

ANNUAL ENVIRONMENTAL REPORT

For

Muckish Landfill Site

(Waste Licence Reference W0126-1)

By
Donegal County Council
For
Environmental Protection Agency

Reporting Period: January 2009 to December 2009

March 2010

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1. INTRODUCTION

- 1.1 This Annual Environmental Report (AER) has been prepared to meet the requirements of Condition 2.3 of Waste Licence W0126-1 for Muckish Landfill and includes the information listed in Schedule A of the Waste Licence.
- 1.2 Muckish Landfill Site is located in a rural setting on the lower slopes of Muckish Mountain, approximately 5km south east of the village of Falcarragh. The site is within the upper catchment of the Ray River and is situated on an extensive area of blanket bog.
- 1.3 Donegal County Council submitted an application to the Environmental Protection Agency for the continued operation of the landfill site, as required by the Waste Management (Licensing) Regulations 1997. On the 29th of May 2001 the Environmental Protection Agency granted the Council a Waste Licence (registration number W0126-1) for the facility, in accordance with the Third Schedule of the Waste Management Act, 1996.
- 1.4 The Licence granted was for the orderly closure, capping and restoration of the landfill and allows only for the acceptance of inert waste to be used for the purpose of site restoration. The facility ceased to accept waste on the 6th of November 2001 and the site was closed.
- 1.5 The facility had been developed and operated on the 'dilute and disperse' principle, whereby rainfall infiltrated the landfill and generated leachate, the leachate was in turn allowed to disperse into the surrounding environment.
- 1.6 The site was fully restored during 2005/6 in accordance with the approved Restoration and Aftercare Plan.

2. REPORTING PERIOD

2.1 This report refers to the period from 1st January, 2009 to 31st December 2009.

3. WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

3.1 Type of Waste

The licensed 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): This activity is limited to the disposal of inert waste only and leachate treatment at the facility.
- Class 13 Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced: This activity is limited to leachate collection and storage prior to treatment.

4. QUANTITIES OF WASTE

4.1 In accordance with Condition 1 of the waste licence only inert waste shall be accepted for the purposes of remediation, rehabilitation, enhancement and restoration of the facility. The maximum total of inert waste to be disposed of at the site is 40,000 tonnes. The quantities of waste received during each year at the facility are presented in Table 1. 2,500 tonnes of inert waste (for use in restoration works) was accepted onto the site during 2004. The balance of restoration materials were imported during this reporting period and the quantity is shown under 2005 in the table.

Table 1: Waste Quantities Accepted (tonnes)

Waste Type	1998	1999	2000	2001	2002	2003	2004	2005	200€	2007	2008	2009
Domestic Refuse*	4418	5639	7008	5729	0	0	0	0	0	0	0	0
Inert Waste	0	0	0	0	0	0	2,500	34,667	0	0	0	0

^{*}Figures based on estimates

5. SUMMARY REPORT ON EMISSIONS

5.1 Groundwater

- 5.1.1 Groundwater flow is typically in a north-easterly direction ultimately providing base flow to the Ray River. Groundwater monitoring is carried out at three locations (GW1, GW2 and GW3) as shown on Drawing No 5234.20/102 Monitoring Locations. These groundwater monitoring boreholes were installed at the landfill early in 2000 as per licence requirements. Results of this year's monitoring are presented in Appendix A in tabular and graphical format. Monitoring location GW1 is representative of water quality upstream and monitoring locations GW2 and GW3 are immediately downstream of the waste body.
- 5.1.2 Groundwater results show that levels of parameters indicative of groundwater contamination with leachate, such as ammonia and electrical conductivity, are lower than those detected in the last reporting period. Again this period, the only well showing any significant presence of parameters indicative of leachate is GW3, which is situated immediately downstream of the waste body.

5.2 Surface Water

5.2.1 Muckish landfill site is situated in the upper catchment of the Ray (Duvowen) River. The landfill site is based on an area of extensive blanket bog. This river forms the northeastern boundary of the landfill. Surface water monitoring is carried out at four monitoring locations as shown on Drawing No 5234.20/04 Monitoring Locations. Monitoring points S1 and S2 are upstream of the waste body. Results continue to show that previous low levels of leachate contamination of the Ray River have been virtually eliminated since the capping of the site.

5.3 Leachate Composition

5.3.1 Leachate monitoring is carried out at one monitoring location point on the site as shown on Drawing No 5234.20/04 Monitoring Locations. All parameters are consistent with typical leachate composition ranges (as presented in EPA Manual 'Landfill Operational Practices'), but leachate is weaker in composition when compared results from the previous reporting period.

5.4 Landfill gas

5.4.1 Landfill gas monitoring is undertaken at three locations as shown on Drawing No 5234.20/102 Monitoring Locations, which are located within the site boundary in waste. Gas monitoring on the mature waste body is indicative of methanogenic gas processes that would be occurring under anaerobic conditions.

6. SUMMARY OF RESULTS AND INTERPRETATIONS OF ENVIRONMENTAL MONITORING.

6.1 Summary of Results

All monitoring data for the period is contained in Appendix A. This data is summarised in Graphs also contained in this Appendix.

6.2 Update of Monitoring Locations

Monitoring locations for the site are as given in Table 6.1. These locations are shown on Drawing No 5234.20/04 Monitoring Locations and grid coordinates for the points are included on this drawing. A post restoration topographical survey was undertaken in July 2006. This was submitted to the Agency under separate cover. There have not been any new monitoring locations installed during this reporting period.

Table 6.1: Monitoring Points

	Monitoring Locations
Landfill Gas	P1, P2, P3
Groundwater	GW1, GW2, GW3
Leachate	L1
Surface Water	SW1, SW2, SW3, SW4

6.3 Interpretation of Environmental Monitoring

6.3.1 Groundwater

Condition 9 and Schedule D of the Licence requires the Licensee to monitor groundwater water quality at various locations on and outside the site on a monthly, quarterly and annual basis for those parameters as listed in Table D3 of the Waste Licence. Since restoration the Agency has agreed to reduce monitoring frequency to bi-annual. These results have been compared to EC (Quality of Water Intended For Human Consumption) Regulations, 1988, the European communities (Drinking Water) Regulations, 2000 and the EPA Interim Report, Towards Setting Guidelines Values for the Protection of Groundwater in Ireland.

The majority of the parameters measured are below the recommended limits. Those exceeding the limits are discussed below. Parameters indicative of possible leachate contamination include Ammoniacal-N, Conductivity, Iron, Chloride and heavy metals.

Upstream

Levels of iron, boron and chlorides are slightly raised at GW1 relative to MAC.

Downstream

Monitoring at GW2 and GW3 detected elevated levels of Ammoniacal Nitrogen (max 4.7mg/l), SS (max 5224mg/l), iron (max 2840ug/l), chloride (79mg/l), manganese (max 2510ug/l), fluoride (2.12mg/l), pH (5.34) and nutrients during the reporting period.

These results generally indicate that leachate was being released from the waste body into the immediate groundwater environment. The downstream wells, however, are very close to the waste body.

