

Application Form Attachment E – Appendix 1

Environmental Reports 2003-2007

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**Report on Noise levels at
Waste Recovery Services (Fermoy Ltd.)
For Annual Report to the EPA**

Report Ref: - 406/2003

Confidential Report To:

Mr. Shane Dunlea,
Waste Recovery Services (Fermoy Ltd.),
Cullenagh,
Fermoy,
Co. Cork.

Report submitted by:

Biospheric Engineering Ltd.

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Issued by:

Eugene McKeown, B.E., L.L.B.
M.I.O.A., Chartered Engineer

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1. INTRODUCTION

This Report was prepared by Biospheric Engineering Ltd as part of Waste Recovery Services (Fermoy Ltd.) compliance with their waste licence no. 107-1 as issued by the Environmental Protection Agency.

Condition 6.4 and Schedules C1, D1 and D3 detail the monitoring requirements as follows:

Condition 6.4

There shall be no clearly audible tonal component or impulsive component in the noise emissions from the activity at the noise sensitive locations.

C.1 Noise Emissions: (Measured at the monitoring points indicated in Table D.1.1).

Day dB (A) L_{Aeq} (30 minutes)	Night dB(A) L_{Aeq} (30 minutes)
55	45

D.1 Monitoring Locations

Monitoring locations shall be those as set out in Table D.1.1 and "Drawing No. 21802/0B/03, Borehole and Noise Monitoring Sites of EIS submitted 18/05/00 and Fig 1 Dust deposition monitoring locations of Article 14 reply dated 14/11/00" of the application.

Table D.1.1 Noise, groundwater, foul water and dust monitoring locations

Noise Stations	Groundwater Stations	Foul Water Stations	Dust Stations
MP1 ^{Note 1}	GW1 (Borehole of John Dunlea)	FW1 ^{Note 1}	Site 1
MP2 ^{Note 1}	GW2 ^{Note 1}		Site 2
	GW3 ^{Note 1}		Site 3 ^{Note 1}
	Private wells (Condition 9.4.4)		
	P1 (Emissions to percolation area ^{Note 1})		

Note 1: Location to be agreed with the Agency

D.3 Noise

Table D.3.1 Noise Monitoring Frequency and Technique

Parameter	Monitoring Frequency	Analysis Method/Technique
L(A) _{EQ} [30 minutes]	Annual	Standard ^{Note 1}
L(A) _{EQ} [30 minutes]	Annual	Standard ^{Note 1}
L(A) _{EQ} [30 minutes]	Annual	Standard ^{Note 1}
Frequency Analysis (1/3 Octave band analysis)	Annual	Standard ^{Note 1}

Note 1: "International Standards Organisation. ISO 1996. Acoustics – description and Measurement of Environmental noise. Parts 1, 2 and 3".

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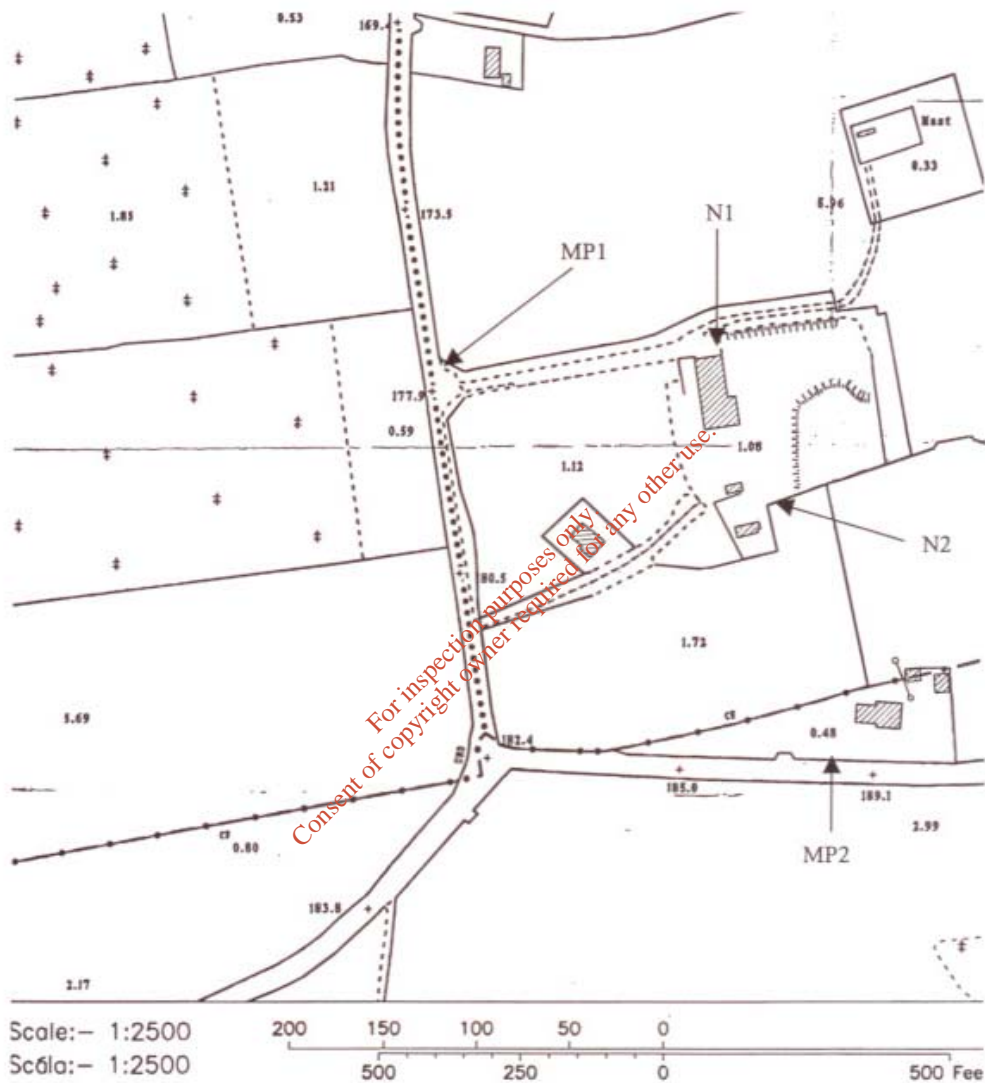
2. MEASUREMENT METHODOLOGY

Measurements were taken using a Bruel & Kjaer model 2260 type 1 sound level meter with modular real-time analysis using BZ7210 noise analysis module. The instrument was calibrated using a Bruel & Kjaer model 4231 sound level calibrator. Post Measurement analysis was carried out using Bruel & Kjaer Noise Explorer software. During measurement the height of the microphone was 1.3 metres above ground at the sampling location.

Weather data was compiled using Prosser model Weathertrend digital barometer, Rotronic model A1 Hygrometer and RS model 180-7111 digital anemometer.

Noise measurements were taken in accordance with International Standards Organisation ISO 1996 – Acoustics – Description and Measurement of environmental noise.

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Project: Noise Monitoring Locations

Client: Waste Recovery Services (Fermoy Ltd.)
 Cullenagh,
 Fermoy,
 Co. Cork.



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 Partners in Sustainable Development

Barna, Galway, Ireland.
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Date: 08/04/03

Scale: NTS

3. Weather Data

8 th April, 2003	Barometric Pressure (mBar)	Temperature °C	Relative Humidity %	Wind speed & Direction
12.00 hrs	1020	7.8	60	2.5 m/s SE
14.00 hrs	1020	8.3	58	2.0 m/s SE

Weather: sunny and dry

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4. Noise Measurements

The noise measurements taken on site are reproduced on the following tables:

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NOISE EMISSIONS

Emission point reference No.	Location	Octave bands (Hz) Sound Pressure Levels dB (unweighted) per band									Impulsive or tonal qualities	Periods of Emission	Other Comments
		31.5	63	125	250	500	1K	2K	4K	8K			
N 1	North of Site	77	72	64	57	53	54	51	45	41	No	Working hours	
N 2	South of Site	72	71	59	52	52	55	55	54	46	No	Working hours	
MP1	Entrance to Site	65	62	55	50	48	49	45	36	28	No		
MP2	Nearby House	58	61	56	53	51	52	48	41	34	No		Local traffic

Note:**Identification of Tones**

A prominent tonal component can be identified by one-third octave band analysis, where the level of a one-third-octave band exceeds the levels of the adjacent bands by 5 dB or more.

Identification of impulsive characteristics

An impulsive characteristic can be determined by measuring the difference between the A-weighted sound pressure level, with time-weighting characteristic I, averaged over the same time interval, and $LA_{eq,T}$ value of greater than 2 dB ($LA_{Im} - LA_{eq}$) would indicate an impulsive characteristic.

Location	National Grid Reference (5N, 5E)	Sound Pressure Levels			Comment
		L(A) _{eq}	L(A) ₁₀	L(A) ₉₀	
SITE BOUNDARY					
Location 1: N1	17904, 09581	59	60	43	
Location 2: N2	17907, 09571	61	64	39	
NOISE SENSITIVE LOCATIONS					
Location 1: MP1	17890, 09578	54	50	36	Complies with licence conditions
Location 2: MP2	17906, 09557	57	50	41	Determined by traffic on Golf Course Road not licensed activity therefore in compliance with licence conditions

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5. DISCUSSION OF RESULTS

Location N1

- site based noise level

Location N2

- site based noise level

Location MP1

- noise sensitive location 1 – noise climate predominantly influenced by road traffic noise on local road. No tonal or impulsive components. No audible noise from licensed activities - complies with licence conditions.

Location MP2

- noise sensitive location 1 – noise climate predominantly influenced by road traffic noise on local road (access to golf course). No audible noise from licensed activities. No tonal or impulsive components – complies with licence conditions.

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6. CONCLUSIONS

Two noise sensitive monitoring locations were chosen:

1. At the site entrance – opposite a new residence under construction
2. At the nearest residence to the south of the site.

These locations offer the best monitoring locations as the sites are easily accessible and offer a representative view of noise emissions from the site.

Noise levels within the site boundary can exceed the guidance limit due to the operation of equipment such as the load-all and the bulldozer out of doors.

Noise levels due to licensed activities at noise sensitive locations MP1 and MP2 are within the licence limits.

The noise levels at the two noise sensitive locations are determined by the road traffic noise on local road rather than any noise arising from the licensed activities and so the licensed activity should be considered to comply with licence conditions.

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Appendix A. Detailed Monitoring Results

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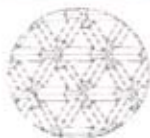
Biospheric Engineering Ltd.

Frequency Analysis Table

Client:	Waste Recovery Services
Site:	Cullenagh, Fermoy, County Cork.
Location:	MP1 Entrance Gate
Survey Date:	8th April 2003

Frequency Hz	$1/3$ Octave		$1/1$ Octave	
	dBA	dB lin	dBA	dB lin
25	17	62		
31.50	21	60	26	65
40	24	58		
50	28	59		
63	30	56	37	62
80	35	58		
100	32	51		
125	32	48	39	55
160	36	50		
200	35	46		
250	37	46	42	50
315	38	44		
400	39	43		
500	40	43	45	48
630	42	44		
800	43	44		
1000	44	44	49	49
1250	44	44		
1600	43	42		
2000	41	39	46	45
2500	38	36		
3150	34	33		
4000	32	31	37	36
5000	30	29		
6300	26	26		
8000	21	22	28	28
10000	20	17		
Leq Sound Level	53	67		

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Biospheric Engineering Ltd.

Frequency Analysis Table

Client: Site: Location: Survey Date:	Waste Recovery Services Cullenagh, Fermoy, County Cork. MP2 Nearby House to South 8th April 2003			
Frequency Hz	$1/3$ Octave		$1/1$ Octave	
	dBA	dB lin	dBA	dB lin
25	7	52		
31.50	15	55	21	58
40	19	53		
50	27	57		
63	28	54	36	61
80	35	57		
100	34	54		
125	34	50	40	56
160	36	50		
200	37	48		
250	39	48	44	53
315	40	48		
400	43	46		
500	44	47	48	51
630	45	46		
800	46	47		
1000	48	48	52	52
1250	47	46		
1600	45	44		
2000	44	42	49	48
2500	42	41		
3150	40	39		
4000	37	36	42	41
5000	34	33		
6300	31	31		
8000	28	29	34	34
10000	28	26		
Leq Sound Level	55	65		

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Biospheric Engineering Ltd.

Frequency Analysis Table

Client:	Waste Recovery Services
Site:	Cullenagh, Fermoy, County Cork.
Location:	N1 North of Site
Survey Date:	8th April 2003

Frequency Hz	¹ / ₃ Octave		¹ / ₁ Octave	
	dBA	dB lin	dBA	dB lin
25	28	73		
31.50	33	72	39	77
40	37	71		
50	40	71		
63	39	66	45	72
80	41	63		
100	44	63		
125	39	55	46	64
160	41	54		
200	40	51		
250	42	51	50	57
315	43	55		
400	44	48		
500	46	49	50	53
630	47	49		
800	50	51		
1000	49	49	54	54
1250	49	49		
1600	48	47		
2000	47	46	52	51
2500	46	44		
3150	43	42		
4000	41	40	46	45
5000	39	39		
6300	37	37		
8000	35	36	41	41
10000	37	34		
Leq Sound Level	59	79		

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Biospheric Engineering Ltd.

Frequency Analysis Table

Client: Site: Location: Survey Date:	Waste Recovery Services Cullenagh, Fermoy, County Cork. N2 South of Site 8th April 2003			
Frequency Hz	$\frac{1}{3}$ Octave dBA dB lin		$\frac{1}{1}$ Octave dBA dB lin	
25	14	59		
31.50	28	67	36	72
40	35	70		
50	39	69		
63	38	65	43	71
80	36	58		
100	37	56		
125	38	54	42	59
160	35	49		
200	38	49		
250	38	47	44	52
315	41	48		
400	42	46		
500	44	47	49	52
630	46	48		
800	47	48		
1000	50	50	55	55
1250	52	52		
1600	51	50		
2000	52	51	57	55
2500	52	50		
3150	51	50		
4000	50	49	55	54
5000	47	47		
6300	44	44		
8000	40	41	46	46
10000	40	37		
Leq Sound Level	61	75		

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**Report on Noise levels at
Waste Recovery Services (Fermoy Ltd.)
For Annual Report to the EPA**

Report Ref: - WRS/2004

Confidential Report To:

Mr. Shane Dunlea,
Waste Recovery Services (Fermoy Ltd.),
Cullenagh,
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1. INTRODUCTION

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Condition 6.4 and Schedules C1, D1 and D3 detail the monitoring requirements as follows:

Condition 6.4

There shall be no clearly audible tonal component or impulsive component in the noise emissions from the activity at the noise sensitive locations.

