	0	2.4	19.4	0	2.6	19.2
PZ48	0	1.6	19.8	0	1.4	19.9	0	1.2	19.8	0	1.2	19.6
PZ47	0	1.2	20	0	1.1	20.1	0	1.2	19.8	0	0.8	20.2
PZ46	0	4.2	17.2	0	3.8	18.2	0	3.6	18.4	0	2.8	18.6
PZ45	0	1.1	19.8	0	1.2	19.6	0	1.2	19.6	0	1.2	19.2
PZ44	0	0.2	21.1	0	0.4	20.6	0	0.2	20.4	0	0.2	20.4
PZ43	0	0.4	20.6	0	0.2	20.6	0	0.2	20.6	0	0.4	20.4
PZ42	0	1.1	20.6	0	1	20.4	0	0.8	20.4	0	0.6	20.2
PZ41	0	0.4	20.4	0	0.4	20.4	0	0.4	20.4	0	0.2	20.4
PZ40	0	0.4	20.1	0	0.4	20.1	0	0.4	20.1	0	0.4	20.1
PZ39	0	0.6	20.2	0	0.4	20.4	0	0.4	20.2	0	0.2	20.4
PZ38	0	0.2	20.8	0	0.2	20.8	0	0.2	20.2	0	0.2	20.2
PZ37	0	0.4	20.6	0	0.6	20.2	0	0.4	20.2	0	0.4	20.2
PZ36	0	1.2	20.2	0	1.1	20	0	1.2	19.8	0	1.4	19.4
PZ35	0	0.4	20.6	0	0.4	20.6	0	0.4	20.6	0	0.4	20.6
PZ34	0	0.6	20.6	0	0.4	20.6	0	0.2	20.6	0	0.2	20.6
PZ33	0	0.4	20.2	0	0.4	20.2	0	0.4	20.2	0	0.2	20.2
PZ32	0	0.8	20.8	0	0.6	20.6	0	0.4	20.4	0	0.4	20.2
PZ31	0	0.4	20.6	0	0.6	20.4	0	0.6	20.4	0	0.8	20
PZ30	0	0.2	20.2	0	0.2	20.2	0	0.2	20.2	0	0.6	19.6
PZ29	0	0.4	20.4	0	0.2	20.4	0	0.2	20.4	0	0.2	20.4
PZ28	0	3.2	17.8	0	2.6	18.2	0	2.2	19	0	2.4	19.1
PZ27	0	0.2	20.5	0	0.2	20.5	0	0.2	20.2	0	0.2	20.4
PZ26	0	1.5	20.2	0	1.3	19.6	0	1.2	19.8	0	1.2	19.8
PZ25	0	0.2	20.8	0	0.2	20.8	0	0.2	20.4	0	0.6	19.8
PZ24	0	0.4	20.8	0	0.4	20.8	0	0.4	20.6	0	0.4	20.6
PZ23	0	0.2	21	0	0.5	20.2	0	0.4	20.2	0	0.2	20.2
PZ22	0	0.4	19.8	0	0.4	19.8	0	0.4	19.8	0	0.4	19.8
PZ21	0	0.2	21.2	0	0.2	21.2	0	0.2	20.6	0	0.2	20.6
PZ11	0	1.1	20.1	0	1.2	19.8	0	1.1	19.4	0	1.2	19.8
PZ12	0	0.8	20.8	0	0.4	20.8	0	0.2	20.8	0	0.2	20.8
PZ13	0	0.2	21	0	0.4	20.2	0	0.4	20.2	0	0.4	20.2
PZ14	0	0.2	21.2	0	0.2	20.6	0	0.2	20.6	0	0.2	20.6
PZ15	0	0.2	21.2	0	0.2	21.2	0	0.2	21.2	0	0.2	21.2
PZ16	0	1	19.8	0	0.8	19.6	0	1.1	19.2	0	1.2	19.6