6.3.2 Surface Water

Condition 9 and Schedule D of the licence requires the licensee to monitor surface water at four locations in the vicinity of the site on a quarterly and annual basis for those parameters as listed in Table D3 of the waste licence. Since restoration, bi-annual monitoring has been agreed with the Agency.

These results have been compared to EC (Quality of Surface Water Intended For The Abstraction of Drinking Water) Regulations, 1989. The majority of the parameters have been below the recommended limits for A1 category surface water. Those exceeding the limits are discussed below.

Upstream

Upstream only iron (max. 570ug/l) levels are slightly raised.

Downstream

Chemical analysis of samples indicates ammonia levels well below MAC in SW3 and SW4 throughout the period. Leachate contamination of surface water appears to have been eliminated. Iron is the only parameter detected in excess of MAC (max 579ug/l).

6.3.3 Leachate

Leachate quality can vary during the lifetime of landfill site depending on the phase of decomposition of the waste. Leachate results for the reporting period are presented in Appendix A and some of the characteristic parameters of the leachate are listed in Table 6.2 below.

Table 6.2: Leachate Concentrations

	(All into a contraduction tento sales	andfill Site	landfills acce	mples from Ub epting domesti sults in mg/l	
PARAMETER	Min.Conc	Max.Conc	Min.Conc	Max.Conc	Mean
Ammonia (mg/N)	2.94	301	<0.2	1700	491
BOD	0.8	18	4.5	>4800	>834
COD	80	608	<10	33,700	3078
Chloride (mg/l)	40	371	27	3410	1256
Iron (ug/I)	<u>20</u> 73	1170	0.4	664	54.4
Potassium(ug/l)	*	8.68	2.7	1480	491
TON (mg/l N)		<0.01	1	1	1
Conductivity (mS/cm)	825	5220	503	19,200	7789
pН	6.27	7.16	6.4	8	7.2

Leachate results have been compared to "Typical Leachate Composition of 30 Samples from UK/Irish Landfills accepting mainly Domestic Waste" (Landfill Operational Practices). All parameters are consistent with typical leachate composition ranges. The leachate composition is weaker this reporting period when compared with the last.

6.3.4 Landfill Gas

Gas monitoring on the mature waste body is indicative of methanogenic gas processes that would be occurring under anaerobic conditions. Methane concentrations range from 29.4% to 62.2%. Carbon Dioxide levels range from 20.2% to 48.4%. There are no monitoring locations outside of the waste body.

7. VOLUME OF LEACHATE PRODUCED AND VOLUME OF LEACHATE DISCHARGED

- 7.1 Leachate is been tankered on a weekly basis from the collection sump on site. Records show that during this period 963m³ of leachate was removed from the site and tankered to Donegal County Council's Wastewater Treatment Plant in Letterkenny.
- 7.2 A water balance calculation has been produced for this period and is shown in Appendix B. This indicates that the estimated volume of leachate being produced at the site for the reporting period is 2402m³. The water balance calculation is attached in Appendix B.

8. CAPPING AND RESTORATION OF COMPLETED CELLS / PHASES

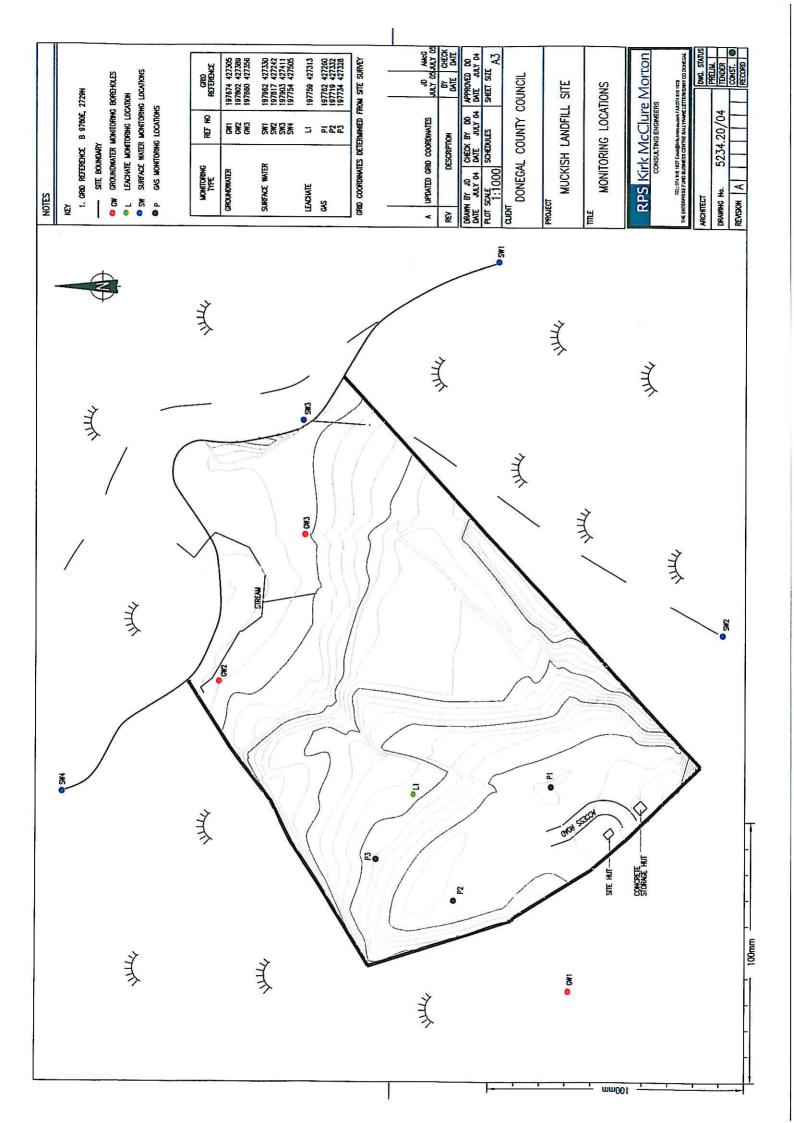
8.1 The site is fully restored.

9. REPORTED INCIDENTS AND COMPLAINTS SUMMARIES

- 9.1 Donegal County Council reports to the EPA emissions exceedances on an on-going basis. In the case of Muckish, there are no perimeter gas wells, but levels of ammonia in excess of 0.2mg/l in either surface water or groundwater monitoring locations are reported as incidents with each bi-annual report.
- 9.2 Other than the on-going exceedance incident reporting described above, no further incidents occurred during this reporting period, and therefore none were reported to the EPA.
- 9.3 No complaints were received during the reporting period.

10. REVIEW OF NUISANCE CONTROLS

10.1 The site is inspected regularly for all types of nuisances (flies, pests, dust, litter and illegal dumping, birds and odours) and where any action is deemed necessary the appropriate steps are taken in accordance with the EMS.



