

Chapter	Appendix	Title
9	Appendix 9.1	Noise and Vibration in the Existing Environment
	Appendix 9.2	Calculation of Noise Emissions

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Test report

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Assignment:	
Dublin Waste To Energy Noise and vibration in the existing environment Measuring report	
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Summary

Measurements of noise and vibration levels have been performed at the proposed waste to energy facility in Ringsend, at the corner of Pigeon House Road and Shellybanks Road.

The measurements were made on 6 and 7 October 2005, and on 5 to 7 December 2005, covering the day and night period.

The purpose of the measurements is to document the existing noise and vibration level in the surroundings of the proposed waste to energy facility. Noise measurements have been performed at the site boundary to the north, east, south and west, and additionally at the walkway of the Irishtown Nature Park at the shore, south of the site.

Vibration levels have been measured at selected locations along the site boundary.

The noise measurements show relatively high levels of noise at the site boundary, both at day and at night time.

No significant vibration levels were measured.

Note:

- Results marked with * do not fulfil the standard used.
- Text written in italic is not part of accrediting of the laboratory.

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1. Introduction

The measurements and data analysis were performed by Torben Foged - Elsam Engineering, accredited to noise and vibration measurements by Danak under registration no. 446.

2. The Site and its surroundings

The Site of the proposed waste to energy facility is divided into three separate zones.

The northern part of the Site is a scrap yard, the middle part is a molasses factory, and the southern part is not in industrial use and is therefore practically empty.

The Site is situated in an industrial zone. To the east is a sewage treatment plant, to the north a scrap yard (at the opposite side of Pigeon House Road), and to the west a power plant. South of the Site is an open unused area, which extends to the walkway situated near the shore. The walkway leads to the Irishtown Nature Park situated southeast of the site.



Figure 1: The Site and its surroundings

3. Measuring method

The noise measurements are generally conducted according to BS 4142:1997. The measurements were made manned, meaning that influential conditions such as dominant noise sources, wind speed and direction are registered and reported.

The measuring period was 3 hours during the day, and 3 hours during the night for each measuring position, except for the position at the walkway which was not measured at night time. Due to lacking battery capacity of the measuring equipment, the measuring period at that position was reduced to 1 hour. The 3-hour time interval was selected to achieve the best possible equalization of the periodical activities for the surrounding industrial enterprises in the area, such as deliveries by truck to the molasses factory, use of hammers at the scrap yard and similar.

Steady noise, eg fans, pumps and chimneys, is well covered by the chosen reference period.

For measuring and for the subsequent analyses in the laboratory the instruments mentioned in section 12 were used.

The measuring equipment was calibrated before and after the measuring series. The deviation was in all cases less than 0.2 dB.

The measurements were additionally stored as WAW files, which allows for subsequent data treatment.

4. Measuring positions

The microphone positions 1-5 were chosen to cover the site boundary, see Figure 2. The measuring height for positions 1, 2, 3 and 5 is 1.5 m above ground. At position 4 there was a concrete wall, and therefore the measuring height was chosen to be 1.5 m above the upper edge of the wall. This was done to avoid shielding and reflections caused by the wall.