Appendix F

Water Balance Calculation

MONTHLY WATER BALANCE CALCULATION 2015

	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		78.2				0	125	Whole site	129806	1015	1140	1140	0.00	0.00	1140	1140	1701.8	
February	leachate lagoon	1,600		52				0	83	Whole site	129806	675	758	1898	0.00	0.00	1898	758	1191.4	
March	leachate lagoon	1,600		66.80				0	107	Whole site	129806	867	974	2872	0.00	0.00	2872	974	728.52	
April	leachate lagoon	1,600		50.80				0	81	Whole site	129806	659	741	3613	0.00	0.00	3613	741	1226.02	
May	leachate lagoon	1,600		120.80				0	193	Whole site	129806	1568	1761	5374	0.00	0.00	5374	1761	1225.86	
June	leachate lagoon	1,600		32.20				0	52	Whole site	129806	418	469	5844	0.00	0.00	5844	469	668.72	
July	leachate lagoon	1,600		84.80				0	136	Whole site	129806	1101	1236	7080	0.00	0.00	7080	1236	445.16	
August	leachate lagoon	1,600		74.80				0	120	Whole site	129806	971	1091	8171	0.00	0.00	8171	1091	531.98	
September	leachate lagoon	1,600		36.80				0	59	Whole site	129806	478	537	8708	0.00	0.00	8708	537	907.22	
October	leachate lagoon	1,600		45.00				0	72	Whole site	129806	584	656	9364	0.00	0.00	9364	656	500.78	
November	leachate lagoon	1,600		143.00				0	229	Whole site	129806	1856	2085	11449	0.00	0.00	11449	2085	1487.9	
December	leachate lagoon	1,600		218.80				0	350	Whole site	129806	2840	3190	14639	0.00	0.00	14639	3190	2788.35	
Total				1004				0	1606			13033	14639		0			14639	13404	