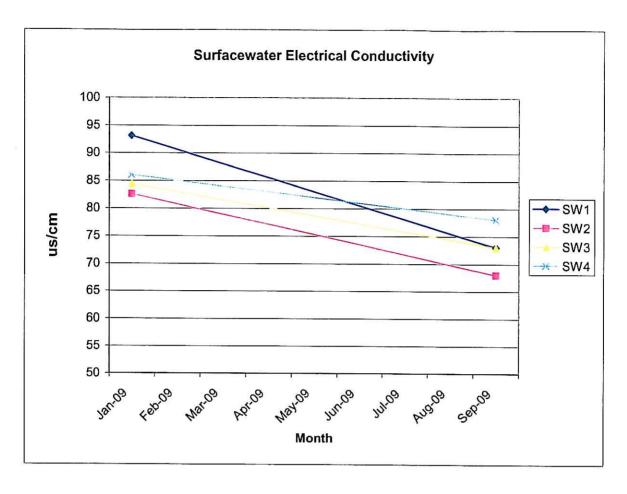
APPENDIX A MONITORING DATA

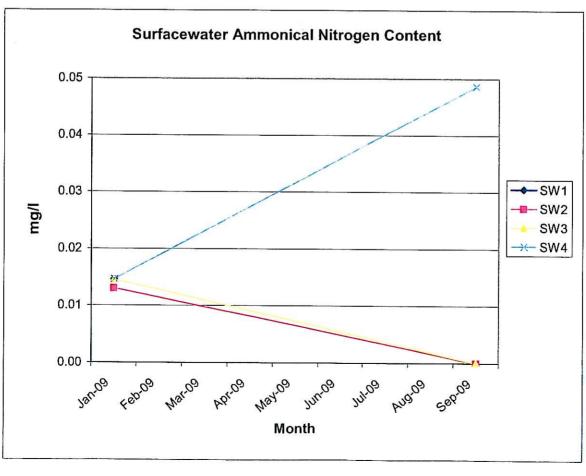
HORBOOT	CALEBRASIC PASSING		SALES CALLED		September 1			machini i areanagni, eo conegai	Ollegai	Barter Control			
Sample Type							surfac	surface water					
Site No							15	SW1					
Date of Sample		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Lab No	DATE OF STREET	1284	l	1	1		ı	ı	1	4804	1	ı	
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COD	l/bm	14	•	-	-	I	-		-	22		-	1
BOD	l/bm	1.90	-		1	1		1	1	0.33		-	1
Dissolved Oxygen	l/bш	12.81	1	1	1	1	ı		I	9.01		1	1
SS	l/6m	0.8	-		-	I		I	-	2.0			1
Residue on Evaporator	l/6m	1	ı		-	1	ı		-	-	-		-
Calcium	l/6n	1	1	1	-	1		-		-	1	-	
Cadmium	l/6n	ı	l	1	ı	1	1	1	1	<0.220	1	1	1
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Potassium	l/bu	1	-	-	-				1	<2.34	ı		1
Sodium	l/bm	-	1	i	ļ	***	***	1	ı	9.4100	ł	1	1
Sulphate	l/bu	-	١	-	1	1		-	ı	3.8000	-	1	1
Zinc	∬6n	ı	1	-	-					15.50	ı	1	1
Total Alkalinity as CaCO3	l/bm	i	-	1	1		***	-		-	1	1	1
Total Organic Carbon		l	ı	ı	ı	1	1	1	1	1	1	1	1
Total Oxidised Nitrogen	l/bu	0.21	1					-	-	0.15		-	-
Arsenic	l/bm	I	i	ı	1	1		1	1	i	1	-	-
Barlum	mg/l	-	-	1	I	1		1	1	ŀ			
Boron	l/bn	1	ı	1	ı	ı		I	-	ı	1	1	I
Flouride	l/gm	ļ	I	I	ı	1	1	1	ı	I	1		I
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Selenium	l/gm	1	1	ı	I	i	I	ı	l	ı	I	I	1
Silver	l/gm	ı	I	١	I	I	1	1	1	1	1	1	1
Mircrotox	Toxic Units	I	l	I	i	i	1	1	1	1	1	ı	I
Microtox	Toxic Units	1	1	1	1	1	-	I	ı				1
Nitrite	l/6m	<0.03	1	1	1		-		1	0.01			-
Nitrate	mg/]	0.9017	1	1	-	1	-	-		0.147		****	
Phosphate - ORTHO	l/bm	<0.0001	1	1	-	-			-	<0.01		****	***
Phosphate - TOTAL	mg/l	1	ı	I	1	I	1	-	1	0.098	1	-	
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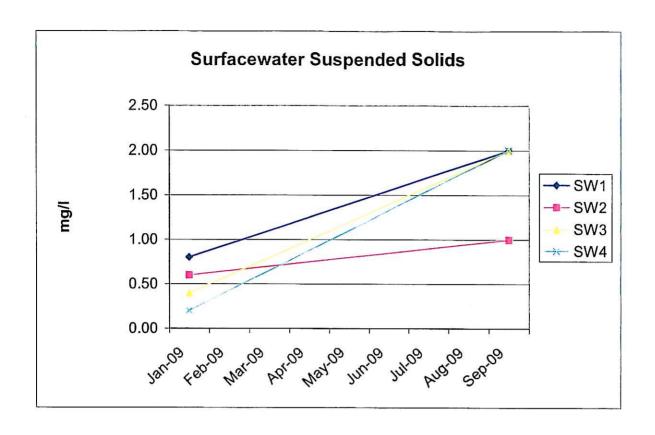
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Sample Type							surfac	surface water					
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Electrical Conductivity	uS/cm	83	1	1	I	1	1	1		89		7	-
Ammonical Nitrogen	l/bm	0.01	1				-	1		<0.01		-	1
COD	l/bm	8	-	1	-	-	ı	ı	1	36	1	1	l
BOD	l/bm	1.30	-	ı	ı	1	1	1	1	0.32	1	1	I
Dissolved Oxygen	l/bm	11.41		i	1	1	ı	1	1	8.83		ı	i
SS	l/bm	9.0	1	I	1	1	1	ı	1	1.0	1	I	I
Residue on Evaporator	l/bm	1	1	1	1	1	i	ı	1	ı	1	ı	1
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Potassium	l/bm	1		ı	I	1			I	<2.34		ŀ	ŀ
Sodium	l/bm	1	1	ı	ı	1		I	1	9.2500		ı	
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Total Organic Carbon	mg/l		1	1	ı	1	1	ı	1	ı	ı	i	ı
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Arsenic	mg/l	-		-	1	1	-	1	1	ı	ŀ	1	1
Barlum	mg/l		-			-	-		ı	1	ı	1	I
Boron	ug/l		1		-		I	****	-		1		ı
Flouride	mg/l	1	-	-	ı	-	1	1	ı	-			ı
Total Phenois	mg/l	-	1	-		1	ı		ı		1	1	ı
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Selenium	mg/l	ı	1	1	I				ı	-			1
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Mircrotox	Toxic Units	Ī	I	l	1	ı	1		1	ı	ŀ	-	1
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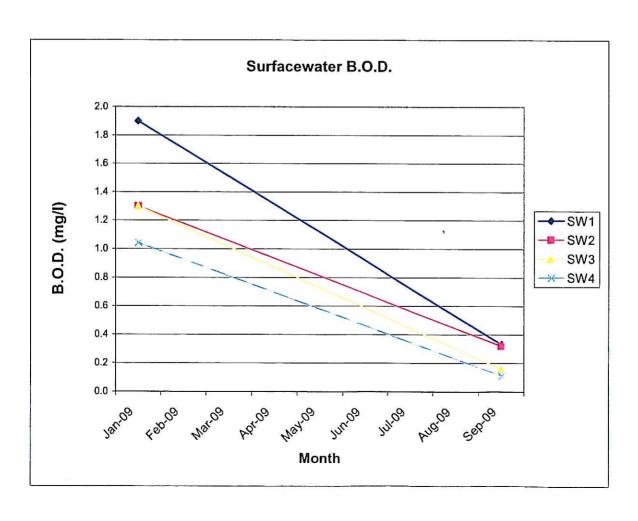
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Ammonical Nitrogen	l/gm	0.01	1	1		ı		-		<0.01		ı	ı
COD	l/bm	0	I	1		I	-	1	***	33		1	
BOD	l/bm	1.30	****	-	ı	****	1	1	ı	0.16	1	i	1
Dissolved Oxygen	l/6m	12.78	i	-	1	-	1	1	1	8.93	-		I
SS	l/bu	0.4		1	ı	1	ı	ı	ı	2.0			!
Residue on Evaporator	l/bm	1	1	1	1	1	j	-	I	1	1	I	1
Calcium	l/bn	1	1	1	1	ŀ	1	1	***	2		1	i
Cadmium	l/bn	ı		1	I	ŀ	1	****	!	<0.220	I	1	1
Chromium	I/bn	ı	ı	1	I		ł	1	!	5.750	1	1	1
Chloride	I/bm	27		1	-	1	1	1	ı	21		I	1
Chlorine	l/bm	1	I	ı	ı	1			ŀ			l	
Copper	I/on	-	I	1	I		1	ı	ı	217			
Cvanide	l/om	1	1		ı	1							
Dissolved Iron]/UII	l		I		-				579 00			
Lead	1/011		ŀ	1	1		1	1		0 050			
Magnesium	1/011									1 7400			
Manganese	1/011									0086.6	I		
Merciny	1/011									2000			
Nickel	l/bm	ı			1	1				2.0			
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Zinc	1/011								000000	20000			!
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Total Organic Carbon	1/500						!	ı			ı	1	1
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Otal Oxidised Miliogell	Will I	00	١	1	1	1	i	1	1	0.00	1	1	1
Aisemo	White the second	1	I	1	ı	ı	=	l	l	-	1	l	I
Darium	I/BIII	ı	ı	1		1	1	1	1	1	I	1	i
Boron	ng/l	-		ı	1	1	1	ı	1	ı	I	1	1
riouriue	I/BIII	1	1	I	1	-	1	;	!	1	I	!	1
lotal Phenois	mg/I	ı	ı	1	1	ı	1	I	I	1	1	I	1
Phosphorous	l/bm			I	1	1	1	1	1	-	1	-	1
Selenium	l/gm	I	1		1	I	-	I	I				-
Silver	mg/l	ı	i	i	1	ı	-	I	ı	-	-		1
Mircrotox	Toxic Units	1	I	1	1	1	-	-	ı	ı	-	1	l
Microtox	Toxic Units	1		1	-		1		1	ı	1		ı
Nitrite	mg/l	<0.03	-	-	ı	-	1	1	ŀ	900'0	1		!
Nitrate	mg/l	0.8000	-	i	-	-	1	1	ı	0.039	ı	ı	1
Phosphate - ORTHO	mg/l	<0.0001		I	i	***	1	1	1	<0.01	1	1	I
Phosphate - TOTAL	mg/l	1	1	1	ı		-		1	0.004	ı	ı	i
Total Coliforms	A PARTY CONTRACTOR	-	ı	-	1	-	i	1	ı	ı	1	ı	I
Facel Coliforme	あいしいよう たからは はないしな	1			050000	30000		S STATE OF THE STA					
i deci comonina		The second secon		1	ı	1	-	ŀ	1	1	!	1	ı

