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2017 annual noise compliance survey at Forge Hill Recycling waste management installation, Forge Hill, Ballycurreen, Cork

Licence ref. W0291-01

Client **O'Callaghan Moran & Associates**
OBO Forge Hill Recycling

Prepared by **Damian Brosnan BSc MSc MIOA MIEI**

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Contents

Summary

On 15.11.17 and 16.11.17, Damian Brosnan Acoustics carried out an environmental noise survey in the vicinity of the Forge Hill Recycling Ltd. installation at Forge Hill, Ballycurreen, Cork. The survey is a requirement of waste licence W0291-01 issued 21.08.17 by the Environmental Protection Agency in respect of the facility.

The survey consisted of daytime, evening and night-time monitoring. Monitoring was undertaken at four boundary and three offsite stations specified by the licence. Noise limits set out in the licence apply only to the offsite stations.

Noise levels at all seven stations were chiefly influenced by offsite road traffic, which remained significant through the evening and into the night. Site emissions were inaudible at the three offsite stations. It follows that noise limits specified by the licence were complied with. Site operations did not give rise to tones or impulses at the offsite stations, thus complying with the licence.

1 Introduction

1.1 Damian Brosnan Acoustics was instructed by O'Callaghan Moran & Associates, on behalf of their client Forge Hill Recycling Ltd. (FHR), to carry out an environmental noise survey in the vicinity of the FHR waste recycling installation at Forge Hill, Ballycurreen, Cork. The survey is a requirement of waste licence W0291-01 issued 21.08.17 by the Environmental Protection Agency (EPA) in respect of the facility. The objectives of the survey were as follows:

- Undertake noise monitoring in accordance with *International Standard ISO 1996-2:2007 Acoustics – Description, measurement and assessment of environmental noise, Part 2: Determination of environmental noise levels* (2007) and Environmental Protection Agency document *NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities* (2016).
- Measure noise levels at four onsite and three offsite stations specified in waste licence W0291-01, as shown in **appendix 1**.
- Assess measured levels in the context of noise limits specified in the licence, reproduced in **appendix 2**. Condition 4.3 of the licence states that limits are applicable to the three offsite stations only.

1.2 The noise survey consisted of daytime, evening and night-time monitoring as required by EPA guidance document NG4. The daytime survey was undertaken Wednesday 15.11.17 and Thursday 16.11.17. Evening monitoring was carried out across both dates. The night-time survey was undertaken 15.11.17 from 2300 h, extending into the early morning of 16.11.17. Survey methodology, equipment specifications and weather conditions are listed in **appendix 3**.

1.3 Operations were underway at the FHR installation throughout the daytime and evening monitoring periods. Night-time operations ceased at 0000 h, although limited site clean-up and maintenance activities occurred after 0000 h. During operating periods, noise emissions arose from the following sources:

- Compressor in continuous operation in building.
- Waste processing lines in continuous operation in building, outside of break periods.
- Mobile plant (grab, telescopic handler, clamp truck, forklift truck) in various use in building.
- Occasional truck movements on yard areas during daytime hours.

2 Results

2.1 Noise data recorded are presented in **appendix 4**, and summarised in **tables 1-3** over. Frequency spectra and time history profiles are shown in **appendix 5**. Tabulated frequency data are presented in **appendix 6**.

Table 1: Noise data summary – Daytime.

Station	N1	N2	N3	N4	NSL1	NSL2	NSL3
Period	Day	Day	Day	Day	Day	Day	Day
Ambient $L_{Aeq\ 30\ min}$ (dB)	63-65	63-66	59-76	58-62	70	65-68	48-51
Facility specific $L_{Aeq\ 30\ min}$ (dB)	<55	53-61	≤75	≤61	<55	<56	<49
Tone objectively detected	x	x	x	x	x	x	x
Tone attributable to facility	x	x	x	x	x	x	x
Facility audibly tonal	x	x	x	x	x	x	x
Facility audibly impulsive	x	x	x	x	x	x	x
Facility rated $L_{AReq\ 30\ min}$ (dB)	<55	53-61	≤75	≤61	<55	<56	<49
Limit (dB)	-	-	-	-	55	55	55
Compliance	N/A	N/A	N/A	N/A	✓	✓	✓

Table 2: Noise data summary – Evening.

Station	N1	N2	N3	N4	NSL1	NSL2	NSL3
Period	Evening	Evening	Evening	Evening	Evening	Evening	Evening
Ambient $L_{Aeq\ 30\ min}$ (dB)	57	57	57	56	64	62	47
Facility specific $L_{Aeq\ 30\ min}$ (dB)	<49	<47	<52	<51	<49	<51	<42
Tone objectively detected	x	x	x	x	x	x	x
Tone attributable to facility	x	x	x	x	x	x	x
Facility audibly tonal	x	x	x	x	x	x	x
Facility audibly impulsive	x	x	x	x	x	x	x
Facility rated $L_{AReq\ 30\ min}$ (dB)	<49	<47	<52	<51	<49	<51	<42
Limit (dB)	-	-	-	-	50	50	50
Compliance	N/A	N/A	N/A	N/A	✓	✓	✓

Table 3: Noise data summary – Night-time.

Station	N1	N2	N3	N4	NSL1	NSL2	NSL3
Period	Night	Night	Night	Night	Night	Night	Night
Ambient $L_{Aeq\ 15\ min}$ (dB)	46-59	52-59	53-57	47-56	54-57	57-58	34-38
Facility specific $L_{Aeq\ 15\ min}$ (dB)	<53	<49	<54	<51	<45	<52	<33
Tone objectively detected	x	x	x	x	x	x	x
Tone attributable to facility	x	x	x	x	x	x	x
Facility audibly tonal	x	x	x	x	x	x	x
Facility audibly impulsive	x	x	x	x	x	x	x
Facility rated $L_{AReq\ 15\ min}$ (dB)	<53	<49	<54	<51	<45	<52	<33
Limit (dB)	-	-	-	-	45	45	45
Compliance	N/A	N/A	N/A	N/A	✓	✓	✓

2.2 Two of the onsite stations, N1 and N2, are located at the western end of the FHR site, adjacent to Forge Hill. The soundscape at both stations throughout all periods was dominated by road traffic passing outside the boundary. Distant traffic was also a significant contributor. Truck movements at the FHR installation were audible when present during daytime hours. In addition, compressor emissions were audible at N1, and in-building operations were slightly audible at N2. The highest FHR specific $L_{Aeq\ T}$ level measured at these stations was 61 dB, attributable to a nearby truck. In the absence of truck movements, FHR $L_{Aeq\ T}$ levels due to the compressor and in-building operations were markedly lower. Traffic noise intrusion prevented calculation of their contribution during daytime and evening hours. The night-time contribution attributable to FHR operations was 38 dB at both stations. Noise limits specified in licence W0291-01 do not apply to N1 or N2.

2.3 Stations N3 and N4 are located at the eastern end of the FHR site, away from Forge Hill traffic. However, this end of the site lies close to national route N27, and road traffic remained continuously intrusive. Daytime levels were significantly influenced by onsite truck activity, with trucks using this end of the FHR site to gain access to the waste processing building. As a result, daytime FHR specific $L_{Aeq\ T}$ levels were 55-75 dB, with the 75 dB level attributable to a truck idling close to the sound level meter. The absence of yard activity during evening and night-time hours resulted in low specific $L_{Aeq\ T}$ levels, falling below background levels in all cases. During these intervals, in-building operations were slightly audible. Noise limits set out in the waste licence do not apply to stations N3 or N4.