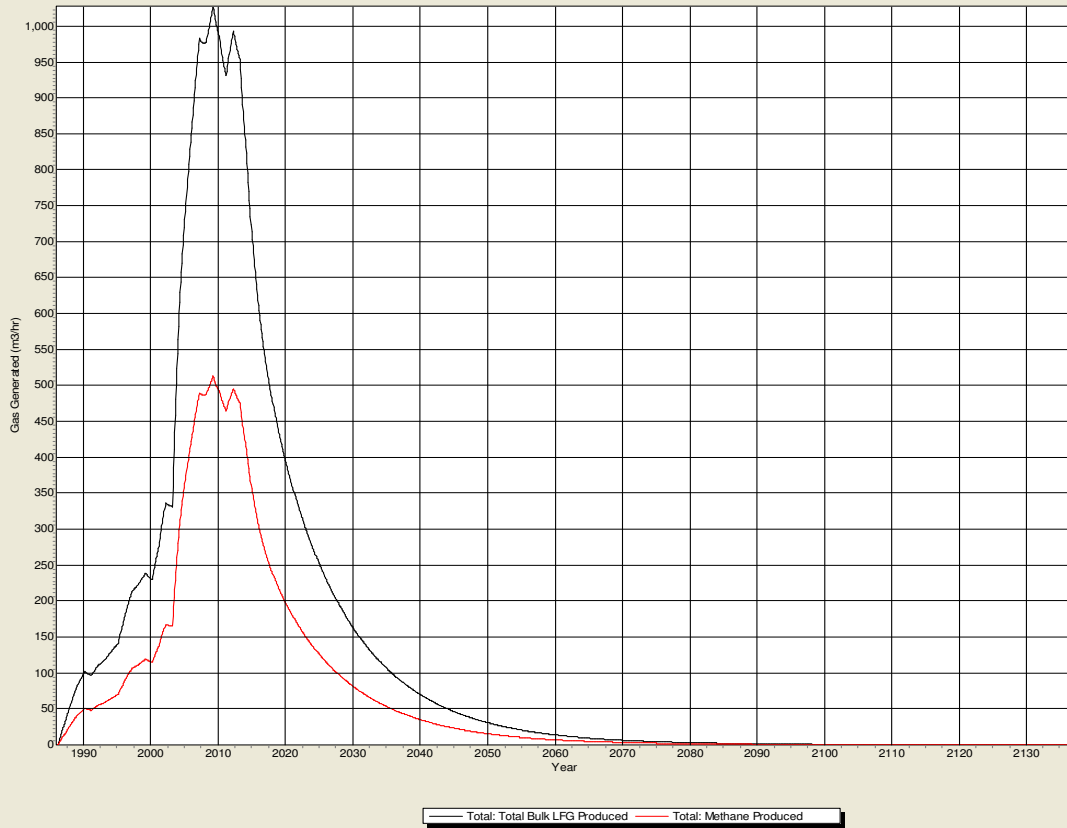
Assumptions

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)	41,000	m ²
	Area of Phase 3	11,500	m ²
	Area of Phase 1,2 and 3 remaining to be temp capped	7,000	m ²
	Area of Phase 4, Cell 1A	2,190	m ²
	Area of Phase 4, Cell 1	15,000	m ²
	Area of Phase 4, Cell 2	8,000	m ²
	Area of Phase 5, Cell 3A	7,974	m ²
	Area of Phase 5, Cell 3B	7,180	m ²
	Area of Phase 5, Cell 2A	13,761	m ²
	Area of Phase 5, Cell 2B	5,795	m ²
	Area of Phase 5, Cell 1A	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	1004.0	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%



— Total: Total Bulk LFG Produced — Total: Methane Produced

04/03/2014 09:59:08

w:\0501 - 0600 lbr jobs\lbr0600 whiteriver gassim pi report 2013\lbr0600 whiteriver landfill 2013 pi reporting 4.03.14.gss



A survey of landfill sites to determine the quantity of methane flared and or recovered in utilisation plants for 2015

Please choose from the drop down menu the license number for your site	W0060
Please choose from the drop down menu the name of the landfill site	Whiteriver Landfill Site
Please enter the number of flares operational at your site in 2015	2
Please enter the number of engines operational at your site in 2015	2
Total methane flared	10,970 kg/year
Total methane utilised in engines	2,113,968 kg/year

Please note that the closing date for receipt of completed surveys is 31/03/2016

Introduction

The Office of Environmental Sustainability (OES) of the Environmental Protection Agency acts as the inventory agency in Ireland with responsibility for compiling and reporting national greenhouse gas inventories to the European Commission and the United Nations Framework Convention on Climate Change. In addition to meeting international commitments Ireland's national greenhouse gas inventory informs national agencies and Government departments as they face the challenge to curb emissions and meet Ireland's emission reduction targets under the Effort Sharing Decision (No. 406/2009/EC). The national inventory also informs data suppliers, making them aware of the importance of their contributions to the inventory process and a means of identifying areas where input data may be improved.

It is on this basis that the Environmental Protection Agency is asking landfill operators to partake in this survey so that the most up to date information on methane flaring and recovery in utilisation plants at landfill sites is used in calculating the contribution of the landfill sector to national greenhouse gas emissions

The Environmental Protection Agency wishes to thank you for partaking in this survey. If you have any questions about the survey and how to complete it please view the "Help sheet" worksheet. If however, your query is not answered by viewing the "Help sheet" worksheet please contact:

LFGProject@epa.ie

Once completed please send the completed file as an attachment clearly stating the name and or license number of the landfill site (e.g. W000 Xanadu landfill_2015) to:

LFGProject@epa.ie



A survey of landfill sites to determine the quantity of methane flared and or recovered in utilisation plants for 2015

How to use the survey?