Location		MATERIAL PROPERTY.					1000	100	muchisii, raicariagii, co pollegal				
Sample Type	RESULTING TO S						surfac	surface water					
Site No				がある。			S	SW4					
Date of Sample	THE REPORT OF THE PARTY OF THE	Jan	Feb	Mar	Apr	May	Lon	Jul	Aug	Sept	Oct	Nov	Dec
Lab No	WANTED STATES	1287			ı	ı	ı	l	,	4807			1
SECTION HOLL BY SECTION OF THE SECTI	THE PROPERTY AND ADDRESS.	6.28	1	1	-	1		ı		6.38	1		I
Тетр	TO SEE SEE CONTROL	7.76	-	1		-		-	1	13.20	i		***
Electrical Conductivity	uS/cm	98	1	1	1	1	-	1		78	1	1	-
Ammonical Nitrogen	l/bm	0.01		1	-		1	-	1	0.05			(TTT)
COD	l/bm	2	-	1	I	-	1		-	30	i		-
BOD	l/bm	1.04	-	•	l	ı	1	!	ı	0.11	ı	1	
Dissolved Oxygen	l/bm	12.75	-	-	I	I	ı	ı	1	8.99	1	1	۱
SS	l/bu	0.2	ı	ı	1	1	1	ì	1	2.0	1	1	1
Residue on Evaporator	l/bm	l	1	1	1	ı	ı	ı	1	1	I	1	1
Calcium	l/bn	ı		1	1	I	ı	ı	ı	21	ı	-	1
Cadmium	l/bn				I		1			<0.220	ŀ	1	1
Chromium	l/bn			1			!	1	ı	5.610	ı		
Chloride	ma/le	20	1	ı					l	21	l		
Chlorine	l/bm							ŀ					
Conner	110/1	ŀ	1							206			
Cvanide	l/bm		ı		1		ı	ŀ					
Dissolved Iron	1/011		-		l					517.00			
Pad	1/2/1									1 120			
Magnesium	l'an									1 5300			
Manganese	/BI	1					l	ı	l	3 4300			
Merciny	[/ull				-					2007			
Nickel	l/om									2			
Potassium	[/om	ŀ								NE C>			
Sodium	l/om									0 2800			
Culthata	1511									3.3000		1	1
Suipnate	I/BEL	1	1	:		1	1	1	-	<3.00	1	1	1
Zinc C Line	ı/bn	1	-	1	-	i	-	1	1	21.00	I	1	I
I otal Alkallnity as Cacus	l/bu		1	1	I	1	-		ı	1	1	1	I
lotal Organic Carbon	/bm	1	l	-	•	1	1	I	I	I	I	i	1
lotal Oxidised Nitrogen	mg/l	0.18	-	-	1	1	1	!	-	0.05	1	İ	1
Arsenic	l/gm	I	ı	I	1	I	ł	1	1	I	-	1	1
Barium	l/gm	I	1	ŀ	ı	ı	i	1	1	I	1	1	ı
Boron	ug/l	1		-		-		-				-	Ì
Flouride	l/bm	-		-		-	***				ı	1	1
Total Phenois	l/bm		-	-	-	***	****	-	l	****	-	ı	1
Phosphorous	l/gm	-	1	-	-	-	-	-			ı	I	I
Selenium	l/bm	-		-	-	-	***				-	ı	ı
Silver		-	ı		-	-	ı	1	1	1	ı	1	I
Mircrotox	Toxic Units		-					1	ı	ı	1	1	1
Microtox	Toxic Units		1			-		1	1	-	1	ı	-
Nitrite	s cree mg/l ass	<0.03	1	I		1	1	1	-	0.002	ı	ı	:
Nitrate	// mg//	0.7956	1			-	-		1	0.045	1	ı	1
Phosphate - ORTHO	l/bm	<0.0001				1	1	1		<0.01	ı	1	1
Phosphate - TOTAL	l/bw	1	1	1	1	1	ı			0.001			1
Total Coliforms	SHOWING THE RESIDENCE OF		-						-		1		I
Facel Coliforms	衛行所のないというないのかのか	-			(A)	(Sec.)	3005007	5000000	5,975,575			100000	2210903
The second second	The second secon							1	1	i	1	l	i