2.4 No site emissions were audible at any stage at the three offsite stations NSL1, NSL2 and NSL3, located respectively on Forge Hill, adjacent to the N27, and at a residential estate to the southwest. The noise environment at all three was entirely dominated by road traffic, with traffic remaining significant through the night. Daytime $L_{Aeq\ T}$ levels were 70 dB at NSL1, and slightly lower at NSL2. The absence of local traffic allowed daytime levels to fall towards 48 dB at NSL3. A similar pattern was evident through the evening and into the night. The lowest noise levels recorded at any station were at NSL3 during night-time hours, when reducing traffic in the distance allowed the $L_{Aeq\ T}$ level fall to 34 dB. Noise limits specified in licence W0291-01 apply to the three offsite stations. As FHR emissions were inaudible at these stations, it follows that the limits were complied with.

2.5 Schedule B.4 of the licence prohibits tones or impulses at the offsite stations during night-time hours. Such characteristics, if present in facility emissions during daytime or evening hours, are subject to a penalty rating. No such characteristics were detected in FHR emissions at the offsite stations, and indeed FHR emissions were not audible at these stations. A single tone was detected during the survey, traced to a squeaking gate at an offsite premises (see **appendix 6)**.

3 Conclusions

3.1 Noise levels at all seven stations were chiefly influenced by offsite road traffic, which remained significant through the evening and into the night.

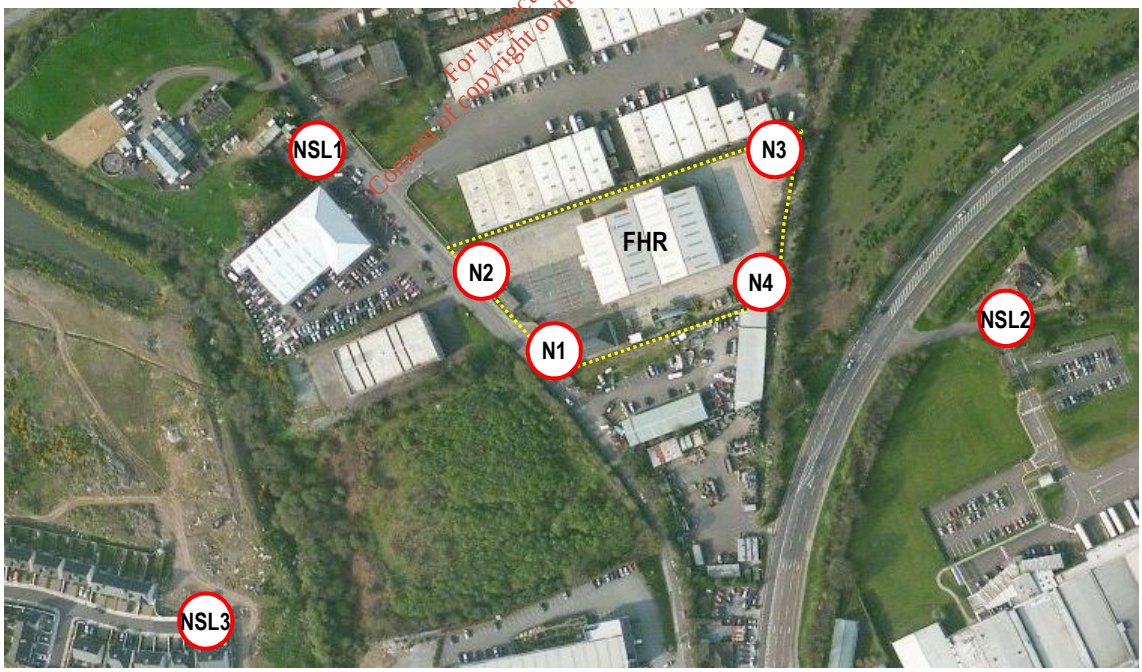
3.2 FHR specific $L_{Aeq\ T}$ levels measured at the four onsite stations N1-N4 ranged from 75 dB during the day to 38 dB during the night. The chief contributor to daytime levels was local truck activity. Noise limits set out in licence W0291-01 do not apply to the four onsite stations.

3.3 No site emissions were audible at any stage at the three offsite stations NSL1-NSL3, the only stations subject to W0291-01 noise criteria. As FHR emissions were inaudible at these stations, it follows that the limits were complied with.

3.4 FHR operations did not give rise to tones or impulses at the offsite stations, thus complying with schedule B.4 of the licence.

Appendix 1: Noise stations

Station	NGR	Location	Propagation route terrain
N1	566800 568768	SW corner of site, adjacent to boundary W of admin building, 5 m S of S gate	Free field; clear line of sight to main building W façade, although S façade and compressor vent partially screened by admin building; terrain level; route over hard ground
N2	566768 568802	NW corner, adjacent to boundary, 5 m S of N gate	Free field; clear line of sight to main building W façade; terrain level; route over hard ground
N3	566913 568859	NE corner, 5 m W of small onsite building	Free field; clear line of sight to main building E façade & roller shutter doors; terrain level; route over hard ground
N4	566901 568794	SE corner, 5 m inside corner apex	Free field; clear line of sight to main building E & S façades; terrain level; route over hard ground
NSL1	567005 568771	Adjacent to dwelling entrance on N side of car garage on Forge Hill, N of FHR, on opposite side of road, 80 m NW of FHR boundary	Free field; line of sight to upper building facades; terrain level; route over hard ground
NSL2	566693 568860	On access road to Ferrero facility off N27, 10 m SW of dwelling, 120 ESE of FHR boundary	Free field; line of sight obscured by local vegetation; terrain approx level; route over hard ground
NSL3	566632 568620	15 m W of end of cul de sac at residential estate SW of FHR, 220 m SW of FHR boundary	Free field; line of sight to upper building facades; terrain falling source-receiver; route over disturbed & hard ground



Appendix 2: W0291-01 noise conditions

1.7 Waste Acceptance Hours and Hours of Operation

1.7.1 With the exception of emergencies or as may be agreed by the Agency, waste shall be accepted at or dispatched from the facility only between the hours of 06:30 and 23:30 Monday to Friday inclusive, 06:30 to 17:30 Saturdays and 08:30 to 17:30 Sundays and Bank Holidays.

1.7.2 The facility shall be operated only during the hours 06:00 and 24:00 Monday to Friday inclusive, 06:00 to 18:00 Saturdays and 08:00 to 18:00 Sundays and Bank Holidays.

4.3 Noise

Noise from the installation shall not give rise to sound pressure levels, measured at any noise-sensitive location, which exceed the limit values.

6.14 Noise

The licensee shall carry out a noise survey of the site operations as required by the Agency. The survey programme shall be undertaken in accordance with the methodology specified in the 'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)' as published by the Agency.

B.4 Noise Emissions

Daytime dB $L_{Ar,T}$ (30 minutes)	Evening time dB $L_{Ar,T}$ (30 minutes)	Night-time dB $L_{Aeq,T}$ (15-30 minutes)
55	50	45 Note 1

Note 1: There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise-sensitive location.

C.5 Noise Monitoring

Location:

	NSL1	(567005E, 568771N)
	NSL2	(566693E, 568860N)
	NSL3	(566632E, 568620N)
	N1	(566800E, 568768N)
	N2	(566768E, 568802N)
	N3	(566913E, 568859N)
	N4	(566901E, 568794N)

Period	Minimum Survey Duration
Daytime	4 hour survey with a minimum of 3 sampling periods at each noise monitoring location Note 2
Evening-time	2 hours survey with a minimum of 1 sampling period at each noise monitoring location.
Night-time Note 1	3 hour survey with a minimum of 2 sampling periods at each noise monitoring location.