- 1) Please enter your license details in the title sheet
- 2) Please enter the landfill name in the title sheet
- 3) Please enter the number of flares present and in use at your site in 2015 in the title sheet
- 4) Please enter the number of engines present and in use at your site in 2015 in the title sheet
- 5) The survey consists of 10 worksheets for flares. Only complete the number of worksheets for the number of flares present and in use in 2015 at your site
- 6) The survey consists of 10 worksheets for utilisation engines. Only complete the number of worksheets for the number of engines present and in use in 2015 at your site
- 7) Data can either be directly entered in each cell of the tables or chosen from the drop down menus. Where data is outside of the range of values presented in the drop down menus an error message will appear. Please check the value and try again. Where data or description is not provided in the drop down menus please type the answer in the box provided
- 8) Please view a copy of the worksheet for flare No. 1 below and click on the cells under each of the headings to help you fill out the survey questionnaire.
- 9) Please note under the method heading
 M = Measured e.g. direct from scada
 C = Calculated e.g from weekly/fortnightly/monthly checks/monitoring
 E = Estimated e.g. based on operational design of flare/engine

10) Please note that data is only to be entered in either the monthly or the yearly tables but not both

				to be filled in by licensee									
				calculated by spreadsheet									
Flare No. 1													
Flare type ?		AFS HT750	Enclosed	If "other" enter flare description here									
Is the flare an open or enclosed flare ?				Rated flare capacity ?	700 m3/hr								
Month /year commissioned ?		September	2012										
Month decommissioned if decommissioned in 2015 ?		Select											
What is the function of the flare ?		Extraction from capped and uncapped areas	If "other" enter flare function here										
Monthly	Method M/C/E	Runtime days/month	Runtime hrs/day	Downtime hrs	Total runtime hrs/month	Average Inlet Pressure (mbg)	Average Flow Rate (m ³ /hr)	Average CH ₄ %v/v	Average CO ₂ %v/v	Average O ₂ %v/v	Combustion efficiency (%)	Total CH ₄ m ³	Total CH ₄ kgs
January	C	29	21	10	599	-21	700	32	44	4	98	131,492	88,907

to be filled in by licensee calculated by spreadsheet

Flare No. 1

Flare type ? Other

Is the flare an open or enclosed flare ? Enclosed AFS 2000M3/hr

Month /year commissioned ? March 2009 Rated flare capacity ? Select m3/hr

Month decommissioned if decommissioned in 2015 ? Select

What is the function of the flare ? Extraction from capped area If "other" enter flare function here

Monthly	Method M/C/E	Runtime days/month	Runtime hrs/day	Downtime hrs	Total runtime hrs/month	Average Inlet Pressure (mbg)	Average Flow Rate (m ³ /hr)	Average CH ₄ %v/v	Average CO ₂ %v/v	Average O ₂ %v/v	Combustion efficiency (%)	Total CH ₄ m ³	Total CH ₄ kgs
January	MCE	0			0	-55	880	47.50	28.50	2.10	98.0	0	0
February	MCE				0	-55	875	47.50	28.50	2.00	98.0	0	0
March	MCE	1	2.0	0.0	2	-50	860	47.60	28.30	1.90	98.0	802	527
April	MCE				0	-60	855	47.70	28.70	1.80	98.0	0	0
May	MCE				0	-65	845	47.90	28.10	1.70	98.0	0	0
June	MCE	1	2.0	0.0	2	-65	835	48.00	28.00	1.60	98.0	786	508
July	MCE				0	-60	825	48.10	27.80	1.50	98.0	0	0
August	MCE				0	-70	815	48.50	27.70	1.40	98.0	0	0
September	MCE	1	2.0	0.0	2	-65	810	48.30	27.50	1.30	98.0	767	495
October	MCE				0	-55	790	48.50	27.40	1.20	98.0	0	0
November	MCE	1	8.0	0.0	8	-65	790	48.50	27.10	1.10	98.0	3,004	1,941
December	MCE	1	16.0	0.0	16	-60	750	48.00	28.30	1.00	98.0	5,645	3,667
Total					30							11,003	7,137