C.1 Noise Emissions: (Measured at the monitoring points indicated in Table D.1.1).

Day dB (A) L _{Aeq} (30 minutes)	Night dB(A) L _{Aeq} (30 minutes)
55	45

D.1 Monitoring Locations

Monitoring locations shall be those as set out in Table D.1.1 and "Drawing No. 21802/0B/03, Borehole and Noise Monitor Sites of EIS submitted 18/05/00 and Fig 1 Dust deposition monitoring locations on Article 14 reply dated 14/11/00" of the application.

Table D.1.1 Noise, groundwater, foul water and dust monitoring locations

Noise Stations	Groundwater Stations	Foul Water Stations	Dust Stations
MP1 ^{Note 1}	GW1 (Borehole of John Dunlea)	FW1 ^{Note 1}	Site 1
MP2 ^{Note 1}	GW2 ^{Note 1}		Site 2
	GW3 ^{Note 1}		Site 3 ^{Note 1}
	Private wells (Condition 9.4.4)		
	P1 (Emissions to percolation area) ^{Note 1}		

Note 1: Location to be agreed with the Agency

D.3 Noise

Table D.3.1 Noise Monitoring Frequency and Technique

Parameter	Monitoring Frequency	Analysis Method/Technique
$L(A)_{EQ}$ [30 minutes]	Annual	Standard ^{Note 1}
$L(A)_{EQ}$ [30 minutes]	Annual	Standard ^{Note 1}
$L(A)_{EQ}$ [30 minutes]	Annual	Standard ^{Note 1}
Frequency Analysis (1/3 Octave band analysis)	Annual	Standard ^{Note 1}

Note 1: "International Standards Organisation. ISO 1996. Acoustics – description and Measurement of Environmental noise. Parts 1, 2 and 3".

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2. MEASUREMENT METHODOLOGY

Measurements were taken using a Bruel & Kjaer model 2260 type 1 sound level meter with modular real-time analysis using BZ7210 noise analysis module. The instrument was calibrated using a Bruel & Kjaer model 4231 sound level calibrator. Post Measurement analysis was carried out using Bruel & Kjaer Noise Explorer software. During measurement the height of the microphone was 1.3 metres above ground at the sampling location.

Weather data was compiled using Prosser model Weathertrend digital barometer, Rotronic model A1 Hygrometer and Silva Windwatch digital anemometer.

Noise measurements were taken in accordance with International Standards Organisation ISO 1996 – Acoustics – Description and Measurement of environmental noise.

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3. Weather Data

Nov 1st, 2004	Barometric Pressure (mBar)	Temperature °C	Relative Humidity %	Wind speed & Direction
11.30 hrs	1022	14.0	78	0.5 m/s SW

Weather: overcast & dry

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4. Noise Measurements

The noise measurements taken on site are reproduced on the following tables:

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NOISE EMISSIONS

Emission point reference No.	Location	Octave bands (Hz) Sound Pressure Levels dB (unweighted) per band									Impulsive or tonal qualities	Periods of Emission	Other Comments
		31.5	63	125	250	500	1K	2K	4K	8K			
N 1	North of Site	76	70	64	56	52	53	49	44	39	No	Working hours	
N 2	South of Site	72	69	56	51	52	55	55	52	44	No	Working hours	
MP1	Entrance to Site	65	61	54	48	46	47	43	34	27	No		
MP2	Nearby House	57	58	55	51	48	50	45	39	33	No		

Note:**Identification of Tones**

A prominent tonal component can be identified by one-third-octave band analysis, where the level of a one-third-octave band exceeds the levels of the adjacent bands by 5 dB or more.

Identification of impulsive characteristics

An impulsive characteristic can be determined by measuring the difference between the A-weighted sound pressure level, with time-weighting characteristic I, averaged over the same time interval, and LA_{e,T}A value of greater than 2 dB (LA_{Im}-LA_{eq}) would indicate an impulsive characteristic.

Location	National Grid Reference (5N, 5E)	Sound Pressure Levels			Comment
		L(A) _{eq}	L(A) ₁₀	L(A) ₉₀	
SITE BOUNDARY					
Location 1: N1	17904, 09581	57	61	43	
Location 2: N2	17907, 09571	60	68	41	
NOISE SENSITIVE LOCATIONS					
Location 1: MP1	17890, 09578	51	48	36	Determined by local traffic
Location 2: MP2	17906, 09557	53	49	40	Determined by traffic on Golf Course Traffic on N8 audible

5. DISCUSSION OF RESULTS

Location N1

- site based noise level

Location N2

- site based noise level, shredder and loader operating in yard

Location MP1

- noise sensitive location 1 – noise influenced by road traffic noise on local road. No tonal or impulsive components. No audible noise from licensed activities - complies with licence conditions.

Location MP2

- noise sensitive location 1 – noise climate predominantly influenced by road traffic noise on local road, noise from N8 (Cork-Dublin national route) audible. No clearly audible noise from licensed activities, but occasional noise audible in lulls. No tonal or impulsive components – complies with licence conditions.

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6. CONCLUSIONS

Two noise sensitive monitoring locations were chosen:

1. At the site entrance – opposite a new residence.
2. At the nearest residence to the south of the site.

These locations offer the best monitoring locations as the sites are easily accessible and offer a representative view of noise emissions from the site.

Noise levels within the site boundary can exceed the guidance limit due to the operation of equipment such as the shredder and the loader out of doors.

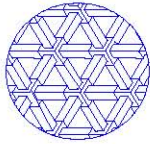
Noise levels due to licensed activities at noise sensitive locations MP1 and MP2 are within the licence limits.

The noise levels at the two noise sensitive locations are determined by the road traffic noise on local road rather than any noise arising from the licensed activities and so the licensed activity should be considered to comply with licence conditions.

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Appendix A. Detailed Monitoring Results

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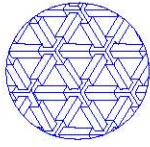
Biospheric Engineering Ltd.

Frequency Analysis Table

Client: Waste Recovery Services
 Site: Cullenagh, Fermoy, County Cork.
 Location: N1 North of Site
 Survey Date: November 1st 2004

Frequency Hz	$1/3$ Octave		$1/1$ Octave	
	dBA	dB lin	dBA	dB lin
25	26	70		
31.50	31	71	38	75
40	36	71		
50	37	68		
63	39	65	43	70
80	39	61		
100	42	61		
125	37	53	45	62
160	40	53		
200	37	48		
250	40	49	49	56
315	48	55		
400	41	46		
500	46	49	49	52
630	44	46		
800	48	49		
1000	48	48	52	52
1250	47	46		
1600	48	47		
2000	46	45	51	50
2500	43	42		
3150	42	41		
4000	38	37	45	44
5000	38	37		
6300	36	37		
8000	35	36	41	41
10000	37	34		
Leq Sound Level	57	77		

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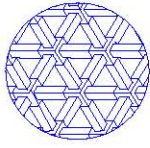
Biospheric Engineering Ltd.

Frequency Analysis Table

Client:	Waste Recovery Services
Site:	Cullenagh, Fermoy, County Cork.
Location:	N2 South of Site
Survey Date:	November 1st 2004

Frequency Hz	¹ / ₃ Octave		¹ / ₁ Octave	
	dBA	dB lin	dBA	dB lin
25	22	67		
31.50	26	65	35	72
40	34	68		
50	38	68		
63	37	63	42	69
80	36	68		
100	34	53		
125	36	52	39	56
160	32	46		
200	35	46		
250	38	47	42	51
315	38	45		
400	42	46		
500	41	44	47	50
630	44	46		
800	44	45		
1000	48	48	54	54
1250	52	51		
1600	49	48		
2000	51	50	55	54
2500	50	49		
3150	51	50		
4000	49	48	54	53
5000	47	46		
6300	42	42		
8000	39	40	44	44
10000	37	35		
Leq Sound Level	60	74		

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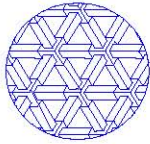
Biospheric Engineering Ltd.

Frequency Analysis Table

Client: Waste Recovery Services
 Site: Cullenagh, Fermoy, County Cork.
 Location: MP1 Entrance Gate
 Survey Date: November 1st 4004

Frequency Hz	$1/3$ Octave		$1/1$ Octave	
	dBA	dB lin	dBA	dB lin
25	17	62		
31.50	20	59	25	64
40	22	57		
50	28	58		
63	27	53	35	61
80	33	55		
100	32	51		
125	30	46	38	54
160	35	48		
200	33	44		
250	36	45	40	49
315	36	42		
400	38	42		
500	38	41	44	47
630	40	42		
800	41	42		
1000	44	44	47	47
1250	42	41		
1600	41	40		
2000	40	39	45	43
2500	36	35		
3150	33	32		
4000	32	31	36	35
5000	28	27		
6300	23	24		
8000	20	21	26	26
10000	17	15		
Leq Sound Level	51	66		

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Biospheric Engineering Ltd.

Frequency Analysis Table

Client:	Waste Recovery Services			
Site:	Cullenagh, Fermoy, County Cork.			
Location:	MP2 Nearby House to South			
Survey Date:	November 1st 2004			
Frequency Hz	$1/3$ Octave		$1/1$ Octave	
	dBA	dB lin	dBA	dB lin
25	5	50		
31.50	13	53	18	56
40	16	51		
50	25	56		
63	24	51	33	59
80	31	54		
100	32	51		
125	30	47	37	54
160	34	48		
200	36	47		
250	38	46	42	51
315	37	44		
400	39	43		
500	43	46	46	49
630	41	43		
800	46	46		
1000	48	48	52	52
1250	47	46		
1600	43	42		
2000	43	41	47	46
2500	41	40		
3150	39	38		
4000	34	33	41	40
5000	32	31		
6300	29	29		
8000	25	26	32	32
10000	28	25		
Leq Sound Level	54	62		

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Biospheric engineering

PARTNERS IN SUSTAINABLE DEVELOPMENT

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Mr. Shane Dunlea,
Waste Recovery Services (Fermoy) Ltd,
Cullenagh,
Fermoy,
Co. Cork.

December 13th 2002.

Re: Dust Monitoring Results November 2002

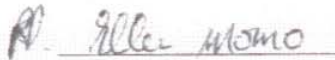
Dear Shane,

Please find enclosed dust monitoring results for the period November 6th 2002 to December 6th 2002 inclusive. We note that the period was unusually wet resulting in significant water retained in the collection jars.

The results on the enclosed table indicate that all these sampling points were within the limits set in your licence from the EPA.

If you have any further queries please do not hesitate to contact me on 087-2660177.

Yours sincerely,



Eugene McKeown

Biospheric Engineering Ltd. - Dust Deposition Monitoring Sheet



Project: Deposition Monitoring Waste Recovery Services (Fermoy) Ltd. - Cult
 Client: Waste Recovery Services (Fermoy) Ltd
 Monitoring Period: November 2002

Dates: Samples Set 6-Nov-02 Samples Collected 6-Dec-02 Analysis 7-Dec-02 Duration 30

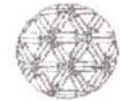
Sample No.	Site Location	Collecting Jar No.	Evaporating Dish No.	Gross Wt. Grams	Tare Wt. Grams	Deposition Rate mg/m2/day	Comments
1	Site 1	D2	B	99.1952	99.1754	97	
2	Site 2	23	H	101.8783	101.8704	39	
3	Site 3	D4	G	99.463	99.4303	132	
4							
5							
6							
7							
8							
9							
10							
Average Value						89	

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Analysis By:

Checked By:

Biospheric Engineering Ltd. - Dust Deposition Monitoring Sheet



Project: Deposition Monitoring Waste Recovery Services (Farmoy) Ltd. - Cull
 Client: Waste Recovery Services (Farmoy) Ltd
 Monitoring Period: December 2002

Dates: 08-Dec-02 Samples Set: 07-Jan-03 Samples Collected: 09-Jan-03 Analysis: 32
 Duration: 32

Sample No	Site Location	Collecting Jar No	Evaporating Dish No	Gross Wt. Grams	Tare Wt. Grams	Deposition Rate mg/m2/day	Comments
1	Site 1 (North)	B5	C	99.7025	99.6702	149	
2	Site 2 (East)	D1	F	100.1956	100.1283	311	
3	Site 3 (South)	D2	K	99.8041	99.7792	575	Bird Strike
4							
5							
6							
7							
8							
9							
10							
Average Value						345	

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Analysis By:

Checked By:



Scale:- 1:2500
 Scála:- 1:2500

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Project: Dust Monitoring Locations

Client: Waste Recovery Services (Fermoy Ltd.)
 Cullenagh,
 Fermoy,
 Co. Cork.

Date: 08/04/03

Scale: NTS



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 Partners in Sustainable Development

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 Fax: +353 (0)91 591364
 Email: info@biospheric.ie

Report on Dust Levels
for
Waste Recovery Services (Fermoy) Ltd.

Report Ref: - 406

Confidential Report To:

Mr. Shane Dunlea,
Waste Recovery Services (Fermoy) Ltd.,
Cullenagh,
Fermoy,
Co. Cork.

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Report submitted by:

Biospheric Engineering Ltd.

Barna,
Co. Galway,
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Tel: + 353-(0) 91 - 591336
Fax: + 353-(0) 91 - 591364
Tel: + 353-(0) 87-2660177

Issued by:

Eugene McKeown, B.E., L.L.B.
M.I.O.A., Chartered Engineer

1. INTRODUCTION

This Report was prepared by Biospheric Engineering Ltd as part of Waste Recovery Services (Fermoy Ltd.) compliance with their waste licence no. 107-1 as issued by the Environmental Protection Agency.

Schedules C2, D1 and D2 detail the monitoring requirements as follows:

C.2 Dust Deposition Limits: (Measured at the monitoring points indicated in Table D.1.1.)

Level (mg/m ² /day) ^{Note 1}
350

Note 1: 30 day composite sample with the results expressed as mg/m²/day.