Note 1: Night-time measurements should be made between 2300hrs and 0400hrs, Sunday to Thursday, with 2300hrs being the preferred start time.

Note 2: Sampling period is to be the time period T stated within the relevant licence. Typically this will be either 15 minutes or 30 minutes in duration. This applies to day, evening and night time periods.

Appendix 3: Survey details

File	Project ref.	107
	Client	O'Callaghan Moran & Associates OBO Forge Hill Recycling
	Location	FHR Forge Hill Cork
	Stations	Onsite: N1 N2 N3 N4 Offsite: NSL1 NSL2 NSL3
	Purpose	Waste licence compliance survey
	Comment	Facility operating **DAY 1 – 2250**
Event	Period	Daytime
	Date	15.11.17
	Day	Wednesday
	Time	1545-1900
	Operator	Damian Brosnan BSc MSc MIOA MIEI
	Sound level meter	2250: N2 N4 NSL1 NSL2 NSL3 2250L: N1 N3
Conditions	Cloud cover	100 %
	Precipitation	0 mm
	Temperature	13 falling to 11 °C
Wind	Direction	SW
	Speed	0-2 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2506594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband & 1/3 octaves
	Max. input level	141.16 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA-1650
	Sound field correction	Free-field
	UKAS calibration	08.02.16
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Onsite calibration	Time	15/11/2017 15:50:54
	Type	External
	Sensitivity	47.30 mV/Pa
	Post survey check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	3017723
	UKAS calibration	20.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Methodology	Standards	ISO 1996 (2007 & 2016) EPA NG4 (2016)
	Microphone position	Free field, 1.5 m above ground level
	Intervals	30 min logging at 10 s
Uncertainty	Instrumentation	±1 dB (IEC 61672:2002 Class 1)
	External	±0-3 dB (station & weather dependent, estimated)
	Total	±5 dB (estimated, including expanded uncertainty)

File	Project ref.	107
	Client	O'Callaghan Moran & Associates OBO Forge Hill Recycling
	Location	FHR Forge Hill Cork
	Stations	Onsite: N1 N2 N3 N4 Offsite: NSL1 NSL2 NSL3
	Purpose	Waste licence compliance survey
	Comment	Facility operating **DAY 1 – 2250L**
Event	Period	Daytime
	Date	15.11.17
	Day	Wednesday
	Time	1545-1900
	Operator	Damian Brosnan BSc MSc MIOA MIEI
	Sound level meter	2250: N2 N4 NSL1 NSL2 NSL3 2250L: N1 N3
Conditions	Cloud cover	100 %
	Precipitation	0 mm
	Temperature	13 falling to 11 °C
Wind	Direction	SW
	Speed	0-2 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250-L
	Instrument serial no.	2566801
	Microphone serial no.	2571655
	Application	BZ7130 Version 2.0
	Bandwidth	Broadband & 1/3 octaves
	Max. input level	142.66 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA1404 outdoor kit
	Sound field correction	Free-field
	UKAS calibration	24.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Onsite calibration	Time	15/11/2017 15:57:27
	Type	External
	Sensitivity	42.24 mV/Pa
	Post survey check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	3017723
	UKAS calibration	20.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Methodology	Standards	ISO 1996 (2007 & 2016) EPA NG4 (2016)
	Microphone position	Free field, 1.5 m above ground level
	Intervals	30 min logging at 10 s
Uncertainty	Instrumentation	±1 dB (IEC 61672:2002 Class 1)
	External	±0-3 dB (station & weather dependent, estimated)
	Total	±5 dB (estimated, including expanded uncertainty)

File	Project ref.	107
	Client	O'Callaghan Moran & Associates OBO Forge Hill Recycling
	Location	FHR Forge Hill Cork
	Stations	Onsite: N1 N2 N3 N4 Offsite: NSL1 NSL2 NSL3
	Purpose	Waste licence compliance survey
	Comment	Facility operating **DAY 2 – 2250**
Event	Period	Daytime
	Date	16.11.17
	Day	Thursday
	Time	0745-1500
	Operator	Damian Brosnan BSc MSc MIOA MIEI
	Sound level meter	2250: N2 N4 NSL1 NSL2 NSL3 2250L: N1 N3
Conditions	Cloud cover	Initially 100 %, clearing quickly to 0 % by 1000
	Precipitation	0 mm
	Temperature	9 rising to 11 °C
Wind	Direction	NW
	Speed	0-2 m/s, rising to 1-3 m/s after 1300
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2506594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband & 1/3 octaves
	Max. input level	141.16 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA-1650
	Sound field correction	Free-field
	UKAS calibration	08.02.16
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Onsite calibration	Time	16/11/2017 07:56:23
	Type	External
	Sensitivity	47.44 mV/Pa
	Post survey check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	3017723
	UKAS calibration	20.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Methodology	Standards	ISO 1996 (2007 & 2016) EPA NG4 (2016)
	Microphone position	Free field, 1.5 m above ground level
	Intervals	30 min logging at 10 s
Uncertainty	Instrumentation	±1 dB (IEC 61672:2002 Class 1)
	External	±0-3 dB (station & weather dependent, estimated)
	Total	±5 dB (estimated, including expanded uncertainty)

File	Project ref.	107
	Client	O'Callaghan Moran & Associates OBO Forge Hill Recycling
	Location	FHR Forge Hill Cork
	Stations	Onsite: N1 N2 N3 N4 Offsite: NSL1 NSL2 NSL3
	Purpose	Waste licence compliance survey
	Comment	Facility operating **DAY 2 – 2250L**
Event	Period	Daytime
	Date	16.11.17
	Day	Thursday
	Time	0745-1500
	Operator	Damian Brosnan BSc MSc MIOA MIEI
	Sound level meter	2250: N2 N4 NSL1 NSL2 NSL3 2250L: N1 N3
Conditions	Cloud cover	Initially 100 %, clearing quickly to 0 % by 1000
	Precipitation	0 mm
	Temperature	9 rising to 11 °C
Wind	Direction	NW
	Speed	0-2 m/s, rising to 1-3 m/s after 1300
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250-L
	Instrument serial no.	2566801
	Microphone serial no.	2571655
	Application	BZ7130 Version 2.0
	Bandwidth	Broadband & 1/3 octaves
	Max. input level	142.66 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA1404 outdoor kit
	Sound field correction	Free-field
	UKAS calibration	24.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Onsite calibration	Time	16/11/2017 08:00:34
	Type	External
	Sensitivity	41.77 mV/Pa
	Post survey check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	3017723
	UKAS calibration	20.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Methodology	Standards	ISO 1996 (2007 & 2016) EPA NG4 (2016)
	Microphone position	Free field, 1.5 m above ground level
	Intervals	30 min logging at 10 s
Uncertainty	Instrumentation	±1 dB (IEC 61672:2002 Class 1)
	External	±0-3 dB (station & weather dependent, estimated)
	Total	±5 dB (estimated, including expanded uncertainty)