Please note: Only fill the "Yearly" table if data is not available or cannot be calculated nor estimated on a monthly basis

Yearly	Method M/C/E	Runtime days/year	Runtime hrs/day	Downtime hrs	Total runtime hrs/year	Average Inlet Pressure (mbg)	Average Flow Rate m ³ /hr	Average CH ₄ %v/v	Average CO ₂ %v/v	Average O ₂ %v/v	Combustion efficiency (%)	Total CH ₄ m ³	Total CH ₄ kgs
2015					0						98.0	0	0

to be filled in by licensee calculated by spreadsheet

Flare No. 2

Flare type ? If "other" enter flare description here

Is the flare an open or enclosed flare ? Rated flare capacity ? m3/hr

Month /year comissioned ?

Month decomissioned if decomissioned in 2015 ?

What is the function of the flare ? If "other" enter flare function here

Monthly	Method M/C/E	Runtime days/month	Runtime hrs/day	Downtime hrs	Total runtime hrs/month	Average Inlet Pressure (mbg)	Average Flow Rate (m ³ /hr)	Average CH ₄ %v/v	Average CO ₂ %v/v	Average O ₂ %v/v	Combustion efficiency (%)	Total CH ₄ m ³	Total CH ₄ kgs
January					0						98.0	0	0
February					0						98.0	0	0
March					0						98.0	0	0
April					0						98.0	0	0
May					0						98.0	0	0
June					0						98.0	0	0
July					0						98.0	0	0
August					0						98.0	0	0
September					0						98.0	0	0
October					0						98.0	0	0
November	MCE	2	24.0	0.0	48	-70	150	48.50	27.10	1.10	98.0	3,422	2,200
December	MCE	1	24.0	0.0	24	-70	225	48.00	28.30	1.00	98.0	2,540	1,633
Total					72							5,962	3,832

Please note: Only fill the "Yearly" table if data is not available or cannot be calculated nor estimated on a monthly basis

Yearly	Method M/C/E	Runtime days/year	Runtime hrs/day	Downtime hrs	Total runtime hrs/year	Average Inlet Pressure (mbg)	Average Flow Rate m ³ /hr	Average CH ₄ %v/v	Average CO ₂ %v/v	Average O ₂ %v/v	Combustion efficiency (%)	Total CH ₄ m ³	Total CH ₄ kgs
2015					0						98.0	0	0

to be filled in by licensee	calculated by spreadsheet
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Engine No. 1	
Engine type ?	Other <input type="text"/> MWM Generating Set TCG2016V16C (800KW)
Month /year comissioned ?	July <input type="text"/> 2014 <input type="text"/>
Month decomissioned if decomissioned in 2015 ?	Select <input type="text"/>

Monthly	Method M/C/E	Runtime days/month	Runtime hrs/day	Downtime hrs	Total runtime hrs/month	Average Inlet Pressure (mbg)	Average Flow Rate (m ³ /hr)	Average CH ₄ %v/v	Average CO ₂ %v/v	Average O ₂ %v/v	Combustion efficiency (%)	Total CH ₄ m ³	Total CH ₄ kgs
January	MCE	30	24	0	720	-60	530	47.50	28.50	2.10	98.0	177,635	115,385
February	MCE	28	24	0	672	-55	525	47.50	28.50	2.00	98.0	164,228	107,236
March	MCE	30	24	0	720	-65	515	47.60	28.30	1.90	98.0	172,971	111,766
April	MCE	30	24	0	720	-70	515	47.70	28.70	1.80	98.0	173,334	111,411
May	MCE	31	24	0	744	-50	505	47.90	28.10	1.70	98.0	176,370	115,766
June	MCE	30	24	0	720	-55	500	48.00	28.00	1.60	98.0	169,344	110,577
July	MCE	31	24	0	744	-60	495	48.10	27.80	1.50	98.0	173,600	112,764
August	MCE	31	24	0	744	-65	490	48.50	27.70	1.40	98.0	173,275	111,963
September	MCE	29	24	0	696	-70	485	48.30	27.50	1.30	98.0	159,781	102,699
October	MCE	27	24	0	648	-70	475	48.50	27.40	1.20	98.0	146,297	94,033
November	MCE	27	24	0	648	-65	475	48.50	27.10	1.10	98.0	146,297	94,531
December	MCE	27	24	0	648	-55	450	48.00	28.30	1.00	98.0	137,169	89,567
Total					8,424							1,970,302	1,277,698