D.1 Monitoring Locations

Monitoring locations shall be those as set out in Table D.1.1. and "Drawing No. 21802/0B/03, Borehole and Noise Monitor Sites of EIS submitted 18/05/00 and Fig 1 Dust deposition monitoring locations of Article 14 reply dated 14/11/00" of the application.

Table D.1.1 Noise, groundwater, foul water and dust monitoring locations

Noise Stations	Groundwater Stations	Foul Water Stations	Dust Stations
MP1 ^{Note 1}	GW1 (Borehole of John Dunlea)	FW1 ^{Note 1}	Site 1
MP2 ^{Note 1}	GW2 ^{Note 1}		Site 2
	GW3 ^{Note 1}		Site 3 ^{Note 1}
	Private wells (Condition 9.4.4)		
	P1 (Emissions to percolation area) ^{Note 1}		

Note 1: Location to be agreed with the Agency

D.2 Dust

Table D.2.1 Dust Monitoring Frequency and Technique

Parameter (mg/m ² /day)	Monitoring Frequency	Analysis Method/Technique
Dust	Three times a year ^{Note 2}	Standard Method ^{Note 1}

Note 1: Standard Method VD12119 (Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method) German Engineering Institute). A modification (not included in the standard) which 2 methoxy ethanol may be employed to eliminate interference due to algae growth in the gauge.

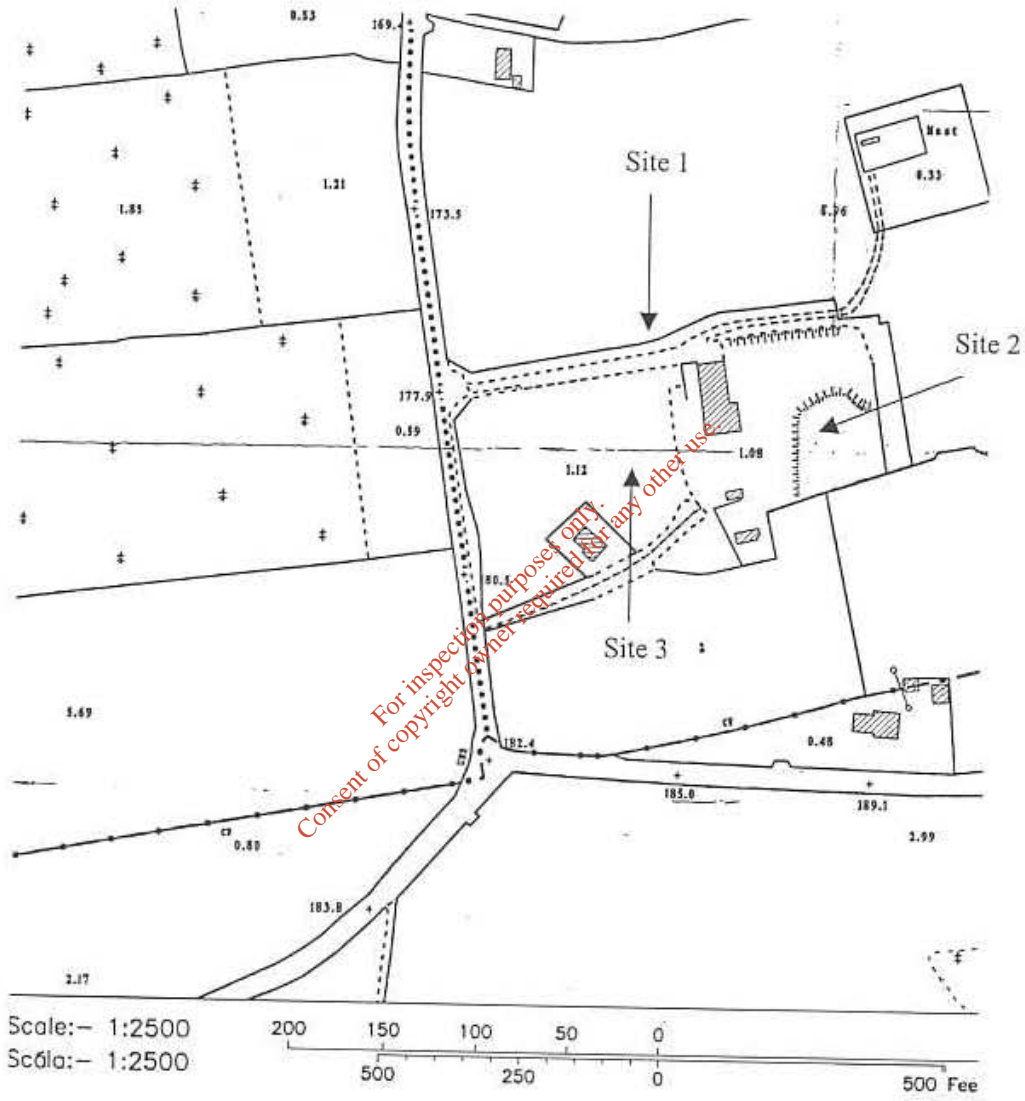
Note 2: Twice during the period May to September, and at least once during timber shredding operations.

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2. MEASUREMENT METHODOLOGY

Samples were collected using collecting pots complying with VDI 2119 and gravimetric analysis was carried out at the Biospheric Engineering Laboratory using a Binder drying oven and Precisia model 405m – 200A precision balance.

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Project: Dust Monitoring Locations
Client: Waste Recovery Services (Fermoy Ltd.)
 Cullenagh,
 Fermoy,
 Co. Cork.

Date: 08/04/03 **Scale:** NTS



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 Partners in Sustainable Development

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 Email: info@biospheric.ie

3. DUST MEASUREMENTS

The dust measurements taken on site are reproduced on the following tables:

Period: November 2002	
Location 1	97 mg/m ² /day
Location 2	39 mg/m ² /day
Location 3	132 mg/m ² /day
Period: December 2002 ^{Note 1}	
Location 1	279mg/m ² /day
Location 2	199 mg/m ² /day
Location 3	167 mg/m ² /day
Period: January 2003	
Location 1	149 mg/m ² /day
Location 2	311 mg/m ² /day
Location 3	Bird Strike

Note 1: Timber shredding carried out on 10/11/12 December 2002

4. CONCLUSIONS

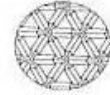
Readings taken at all sites for the three months were within the permitted limit. Timber shredding was carried out on site during December 2002, during one of the monitoring periods as required under the licence. The dust emissions can therefore be considered to comply with the licence conditions.

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Appendix A. Detailed Monitoring Results

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Biospheric Engineering Ltd. - Dust Deposition Monitoring Sheet



Project: Deposition Monitoring Waste Recovery Services (Fermoy) Ltd. - Cull
 Client: Waste Recovery Services (Fermoy) Ltd
 Monitoring Period: November 2002

Dates: 6-Nov-02 Samples Set: 6-Nov-02 Samples Collected: 6-Dec-02 Analysis: 7-Dec-02 Duration: 31

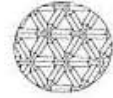
Sample No.	Site Location	Collecting Jar No.	Evaporating Dish No.	Gross Wt. Grams	Tare Wt. Grams	Deposition Rate mg/m ² /day	Comments
1	Site 1 (North)	B	A	103.0535	102.9947	279	
2	Site 2 (East)	D5	B	99.2173	99.1754	199	
3	Site 3 (South)	36	C	99.7054	99.6702	167	
4							
5							
6							
7							
8							
9							
10							

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Analysis By:

Checked By:

Biospheric Engineering Ltd. - Dust Deposition Monitoring Sheet



Project: Deposition Monitoring Waste Recovery Services (Fermoy) Ltd. - Cull
 Client: Waste Recovery Services (Fermoy) Ltd
 Monitoring Period: December 2002

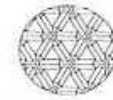
Dates: Samples Set 6-Dec-02 Samples Collected 7-Jan-03 Analysis 9-Jan-03 Duration 32

Sample No.	Site Location	Collecting Jar No.	Evaporating Dish No.	Gross Wt. Grams	Tare Wt. Grams	Deposition Rate mg/m2/day	Comments
1	Site 1 (North)	B5	C	99.7025	99.6702	149	
2	Site 2 (East)	D1	F	100.1958	100.1283	311	
3	Site 3 (South)	D2	K	99.904	99.7792	575	Bird Strike
4							
5							
6							
7							
8							
9							

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Checked By:

Biospheric Engineering Ltd. - Dust Deposition Monitoring Sheet



Project: Deposition Monitoring Waste Recovery Services (Farmoy) Ltd. - Cull
 Client: Waste Recovery Services (Farmoy) Ltd
 Monitoring Period: November 2002

Dates: Samples Set 6-Nov-02 Samples Collected 6-Dec-02 Analysis 7-Dec-02 Duration 30

Sample No.	Site Location	Collecting Jar No.	Evaporating Dish No.	Gross Wt. Grams	Tare Wt. Grams	Deposition Rate mg/m ² /day	Comments
1	Site 1	D2	B	99.1952	99.1754	97	
2	Site 2	23	H	101.8783	101.8704	39	
3	Site 3	D4	G	99.8572	99.4303	132	
4							
5							
6							
7							
8							
9							
10							

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Analysis By: _____ Checked By: _____



Biospheric Engineering Ltd.

PARTNERS IN SUSTAINABLE DEVELOPMENT
E-mail: biospheric@eircom.net

Barna, Co. Galway.
Tel: +353-91-591336. Fax: +353-91-591364.

Mr. Shane Dunlea
Environmental Manager
Waste Recovery Services
Fermoy
Co. Cork

Sept. 28th 2004

RE: Dust Deposition Results

Dear Shane,

Please find below our dust deposition results for the calendar month of August.

Dust Deposition Rates:

Sample ID	Dust Deposition mg/m ² /day	
	Monitoring Result	Limit
Site 1	171	350
Site 2	67	350
Site 3	106	350

1. 3 samples as required under licence below limit value, therefore dust deposition is within licence conditions.

We trust the above is to your satisfaction, if you have any queries regarding the proposal please do not hesitate to contact me at 091 591 336.

Yours Sincerely,

Eugene McKeown.
Biospheric Engineering Ltd.

Directors: Eugene McKeown, B.E., L.L.B., C. Eng., M.I.O.A., Chartered Engineer. Mary McKeown R.S.C.N., R.G.N.
V.A.T. No. IE6329750H Company Reg. No. 309750

*GROUNDWATER SAMPLING & ANALYSIS AT
DUNLEA WASTE RECOVERY SERVICE,
CULLENAGH, FERMOY, Co. CORK IN
ACCORDANCE WITH WASTE LICENCE REGISTER.
No. 107-1*

REPORT NO: ECS0292

REPORTING PERIOD: Quarter 2 2003

ATTENTION: Mr. John Dunlea
Waste Recovery Services (Fermoy) Ltd
Cullenagh,
Fermoy,
Co. Cork

PREPARED BY: Ms. Mary Murphy
Environmental Scientist

REVIEWED BY: Ms. Sarah Casey
Environmental Consultant

DATE: June 2003

Executive Summary

In accordance with Waste Licence Register No 107-1, Dunlea Waste Recovery Services is required to carry out an assessment of the underlying groundwater at the Waste Recovery site at Cullenagh, Fermoy, Co. Cork on a quarterly basis. Bord na Móna Environmental Consultancy Services was commissioned to perform the sampling and analysis. The site was subsequently visited by a Bord na Móna Environmental Scientist on the 28th of May 2003 to conduct sampling for the second quarter of 2003. Two groundwater boreholes and four private well samples were obtained as required by Schedule D of Waste Licence Register 107-1. Samples were returned to the laboratory for subsequent analysis.

The pH recorded at all monitoring locations lie below the lower recommended Maximum Admissible Concentration (MAC) of 6.5 pH units as set out in the EC Drinking Water Directive 98/83/EC Quality of Water Intended for Human Consumption. Ammonia was detected at BH-1 (0.05mg/l) and in O’Riordan’s private well (0.11mg/l), however, the levels detected are well below the MAC value of 0.39mg/l. The Conductivity recorded at all monitoring locations is below the MAC value of 2500µS/cm.

Respectively Submitted

Ms. Mary Murphy
Environmental Scientist

Ms. Sarah Casey
Environmental Consultant

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 3.5 Control Chain of Custody

4.0 RESULTS

5.0 COMMENTS

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1.0 INTRODUCTION

Dunlea Waste Recovery Services Ltd commissioned Bord na Móna Environmental Consultancy Services to undertake groundwater sampling and analysis of six locations within the vicinity of their waste facility at Cullenagh, Fermoy, County Cork as required by Schedule D of the company's Waste Licence Reg. No. 107-1.

This report details the methodology and results of the groundwater sampling event undertaken at the Dunlea Waste facility on the 28th of May 2003.

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2.0 ON-SITE METHODOLOGY

2.1 Sampling Locations

The location of the groundwater monitoring boreholes and private well locations is given below in Table 2.1.

TABLE 2.1: BOREHOLE LOCATIONS	
Location	Grid Ref:
BH 1	179075 195710
BH 2	179140 195740
BH 3	179125 195805
BH 4	179025 195790
BH-5	178950 195790
O' Riordan Private Well	-
Coughlan Private Well	-
O' Leary Private Well	-
Dunlea Private Well	178990 195710

2.2 Representative Groundwater Sampling

2.2.1 Borehole Sampling

Groundwater in the well casing and in close proximity to the well is not considered representative of the general groundwater at a given location. In order to ensure that the groundwater samples extracted from the monitoring wells were representative of the groundwater held in the subsurface strata and not water held stagnant in the casing, it was necessary to evacuate the monitoring wells prior to sampling.

A common procedure is to pump the well until between 2 and 5 bore volumes have been removed (Marsh and Lloyd 1980 and Boating 1987). The purged volumes were calculated on-site from the measured static water levels (measured using an electronic well dipper) and the total depth of the well.

A submersion 2-inch 12 V pump was utilised to evacuate all the monitoring boreholes. Samples were taken using individual bailers and transferred into the sample containers to eliminate the possibility of cross contamination.

2.2.2 Private Wells

In order to ensure that the groundwater samples extracted from the private wells were representative of the groundwater held in the subsurface strata and not water held stagnant in the casing, it was necessary to evacuate the wells prior to sampling. This was done by allowing the tap to run for a number of minutes (approx. 20mins.) prior to sampling. The samples were taken directly from the tap located nearest to the pump.