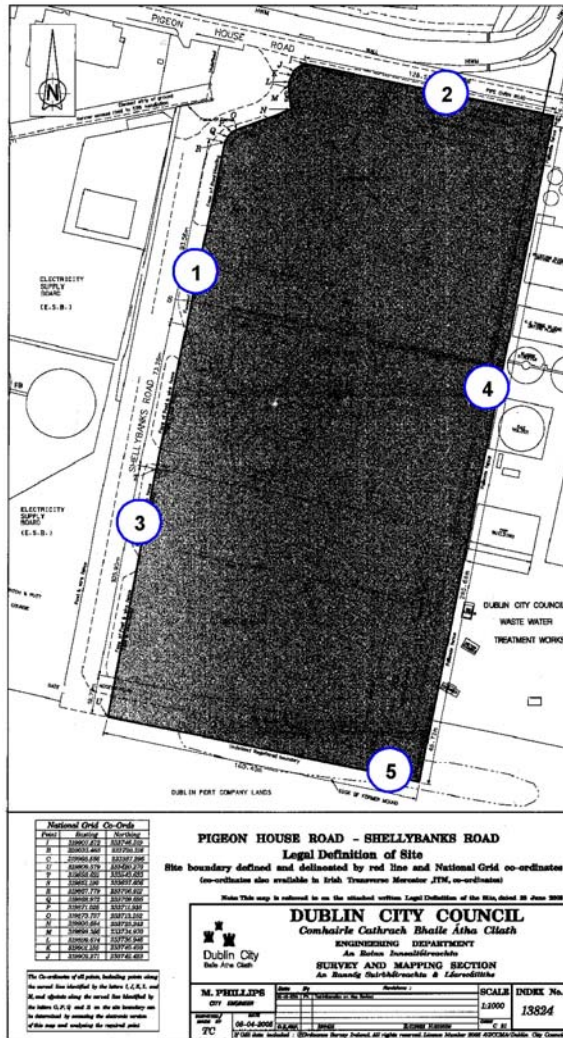


Figure 2: The Site - measuring positions at site boundary

Measurements were conducted at the walkway to Irishtown Nature Park, as this measuring point is part of Schedule 12, Environmental Management.

The microphone position was 1.5 m above ground, just north of the walkway, see Figure 3.



Figure 3: Measuring position at the walkway to Irishtown Nature Park

5. Noise propagation conditions

The site area and the immediate surroundings are flat without significant contours. To the south, just north of the walkway, there are 2 soil barriers, approximately 6-8 metres high. These barriers shield the noise from the industrial zone to the walkway very efficiently.

6. Meteorological conditions

During the measurements the wind speed was measured using a handheld anemometer at a height of two metres.

For the measurements made on 6 and 7 October 2005, the wind speed during the day period was generally between 2.0 and 5.0 m/s at the measuring positions. The wind direction was from southeast. The degree of clouds was 4/8 (50%) to 8/8 (100%), and the temperature was approx. 15 °C.

In the night period, the wind was low, less than 2 m/s. The degree of clouds was 8/8, and the temperature was approx. 10 °C.

For the measurements made on 5 to 7 December 2005, the wind speed during the day period was generally between 2.0 and 5.0 m/s at the measuring positions. The wind direction was westerly. Specific values are stated together with the measuring results. The degree of clouds was between 0/8 (0%) and 4/8 (50%), and the temperature was approx. 5 °C.

In the night period, the wind was low, less than 2 m/s, the degree of clouds was approx. 4/8, and the temperature was approx. 0 °C.

Specific values are stated together with the measurement results.

7. Measurement results, noise

The noise measurements were made using 2-channel equipment allowing measurements at two positions simultaneously. Therefore some of the wind data are the same for different positions.

In some cases, LAmax, LAmin, LA10 and LA90 are post calculated from WAW files. This may cause a minor deviation (up to 1 dB), and the results are therefore printed in italics.

7.1 Position 1, site boundary at Shellybanks Road

Position	Period	LAeq	LAmax	LAmin	LA10	LA90
1	Day, average	61.4	98	48	61	53
1	Night, average	51.3	76	48	52	50

Table 1: Measurement results, dB(A) re 20 µPa

During the daytime, the wind speed was measured to 2.4 m/s, with wind coming from southeast. The dominant noise sources were noise from scrap handling, trucks to the molasses factory and a fan at the sewage treatment plant.

During the night time, the wind was very low. The dominant noise sources were fan noise from the sewage treatment plant and noise from the power plant to the west.