File	Project ref.	107
	Client	O'Callaghan Moran & Associates OBO Forge Hill Recycling
	Location	FHR Forge Hill Cork
	Stations	Onsite: N1 N2 N3 N4 Offsite: NSL1 NSL2 NSL3
	Purpose	Waste licence compliance survey
	Comment	Facility operating **EVE 1 & NIGHT – 2250**
Event	Period	Evening & night-time
	Date	15.11.17—16.11.17
	Day	Wednesday evening to Thursday morning
	Time	2000-0300
	Operator	Damian Brosnan BSc MSc MIOA MIEI
	Sound level meter	2250: N2 N4 NSL1 NSL2 NSL3 2250L: N1 N3
Conditions	Cloud cover	100 %
	Precipitation	0 mm
	Temperature	11 °C
Wind	Direction	SW veering W from 2200
	Speed	1-4 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2506594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband & 1/3 octaves
	Max. input level	141.16 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA-1650
	Sound field correction	Free-field
	UKAS calibration	08.02.16
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Onsite calibration	Time	15/11/2017 20:21:01
	Type	External
	Sensitivity	47.39 mV/Pa
	Post survey check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	3017723
	UKAS calibration	20.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Methodology	Standards	ISO 1996 (2007 & 2016) EPA NG4 (2016)
	Microphone position	Free field, 1.5 m above ground level
	Intervals	30 min logging at 10 s
Uncertainty	Instrumentation	±1 dB (IEC 61672:2002 Class 1)
	External	±0-3 dB (station & weather dependent, estimated)
	Total	±5 dB (estimated, including expanded uncertainty)

File	Project ref.	107
	Client	O'Callaghan Moran & Associates OBO Forge Hill Recycling
	Location	FHR Forge Hill Cork
	Stations	Onsite: N1 N2 N3 N4 Offsite: NSL1 NSL2 NSL3
	Purpose	Waste licence compliance survey
	Comment	Facility operating **EVE 1 & NIGHT – 2250L**
Event	Period	Evening & night-time
	Date	15.11.17—16.11.17
	Day	Wednesday evening to Thursday morning
	Time	2000-0300
	Operator	Damian Brosnan BSc MSc MIOA MIEI
	Sound level meter	2250: N2 N4 NSL1 NSL2 NSL3 2250L: N1 N3
Conditions	Cloud cover	100 %
	Precipitation	0 mm
	Temperature	11 °C
Wind	Direction	SW veering W from 2200
	Speed	1-4 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250-L
	Instrument serial no.	2566801
	Microphone serial no.	2571655
	Application	BZ7130 Version 2.0
	Bandwidth	Broadband & 1/3 octaves
	Max. input level	142.66 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA1404 outdoor kit
	Sound field correction	Free-field
	UKAS calibration	24.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Onsite calibration	Time	15/11/2017 21:53:18
	Type	External
	Sensitivity	42.04 mV/Pa
	Post survey check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	3017723
	UKAS calibration	20.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Methodology	Standards	ISO 1996 (2007 & 2016) EPA NG4 (2016)
	Microphone position	Free field, 1.5 m above ground level
	Intervals	30 min logging at 10 s
Uncertainty	Instrumentation	±1 dB (IEC 61672:2002 Class 1)
	External	±0-3 dB (station & weather dependent, estimated)
	Total	±5 dB (estimated, including expanded uncertainty)

File	Project ref.	107
	Client	O'Callaghan Moran & Associates OBO Forge Hill Recycling
	Location	FHR Forge Hill Cork
	Stations	Onsite: N1 N2 N3 N4 Offsite: NSL1 NSL2 NSL3
	Purpose	Waste licence compliance survey
	Comment	Facility operating **EVE 2 – 2250**
Event	Period	Evening
	Date	16.11.17
	Day	Thursday
	Time	2030-2130
	Operator	Damian Brosnan BSc MSc MIOA MIEI
	Sound level meter	2250
Conditions	Cloud cover	10 %
	Precipitation	0 mm
	Temperature	4 °C
Wind	Direction	NW airflow
	Speed	0 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2506594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband & 1/3 octaves
	Max. input level	141.16 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA-1650
	Sound field correction	Free-field
	UKAS calibration	08.02.16
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Onsite calibration	Time	16/11/2017 20:38:36
	Type	External
	Sensitivity	47.66 mV/Pa
	Post survey check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	3017723
	UKAS calibration	20.01.17
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Methodology	Standards	ISO 1996 (2007 & 2016) EPA NG4 (2016)
	Microphone position	Free field, 1.5 m above ground level
	Intervals	30 min logging at 10 s
Uncertainty	Instrumentation	±1 dB (IEC 61672:2002 Class 1)
	External	±0-3 dB (station & weather dependent, estimated)
	Total	±5 dB (estimated, including expanded uncertainty)

Appendix 4: Noise data

See glossary at end of report for definition of parameters
Daytime T: 30 min Evening T: 30 min Night-time T: 15 min
Daytime 0700-1900 Evening 1900-2300 Night-time 2300-0700

Station	Date	Time	Wind vector	$L_{Aeq\,T}$ dB	$L_{AF10\,T}$ dB	$L_{AF90\,T}$ dB	Specific $L_{Aeq\,T}$ dB
N1 day 1/3	15.11.17	1633-1703	0	63	67	57	53
	Facility: Inbuilding operations inaudible, apart from compressor audible at low level ramping up and down. Truck movement x1 through entrance dominant when present. Truck idling at 20 m from 1645 clearly audible until shut off at 1651. **Extraneous**: Road traffic outside boundary continuously dominant, masking all sources except distant road traffic, particularly N27 traffic. **Specific $L_{Aeq\,T}$ determination**: Only onsite source of significance: truck idling 1645-1651. L90 during this period representative, normalised to 30 min.						
N1 day 2/3	16.11.17	0838-0908	0	65	69	54	<54
	Facility: Compressor continuously at low level. Truck idling on weighbridge at NW corner of site continuously quite audible until departure at 0847. Sporadic truck movements through adjacent gate dominant when present. **Extraneous**: Passing traffic outside boundary almost continuously dominant. Distant traffic also quite audible. Low altitude aircraft audible. **Specific $L_{Aeq\,T}$ determination**: Traffic, truck and compressor all contributing to L90. Not possible to determine site contribution. <L90 determination possible only.						
N1 day 3/3	16.11.17	1206-1236	0	63	66	55	<55
	Facility: Compressor continuously slightly audible. Several vehicle movements through gate clearly audible. **Extraneous**: As previous. **Specific $L_{Aeq\,T}$ determination**: Not possible to determine compressor contribution due to traffic intrusion. <L90 determination possible only.						
N1 eve 1/1	15.11.17	2231-2301	0	57	59	49	<49
	Facility: Compressor quite audible continuously, ramping up and down. No other emissions audible. **Extraneous**: N27 traffic to S almost continuously quite audible. Intermittent passing traffic outside boundary dominant when present. Aircraft. **Specific $L_{Aeq\,T}$ determination**: N27 & N40 traffic reducing slightly, although still affecting L90. <L90 derivation possible only.						
N1 night 1/2	15.11.17	2302-2317	0	59	60	53	<53
	Facility: As previous. **Extraneous**: As previous. **Specific $L_{Aeq\,T}$ determination**: As previous.						
N1 night 2/2	16.11.17	0235-2050	0	46	47	38	38
	Facility: Compressor quite audible continuously. **Extraneous**: Distant road traffic regularly quite audible. Sporadic passing road traffic outside boundary dominant when present. **Specific $L_{Aeq\,T}$ determination**: Traffic sufficiently reduced to allow L90 become representative of compressor.						
N2 day 1/3	15.11.17	1627-1657	0	64	67	56	53
	Facility: Inbuilding operations slightly audible from time to time, chiefly plant reversing alarms. Truck manoeuvring and idling at 20 m 1645-1651 clearly audible. Nearest roller shutter door open 1657-1700, allowing inbuilding waste processing plant become continuously audible at low level. **Extraneous**: Road traffic outside boundary continuously dominant, masking all sources except distant road traffic, particularly N27 traffic. **Specific $L_{Aeq\,T}$ determination**: Only onsite source of significance: truck idling 1645-1651. L90 during this period representative, normalised to 30 min. L90 during period 1657-1700 dominated by road traffic.						