2.3 In-situ Field Measurements

- **pH**

In-situ measurements of pH were taken with a WTW portable pH meter. Measurements are based on an electrochemical sensor which consists of a measuring electrode and a reference electrode. The voltage at the membrane alters according to the pH of the sample solution. The pH electrode contains a built in temperature sensor, for which the instrument conducts automatic temperature compensation. Calibration was conducted onsite using standard pH buffers 4, and 7.

- **Conductivity**

In-situ measurements of conductivity were taken with a WTW portable conductivity meter. Conductivity is recorded by taking a measurement of the electrical resistance. The instrument measures the current and uses Ohm's law to calculate first the conductance of the solution and then, by taking the cell data into account, the conductivity. Automatic temperature compensation ensures that results are displayed at a constant reference temperature (25 °C). The measuring range of the meter is 0.00 µS/cm to 500mS/cm.

- **Dissolved Oxygen**

In-situ measurements of Dissolved Oxygen were taken using a WTW portable dissolved oxygen meter. Dissolved Oxygen is recorded by taking a measurement of an electronic sensor. The instrument automatically changes to the measuring range of the sample. Calibration is conducted in water vapour saturated air.

2.4 Analysis of Groundwater Samples

All samples returned to the laboratory were stored at 5°C. Subsequent analysis of all samples was carried out in strict accordance with recognised standard methods. Table 2.2 below outlines the methods used.

TABLE 2.2 CHEMICAL AND MICROBIOLOGICAL ANALYSIS OF SAMPLES		
Parameter	Limit of Detection/Range	Method
Visual Inspection	-	On-Site Visual Determination
Odour	-	On-Site Sensory Determination
pH (pH units)	0.1 – 14	<i>In-Situ</i> Calibrated pH probe
Temperature (°C)	-	<i>In-Situ</i> Calibrated Thermometer
Dissolved Oxygen	-	<i>In-Situ</i> Calibrated Dissolved Oxygen probe
Ammonia-N (mg/l)	0.02	G/67
Conductivity (µS/cm)	0.1	G/06

G/ ILAB Accredited Method, Bord na Móna Environmental & Analytical Services Standard Operating Procedures Manual

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3.0 ACCREDITED QUALITY SYSTEM

3.1 ILAB Accreditation

Bord na Móna Environmental Consultancy Services analytical laboratories were awarded ILAB accreditation by the National Accreditation Board (NAB) in 1997. It has always been the policy of the laboratories to achieve and maintain a high standard of quality consistent with client's requirements in all aspects of the work carried out within the laboratory.

NAB as a member of the International Laboratory Accreditation Cooperation (ILAC) and the European Co-operation for accreditation (EA) have adopted ISO 17025 as the new standard for its laboratory accreditation programme since January 2002.

This new standard contains all of the requirements that testing laboratories have to meet if they wish to demonstrate that they operate a quality system, are technically competent, and are able to generate technically valid results. ISO 17025 incorporates all those requirements of ISO 9000 that are relevant to the scope of testing services that are covered by the laboratory's quality system. Thus a laboratory that complies with ISO 17025 will therefore also operate in accordance with ISO 9000.

Bord na Móna Environmental Consultancy Services analytical laboratory successfully transferred to ISO 17025 on 16th of November 2001.

3.2 Interlaboratory Proficiency Schemes

To ensure the accuracy of the analytical testing we participate in several external proficiency schemes. The ongoing competence of the laboratory and its staff is assessed by participation in various inter-laboratory proficiency testing schemes, such as Aquacheck and the EPA scheme organised for environmental laboratories throughout Ireland.

3.3 EPA Quality Control Register

Bord na Móna Environmental Consultancy Services Analytical Laboratories performance in the EPA intercalibration scheme has insured its listing on the EPA's register of Quality Controlled Laboratories. Both accredited and non-accredited test methods are assessed by these schemes.

3.4 Quality Control Audits

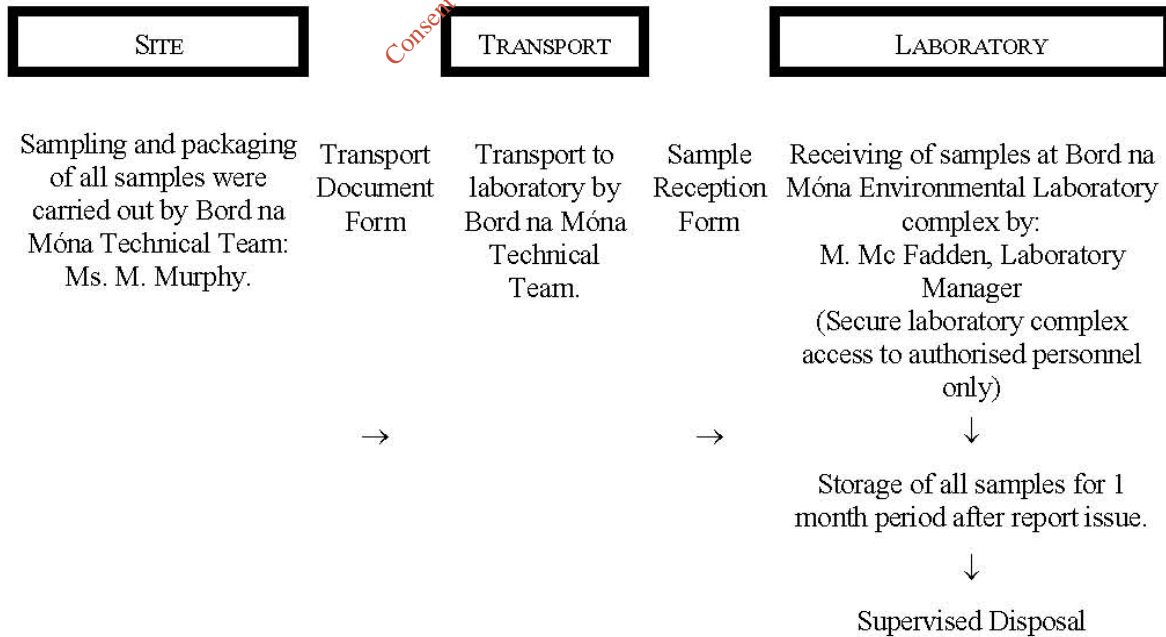
Bord na Móna Environmental Ltd. Consistently strives to improve the quality of the analytical work out in its laboratories. The laboratory has a full time Quality Control Manager who assists in the organisation and execution of the extensive programme of internal Quality Audits. These quality audits examine all aspects of the laboratory’s Quality System, with particular focus on auditing of test methods, and enable potential problems to be highlighted and immediate corrective action to be taken.

3.5 Control Chain of Custody

As part of the Quality System in place in Bord na Móna, Environmental Ltd., measures are taken to ensure controlled chain of custody. An outline of the chain of custody is given below.



CONTROLLED CHAIN OF CUSTODY



4.0 RESULTS

The results of the investigations carried out by Bord na Móna Environmental Ltd. are presented as follows:

Table 4.1: Results of Field Measurements and Chemical Analysis of groundwater samples.

Table 4.1: RESULTS OF FIELD MEASUREMENTS AND CHEMICAL ANALYSIS OF GROUNDWATER SAMPLES							
Location	Static Water Level (m bpl)	pH (pH units)	Conductivity (µS/cm)	Ammonia as N (mg/l)	Temperature (°C)	Visual	Odour
BH 1	6.24	5.81	553	0.05	11.5	Clear, no suspended solids	None
BH 2	6.46	-	-	-	-	-	-
BH 3	8.90	5.52	288	0.02	11.3	Opaque, some suspended solids	None
BH 4	5.60	-	-	-	-	-	-
BH-5	6.06	-	-	-	-	-	-
O' Riordan Private Well	5.30	6.46	150	0.11	12.5	Clear, no suspended solids	None
Coughlan Private Well	4.34	6.16	112	<0.02	11.5	Clear, no suspended solids	None
O' Leary Private Well	4.40	6.25	109	<0.02	11.2	Clear, no suspended solids	None
Dunlea Private Well	7.24	5.83	582	<0.02	11.6	Clear, no suspended solids	None
MAC ^{Note 1}	-	6.5-9.5	2500	0.39	-	-	-

mbpl metres below pipe level

Note 1: Recommended Maximum Admissible Concentrations (MAC) are taken from European Directive 98/83/EC Quality of Water Intended for Human Consumption.

5.0 COMMENTS

5.1 Groundwater Monitoring Borehole Samples

As required by Waste Licence Reg. No. 107-1, Schedule D: (Monitoring), samples were obtained from groundwater boreholes BH-1 and BH-3 located at Dunlea Waste Recovery Services, Fermoy, Co. Cork. In addition the groundwater levels at BH-2, BH-4 and BH-5 were measured. The chemical results obtained are compared to the EC Directive 98/83/EC Quality of Water Intended for Human Consumption.

Borehole 1 (BH-1)

On review of the results obtained at BH-1 it is evident that the pH recorded of 5.81 pH units is outside the recommended Maximum Admissible Concentration (MAC) value of 6.5 – 9.5 pH units as set out in EC Directive 98/83/EC. As recorded on the previous monitoring event (March 2003 *Report ECS0061*) a trace amount of Ammonia was detected at BH-1 (0.05mg/l) but this level is well below the recommended MAC value of 0.39mg/l. The Conductivity level of 288µS/cm is well below the recommended MAC of 2500µS/cm.

Borehole 3 (BH-3)

Following the analysis of samples taken from BH-3 the results indicate that the pH recorded of 5.52 pH units is outside the recommended MAC values of 6.5 – 9.5 pH units. Ammonia was not detected at BH-3 and the Conductivity level (288µS/cm) is below the MAC of 2500µS/cm.

5.2 Private Well Samples

Four private supply wells were sampled during this monitoring event as required by Schedule D of Waste Licence Reg. No 107-1.

O' Riordan Private Well

The pH recorded at this sampling location was 6.46 pH units and borders the lower recommended MAC of 6.5 pH units. A low level of Ammonia (0.11mg/l) was detected at this location and was also detected during the previous monitoring event however, this level is below the MAC of 0.39mg/l as set out in EC Directive 98/83/EC. The level of Conductivity recorded (150µS/cm) is also below its respective MAC of 2500µS/cm.

Coughlan Private Well

The results of the analysis of samples taken from this monitoring location are all below their respective MAC values with the exception of pH (5.1 pH units). Ammonia was not detected in the Coughlan Private Well.

O' Leary Private Well

The analyses of samples taken from O'Leary's private well indicate that Ammonia was not detected at this location. The pH recorded of 6.25pH units is slightly below the MAC of 6.5pH units. The Conductivity level of 109µS/cm is well below its respective MAC of 2500µS/cm.

Dunlea Private Well

Following the analysis of the samples obtained at Dunlea Private Well the pH recorded of 5.83 pH units is below the MAC of 6.5 pH units. Ammonia was not detected at this location and Conductivity (582µS/cm) is below the recommended MAC of 2500µS/cm.

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APPENDIX 1

BOREHOLE LOCATION MAP

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***GROUNDWATER SAMPLING &
ANALYSIS AT DUNLEA WASTE
RECOVERY SERVICES (FERMOY)
LTD., CULLENAGH, FERMOY, CO.
CORK IN ACCORDANCE WITH WASTE
LICENCE REGISTER. NO. 107-1***

For the Attention of:

Mr. John Dunlea,
Waste Recovery Services (Fermoy) Ltd.,
Cullenagh,
Fermoy,
Co. Cork.

Prepared by:

Ms. Joan McCormack
Environmental Scientist

Reviewed by:

Ms. Sarah Casey
Environmental Consultant

Ref: ECS0459-GW – October 03

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Executive Summary

In accordance with Waste Licence Register No 107-1, Dunlea Waste Recovery Services (Fermoy) Ltd. is required to carry out an assessment of the underlying groundwater at the Waste Recovery site at Cullenagh, Fermoy, Co. Cork on a quarterly basis. Bord na Móna Technical Services was commissioned to perform the sampling and analysis. The site was subsequently visited by a Bord na Móna Environmental Scientist on the 26th of August 2003 to conduct sampling for the third quarter of 2003. Two groundwater boreholes and four private well samples were obtained as required by Schedule D of Waste Licence Register 107-1. Samples were returned to the laboratory for subsequent analysis.

Overall the results obtained are broadly similar to that of previous monitoring events. The pH recorded at all monitoring locations lie below the lower recommended Maximum Admissible Concentration (MAC) of 6.5 pH units as set out in the EC Drinking Water Directive 98/83/EC Quality of Water Intended for Human Consumption. Ammonia was detected at BH-1 (0.06mg/l) and in O’Riordan’s private well (0.20mg/l) however, the levels detected are below the MAC value of 0.39mg/l. The Conductivity recorded at all monitoring locations is below the MAC value of 2500µS/cm.

Respectively Submitted

Ms. Joan McCormack
Environmental Scientist

Ms. Sarah Casey
Environmental Consultant

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 3.2 Interlaboratory Proficiency Schemes

 3.3 EPA Quality Control Register

 3.4 Quality Control Audits

 3.5 Control Chain of Custody

4.0 RESULTS

5.0 COMMENTS

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1.0 INTRODUCTION

Dunlea Waste Recovery Services (Fermoy) Ltd commissioned Bord na Móna Technical Services to undertake groundwater sampling and analysis of six locations within the vicinity of their waste facility at Cullenagh, Fermoy, Co. Cork as required by Schedule D of the company's Waste Licence Reg. No. 107-1.

This report details the methodology and results of the groundwater sampling event undertaken at the facility on the 26th of August 2003.

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2.0 ON-SITE METHODOLOGY

2.1 Sampling Locations

The location of the groundwater monitoring boreholes and private well locations is given below in Table 2.1.

TABLE 2.1: BOREHOLE LOCATIONS	
Location	Grid Ref:
BH 1	179075 195710
BH 2	179140 195740
BH 3	179125 195805
BH 4	179025 195790
BH-5	178950 195790
O' Riordan Private Well	-
Coughlan Private Well	-
O' Leary Private Well	-
Dunlea Private Well	178990 195710

2.2 Representative Groundwater Sampling

2.2.1 Borehole Sampling

Groundwater in the well casing and in close proximity to the well is not considered representative of the general groundwater at a given location. In order to ensure that the groundwater samples extracted from the monitoring wells were representative of the groundwater held in the subsurface strata and not water held stagnant in the casing, it was necessary to evacuate the monitoring wells prior to sampling.