7.2 Position 2, site boundary at Pigeon House Road

Position	Period	LAeq	LAmax	LAmin	LA10	LA90
2	Day, average	65.2	89	54	67	60
2	Night, average	56.9	83	54	57	55

Table 2: Measurement results, dB(A) re 20 µPa

The measurements at daytime were done on two separate occasions at wind speeds of 2.0 m/s from south and 4.5 m/s from west-southwest. The dominant noise sources were noise from scrap handling, primarily from the scrap yard placed on the north side of Pigeon House Road, a fan at a silo to the north of the measuring position, a fan at the sewage treatment plant, and to some extent vehicles on Pigeon House Road.

During the night time, the wind speed was 1 m/s from north west. The dominant noise sources were fans and to some extent vehicles on Pigeon House Road.

7.3 Position 3, site boundary at Shellybanks Road

Position	Period	LAeq	LAmax	LAmin	LA10	LA90
3	Day, average	57.8	86	48	58	52
3	Night, average	51.8	70	45	54	49

Table 3: Measurement results, dB(A) re 20 µPa

During the daytime, the wind speed was measured to 2.4 m/s coming from southeast. The dominant noise sources were noise from scrap handling, trucks to the molasses factory and a fan at the sewage treatment plant.

During the night time, the wind was very low. The dominant noise sources were fan noise from the sewage treatment plant and noise from the power plant to the west.

7.4 Position 4, site boundary to the east (sewage treatment plant)

Position	Period	LAeq	LAm _{ax}	LAm _{in}	LA10	LA90
4	Day, average	68.5	90	62	70	64
4	Night, average	60.7	73	58	61	60

Table 4: Measurement results, dB(A) re 20 µPa

During the daytime, the wind speed was measured to 1.8 m/s coming from north. The dominant noise sources were noise from scrap handling and fans and pumps at the sewage treatment plant.

During the night time, the wind was very low, less than 1 m/s from northwest. The dominant noise sources were fan noise from the sewage treatment plant.

7.5 Position 5, site boundary to the south

Position	Period	LAeq	LAm _{ax}	LAm _{in}	LA10	LA90
5	Day, average	52.5	68	44	54	50
5	Night, average	53.0	63	47	54	51

Table 5: Measurement results, dB(A) re 20 µPa

During the daytime, the wind speed was measured to 4.1 m/s, with wind coming from southeast. The dominant noise sources were noise from a fan or possibly chimney at the sewage treatment plant, engine noise from a dozer/loader tractor and noise from the scrap yard.

During the night time, the wind was low. The dominant noise sources were noise from a fan or possibly chimney at the sewage treatment plant. The increased noise levels at night time are caused by the lower wind speed compared to daytime.

7.6 Position 6, at the walkway to Irishtown Nature Park

Position	Period	LAeq	LAm _{ax}	LAm _{in}	LA10	LA90
6	Day, average	48.3	79	40	49	45
6	Night, average	44.8	64	38	47	41

Table 6: Measurement results, dB(A) re 20 µPa

During the daytime, the wind speed was measured to 5 m/s, with wind coming from southeast. The dominant noise source was traffic noise from Sandymount. Noise from the industrial area surrounding the site was not audible. It is estimated that this is caused by the shielding of the two approx. 6-8-metre high soil barriers just north of the measuring position. In addition, the wind direction lowered the sound propagation from industry to the walkway.

During the night time, the wind speed was measured to 2.5 m/s from north west. It was not possible to hear industrial noise from the industrial site. The dominant noise sources were traffic noise from Sandy-mount and seabirds at the sandy beach.

8. Measurement results, vibration

Measurements of the vibration levels were performed at positions 1-5 during daytime. A special high-sensitive, low-frequency accelerometer calibrated from 5 Hz-5 kHz was used. The accelerometer was mounted on a heavy steel plate. The steel plate was placed on hard heavy surfaces, such as concrete foundations and concrete areas using steel spikes.

The measuring equipment was calibrated before and after the measurements.

All measurement results show insignificant values, and further data treatment is therefore not performed.