Audibility scale: Inaudible; faintly discernible; slightly audible; audible at low level; quite audible; clearly audible; dominant; intrusive; excessive.

Station	Date	Time	Wind vector	$L_{Aeq\,T}$ dB	$L_{AF10\,T}$ dB	$L_{AF90\,T}$ dB	Specific $L_{Aeq\,T}$ dB
N2 day 2/3	16.11.17	0837-0907	0	66	69	55	61
	Facility: Truck idling on weighbridge to 0847 continuously clearly audible. No other emissions audible, apart from faintly audible inbuilding reversing alarms after 0847. **Extraneous**: Passing traffic outside boundary almost continuously dominant. Distant traffic also quite audible, partially masked by idling truck. Loudest vehicle movements at commercial park N of boundary audible at low level. Low altitude aircraft audible. **Specific $L_{Aeq\,T}$ determination**: L90 to 0847 representative, normalised to 30 min.						
N2 day 3/3	16.11.17	1204-1234	0	63	66	56	54
	Facility: No emissions audible, due to break, apart from single truck movement through adjacent gate 1216. **Extraneous**: Passing traffic outside boundary almost continuously dominant. Distant traffic also quite audible. Loudest vehicle movements at commercial park N of boundary audible at low level, in addition to recurring impulsive source, unidentified. Low altitude aircraft audible. **Specific $L_{Aeq\,T}$ determination**: Truck movement LAeq, normalised to 30 min.						
N2 eve 1/1	15.11.17	2225-2255	0	57	59	47	<47
	Facility: Inbuilding operations audible at low level continuously. **Extraneous**: N27 traffic to S quite audible continuously. Intermittent passing traffic dominant when present. Aircraft. **Specific $L_{Aeq\,T}$ determination**: L90 unrepresentative due to N27 traffic. <L90 determination possible only.						
N2 night 1/2	15.11.17	2300-2315	0	59	61	49	<49
	Facility: As previous. **Extraneous**: As previous. **Specific $L_{Aeq\,T}$ determination**: As previous.						
N2 night 2/2	16.11.17	0233-0248	0	52	46	38	38
	Facility: Compressor slightly audible continuously. **Extraneous**: Distant road traffic regularly quite audible. Sporadic passing road traffic outside boundary dominant when present. Occasional banging, vehicle movements, and gate-squeak quite audible at commercial premises to NE. **Specific $L_{Aeq\,T}$ determination**: L90 considered representative of compressor.						
N3 day 1/3	15.11.17	1600-1630	0	76	83	58	75
	Facility: Several truck movements on yard until 1619, remaining dominant throughout due to idling/manoeuvring. Truck idling adjacent to SLM 1613-1619. Trucks tipping in building also clearly audible. From 1620, trucks absent, and building roller shutter doors closed, with inbuilding operations remaining slightly audible. **Extraneous**: Road traffic in several directions continuously clearly audible, masking all other extraneous sources except airport related air traffic. **Specific $L_{Aeq\,T}$ determination**: Leq to 1619 representative of yard activity, normalised to 30 min. Inbuilding emissions negligible in context of continuous traffic.						
N3 day 2/3	16.11.17	0803-0833	0	61	62	58	55
	Facility: Several truck movements on yard dominant when present. Operations in building slightly audible, almost entirely masked by traffic. **Extraneous**: As previous. **Specific $L_{Aeq\,T}$ determination**: L90 representative of continuous traffic. Leq to 0814, minus L90, considered representative of facility, normalised to 30 min.						
N3 day 3/3	16.11.17	1130-1200	0	59	61	56	<56
	Facility: As previous. **Extraneous**: As previous. **Specific $L_{Aeq\,T}$ determination**: <Leq determination possible only, due to dominance of traffic.						

Audibility scale: Inaudible; faintly discernible; slightly audible; audible at low level; quite audible; clearly audible; dominant; intrusive; excessive.

Station	Date	Time	Wind vector	$L_{Aeq\ T}$ dB	$L_{AF10\ T}$ dB	$L_{AF90\ T}$ dB	Specific $L_{Aeq\ T}$ dB
N3 eve 1/1	15.11.17	2157-2227	0	57	60	52	<52
	Facility: No emissions audible, apart from slightly audible grab activity to 2200. **Extraneous**: N27 & N40 traffic continuously clearly audible, dominating soundscape. Ferrero whine also clearly audible. Aircraft. Rustling trees nearby quite audible intermittently. **Specific $L_{Aeq\ T}$ determination**: Traffic dominating all parameters, including L90. <L90 determination.						
N3 night 1/2	15.11.17	2324-2339	0	57	60	54	<54
	Facility: Inbuilding operations audible at low level continuously, significantly masked by N27 traffic. **Extraneous**: N27 & N40 traffic continuously clearly audible, and continuing to dominate soundscape. Ferrero whine continuously clearly audible. **Specific $L_{Aeq\ T}$ determination**: As previous.						
N3 night 2/2	16.11.17	0210-0225	0	53	55	46	<45
	Facility: No emissions audible. **Extraneous**: Road traffic regularly clearly audible in distance on several roads. Ferrero whine continuously significant, dominating soundscape outside traffic movements. Lightly rustling vegetation audible at low level. Occasional birdsong. Loud passing source on N27 0212. **Specific $L_{Aeq\ T}$ determination**: Inaudible, thus <L95.						
N4 day 1/3	15.11.17	1554-1624	0	62	64	57	61
	Facility: Several truck movements on yard until 1619, remaining dominant throughout due to idling/manoeuvring. From 1620, operations in building continuously slightly audible. **Extraneous**: N27 & N40 traffic continuously clearly audible, masking all other extraneous sources apart from airport related air traffic. **Specific $L_{Aeq\ T}$ determination**: Leq to 1619 representative of yard activity, normalised to 30 min. Inbuilding emissions negligible in context of continuous traffic.						
N4 day 2/3	16.11.17	0759-0829	0	60	62	57	56
	Facility: Several truck movements on yard up to 0814 dominant when present. Operations in building slightly audible, almost entirely masked by traffic. **Extraneous**: As previous. **Specific $L_{Aeq\ T}$ determination**: L90 representative of continuous traffic. Leq to 0814, minus L90, considered representative of facility, normalised to 30 min.						
N4 day 3/3	16.11.17	1128-1158	0	58	59	55	<58
	Facility: Several truck movements on yard clearly audible. Operations in building slightly audible, almost entirely masked by traffic. **Extraneous**: As previous. Continuous unidentified plant source clearly audible outside boundary. **Specific $L_{Aeq\ T}$ determination**: <Leq determination possible only, due to traffic and offsite plant intrusion						
N4 eve 1/1	15.11.17	2151-2221	0	56	58	51	<51
	Facility: Processing emissions in building slightly audible continuously to 2158, when shut down. No emissions audible thereafter. **Extraneous**: N27 & N40 traffic continuously clearly audible, dominating soundscape. Ferrero whine also clearly audible. Aircraft. **Specific $L_{Aeq\ T}$ determination**: N27 traffic dominating all parameters, including L90. <L90 determination possible only.						
N4 night 1/2	15.11.17	2318-2333	0	56	59	51	<51
	Facility: Inbuilding operations slightly audible continuously, almost entirely masked by road traffic noise. **Extraneous**: N27 & N40 traffic continuously dominant. Ferrero whine also clearly audible continuously. **Specific $L_{Aeq\ T}$ determination**: As previous.						
N4 night 2/2	16.11.17	0211-0226	0	47	50	40	<39
	Facility: No emissions audible. **Extraneous**: Road traffic regularly clearly audible in distance on several roads. Ferrero whine continuously significant, dominating soundscape outside of traffic movements. Occasional birdsong. **Specific $L_{Aeq\ T}$ determination**: Inaudible, thus <L95.						