A common procedure is to pump the well until between 2 and 5 bore volumes have been removed (Marsh and Lloyd 1980 and Boating 1987). The purged volumes were calculated on-site from the measured static water levels (measured using an electronic well dipper) and the total depth of the well.

A submersion 2-inch 12 V pump was utilised to evacuate all the monitoring boreholes. Samples were taken using individual bailers and transferred into the sample containers to eliminate the possibility of cross contamination.

2.2.2 Private Wells

In order to ensure that the groundwater samples extracted from the private wells were representative of the groundwater held in the subsurface strata and not water held stagnant in the casing, it was necessary to evacuate the wells prior to sampling. This was done by allowing the tap to run for a number of minutes (approx. 20mins.) prior to sampling. The samples were taken directly from the tap located nearest to the pump.

2.3 In-situ Field Measurements

- **Conductivity**

In-situ measurements of conductivity were taken with a WTW portable conductivity meter. Conductivity is recorded by taking a measurement of the electrical resistance. The instrument measures the current and uses Ohm's law to calculate first the conductance of the solution and then, by taking the cell data into account, the conductivity. Automatic temperature compensation ensures that results are displayed at a constant reference temperature (25 °C). The measuring range of the meter is 0.00 μ S/cm to 500mS/cm.

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2.4 Analysis of Groundwater Samples

All samples returned to the laboratory were stored at 5°C. Subsequent analysis of all samples was carried out in strict accordance with recognised standard methods. Table 2.2 below outlines the methods used.

TABLE 2.2 CHEMICAL ANALYSIS OF SAMPLES		
Parameter	Limit of Detection/Range	Method
Visual Inspection	-	On-Site Visual Determination
Odour	-	On-Site Sensory Determination
pH (pH units)	0.1 – 14	<i>In-Situ</i> Calibrated pH probe
Temperature (°C)	-	<i>In-Situ</i> Calibrated Thermometer
Dissolved Oxygen	-	<i>In-Situ</i> Calibrated Dissolved Oxygen probe
Ammonia-N (mg/l)	0.02	G/67
Conductivity (µS/cm)	0.1	G/06

G/ ILAB Accredited Method, Bord na Móna Environmental & Analytical Services Standard Operating Procedures Manual

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3.0 COMMITMENT TO QUALITY

3.1 ILAB Accreditation

Bord na Móna Technical Services analytical laboratories were awarded ILAB accreditation by the National Accreditation Board (NAB) in 1997. It has always been the policy of the laboratories to achieve and maintain a high standard of quality consistent with client's requirements in all aspects of the work carried out within the laboratory.

NAB as a member of the International Laboratory Accreditation Cooperation (ILAC) and the European Co-operation for accreditation (EA) have adopted ISO 17025 as the new standard for its laboratory accreditation programme since January 2002.

This new standard contains all of the requirements that testing laboratories have to meet if they wish to demonstrate that they operate a quality system, are technically competent, and are able to generate technically valid results. ISO 17025 incorporates all those requirements of ISO 9000 that are relevant to the scope of testing services that are covered by the laboratory's quality system. Thus a laboratory that complies with ISO 17025 will therefore also operate in accordance with ISO 9000.

Bord na Móna Technical Services analytical laboratory successfully transferred to ISO 17025 on 16th of November 2001.

3.2 Interlaboratory Proficiency Schemes

To ensure the accuracy of the analytical testing we participate in several external proficiency schemes. The ongoing competence of the laboratory and its staff is assessed by participation in various inter-laboratory proficiency testing schemes, such as Aquacheck and the EPA scheme organised for environmental laboratories throughout Ireland.

3.3 EPA Quality Control Register

Bord na Móna Technical Services Analytical Laboratories performance in the EPA intercalibration scheme has insured its listing on the EPA's register of Quality Controlled Laboratories. Both accredited and non-accredited test methods are assessed by these schemes.

3.4 Quality Control Audits

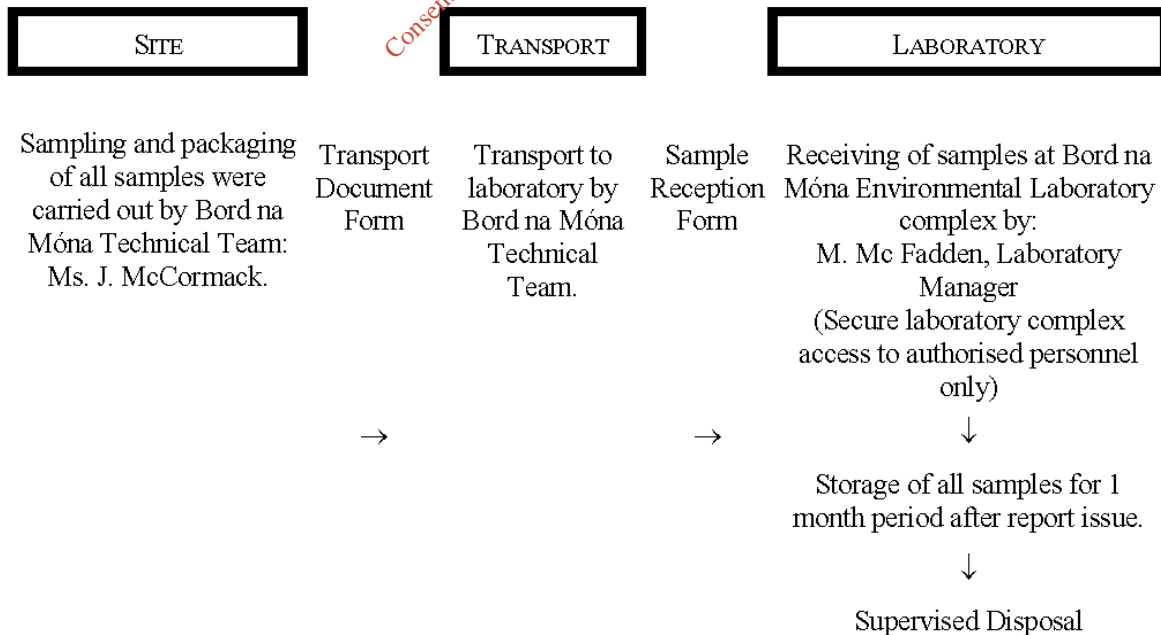
Bord na Móna Environmental Ltd. consistently strives to improve the quality of the analytical work out in its laboratories. The laboratory has a full time Quality Control Manager who assists in the organisation and execution of the extensive programme of internal Quality Audits. These quality audits examine all aspects of the laboratory’s Quality System, with particular focus on auditing of test methods, and enable potential problems to be highlighted and immediate corrective action to be taken.

3.5 Control Chain of Custody

As part of the Quality System in place in Bord na Móna, Environmental Ltd., measures are taken to ensure controlled chain of custody. An outline of the chain of custody is given below.



CONTROLLED CHAIN OF CUSTODY



4.0 RESULTS

The results of the investigations carried out by Bord na Móna Technical Services are presented in Tables 4.1 and 4.2 as follows:

Table 4.1: RESULTS OF FIELD MEASUREMENTS OF GROUNDWATER SAMPLES							
Location	Static Water Level (m bpl)	pH (pH units) Note 1	D.O. (mg/L) Note 1	Conductivity (µS/cm)	Temperature (°C)	Visual	Odour
BH 1	7.14	-	-	585	10.8	Cloudy, little suspended solids	None
BH 2	9.11	-	-	-	-	-	-
BH 3	4.10	-	-	258	10.6	Clear, some suspended solids	None
BH 4	6.88	-	-	-	-	-	-
BH-5	4.59	-	-	-	-	-	-
O' Riordan Private Well	8.10	-	-	200.2	11.4	Cloudy, no suspended solids	None
Coughlan Private Well	6.07	-	-	153	11.1	Cloudy, no suspended solids	None
O' Leary Private Well	10.65	-	-	149	11.8	Clear, no suspended solids	None
Dunlea Private Well	6.57	-	-	606	11.8	Clear, no suspended solids	None

mbpl metres below pipe level

Note 1: Meter malfunction occurred while onsite therefore onsite readings were not able to be taken.

Table 4.2: RESULTS OF CHEMICAL ANALYSIS OF GROUNDWATER SAMPLES			
Location	pH (pH units)	Conductivity (μS/cm)	Ammonia as N (mg/l)
BH 1	6.1	585	0.06
BH 3	6.0	258	<0.02
Coughlan Private Well	4.2	153	<0.02
O' Leary Private Well	4.2	149	<0.02
Dunlea Private Well	5.9	606	<0.02
O' Riordan Private Well	4.0	200.2	0.20
MAC^{Note 2}	6.5-9.5	2500	0.39

Note 2: Recommended Maximum Admissible Concentrations (MAC) is taken from European Directive 98/83/EC Quality of Water Intended for Human Consumption.

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5.0 COMMENT

5.1 **Groundwater Monitoring Borehole Samples**

As required by Waste Licence Reg. No. 107-1, Schedule D: (Monitoring), samples were obtained from groundwater boreholes BH-1 and BH-3 located at Dunlea Waste Recovery Services, Fermoy, Co. Cork. In addition the groundwater levels at BH-2, BH-4 and BH-5 were measured. The chemical results obtained are compared to the EC Directive 98/83/EC Quality of Water Intended for Human Consumption.

Borehole 1 (BH-1)

On review of the results obtained at BH-1 it is evident that the pH recorded of 6.1 pH units is outside the recommended Maximum Admissible Concentration (MAC) value of 6.5 – 9.5 pH units as set out in EC Directive 98/83/EC. The determined level of Ammonia has marginally increased (0.05mg/l → 0.06mg/l) since the previous monitoring event (May 2003 Report no. ECS0292), but this level is below the recommended MAC value of 0.39mg/l. The Conductivity level of 585µS/cm is well below the recommended MAC of 2500µS/cm.

Borehole 3 (BH-3)

Following the analysis of samples taken from BH-3 the results indicate that the pH level has increased (5.52 → 6.0 pH units) and is outside the recommended MAC values of 6.5 – 9.5 pH units. Ammonia levels at BH-3 remain below the laboratory limit of detection (<0.02mg/l) and the Conductivity level (258µS/cm) is below the MAC of 2500µS/cm.

5.2 **Private Well Samples**

Four private supply wells were sampled during this monitoring event as required by Schedule D of Waste Licence Reg. No 107-1.

O' Riordan Private Well

The pH recorded at this sampling location has decreased (6.46 → 4.0pH units) and is outside the recommended MAC values of 6.5 – 9.5 pH units. The determined level of Ammonia (0.11mg/l → 0.20mg/l) has increased since Quarter 2 of 2003, however this level remains below the MAC of 0.39mg/l as set out in EC Directive 98/83/EC. The level of Conductivity recorded (200.2µS/cm) is also below its respective MAC of 2500µS/cm.

Coughlan Private Well

The results of the analysis of samples taken from this monitoring location are all below their respective MAC values with the exception of pH (4.2 pH units). This pH level has decreased in comparison with the level recorded for the previous quarter (6.16pH units). Ammonia was not detected in the Coughlan Private Well which has been the case in previous monitoring events.

O' Leary Private Well

The analyses of samples taken from O'Leary's private well indicate that Ammonia levels remain below the laboratory limit of detection (0.02mg/l) at this location. The pH level recorded at this private well has decreased (6.25→4.2 pH units) and is below the MAC of 6.5pH units. The Conductivity level (149µS/cm) is well below its respective MAC of 2500µS/cm.

Dunlea Private Well

Following the analysis of the samples obtained at Dunlea Private well, the pH recorded has increased marginally (5.6→5.9 pH units) but remains below the MAC of 6.5 pH units. Ammonia levels remain below the laboratory limit of detection (0.02mg/l) at this location, and Conductivity (606µS/cm) is below the recommended MAC of 2500µS/cm.

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APPENDIX 1

BOREHOLE LOCATION MAP

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***GROUNDWATER SAMPLING & ANALYSIS
AT DUNLEA WASTE RECOVERY SERVICE,
CULLENAGH, FERMOY, CO. CORK IN
ACCORDANCE WITH WASTE LICENCE
REGISTER. No. 107-1***

For the Attention of:

Mr John Dunlea
Waste Recovery Services (Fermoy) Ltd
Cullenagh
Fermoy
Co Cork

Prepared by:

Ms Mary Murphy
Environmental Scientist

Reviewed by:

Ms Sarah Casey
Environmental Consultant

Report No:

ECS0565

Reporting Period:

Quarter 4 2003

Date:

December 2003

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Executive Summary

In accordance with Waste Licence Register No 107-1, Dunlea Waste Recovery Services is required to carry out an assessment of the underlying groundwater at the Waste Recovery site at Cullenagh, Fermoy, Co. Cork on a quarterly basis. Bord na Móna Technical Services was commissioned to perform the sampling and analysis. The site was subsequently visited by a Bord na Móna Environmental Scientist on the 4th of November 2003 to conduct sampling for the fourth quarter of 2003. Two groundwater boreholes and four private well samples were obtained as required by Schedule D of Waste Licence Register 107-1. Samples were returned to the laboratory for subsequent analysis.

The pH recorded at all monitoring locations lie below the lower recommended Maximum Admissible Concentration (MAC) of 6.5 pH units as set out in the EC Drinking Water Directive 98/83/EC Quality of Water Intended for Human Consumption. Ammonia was detected at BH-1 (0.13mg/l), in O’Riordan’s private well (0.34mg/l), and for the first time in Coughlans (0.04mg/l) and O’ Learys (0.02mg/l) private wells. The levels detected however are all below the MAC value of 0.39mg/l. The Conductivity recorded at all monitoring locations is below the MAC value of 2500µS/cm.

Respectively Submitted

Ms. Mary Murphy
Environmental Scientist

Ms. Sarah Casey
Environmental Consultant

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1.0 INTRODUCTION

Dunlea Waste Recovery Services Ltd commissioned Bord na Móna Technical Services to undertake groundwater sampling and analysis of six locations within the vicinity of their waste facility at Cullenagh, Fermoy, County Cork as required by Schedule D of the company's Waste Licence Reg. No. 107-1.