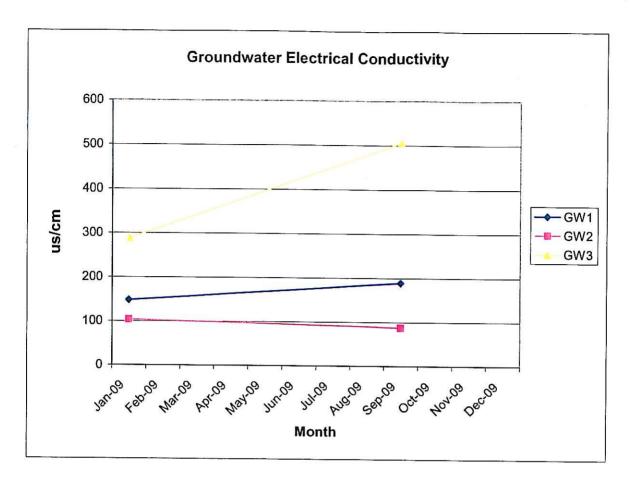


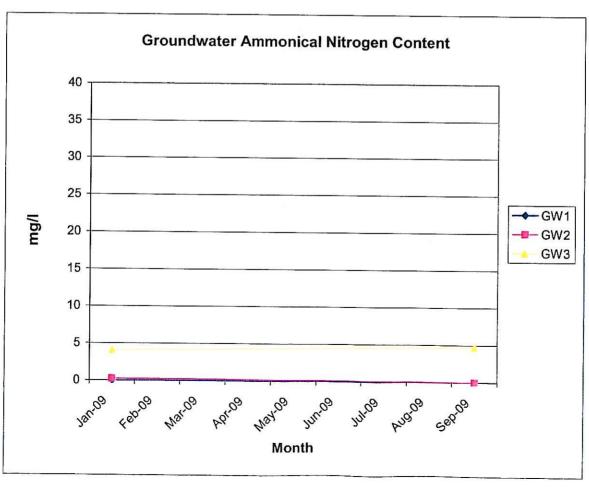


Location		AMERICAN PROPERTY.							mount of another ages, or possesses				
Sample Type		MARKET SERVICE					groun	groundwater					
Site No	語を対ける対対に				医医疗		D	GW1				ANTERSTER SEED	555
Date of Sample		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Lab No	を ないからいのこのない	1288	ŀ	1	l	ı	ı	ŀ	1	4808	ı	1	I
Hd	PERSONAL PROPERTY.	6.55	-		ı	1	1	1	1	6.40	I	I	1
Тетр	ပ	8.96	1	-		1		1	1	13.40	1	1	I
Electrical Conductivity	uS/cm	148	1	I	ı	ı	1	I	1	189	-		1
Ammonical Nitrogen	l/gm	<0.01	-	1	1	1	1	1	1	<0.01		1	
COD	l/bm	1	ı	ı	1	1	-	1	1	1	-	I	i
BOD	mg/l	1		-	1	1	1	-	ı	-	ı	ı	1
Dissolved Oxygen	mg/l	11.43		1	1	ı	l	ı	1	6.44	1	1	1
SS	l/bu	62	-	1	-	ı	ı	1	1	532	ı	ı	1
Residue on Evaporator	l/bm	1	1	1	1	1	1	ı	ı	213	1	1	1
Calcium	l/bn			-	ı		1	I	ı	7	l	1	1
Cadmium	l/bn	***		-	1	ı	1	ı	ı	<0.220	ı	I	1
Chromium	l/bn	I	1	1	1	ı	ı	ı	ı	6.100	-	-	1
Chloride	l/bm	32	ı	I	ı	1	1	ı	1	18	1	1	
Chlorine	l/bm			ı	1	I	1	I	1		l	I	
Copper	l/bn	l			1	1	ł		I	7.09	1	1	
Cvanide	l/bm		ŀ	1	1	ı	ı	1	1	<0.05	I		
Dissolved Iron	l/au	520.00		ı	I	I	ı			×19	ļ		
Lead	l/bn	-	!	1	I	I	i	ŀ		1 070	ı	I	1
Magnesium	l/bn	1	I	I	1	1	1	I	ı	2 0600		1	١
Manganese	/bn	1	1	1	1	1	ı	ı	ı	1,1500	ı	!	1
Mercury	nd/I	1	i	1	I	ı	1	1		<0.01	1	ı	1
Nickel	l/bm	1	1	1	1	1	ı	ı	1	1	ı	ı	I
Potassium	l/bm	1.50	-	1	-					<2.34	ı	ı	I
Sodium	mg/l	12.00	1	1	ı			***	-	9.77	l	ı	-
Sulphate	mg/l	1	1	1	1	-		1	-	14.5000	1	ı	I
Zinc	ug/i	1	1	1	1		-	***		22.80	1	1	1
Total Alkalinity as CaCO3	mg/l	1	1	I	1	I	I	ı	1	1	1		1
Total Organic Carbon	l/bm	0.0000	I	I	1	ı	i	I	1	12.9	1	-	1
Total Oxidised Nitrogen	mg/l	0.26	1	I	1	1	-	1	I	0.14	I	ı	1
Arsenic	/bm	I	1	1	1	l	I		1	1	I	i	1
Barium	I/6M	1	1	l	1	1		1	I	I	1	1	1
Boron	l/6n	1	I	I	1	ŀ	1	1	1	19.7000	i	1	1
Flouride	mg/l	1	1	1	1	l	-	-	1	<0.5	1	****	I
Total Phenois	J/BM	<0.01	1			1		1	l	<0.0150	I	-	ł
Phosphorous	mg/l			-		-	-	1	1	I	-	1	I
Selenium	mg/l			ı	1		1	1	I		1		1
Silver)bu	1	I	1	1	1	1	1	I	i	1	İ	1
Mircrotox	Toxic Units	1	1	i	1	I	ı	I	ı	ŀ	-	1	1
Microtox	Toxic Units	ŀ	1	I	I	1	ı	!	I	}	I	1	1
Nitrite	mg/l	<0.03	-	l	I	l	1	1	1	0.01	ı	1	1
Nitrate	l/bm	1.1271	I	1	I	ı	-	I	-	0.1	-		
Phosphate - ORTHO	mg/l	0.0	I	I	ì	ı	1	i	ı	<0.01			
Phosphate - TOTAL	l/gm	1	1	1	1	1	1	-	-	0.4	-	****	1
Total Coliforms	A SCHOOL PARTICION OF	<0.01		1	1	ı	1	1	-	<0.01	i	1	1
Facel Coliforms	E PROPERTY OF THE PARTY OF THE	<0.01	-	1	1	ı	ı	1	1	<0.01			