Position	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5
Level, max [m/s^2 rms]	1.9×10^{-2}	3.3×10^{-2}	0.7×10^{-2}	1.2×10^{-2}	0.8×10^{-2}

Table 7: Vibration levels

9. Uncertainty

Generally, the uncertainty for one measurement is defined as $1.7 \times$ the standard deviation for a 95% unilateral confidence interval. With a standard deviation on the measuring equipment accuracy of 0.5 dB, the uncertainty of the measurement itself will be 1 dB.

However, also other factors are of influence:

- The variation in operation of the surrounding industry
- The meteorology – primarily the wind direction can favour noise sources upwind

During the measurements, the nearest noise emitting plants (the sewage treatment plant, the scrap yard and the molasses factory) were in operation. There may of course be some variation in the noise emission, but with all plants in operation the noise should be quite representative.

Based on the relatively short distances to the surrounding industrial activities, meteorology is estimated to be of less influence.

This means that the uncertainty of the measurement results is estimated to approximately 3 dB.

10. Conclusion

Measurements of noise and vibration levels have been performed at the proposed waste to energy facility in Ringsend, at the corner of Pigeon House Road and Shellybanks Road.

The measurements were made on 6 and 7 October 2005, and on 5 to 7 December 2005, covering daytime and night time.

The purpose of the measurements is to document the existing noise and vibration level in the surroundings of the proposed waste to energy power facility. Noise measurements have been performed at the

site boundary to the north, east, south and west, and additionally at the walkway to Irishtown Nature Park at the shore south of the site.

Vibration levels have been measured at selected locations at the site boundary.

The noise measurements show relatively high levels of noise at site boundary, both at daytime and at night time.

No significant vibration levels were measured.

11. Reference list

1. Measuring of environmental noise from companies
Guide no. 6, November 1984
Danish Environmental Protection Agency
2. BS 4142:1997. Rating Industrial Noise affecting mixed residential and industrial areas.
3. ISO 1996-1. Second edition 2003-08-01.
Acoustics – Description, measurement and assessment of environmental noise.

12. Applied measuring and analysis equipment

Number	Type	Manufacturer	Model	Latest calibration	Calibrated by:	Serial number
M042	Meteorology equipment	Testo	440			
M093	Lab top PC	Fujitsu Siemens	Lifebook T3010			YBHP002878
M131	Microphone ICP	GRAS	40AE	12-11-2004	DELTA	6462
M133	Microphone ICP	GRAS	40AE	14-02-2005	DELTA	6464
M134	Microphone ICP	GRAS	40AE	14-02-2005	DELTA	6465
M221	Analyser	01dB	Symphonie	06-04-2004	DELTA	1800
M236	Microphone preamplifier, ICP	Brüel & Kjær	2671	16-02-2005	DELTA	1920236
M237	Microphone preamplifier, ICP	Brüel & Kjær	2671	24-11-2003	Delta	1920237
M239	Microphone preamplifier, ICP	Brüel & Kjær	2671	02-02-2004	Delta	1920239
M345	Camera	Canon	IXUS 330			5031305194
M129	Microphone ICP	Brüel & Kjær	4155	04-10-2005	DELTA	1394282
M132	Microphone ICP	GRAS	40AE	10-11-2005	DELTA	6563
M181	Accelerometer, ICP	PCB	393A03	24-06-2005	EE	9318
M220	Analyser	01dB	Symphonie	05-10-2005	DELTA	85
M233	Microphone, preamplifier ICP	Brüel & Kjær	2671	04-10-2005	DELTA	1920233
M238	Microphone preamplifier, ICP	Brüel & Kjær	2671	10-11-2005	DELTA	2004142
M341	Calibrator, microphone	01dB	Cal 01	18-07-2005	DELTA	11786
M342	Calibrator, accelerometer	PCB	699A02	04-07-2005	Elsam Engi- neering	417