This report details the methodology and results of the groundwater sampling event undertaken at the Dunlea Waste facility on the 4th of November 2003.

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2.0 ON-SITE METHODOLOGY

2.1 Sampling Locations

The location of the groundwater monitoring boreholes and private well locations is given below in Table 2.1.

Location	Grid Ref:
BH 1	179075 195710
BH 2	179140 195740
BH 3	179125 195805
BH 4	179025 195790
BH-5	178950 195790
O' Riordan Private Well	-
Coughlan Private Well	-
O' Leary Private Well	-
Dunlea Private Well	178990 195710

2.2 Representative Groundwater Sampling

2.2.1 Borehole Sampling

Groundwater in the well casing and in close proximity to the well is not considered representative of the general groundwater at a given location. In order to ensure that the groundwater samples extracted from the monitoring wells were representative of the groundwater held in the subsurface strata and not water held stagnant in the casing, it was necessary to evacuate the monitoring wells prior to sampling.

A common procedure is to pump the well until between 2 and 5 bore volumes have been removed (Marsh and Lloyd 1980 and Boating 1987). The purged volumes were calculated on-site from the measured static water levels (measured using an electronic well dipper) and the total depth of the well.

A submersion 2-inch 12 V pump was utilised to evacuate all the monitoring boreholes. Samples were taken using individual bailers and transferred into the sample containers to eliminate the possibility of cross contamination.

2.2.2 Private Wells

In order to ensure that the groundwater samples extracted from the private wells were representative of the groundwater held in the subsurface strata and not water held stagnant in the casing, it was necessary to evacuate the wells prior to sampling. This was done by allowing the tap to run for a number of minutes (approx. 20mins.) prior to sampling. The samples were taken directly from the tap located nearest to the pump.

2.3 In-situ Field Measurements

- **pH**

In-situ measurements of pH were taken with a WTW portable pH meter. Measurements are based on an electrochemical sensor which consists of a measuring electrode and a reference electrode. The voltage at the membrane alters according to the pH of the sample solution. The pH electrode contains a built in temperature sensor, for which the instrument conducts automatic temperature compensation. Calibration was conducted onsite using standard pH buffers 4, and 7.

- **Conductivity**

In-situ measurements of conductivity were taken with a WTW portable conductivity meter. Conductivity is recorded by taking a measurement of the electrical resistance. The instrument measures the current and uses Ohm's law to calculate first the conductance of the solution and then, by taking the cell data into account, the conductivity. Automatic temperature compensation ensures that results are displayed at a constant reference temperature (25 °C). The measuring range of the meter is 0.00 µS/cm to 500mS/cm.

- **Dissolved Oxygen**

In-situ measurements of Dissolved Oxygen were taken using a WTW portable dissolved oxygen meter. Dissolved Oxygen is recorded by taking a measurement of an electronic sensor. The instrument automatically changes to the measuring range of the sample. Calibration is conducted in water vapour saturated air.

2.4 Analysis of Groundwater Samples

All samples returned to the laboratory were stored at 5°C. Subsequent analysis of all samples was carried out in strict accordance with recognised standard methods. Table 2.2 below outlines the methods used.

TABLE 2.2 CHEMICAL AND MICROBIOLOGICAL ANALYSIS OF SAMPLES		
Parameter	Limit of Detection/Range	Method
Visual Inspection	-	On-Site Visual Determination
Odour	-	On-Site Sensory Determination
pH (pH units)	0.1 – 14	<i>In-Situ</i> Calibrated pH probe
Temperature (°C)	-	<i>In-Situ</i> Calibrated Thermometer
Dissolved Oxygen	-	<i>In-Situ</i> Calibrated Dissolved Oxygen probe
Ammonia-N (mg/l)	0.02	G/67
Conductivity (µS/cm)	0.1	G/06

G/ ILAB Accredited Method, Bord na Móna Environmental & Analytical Services Standard Operating Procedures Manual

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3.0 ACCREDITED QUALITY SYSTEM

3.1 ILAB Accreditation

Bord na Móna Technical Services Analytical Laboratories were awarded ILAB accreditation by the National Accreditation Board (NAB) in 1997. It has always been the policy of the laboratories to achieve and maintain a high standard of quality consistent with client's requirements in all aspects of the work carried out within the laboratory.

NAB as a member of the International Laboratory Accreditation Cooperation (ILAC) and the European Co-operation for accreditation (EA) have adopted ISO 17025 as the new standard for its laboratory accreditation programme since January 2002.

This new standard contains all of the requirements that testing laboratories have to meet if they wish to demonstrate that they operate a quality system, are technically competent, and are able to generate technically valid results. ISO 17025 incorporates all those requirements of ISO 9000 that are relevant to the scope of testing services that are covered by the laboratory's quality system. Thus a laboratory that complies with ISO 17025 will therefore also operate in accordance with ISO 9000.

Bord na Móna Technical Services Analytical Laboratory successfully transferred to ISO 17025 on 16th of November 2001.

3.2 Interlaboratory Proficiency Schemes

To ensure the accuracy of the analytical testing Bord na Móna participate in several external proficiency schemes. The ongoing competence of the laboratory and its staff is assessed by participation in various inter-laboratory proficiency testing schemes, such as Aquacheck and the EPA scheme organised for environmental laboratories throughout Ireland.

3.3 EPA Quality Control Register

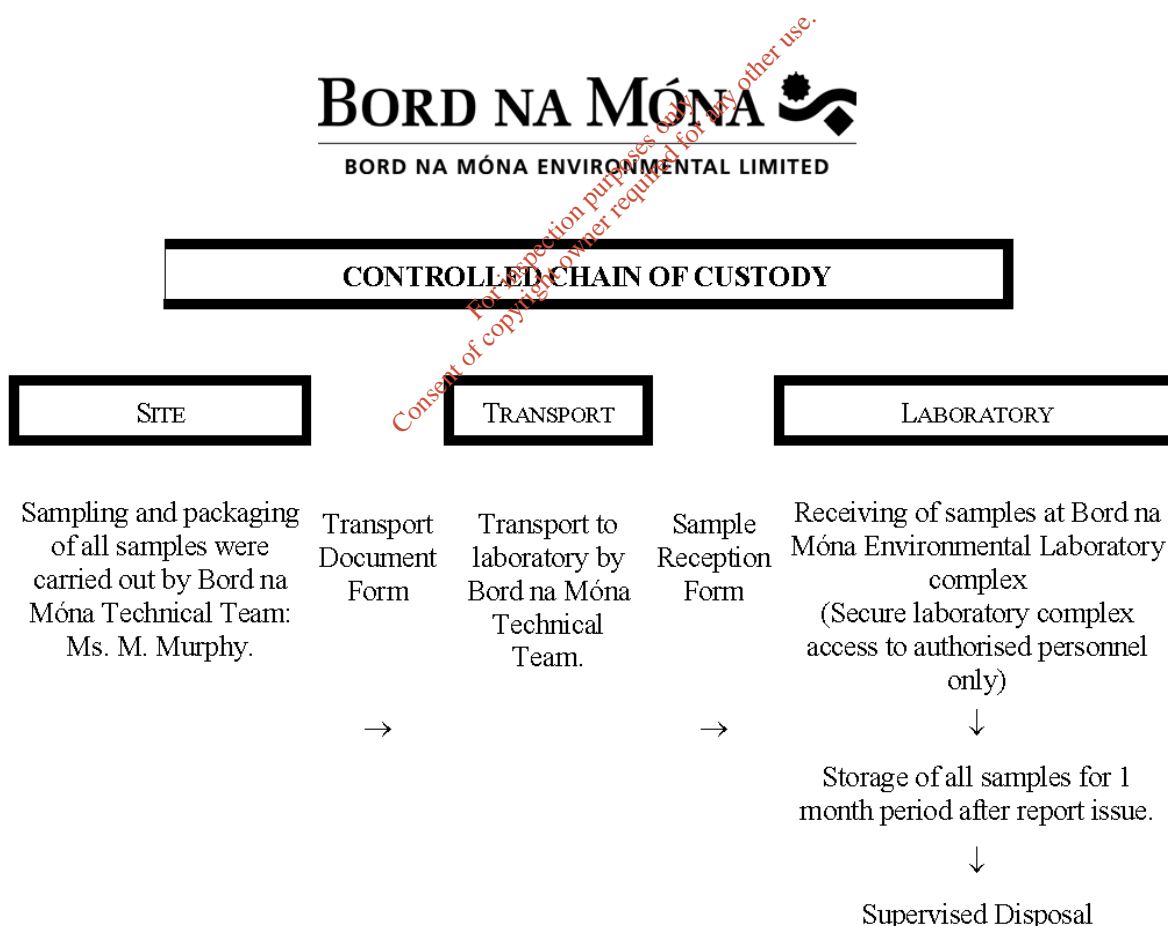
Bord na Móna Technical Services Analytical Laboratories performance in the EPA intercalibration scheme has insured its listing on the EPA's register of Quality Controlled Laboratories. Both accredited and non-accredited test methods are assessed by these schemes.

3.4 Quality Control Audits

Bord na Móna Environmental Ltd. consistently strives to improve the quality of the analytical work out in its laboratories. The laboratory has a full time Quality Control Manager who assists in the organisation and execution of the extensive programme of internal Quality Audits. These quality audits examine all aspects of the laboratory’s Quality System, with particular focus on auditing of test methods, and enable potential problems to be highlighted and immediate corrective action to be taken.

3.5 Control Chain of Custody

As part of the Quality System in place in Bord na Móna, Environmental Ltd., measures are taken to ensure controlled chain of custody. An outline of the chain of custody is given below.



4.0 RESULTS

The results of the investigations carried out by Bord na Móna Technical Services are presented below:

Table 4.1(a): RESULTS OF FIELD MEASUREMENTS AND CHEMICAL ANALYSIS OF GROUNDWATER SAMPLES								
Location	Static Water Level (m bpl)	pH (pH units)	Conductivity (µS/cm)	Ammonia as N (mg/l)	Temperature (°C)	Dissolved Oxygen (mg/l)	Visual	Odour
BH 1	10.17	5.95	451	0.13	12.1	4.86	Light brown colour, suspended solids present	None
BH 2	11.39	-	-	-	-	-	-	-
BH 3	12.98	6.34	258	0.02	12.6	6.87	Clear, no suspended solids	None
BH 4	8.38	-	-	-	-	-	-	-
BH-5	4.98	-	-	-	-	-	-	-
MAC ^{Note 1}	-	6.5-9.5	2500	0.39	-	-	-	-

Table 4.1(b): RESULTS OF FIELD MEASUREMENTS AND CHEMICAL ANALYSIS OF GROUNDWATER SAMPLES continued

Location	Static Water Level (m bpl)	pH (pH units)	Conductivity ($\mu\text{S}/\text{cm}$)	Ammonia as N (mg/l)	Temperature ($^{\circ}\text{C}$)	Dissolved Oxygen (mg/l)	Visual	Odour
O' Riordan Private Well	8.32	6.39	191	0.34	13.0	4.01	Clear, Suspended solids present	None
Coughlan Private Well	7.98	5.80	147	0.04	12.6	4.10	Clear, no suspended solids	None
O' Leary Private Well	6.98	6.01	148	0.02	12.7	8.41	Clear, no suspended solids	None
Dunlea Private Well	8.68	6.23	610	<0.02	13.3	8.02	Clear, no suspended solids	None
MAC ^{Note 1}	-	6.5-9.5	2500	0.39	-	-	-	-

mbpl metres below pipe level

Note 1: Recommended Maximum Admissible Concentrations (MAC) are taken from European Directive 98/83/EC Quality of Water Intended for Human Consumption.

5.0 COMMENTS

5.1 **Groundwater Monitoring Borehole Samples**

As required by Waste Licence Reg. No. 107-1, Schedule D: (Monitoring), samples were obtained from groundwater boreholes BH-1 and BH-3 located at Dunlea Waste Recovery Services, Fermoy, Co. Cork. In addition the groundwater levels at BH-2, BH-4 and BH-5 were measured. The chemical results obtained are compared to the EC Directive 98/83/EC Quality of Water Intended for Human Consumption.

Borehole 1 (BH-1)

On review of the results obtained at BH-1 it is evident that the pH recorded of 5.95 pH units is outside the recommended Maximum Admissible Concentration (MAC) value of 6.5 – 9.5 pH units as set out in EC Directive 98/83/EC. This pH level however is indicative of the pH generally obtained at this location. A trace amount of Ammonia was detected on previous monitoring events at this location and the current level of 0.13mg/l as N displays an increase in levels present. However, this level is well below the recommended MAC value of 0.39mg/l as N. The Conductivity level of 451µS/cm is well below the recommended MAC of 2500µS/cm.

Borehole 3 (BH-3)

Following the analysis of samples taken from BH-3 the results indicate that the pH recorded of 6.34 pH units is outside the recommended MAC values of 6.5 – 9.5 pH units. Ammonia remains undetected at BH-3 and the Conductivity level (258µS/cm) is below the MAC of 2500µS/cm.

5.2 **Private Well Samples**

Four private supply wells were sampled during this monitoring event as required by Schedule D of Waste Licence Reg. No 107-1.

O' Riordan Private Well

The pH recorded at this sampling location was 6.39 pH units and lies marginally below the lower recommended MAC of 6.5 pH units. Ammonia (0.34mg/l as N) was detected at this location and has been detected during the previous quarterly monitoring events. However, this level detected is below the MAC of 0.39mg/l as set out in EC Directive 98/83/EC. The level of

Conductivity recorded (191 μ S/cm) is also below its respective MAC of 2500 μ S/cm.

Coughlan Private Well

The results of the analysis of samples taken from this monitoring location are all below their respective MAC values with the exception of pH (5.8 pH units). A trace amount of Ammonia (0.04mg/l as N) was detected in the Coughlan Private Well during this monitoring event however the level is well below the MAC of 0.39mg/l as set out in EC Directive 98/83/EC. The Conductivity recorded is also below the recommended MAC of 2500 μ S/cm.

O' Leary Private Well

The analyses of samples taken from O'Leary's private well indicate that the pH recorded of 6.01pH units is slightly below the MAC of 6.5pH units. A trace amount of Ammonia (0.02mg/l as N) was detected at this location for the first time since monitoring began but the level is below the MAC of 0.39mg/l as N set out in EC Directive 98/83/EC. The Conductivity level of 149 μ S/cm is well below its respective MAC of 2500 μ S/cm.