						-					THE PERSON NAMED IN		
Sample Type		ASSESSED FOR					groun	groundwater					
Site No							5	GW2					
Date of Sample	新工作的	Jan	Feb	Mar	Apr	May	Jun	Inc	Aug	Sept	Oct	Nov	Dec
Lab No		1289		l	i		1	,	9 1	4809		ı	1
Programme pH remaining	STATE OF STREET BY	5.61		-	1	1		ı		5.34	ı	I	1
Temp	0	7.32	1	1					ı	13.90	ı	1	1
Electrical Conductivity	m2/cm	104	ı	1	1		***	-		88			1
Ammonical Nitrogen	l/bm	0.25	1	1	1				ı	<0.01		ı	1
COD	l/gm	1	ı	1	1				1	ı		ı	1
BOD	l/6m	1	-	1	İ	1	I	1	1	ı	I		1
Dissolved Oxygen	l/bu	6.58	***	I	ı	I	1	ı	1	4.41	****	1	1
SS	l/bm	637	1	1	1	1	١	1	1	2658	1	1	I
Residue on Evaporator	l/bm		1	ŀ	I	I	ı	1	ı	1110	1		1
Calcium	l/bn	ı	ı	ı	1	J		I	ı	2			1
Cadmium	l/bn		ı	1	ı	1	ı	1	ŀ	<0.220	l	-	
Chromium	l/on		ı	ı	l					4 800			
Chloride	l/om	31	l							500.7			1
Chlorine	/ww			l						3			
Copper	1/011	I	ŀ							300			
Cvanide	l/bm		ŀ							20.07			
Dissolved Iron	1/011	1500 00								00.07		1	I
Pad	1/011								ı	2040.00		1	
Magnesium	/211								ı	2 2000		1	1
Mandanese	1/211					I	1	1	1	3.3000		1	1
Merciny	/BD							1	1	109.000	1	l	1
Merculy	ng/I				1	-	1	-	1	<0.02	١	1	1
Nickel	I/BIII	1		!	-	l	1	1	1		****	-	1
rotassium	I/6III	2.40		1	i	1	1	1		<2.34	1	1	I
minoc	l/bm	13.00	1	1	1			1	1	10.50	ı	ı	1
Sulphate	l/bm	1	1	١		1	ı	-	•	<3.00	i	1	ı
7inc	/bn	1	1	ı	I	1	1	1	ı	13.10	l	ı	1
I otal Alkalinity as CaCO3	mg/l	1	ı	1		-	-	1	l	1	ı	1	ı
Total Organic Carbon	mg/l	0.00			1	1	ı	1	1	46.80	1	ı	I
Total Oxidised Nitrogen	mg/l	0.04			1	1	1	ı	1	0.03	1	i	1
Arsenic	mg/l		-			ı	1	I	ı	ı	ı	1	ł
Barium	mg/l	1	1	ı	1	ı	1	ı	1	١	ı	ı	1
Boron	ug/l				ı	ı	1	ı	ı	29.3000	1	ı	1
Flouride	mg/l	-			1	1	1	1	1	2.1200	1	1	
Total Phenois	l/bm	<0.01	1	1	1	1		1	1	<0.0150		!	ł
Phosphorous	mg/l	1	1	-	1	1	1				I	ŀ	I
Selenium	mg/l	****	I	-	1	ı	1	ı	-	1	!	1	
Silver	l/bm	ı	1	I	1	ı	ı	ı	ì	1	,	1	ŀ
Mircrotox	Toxic Units	1		1	I	ı	1	I	1		l		١
Microtox	Toxic Units	ı	1	1	1	ı	ı	1	ı	I	I	1	
Nitrite	l/6m	<0.03	1	1	ı	ı	1	-	i	<0.03	1	1	1
Nitrate	mg/	0.1812		ı	1	1	ı	ı	1	0.03	ı	1	1
Phosphate - ORTHO	l/bm	0.059	1	1	ı	ı	ı	1	ı	0.05	ı	ı	!
Phosphate - TOTAL	l/bm	-	1	I	ı	ı	ı	1	ı	0.34	1	ı	1
Total Coliforms		<0.01	ı	1		1		!	ı	<0.01	1		
Farel Coliforme	AND REAL PROPERTY AND REAL PROPERTY.	70 0									-		200000000000000000000000000000000000000
acci collici		0.00	1	1	ı	1	Ì	1	-	VO 04			