Audibility scale: Inaudible; faintly discernible; slightly audible; audible at low level; quite audible; clearly audible; dominant; intrusive; excessive.

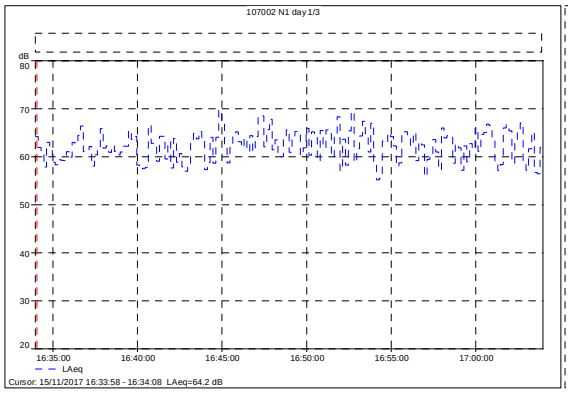
Station	Date	Time	Wind vector	$L_{Aeq\,T}$ dB	$L_{AF10\,T}$ dB	$L_{AF90\,T}$ dB	Specific $L_{Aeq\,T}$ dB
NSL1 day 1/3	15.11.17	1711-1741	-	70	74	54	<52
	Facility: Inaudible. **Extraneous**: Passing traffic frequent, and continuously intrusive. During infrequent lulls, distant traffic clearly audible. **Specific $L_{Aeq\,T}$ determination**: Inaudible, thus <L95.						
NSL1 day 2/3	16.11.17	0916-0946	-	70	75	56	<55
	Facility: Inaudible. **Extraneous**: As previous. Vehicle movements also audible at commercial park across road. Low altitude aircraft audible. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL1 day 3/3	16.11.17	1332-1402	-	70	75	56	<55
	Facility: Inaudible. **Extraneous**: As previous. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL1 eve 1/1	16.11.17	2040-2110	-	64	66	50	<49
	Facility: Inaudible. **Extraneous**: Intermittent passing traffic dominant. During lulls, distant traffic continuously clearly audible. Aircraft. Continuous Ferrero emissions audible as during night-time, although less so. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL1 night 1/2	15/16.11.17	2346-0001	-	57	53	46	<45
	Facility: Inaudible. **Extraneous**: N27 & N40 traffic continuously clearly audible, dominating soundscape. Occasional passing road traffic intrusive when present. Ferrero whine continuously clearly audible. **Specific $L_{Aeq\,T}$ determination**: Inaudible, thus <L95.						
NSL1 night 2/2	16.11.17	0054-0109	-	54	50	43	<42
	Facility: Inaudible. **Extraneous**: As previous, although traffic volume reducing. Squeaking electric gates at 20 m clearly audible during final minute. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL2 day 1/3	15.11.17	1830-1900	+	65	69	55	<54
	Facility: Inaudible. **Extraneous**: N27 traffic continuously dominant. No other noise audible apart from continuously clearly audible refrigerated trailer(s) at Ferrero facility, in addition to whine from unidentified source at same facility. **Specific $L_{Aeq\,T}$ determination**: Inaudible, thus <L95.						
NSL2 day 2/3	16.11.17	1034-1104	+	68	71	57	<56
	Facility: Inaudible. **Extraneous**: N27 and N40 traffic continuously dominant. Continuous emissions at Ferrero facility also audible at low level. No other noise audible, apart from immediately adjacent birdsong, and several vehicle movements through adjacent Ferrero gate. Airport related air traffic clearly audible when present. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL2 day 3/3	16.11.17	1253-1323	+	67	71	57	<56
	Facility: Inaudible. **Extraneous**: As previous. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL2 eve 1/1	15.11.17	2103-2133	+	62	66	53	<51
	Facility: Inaudible. **Extraneous**: N27 traffic continuously dominant. No other noise audible apart from continuously clearly audible refrigerated trailer(s) at adjacent Ferrero facility, in addition to whine from unidentified source at same facility. Aircraft activity at airport audible. **Specific $L_{Aeq\,T}$ determination**: Inaudible, thus <L95.						

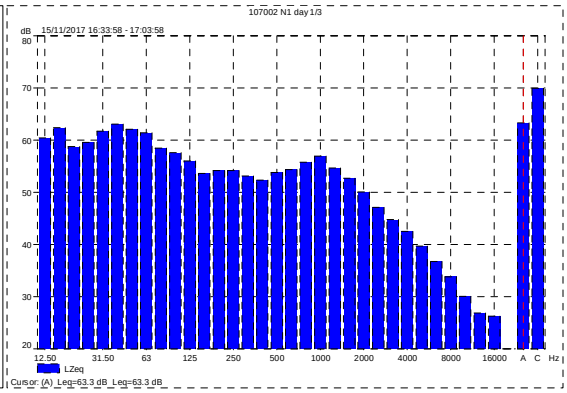
Audibility scale: Inaudible; faintly discernible; slightly audible; audible at low level; quite audible; clearly audible; dominant; intrusive; excessive.

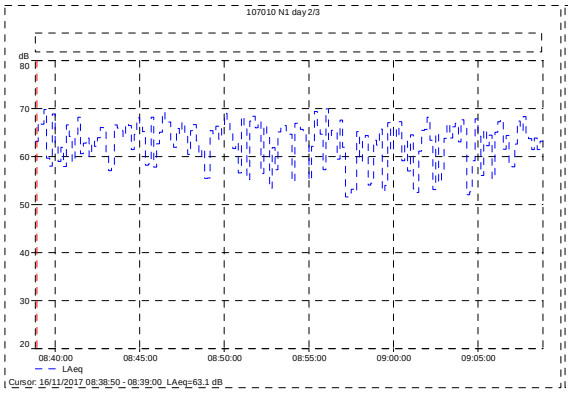
Station	Date	Time	Wind vector	$L_{Aeq\,T}$ dB	$L_{AF10\,T}$ dB	$L_{AF90\,T}$ dB	Specific $L_{Aeq\,T}$ dB
NSL2 night 1/2	16.11.17	0009-0024	+	58	61	53	<52
	Facility: Inaudible. **Extraneous**: Continuous emissions from adjacent Ferrero facility continuously dominant, masking all sources except frequent N27 traffic, and several car movements through adjacent Ferrero entrance. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL2 night 2/2	16.11.17	0119-0134	+	57	58	51	<49
	Facility: Inaudible. **Extraneous**: Continuous emissions from adjacent Ferrero facility dominant, masking all sources except intermittent N27 traffic, **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL3 day 1/3	15.11.17	1751-1821	-	48	51	44	<43
	Facility: Inaudible. **Extraneous**: Road traffic continuously clearly audible in several directions, particularly to SE. Occasional local traffic movements clearly audible in surrounding residential estate. Aircraft. **Specific $L_{Aeq\,T}$ determination**: Inaudible, thus <L95.						
NSL3 day 2/3	16.11.17	0954-1024	-	51	52	47	<47
	Facility: Inaudible. **Extraneous**: As previous. Activity also regularly audible at low level in several commercial premises to W, in addition to sporadic truck and construction plant movements at site 50 m W. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL3 day 3/3	16.11.17	1409-1439	-	51	52	49	<49
	Facility: Inaudible. **Extraneous**: As previous, joined by construction plant audible to S. Refuse truck operating in surrounding estate audible 1418-1423. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL3 eve 1/1	15.11.17	2022-2052	-	47	49	42	<42
	Facility: Inaudible. **Extraneous**: Road traffic continuously clearly audible in several directions, particularly to SE. Occasional local traffic movements clearly audible in surrounding residential estate. Aircraft. Birdsong (due to street lights). **Specific $L_{Aeq\,T}$ determination**: Inaudible, thus <L95.						
NSL3 night 1/2	16.11.17	0033-0048	-	38	40	33	<33
	Facility: Inaudible. **Extraneous**: Road traffic continuously clearly audible in several directions. Ferrero whine audible at low level. **Specific $L_{Aeq\,T}$ determination**: As previous.						
NSL3 night 2/2	16.11.17	0143-0158	-	34	36	31	<31
	Facility: Inaudible. **Extraneous**: As previous, although traffic volume considerably reduced. **Specific $L_{Aeq\,T}$ determination**: As previous.						