Appendix 1. Full list of measurement results

Position	Period	Time	LAeq	LAmaz	LAmín	LA10	LA90
1	Day	7/10-05 10:29-11:29	60.7	87.6	47.8	59.4	49.7
1	Day	7/10-05 11:47-12:47	63.6	98.1	51.4	62.7	56.7
1	Day	7/10-05 12:48-13:48	58.2	91.8	48.2	60.6	52.9
	Day, average		61.4	98.1	47.8	60.9	53.1
1	Night	6/12-05 01:47-02:47	51.2	75.9	48.3	51.9	49.9
1	Night	6/12-05 02:47-03:47	51.1	66.7	48.3	51.9	49.8
1	Night	6/12-05 03:47-04:47	51.7	67.7	48.2	52.4	50.2
	Night, average		51.3	75.9	48.2	52.1	50.0
2	Day	7/10-05 14:35-15:35	62.9	89.1	53.5	64.3	57.6
2	Day	5/12-05 14:05-15:05	65.6	87.5	56.6	68	59.9
2	Day	5/12-05 15:05-16:05	66.3	84	58.3	68.8	61.3
	Day, average		65.2	89.1	53.5	67.0	59.6
2	Night	7/12-05 01:07-02:07	57.2	82.7	53.6	56.6	55
2	Night	7/12-05 02:07-03:07	56.6	75.4	53.6	56.6	55.1
2	Night	7/12-05 03:07-04:07	56.9	74.5	54.4	57.2	55.6
	Night, average		56.9	82.7	53.6	56.8	55.2
3	Day	7/10-05 10:29-11:29	54.9	71.3	48.2	55.7	50.7
3	Day	7/10-05 11:47-12:47	58.2	85.6	49.2	60	51.9
3	Day	7/10-05 12:48-13:48	59.2	75.4	48.7	58	52.1
	Day, average		57.8	85.6	48.2	57.9	51.6
3	Night	6/12-05 01:47-02:47	51.6	70.2	45.3	53.6	48.4
3	Night	6/12-05 02:47-03:47	51.6	60.6	45.9	53.5	48.7
3	Night	6/12-05 03:47-04:47	52.1	70	47.2	53.6	49.6
	Night, average		51.8	70.2	45.3	53.6	48.9
4	Day	6/12-05 10:57-11:57	67.1	90	61.9	68.8	63.6
4	Day	6/12-05 11:57-12:57	70.5	90	62.6	72	64.4
4	Day	6/12-05 12:57-13:57	66.9	87.8	61.9	68.4	63.6
	Day, average		68.5	90.0	61.9	69.7	63.9
4	Night	7/12-05 01:07-02:07	60.7	72.6	58.6	61.2	59.6
4	Night	7/12-05 02:07-03:07	60.7	69.5	58.4	61.1	59.9
4	Night	7/12-05 03:07-04:07	60.8	67.4	59	61.2	60
	Night, average		60.7	72.6	58.4	61.2	59.8
5	Day	6/10-05 14:53-15:53	52	61.7	45.4	54.3	49.8
5	Day	6/10-05 16:02-17:02	52.2	65.8	44.1	54.2	49
5	Day	6/10-05 17:03-18:03	53.1	68.2	47.1	54.8	50.7
	Day, average		52.5	68.2	44.1	54.4	49.8

5	Night	6/10-05 23:43-00:13	52.9	62.8	47.6	54.4	50.8
5	Night	7/10-05 00:21-00:56	52.7	61.3	47.4	54.1	50.7
5	Night	7/10-05 01:28-02:20	53.3	60.9	48.1	54.6	51.5
	Night, average		53.0	62.8	47.4	54.4	51.0
6	Day	6/10-05 14:53-15:53	48.5	79.1	43	48.6	45.9
6	Day	6/10-05 16:02-17:02	48.2	74.1	41.6	49	45.7
6	Day	6/10-05 17:03-18:03	48.2	77.8	39.6	49.4	44
	Day, average		48.3	79.1	39.6	49.0	45.2
6	Night	5/12-05 23:58-00:58	44.8	63.7	38.4	46.9	41.3

Appendix 2. Photos from the measurements

Shellybanks Road



Shellybanks Road



Pigeon House Road



The walkway