Cocanoli	THE RESERVE THE PROPERTY OF THE PARTY OF THE		Confinition of the Confinition o				CONTRACTOR SERVICES			The second secon			
Sample Type					Manager 1		grour	groundwater					
Site No							9	GW3			108 MIN. 15%		
Date of Sample		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Lab No	A REAL PROPERTY.	1290	!	1	1	1	1	ı	ı	4810	١	1	1
Hd	PARTIES AND AND A	69.9	-	1	1	1	1	1	I	09'9	1	1	I
Temp	C	6.77	-	-	1		1	-	1	14.60	-	ł	i
Electrical Conductivity	nS/cm	288		-	1	-	-	-	ı	206	-		1
Ammonical Nitrogen	l/bu	4.05		I	1	1	-		i	4.70		-	
COD	l/bm	1	ı	1	1	-	I	1	1	ı	1	1	1
BOD	l/bm	ı	ı	ı	1	1	1	1	1	1	1	1	1
Dissolved Oxygen	I/bm	2.80	1	I	1	ı	I	ı	I	0.47	-	-	1
SS	ma/I	3405	I	I	ŀ	ŀ	i	ı	1	5224	1	1	!
Residue on Evaporator	I/bm	1	1	1	1	ı	I	i	ı	2200	١	1	1
Calcium	I/DO	I	i	ł	1	1	1	1	I	69	1	I	I
Cadmium	l/bn		ı	ı	I	ŀ	ı	1	1	<0.220	-	1	1
Chromium	/bn	I	ı	I	ı	ı	ı	ı	ı	28.600			1
Chloride	l/am	65		ı	ŀ			ı	!	79	1	ı	!
Chlorine	l/bm	1	1	I	ı	i	l	ŀ	!		ŀ	ŀ	
Copper	l/on	ı	ı	1	ı	I	Ī			<1.60			
Cvanide	l/bm	1		1		l	1	ı		<0.05		1	1
Dissolved Iron	1/011	17000 00	1	1	ı	ļ	1	1		5180.00	J	l	
lead	1/011	1			l		ŀ	J	I	0.400	1	1	1
Magnesium	l/au	1	1	ı	I	I	I	ŀ	l	15 9000	I		
Manganese	na/l	ı		ı	ı			ı		2510	1	1	I
Mercury	1/0/1	ı	1	ı	1	ı	1			×0 01			
Nickel	l/om						ŀ	ļ		2	1	ı	
Potassium	l/om	7.50	ı	I	I		1	l		11 20	ŀ	l	
Sodium	l/om	23.00	l	ı	ļ				ļ	26.10			
Sulphate	l/nm			1	1	l	l			<3.00			
Zing	1/011		l		l		1			5.25		ŀ	
Total Alkalinity as CaCO3	l/nm							l	1	2			
Total Organic Carbon	ma/l	00000			I		I			32	-		
Total Oxidised Nitrogen	ma/l	0.12	1	1	I]	1	1		<0.01		l	I
Arsenic	ma/less	I	!	ı	I	1	1	ı	1	1	1	1	1
Barium	ma/I	1	1	1	1	I	I	1	I	ı	ı	ı	I
Boron	l/bn				l		I	1	I	37.80	ı	ł	1
Flouride	l/bm	1		ı	1	ı	I	1	ı	<0.5	1	1	I
Total Phenois	l/bm	<0.01	1	1	1		1	1	1	0.45	1	1	1
Phosphorous	l/bm	****	ı	1	1	1	1	ı	1	1	1	1	1
Selenium		1	1	1	1	I	1	1	ı	1	1	ı	
Silver	l/bm	ı	!	1	1	1	1	ı	1	i	1	ı	1
Mircrotox	Toxic Units	ı	ı	ı	1	!	ı	ı	I	1	1	1	l
Microtox	Toxic Units	1	ı	I	1	1	ı	I	ı	1	ı	1	1
Nitrite	l/bm	<0.03	1	1			-	1	1	<0.03	ŀ	ı	I
Nitrate	l/bw	0.5304	-			1	1	1]	<0.04	ı	ı	1
Phosphate - ORTHO	mg/l	0.046	-			l	****	1	I	0.040	****	-	
Phosphate - TOTAL	l/bm	1	ı	1	-	1	1	1	1	1	I	i	1
Total Coliforms	APPRINT SPECIAL SPECIA	<0.01	-		() () () () () () () () () ()					<0.01	1	1	1
Facel Coliforms	SHOW SERVICE OF THE PARTY OF TH	<0 O>	1		2,000,000	A AMERICA	155.00			70.07			
						1	l		1		1	I	I



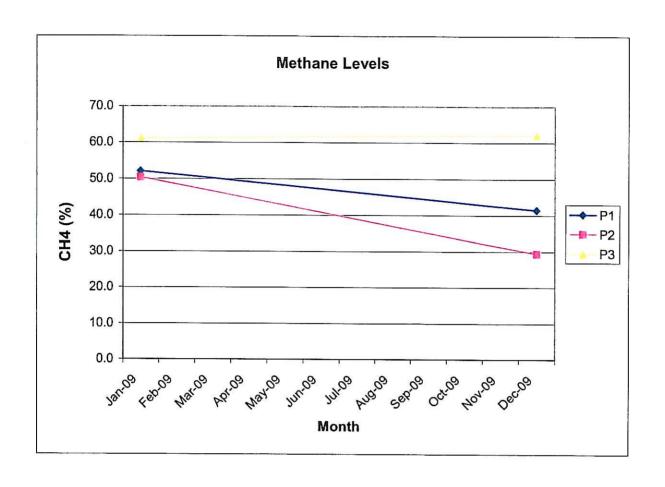


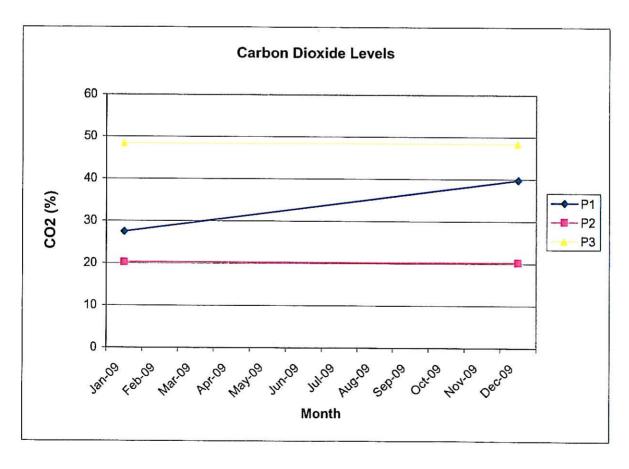
Cample Time													
Sample Lype	記述に はんし						lea	leachate		STATE OF THE STATE OF			
Site No		Man de la companie de			STATE OF STA			5					
Date of Sample	B HOLD WAS BEING	Jan	Feb	Mar	Apr	Mav	un!	Inl.	Aug	Sent	100	VoN	Dan
Lab No	MENTAL PROPERTY	1291	ŀ	ŀ				ı	1	4811	1		
Hd	ACTIVATION AND AND AND AND AND AND AND AND AND AN	7.16		ı	ŀ	ı		ı		6.27	I		
Temp	C	10.90			1	1	1		ı	14.40		I	
Electrical Conductivity	uS/cm	5220	1				-	1		825			
Ammonical Nitrogen	mg/l	301	1	1	I	-		-	1	2.94	1		
COD	mg/i	608	1	1	-		1	1	1	80	1	1	1
BOD	mg/l	18.00	ı	1	1	1	1	-		0.8	1	ı	
Dissolved Oxygen	l/bm	0.14	1	1	ŀ	1	ı	1	1	4 68	1	1	1
SS	l/bm	991	1	1	1	1	I	ı	1	ı	1	١	
Residue on Evaporator	l/bm	1	1	ı	1	1	!	1	ŀ	1		ı	
Calcium	l/bn	I	ı	1	!	l	ı	ı	ŀ	104	ı	I	
Cadmium	l/bn	I	l	-	ŀ	1	ı		I	<0.220	I	l	
Chromium	l/bn	1			ŀ	1	ı			4 010	I	l	
Chloride	l/bm	371		ı	1	ı	ı			40			
Chlorine	ma/l/ma	1		1	l		ı						
Copper	l/bn			ŀ	ŀ	ŀ	1		l	<1.60			
Cvanide	l/um		ı			l				20.07			
Dissolved Iron	1011									4470.00	1		
lead.	1/61						-	1	1	170.00	1	1	1
Magnetium	50.			1	1	!	:	1	I	0.400	1	1	1
Mondanoro	l/bn		1		l		1	I		21.30	I	I	i
Manganesa	i/Sn		1	ı	1	ı	1	I	1	11500.00	-	1	1
Mercury	ng/l	1	1	1	1		1	1		<0.01		1	•
Nickei	mg/l	1		-	1	1	1	1	1	1	ı	1	I
Potassium	mg/	1		I	1	1	1	1	1	8.68	1	1	
Sodium	JbE	Į	i	1	I	1	l	ı		21.30	1	-	1
Sulphate	mg/l	1	1	1	-	ı	-	1	ı	<3.00		1	
Zinc Strategics	ug/l	1	1	1	-	I	I	ı]	<5.00	1	-	
Fotal Alkalinity as CaCO3	mg/l	-			1	-	I	1	ı		1	ı	1
Total Organic Carbon	mg/l		-	I	ı	1	1	1		-	1	I	-
Total Oxidised Nitrogen	mg/i	<0.01			ı	1	1	1	1	<0.01	1	I	1
Arsenic	mg/l	1				-	-	1	1	1	ı	1	1
Barium	l/bm	1	1		-	1	1	ł	1	ı		-	1
Boron	see ng/l see	1	1	1				-	1	45.30	1	1	1
Flouride	l/bm	-	-		ı	-	1		ı	<0.5	ı	1	I
Total Phenois	mg/l				ı	i	1	1		<0.0150			1
Phosphorous	mg/l	1			ı	l	I	1	ı	1	ı]
Selenium	mg/l	1	1	1	1	-	1		I	ı	ı		1
Silver	mg/l	-	1	-	l	I	ı	1	ı	I	ı	I	1
Mircrotox	Toxic Units	-		-	I	1	ı	1	I	1	I	1	1
Microtox	Toxic Units	ł	ł	1	ı	ı	1	-	1	1	I	1	ŀ
Nitrite	l/bm	<0.03	ı	1	ı	ı	I		-	<0.03	1	1	1
Nitrate	and //bm=s=s	<0.04	1	1	ı	ı	1	I	1	<0.04	1		1
Phosphate - ORTHO	l/bm	0.46	1	ı	1	ı		I		0.05	ı		1
Phosphate - TOTAL	l/bm	1	****	1	1	ı	ı	ı		<0.01			1
Total Coliforms	THE SAME AND STREET, SAME AND ADDRESS OF THE PARTY OF THE	1	1			1				1			
Facel Coliforms	Statement of the statem	1			200000			X	20000				
										-			