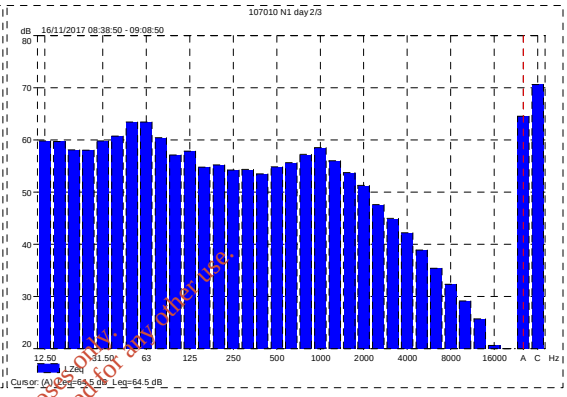
Audibility scale: Inaudible; faintly discernible; slightly audible; audible at low level; quite audible; clearly audible; dominant; intrusive; excessive.

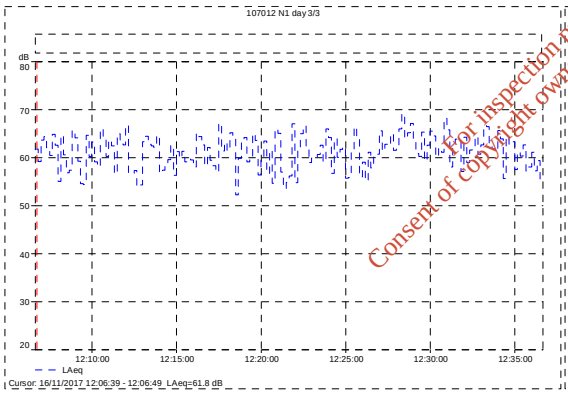
Appendix 5: Profiles & spectra

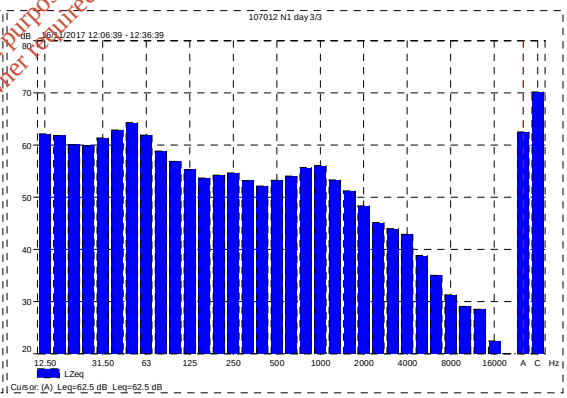


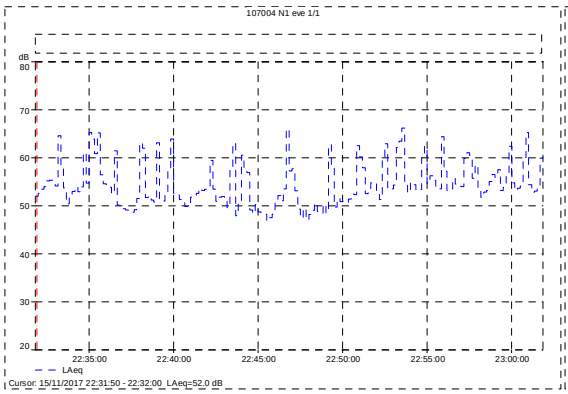


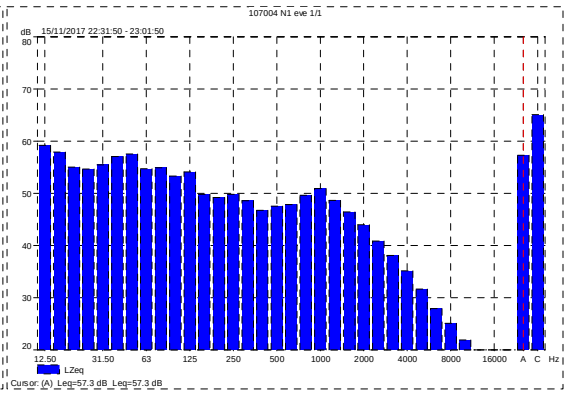


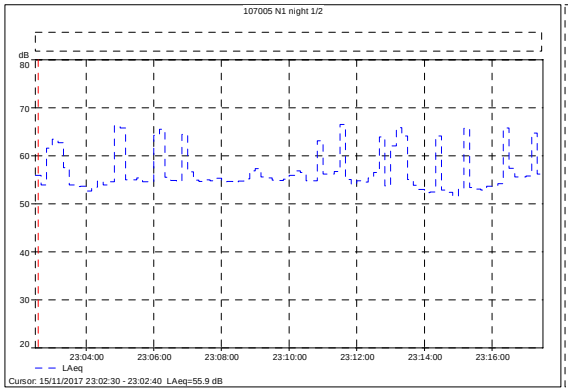


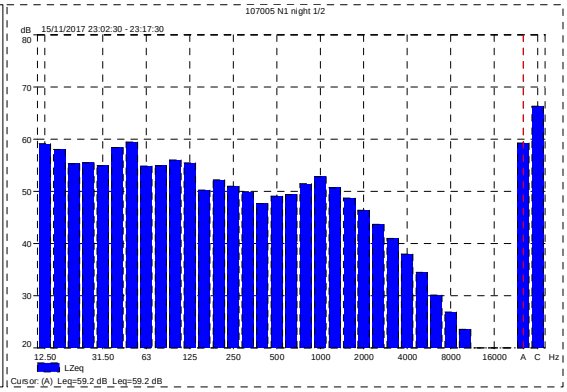