Dunlea Private Well

Following the analysis of the samples obtained at Dunlea Private Well the pH recorded of 6.23 pH units is below the MAC of 6.5 pH units. Ammonia was not detected at this location since monitoring began and the Conductivity detected (610 μ S/cm) is below the recommended MAC of 2500 μ S/cm.

APPENDIX 1

BOREHOLE LOCATION MAP

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*AN HYDROGEOLOGICAL ASSESSMENT
OF DUNLEA WASTE RECOVERY SERVICE,
CULLENAGH, FERMOY, CO. CORK*

REPORT NO: T951

ATTENTION: Mr. John Dunlea
Waste Recovery Services (Fermoy) Ltd
Cullenagh,
Fermoy,
Co. Cork

PREPARED BY: Ms. Sarah Casey
Environmental Consultant

REVIEWED BY: Mr. Garrett Leech
Waste/Water Section Head

DATE: February 2003

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Executive Summary

Bord na Móna Environmental Consultancy Services were commissioned by Dunlea Waste Recovery Services to undertake a hydrogeological assessment of their facility in Fermoy County Cork. This assessment was undertaken in compliance with their Waste Licence (107-1) with particular attention paid to the “Long Term Storage Area” condition 11.7.1.

This hydrogeological study was undertaken in January 2003 and entailed a desk based study, intrusive investigations and the sampling of 3 no. groundwater monitoring boreholes.

The underlying bedrock is provisionally classified by the GSI as a locally Important Aquifer which is moderately productive in local zones (LI). The groundwater beneath the site is classified with an Extreme Vulnerability rating.

Groundwater flow directions are towards the north to north-west with only a slight gradient present.

Groundwater quality within the 3 no. boreholes sampled indicate the presence of contamination of an organic nature within BH 1 and BH 4. This contamination is thought to originate from agricultural activities adjoining the site and not from activities occurring within the facility itself. The groundwater boreholes downgradient from the “long term storage area” do not show signs of contamination from industrial sources such as heavy metals, VOC’s.

Respectively Submitted

Ms. Sarah Casey
Environmental Consultant Waste/water

Mr. Garrett Leech
Section Head

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- 1.2 Site Location
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1.0 INTRODUCTION

Dunlea waste recovery services Ltd (herein referred to as Dunlea Waste) is currently involved in the recovery of timber, steel and other inert wastes from the industrial and commercial sector within the region of Fermoy town, County Cork. In compliance with current waste legislation, Dunlea waste obtained a Waste Licence from the Environmental Protection Agency (Register No. 107-1).

As part of the conditions of their Waste Licence 107-1, Dunlea Waste Recovery Services (Fermoy) Limited are required to undertake an independent hydrogeological assessment of the facility (condition 11.7.1):

“An independent hydrogeological assessment of the site shall be carried out and a report submitted to the Agency within six months of the date of the licence. This shall include in particular, the area to the east of the proposed operational area on which waste has historically been landfilled.”

Bord na Móna Environmental Consultancy Services were commissioned to undertake this assessment. To this end, a proposal for the assessment was forwarded to the agency for its agreement.

This report details the methodology and findings of the hydrogeological assessment undertaken at the Dunlea Waste facility between the 9th – 20th January 2002.

1.1 Site Background

Dunlea Waste has operated a waste recovery facility at Cullenagh, Fermoy since 1982. An area along the eastern boundary of the site was identified, (by Dunlea Waste) within the Article 16 compliance submission to the agency as a “long term storage area”. This area was reported as being backfilled with rubble and covered with topsoil.

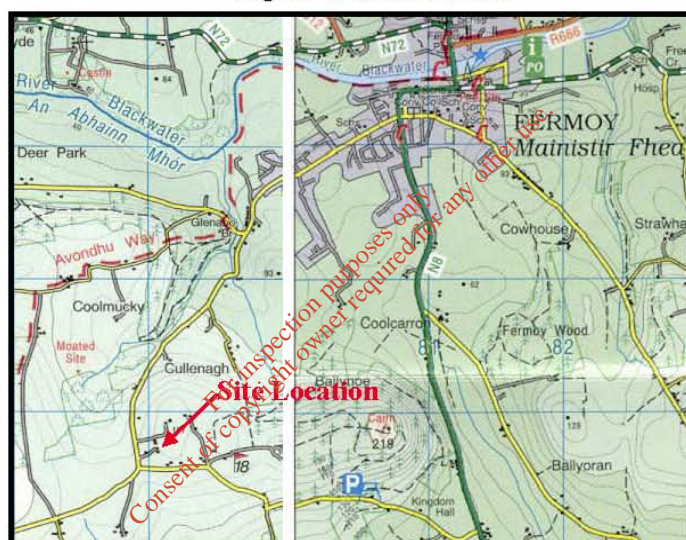
The agency requested that a hydrogeological assessment be undertaken at the facility with particular reference to this area referred to as the *long term storage area*.

The “long term storage area” covers an approx. 1800 m² area (ca 45 m X 40 m) and lies approx. 0.5 m above the natural ground elevation. The area lies directly on bedrock and outcrops were noted adjoining the area.

1.2 Site Location

Dunlea waste facility is located ca. 3 km south-west of Fermoy town in the eastern regions of County Cork. The facility is located within the townland of Cullenagh at grid ref: 17890 95715, as shown in Figure 1 below.

Figure 1. Site Location



1.3 Methodology

The scope of these investigations was to assess the geological and hydrogeological conditions beneath the facility with particular attention paid to the *long-term storage area*. The hydrogeological assessment entailed the following:

- Desk-based study on the geological & hydrogeological conditions beneath the site. Information obtained from the Geological Survey of Ireland and within Bord na Móna database;

- Intrusive investigations were undertaken within the facility. This included the installation of 4 no. monitoring boreholes around the vicinity of the “long term storage area” and 1 no. borehole down gradient of the proposed percolation area for surface water run-off;
- Sampling and chemical/bacteriological analysis of 3 no. groundwater samples;
- Compilation of data and report writing.

2.0

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SITE DESCRIPTION

2.1 Site Description

Dunlea waste is located within a rural area to the south-west of the town of Fermoy. The surrounding area is predominantly agricultural with a Golf Course located to the south east of the site. There are a number of residential properties within 500 m of the site with each of the houses serviced by individual private supply wells. Immediately adjoining the facility are pastoral lands used for the grazing of cattle and sheep and the spreading of organic wastes.

Regionally, the site is located on the eastern flanks of the Nagles Mountains at an elevation of 190 m OD. Topographically the land slopes towards the west/north-west with a moderately steep slope of 1:10.

The site itself is made up of a waste transfer building, waste storage areas, fuel storage areas and an office and toilet facilities. The “long term storage area” is located within the eastern corner of the site as shown in Appendix 1. It is proposed to extend the working area around the facility and increase the area of hardstanding. In addition a septic tank and percolation area will be installed to the north-west of the site for the disposal of surface water run-off from the hardstanding areas.

2.2 Geology

• Quaternary Geology

The facility is located on high ground at an elevation of ca. 190 m O.D. There is only a thin veneer of topsoil/subsoil present overlying the bedrock on the site. Sandstone bedrock outcrops are visible at locations at the facility. During the drilling programme, depths to bedrock ranged from >1 m in the eastern parts of the site to 1.2 m at BH 4 and 2.7 m to the north west of the site (BH 5).

The Quaternary deposits were made up of a fine Clayey SAND and weathered sandstone bedrock.

• Bedrock Geology

The bedrock geology beneath the region is made up of the Devonian Old Red Sandstone (ORS). These rocks are part of the East Cork Succession, which was

deposited in the central position of the Munster Basin approximately 360 million years before present (ma BP).

Site specifically, the site is underlain by rocks from the Ballytrasna Formation (BS). These rocks consist of purple-red fine grained sandstone within interbedded purple mudstones/siltstones.

Bedrock outcrops are present in a number of locations along the eastern sections of the site and bedrock was exposed along pipeline excavations (see Plate 1).



Plate 1: Weathered Bedrock exposed along site excavations

Planar laminations were visible in the bedrock outcrops with bedding planes ranging from medium to massive. Structurally, the site is located on the flanks of the Watergrasshill (east-west trending) Anticline, with the rocks dipping steeply (80°) in a northerly direction. A copy of a typical borehole log is attached in Appendix 2.

2.3 Hydrogeology

- **Aquifer Classification**

The Ballytrasna Formation (BS) has been provisional classified by the Geological Survey of Ireland (GSI) as a locally Important Aquifer which is moderately productive only in local Zones (LI).

During the drilling programme, flow rates within the borehole were estimated ranging between 0.23 to 1.6 m³/hr.

- **Groundwater Levels & Flow Directions**

Static water levels were taken from the 4 no. monitoring wells around the “long term storage area” and the private supply source at the facility as part of these investigations. Previous water levels taken from the private groundwater supply sources within the vicinity of the facility indicate that water levels tend to follow the topography with flows towards the west/north-west.

Location	Grid Ref:	Total Depth (m)	Elevation	Static Water Level (m bpl)	Static Water Level (m OD)
BH 1	179075 195710	13.7	193.25	3.30	189.95
BH 2	179140 195740	13.7	195.41	4.69	190.72
BH 3	179125 195805	28	198.63	6.13	192.5
BH 4	179025 195790	13.7	194.06	4.04	190.02
Dunlea's Supply Well	178990 195710	35	188.6	5.21	183.39

Note: m bpl metres below pipe level.

The levels taken as part of these investigations are illustrated in Appendix 1. As with the previous levels taken, groundwater flow is generally in a northerly direction. A copy of the piezometric map is attached in Appendix 3.

- **Groundwater Vulnerability**

Groundwater vulnerability mapping for North County Cork has not yet been completed by the GSI. Guidelines on groundwater vulnerability mapping have been produced by the GSI and these were consulted as part of these investigations. Based on the published guidelines, an area with depth to bedrock < 3 metres, irrespective of the type of subsoil cover, is classified with an *Extreme Vulnerability* rating.

Integrating the groundwater vulnerability and bedrock aquifer classification gives the resource protection zone of *LVE*.

3.0 INTRUSIVE INVESTIGATIONS

3.1 Installation of Groundwater Monitoring Boreholes

As part of these investigations a total of 5 no. groundwater monitoring boreholes were installed at the facility. Four boreholes were installed around the long term storage area. Proposed locations of the boreholes were chosen by a hydrogeologist on-site with regard to the local topography and previous water levels taken in the area and taken into account proposed site infrastructure, overhead power/service lines and proposed waste storage areas.

Drilling and installation of groundwater monitoring boreholes was undertaken by messr. Jim Harte Well Drilling Ltd, from Milebush, Middleton, County Cork under the supervision of a hydrogeologist from Bord na Móna Environmental Consultancy Services.



Plate 2: Drilling of Groundwater Monitoring Boreholes

Boreholes were drilled through Air Rotary percussion means (see plate 2). The boreholes were cased to between 1-2 m with 6-inch steel casing to prevent the upper horizon of weathered bedrock caving into the borehole. The boreholes were installed with 4-inch PVC standing pipe with slots at the base to allow entry of water.

A gravel pack was installed between the standing pipe and the borehole. The boreholes were finished above ground level and constructed with a 1-inch thick concrete grout around the upper 1 m annulus of the casing and around the well head to prevent the ingress of surface water into the borehole. Lockable caps were fitted to each borehole. A copy of a typical borehole log is attached in Appendix 2.

3.2 Representative Groundwater Sampling

Groundwater in the well casing and in close proximity to the well is not considered representative of the general groundwater at a given location. In order to ensure that the groundwater samples extracted from the monitoring wells were representative of the groundwater held in the subsurface strata and not water held stagnant in the casing, it was necessary to evacuate the monitoring wells prior to sampling.

A common procedure is to pump the well until between 2 and 5 bore volumes have been removed (Marsh and Lloyd 1980 and Boating 1987). The purged volumes were calculated on-site from the measured static water levels (measured using an electronic well dipper) and the total depth of the well.

A submersion 2-inch 12 V pump was utilised to evacuate all the monitoring boreholes. Samples were taken using individual bailers and transferred into the sample containers, to eliminate the possibility of cross contamination.

Samples were taken in 1 litre polypropylene containers (inorganic), PTFE conditioned capped glass bottles (organic), and sterile bottles (bacteriological) and returned to the laboratory for immediate analysis. Sampling was in strict accordance with recognised standard procedures.

3.3 In-situ Field Measurements

- **pH**

In-situ measurements of pH were taken with a WTW portable pH meter. Measurements are based on an electrochemical sensor which consists of a measuring electrode and a reference electrode. The voltage at the membrane alters according to the pH of the sample solution. The pH electrode contains a built in temperature sensor, for which the instrument conducts automatic temperature compensation. Calibration was conducted onsite using standard pH buffers 4, and 7.

- **Conductivity**

In-situ measurements of conductivity were taken with a WTW portable conductivity meter. Conductivity is recorded by taking a measurement of the electrical resistance. The instrument measures the current and uses Ohm's law to calculate first the conductance of the solution and then, by taking the cell data into account, the conductivity. Automatic temperature compensation ensures that results are displayed at a constant reference temperature (25 °C). The measuring range of the meter is 0.00 µS/cm to 500mS/cm.

3.4 Analysis of Groundwater Samples

All samples returned to the laboratory were stored at 4°C. Subsequent analysis of all samples was carried out in strict accordance with recognised standard methods.

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4.0 ACCREDITED QUALITY SYSTEM

4.1 ILAB ACCREDITATION

Bord na Mona Environmental Consultancy Services analytical laboratories is ILAB accredited by the National Accreditation Board (NAB) since 1997. It has always been the policy of the laboratories to achieve and maintain a high standard of quality consistent with client's requirements in all aspects of the work carried out within the laboratory.

Bord na Mona Environmental Consultancy Services laboratories successfully transferred to the new standard of accreditation ISO 17025 on the 16th of November 2001.