Please note: Only fill the "Yearly" table if data is not available or cannot be calculated nor estimated on a monthly basis

Yearly	Method M/C/E	Runtime days/year	Runtime hrs/day	Downtime hrs	Total runtime hrs/year	Average Inlet Pressure (mbg)	Average Flow Rate m ³ /hr	Average CH ₄ %v/v	Average CO ₂ %v/v	Average O ₂ %v/v	Combustion efficiency (%)	Total CH ₄ m ³	Total CH ₄ kgs
2015					0						98.0	0	0

to be filled in by licensee	calculated by spreadsheet
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Engine No. 2
Engine type ? Other ▼ Month /year comissioned ? July ▼ 2014 ▼ Month decomissioned if decomissioned in 2015 ? Select ▼ <div style="text-align: right; font-weight: bold; margin-top: 5px;">MWM Generating Set TCG2016V12C (600KW)</div>

Monthly	Method M/C/E	Runtime days/month	Runtime hrs/day	Downtime hrs	Total runtime hrs/month	Average Inlet Pressure (mbg)	Average Flow Rate (m ³ /hr)	Average CH ₄ %v/v	Average CO ₂ %v/v	Average O ₂ %v/v	Combustion efficiency (%)	Total CH ₄ m ³	Total CH ₄ kgs
January	MCE	30	24	0	720	-50	350	47.50	28.50	2.10	98.0	117,306	76,997
February	MCE	29	24	0	696	-60	350	47.50	28.50	2.00	98.0	113,396	73,658
March	MCE	31	24	0	744	-55	345	47.60	28.30	1.90	98.0	119,736	78,184
April	MCE	29	24	0	696	-65	340	47.70	28.70	1.80	98.0	110,620	71,478
May	MCE	30	24	0	720	-55	340	47.90	28.10	1.70	98.0	114,914	75,036
June	MCE	29	24	0	696	-70	335	48.00	28.00	1.60	98.0	109,678	70,496
July	MCE	30	24	0	720	-65	330	48.10	27.80	1.50	98.0	112,000	72,370
August	MCE	25	24	0	600	-50	325	48.50	27.70	1.40	98.0	92,684	60,835
September	MCE	28	24	0	672	-65	325	48.30	27.50	1.30	98.0	103,377	66,798
October	MCE	28	24	0	672	-60	315	48.50	27.40	1.20	98.0	100,612	65,354
November	MCE	28	24	0	672	-60	315	48.50	27.10	1.10	98.0	100,612	65,354
December	MCE	27	24	0	648	-55	300	48.00	28.30	1.00	98.0	91,446	59,711
Total					8,256							1,286,380	836,270

Please note: Only fill the "Yearly" table if data is not available or cannot be calculated nor estimated on a monthly basis

Yearly	Method M/C/E	Runtime days/year	Runtime hrs/day	Downtime hrs	Total runtime hrs/year	Average Inlet Pressure (mbg)	Average Flow Rate m ³ /hr	Average CH ₄ %v/v	Average CO ₂ %v/v	Average O ₂ %v/v	Combustion efficiency (%)	Total CH ₄ m ³	Total CH ₄ kgs
2015					0						98.0	0	0