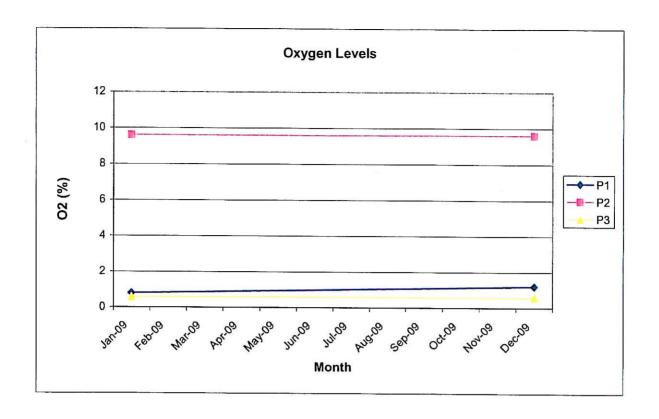
Location	を は は は は は は は は は は は は は は は は は は は					Muckis	Muckish Landfill, Muckish, Co Donegal	ckish, Co Do	negal				
Sample Type	新聞工作						Landfill Gas levels	is levels		The second second			
Site No							P1						
Date of Sample	9					新年							
Parameters	Units	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
		Jan-09	Jan-09 16-Dec-09										
Methane	%	52.1	41.5										
Carbon Dioxide	%	27.4	39.7										
Oxygen	%	0.8	1.2										
Atmos. Pressure	mBar	666	000										

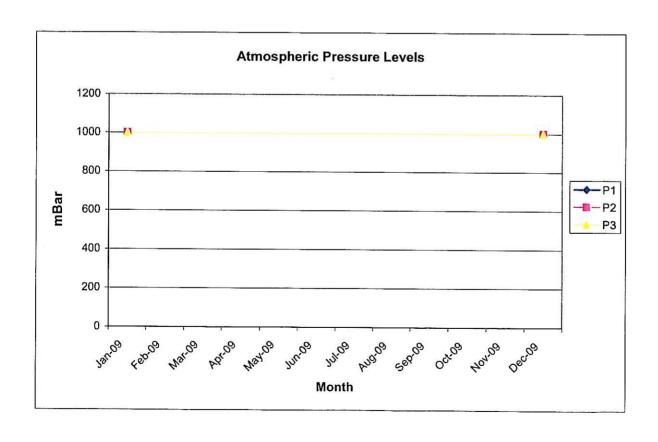
Location	では、後端					Muckis	Muckish Landfill, Muckish, Co Donegal	ickish, Co Do	negal				
Sample Type							Landfill Gas levels	as levels					
Site No							P2	2					
Date of Sample	9		THE RESERVE OF THE PERSON NAMED IN										
Parameters	Units	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
		Jan-09	16-Dec-09										
Methane	%	50.4	29.4			4							
Carbon Dioxide	%	23.9	20.2										
Oxygen	%	5.7	9.6										
Atmos. Pressure	mBar	666	666										

Location			表のはまる			Muckl	Muckish Landfill, Muckish, Co Donegal	uckish, Co Di	onegal				
Sample Type							Landfill G	Landfill Gas levels					
Site No							0	P3					- 一般に かいかい
Date of Sample	ej.												
Parameters	Units	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
		Jan-09	16-Dec-09										
Methane	%	61.2	62.2										
Carbon Dioxide	%	24.1	48.4										
Oxygen	%	5.2	9.0										
Atmos. Pressure	mBar	666	666										









APPENDIX B WATER BALANCE CALCULATION

MUCKISH WATER BALANCE CALCULATION

YEAR	Status	Active	Waste		Active Area	Liquid Waste	Temp	Temp	Restored	Restored Restored area Total Water Leachate	Total Water	Leachate
		Area	Input	The Control of the Co	Infiltration	Infiltration Restored	Restored	Restored	area			
		A(m ²)	=	Rainfall	R(AKm²) LW(m3)	LW(m3)	Area	Infiltration	Area	Infiltration		produced
								IRCA(m3)		IRCA(m3)		Lo(m3)
		The same of the sa						-				
2009	Closed	0	0	1171.7	0	0	0		20,500	2402	2402	2402
1-7-1				i								0.000

Assumptions		A	
IRCA=	Fully Capped/Restored area infiltration of rainfall estimated (2-10%),EPA Manual	10%	%
Restored area	Area capped is 20,500.	20,500	m ²
Rainfall Data	Data taken from Met Eireann Station Malin Head, Total Rainfall used.	1171.7	шш

APPENDIX C E-PRTR Regulations (AER Electronic Reporting System)

At the time of reporting the EPA's web-based database for the submission of PRTR the return is not available. When the return can be made a hard copy will be forwarded to the Agency under separate cover.