4.2 Accredited to ISO 17025

This new standard contains all of the requirements that testing laboratories have to meet if they wish to demonstrate that they operate a quality system, are technically competent, and are able to generate technically valid results. ISO 17025 incorporates all those requirements of ISO 9001 and ISO 9002 that are relevant to the scope of testing services that are covered by the laboratory's quality system. Thus a laboratory that complies with ISO 17025 will therefore also operate in accordance with ISO 9001 or ISO 9002.

4.3 Interlaboratory Proficiency Schemes

To ensure the accuracy of the analytical testing we participate in several external proficiency schemes. The ongoing competence of the laboratory and its staff is assessed by participation in various inter-laboratory proficiency testing schemes, such as Aquacheck and the EPA scheme organised for environmental laboratories throughout Ireland.

4.4 EPA Quality Control Register

Bord na Mona Environmental Consultancy Services Analytical Laboratories performance in the EPA intercalibration scheme has insured its listing on the EPA's register of Quality Controlled Laboratories. Both accredited and non-accredited test methods are assessed by these schemes.

4.5 Quality Control Audits

Bord na Mona Environmental Ltd. Consistently strives to improve the quality of the analytical work out in its laboratories. The laboratory has a full time Quality Control Manager who assists in the organisation and execution of the extensive programme of internal Quality Audits. These quality audits examine all aspects of the laboratory's Quality System, with particular focus on auditing of test methods, and enable potential problems to be highlighted and immediate corrective action to be taken.

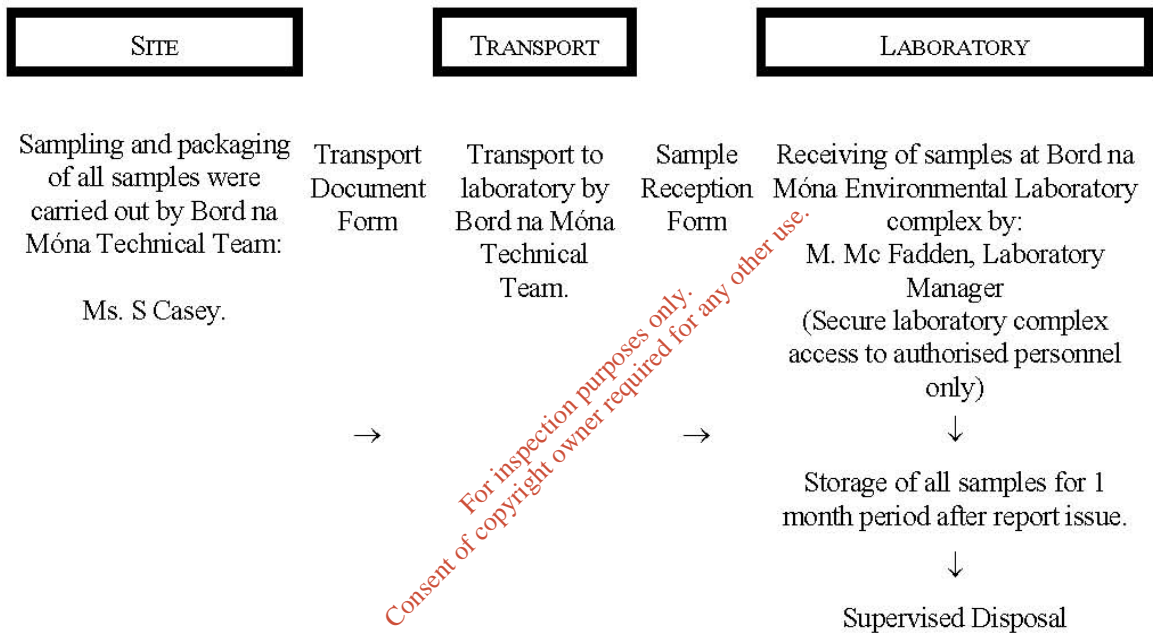
4.6 Control Chain Of Custody

As part of the Quality System in place in Bord na Móna, Environmental Limited measures are taken to ensure controlled chain of custody. An outline of the chain of custody is given overleaf.

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CONTROLLED CHAIN OF CUSTODY



5.0 RESULTS

The results of the investigations carried out by Bord na Móna Environmental Ltd. are presented as follows:

Table 4.1: Results of Field Measurements taken at each monitoring well.

Table 4.2: Results of Chemical & Bacteriological analysis of groundwater samples.

Table 4.3 Results of Total Metal Scan

Table 4.4: Results of Organics screen.

Location	pH (pH units)	Conductivity ($\mu\text{S/cm}$)	Temp ($^{\circ}\text{C}$)
BH 1 (down gradient)	6.4	381	9.8
BH 3 (up gradient)	5.6	163	10.1
BH 4 (down gradient)	6.6	398	9.5

Parameter	Borehole I.D			
	BH-1	BH-3	BH-4	Water Quality MAC ^a
Ammonia as N mg/l	0.05	<0.02	0.15	0.23
*TOC mg/l	16	<5	8	No change
Chloride mg/l	33.8	249	49.7	250
Nitrate as N mg/l	6.6	8.2	5.1	11.3
Phosphate as P mg/l	<0.16	<0.16	<0.16	-
Sulphate mg/l	138.0	16.6	108.1	250
Nitrite as N mg/l	<0.03	<0.03	0.08	0.15
Sodium mg/l	24	11	30	200
Magnesium mg/l	9.8	3.2	7.4	-
Potassium mg/l	24	2.8	3.9	-
Calcium mg/l	50	21	67	-
Total Coliform no./100 ml	6	<1	1.7 x 10 ⁴	0
Faecal Coliform no./100 ml	2		32	0

^a Water Quality Standard = Water Quality Standards set in the EC Drinking Water Directive (98/83/EC).

MAC = Maximum Admissible Concentration.

Parameter	Borehole I.D			
	BH-1	BH-3	BH-4	Water Quality MAC ^a
Chromium µg/l	<2	<2	<2	50
Manganese µg/l	296	3932	713	50
Nickel µg/l	<2	4	3	20
Copper µg/l	<2	<2	3	200
Zinc µg/l	32	11	33	-
Arsenic µg/l	<2	<2	<2	10
Cadmium µg/l	<2	<2	<2	5
Barium µg/l	18	83	36	-
Lead µg/l	<2	10	54	10
Iron mg/l	<0.1	<0.1	0.1	-
Boron µg/l	18	83	36	-
Mercury µg/l	<1	<1	<1	1

Compound (µg/l)	BH-1	BH-3	BH-4
TPH	132	<10	<10
USEPA 524.2 (µg/l) compounds*	<10	<10	<10

* Refer to Appendix 4

6.0 GROUNDWATER QUALITY

The groundwater sample taken from BH-3 represents the groundwater upgradient from the "long term storage area". The groundwater quality within this borehole is generally indicative of clean waters with low levels of ammonia, anions, cations, and heavy metals present. There were no levels of TPHs, organics (USEPA 524.2) or any coliforms present in the sample. Manganese levels detected in this sample are elevated in comparison to the Water Quality MAC value and the other boreholes, however manganese is naturally present in many Irish groundwaters. Nitrate levels are recorded highest in BH-3 at a level of 8.2 mg/l. Elevated Nitrates are present in groundwaters as a result of agricultural activities such as the landspreading of organic wastes/fertilisers etc.

Groundwater samples taken from BH-1 and BH-4 represent groundwaters down gradient from the "long term storage area", with BH 1 located closer to the area than BH4. Groundwater samples taken from BH 1 and BH-4 appear to have the same chemical make-up with higher levels of the anionic parameters (Na, Mg, Ca) and lower levels of CL and SO₄ than that detected in BH-3.

BH-4 recorded the highest levels of Ammonia recorded at a level of 0.15 mg/l. In addition elevated levels of coliforms (total & faecal) and Nitrite were detected in this sample. The high level of faecal coliforms detected in the sample indicate the source of contamination is near-by of organic nature (spreading of organic wastes) and that the groundwater exists under vulnerable conditions (refer to §2.3). It should be noted that whilst ammonia and nitrate levels are elevated, they are not above the Water Quality MAC. BH-4 gave the highest levels of Lead (54µg/l), and Zinc (11µg/l) detected, however these parameters were detected upgradient of the site and therefore are most likely to naturally exist in the groundwaters. There were no organics (USEPA) or TPH's detected in the sample.

BH-1 is located nearest to the to the "long term storage area". The groundwater sample taken detected low levels of Ammonia and the presents of low numbers of coliforms (total & faecal). Due to the low levels detected the source of the organic contamination is likely to be from diffuse agricultural sources rather than activities occurring on the site. TPH's were detected in the sample at a level of 132 µg/l. Levels of TPH's in groundwaters can be compared to the Dutch Target and Intervention Values which are indicative of groundwaters which are relatively unpolluted (50 µg/l) and that which can be said to be a case of serious contamination (600 µg/l) respectively. The level detected in BH-1 whilst elevated above the Target

value does not exceed the Dutch Intervention Value. The source of the TPH is currently unknown; however it is possible that this contamination may have occurred as a result of the historic parking/movement of plant machinery in this area. The fact that TPH levels were not detected at the other monitoring wells and in particular the downgradient well, indicates that this contamination is localised. There were no VOC's (USEPA) detected in the sample. Elevated Potassium levels were detected in the sample and these are considered to originate from agricultural sources (fertilisers).

Overall the quality of the groundwater beneath the facility indicates the presence of contamination of an organic nature, which is thought to be due to agricultural activities within the vicinity of the site and not a result of industrial activities occurring at the facility. There are no organic wastes accepted at the facility, only inert wastes such as timber and builders rubble. In addition the "long term storage area" is located a distance of >80 m from BH 4 which detected the highest levels of organic contamination whilst low levels of faecal coliforms were detected in BH-1 which is located < 20 m from the "long term storage area". Faecal coliforms to this level would not remain in "long term storage area" over the period of time since it was deposited, therefore this is not considered the source of the organic contamination.

Due to the vulnerability of the underlying groundwaters, and agricultural activities occurring adjoining the site diffuse sources of contamination are resulting in elevated levels of ammonia, coliforms and nitrates within the groundwaters.

7.0 CONCLUSION

- Dunlea Wastes is located on the flanks of the Nagle Mountains, south-east of the town of Fermoy. The area is covered by a thin veneer of fine clayey SAND overlying sandstone bedrock of the Ballytrasna Formation (BS).
- The underlying bedrock is provisionally classified by the GSI as a locally Important Aquifer which is moderately productively in local zones (LI). The groundwater beneath the site is classified with an Extreme Vulnerability rating. The groundwater resource protection zone is classified as LI/E.
- Groundwater levels beneath the site range from ca. 3 m – 6 m beneath the ground level with shallow groundwater flow directions generally in a North/North-westerly direction, flowing the local topography.
- Groundwater quality beneath the site shows indications of contamination from an organic source (elevated levels of ammonia, coliforms and nitrates). Activities at the facility entail the handling of inert wastes such as timber, steel and builders rubble. This type of activity would not result in organic contamination of the groundwater therefore it is considered that agricultural activities adjoining the site are resulting in the diffuse contamination of the underlying groundwaters.
- Groundwater downgradient of the “long term storage area” does not indicate the presence of contamination from heavy metals or VOC’s, with results remaining similar to the up-gradient groundwater sample taken. BH-1 detected low levels of TPH’s (132 µg/l) which whilst above the Dutch Target Value of 50 µg/l remains below the Dutch Intervention Value of 600µg/l. The source of the TPH’s within the groundwater at this location is unknown, however it may be a result of historic vehicle movement/parking of plant machinery in this area.

8.0 RECOMMENDATIONS

- Due to the Extreme Vulnerability rating assigned to the site, consideration should be given to the Groundwater Protection Responses for the landspreading of organic wastes (DOELG, EPA, GSI 1999) within the immediate surrounds of the facility.
- Groundwater source protection areas should be established around the well head of all boreholes on-site which are or will be utilised for production wells.
- Monitoring of the groundwater should be undertaken as per the conditions of the waste to allow for the generation of trends in the quality of the groundwater.

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REFERENCES

Daly, D. 1994; Chemical Pollutants in Groundwater, A Review of the Situation in Ireland

Department of Environmental & Local Government, EPA, GSI 1999; Groundwater Protection Schemes

Environmental Protection Agency 2001; Parameters of Water Quality Interpretation & Standards

Geological Survey of Ireland 2003; Consultation of Information held within data files.

Geological Survey of Ireland 1995; Geology of East Cork – Waterford, Geology 1:100,000 Scale Map Series Sheet 22

Ordnance Survey of Ireland 1997; Discovery Series 1:50,000 map 80 & 81

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APPENDIX 1

Site Layout Groundwater Monitoring Boreholes

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APPENDIX 2

Typical Groundwater Monitoring Borehole Log

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APPENDIX 3

Piezometric Map

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APPENDIX 4

List of USEPA 524.2 compound

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Dichlorodifluoromethane.	Chloromethane	Vinyl chloride
Bromoethane	Chloroethane	Trichlorofluoromethane
1,1-Dichloroethene	Methylene Chloride	trans-1,2-Dichloroethene
1,1-Dichloroethane	cis-1,2-Dichloroethene	2,2-Dichloropropane
Bromochloromethane	Chloroform	1,1,1-Trichloroethane
Carbon tetrachloride	1,1-Dichloropropene	Benzene
1,2-Dichloroethane	Trichloroethene	1,2-Dichloropropane
Dibromomethane	Bromodichloromethane	cis-1,3-Dichloropropene
Toluene	trans-1,3-Dichloropropene	1,1,2-Trichloroethane
Tetrachloroethene	1,3-Dichloropropene	Dibromochloromethane
1,2-Dibromoethane	Chlorobenzene	1,1,2,2-Tetrachloroethane
Ethylbenzene	m-Xylene	p-Xylene
o-Xylene	Styrene	Bromoform
Isopropylbenzene	Bromobenzene	1,2,3-Trichloropropane
n-propylbenzene	2-Chlorotoluene	1,3,5-Trimethylbenzene
4-Chlorotoluene	tert-Butylbenzene	1,2,4-Trimethylbenzene
sec-Butylbenzene	1,3-Dichlorobenzene	n-Butylbenzene
1,2-Dichlorobenzene	1,2-Dibromo-3-chloropropane	1,2,4-Trichlorobenzene
Hexachlorobutadiene	Naphthalene	1,2,3-Trichlorobenzene
1,1,1,2-Tetrachloroethane	p-Isopropyltoluene	1,4-Dichlorobenzene

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