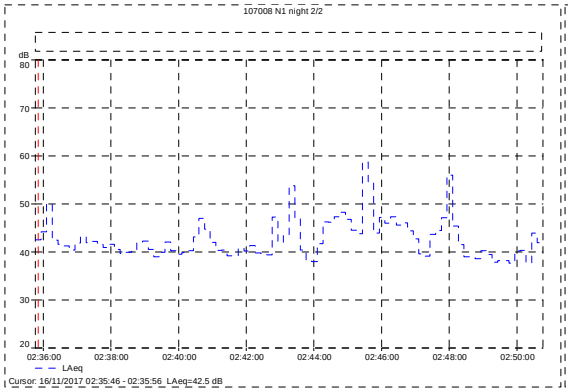


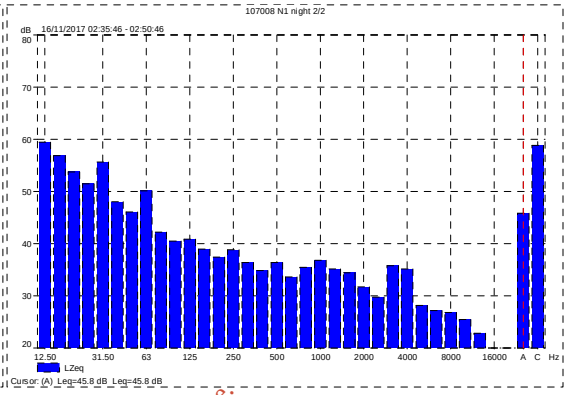


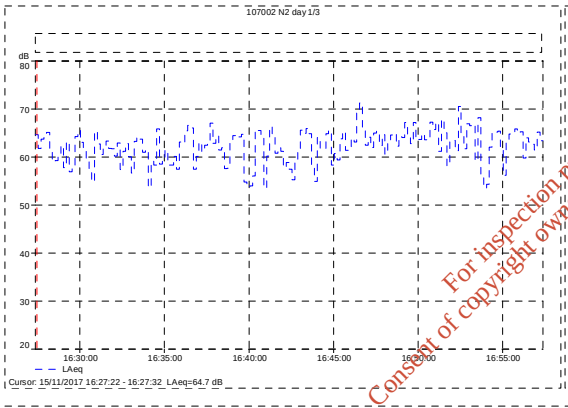


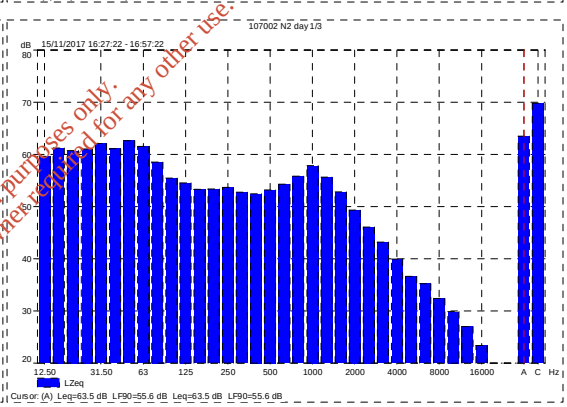


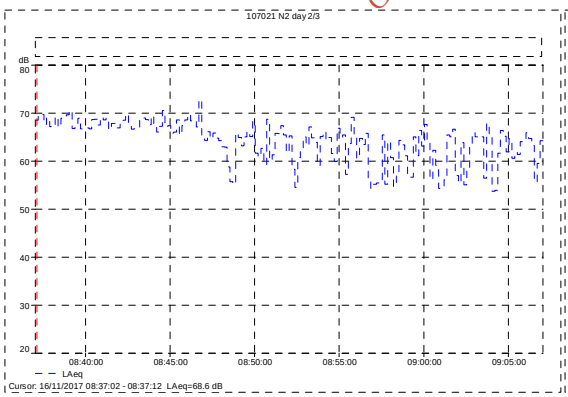


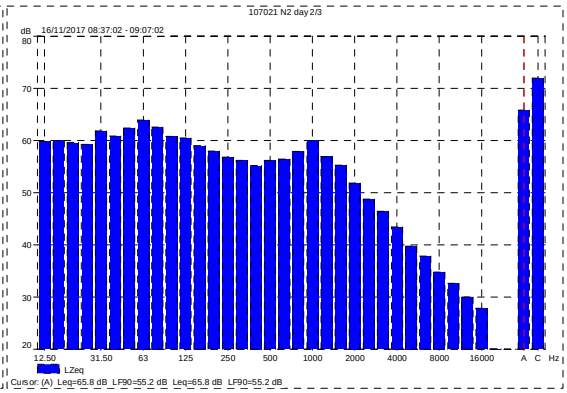


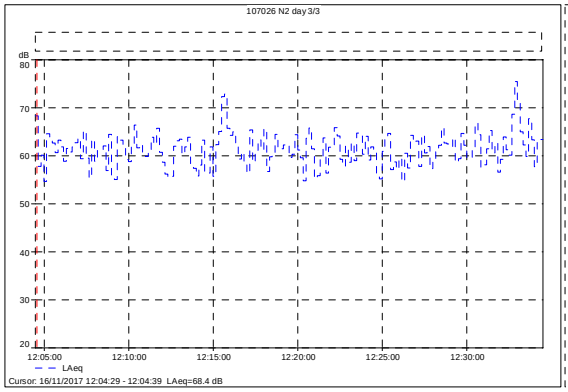


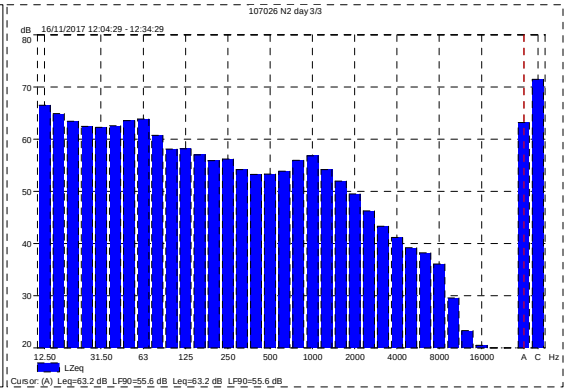


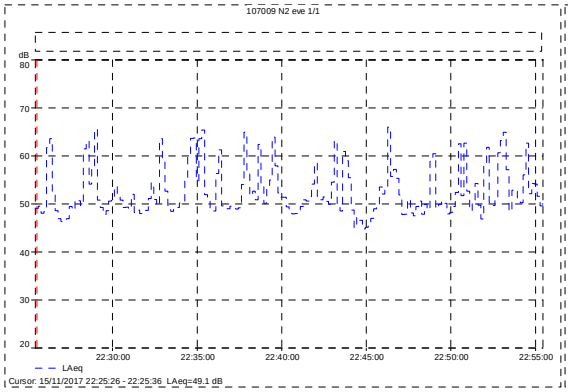


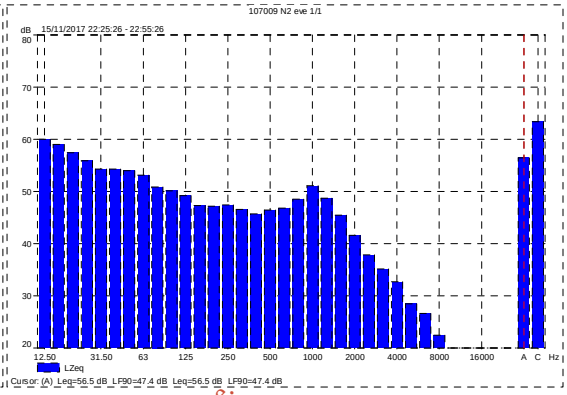


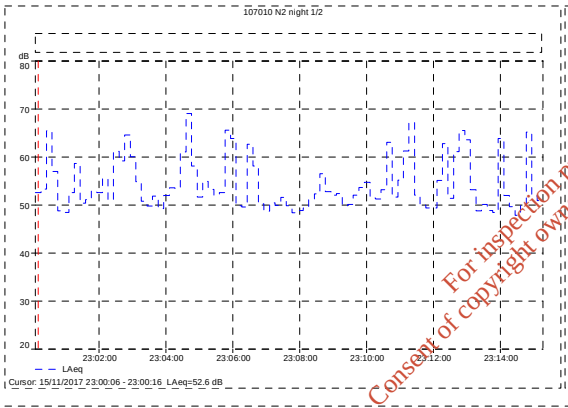


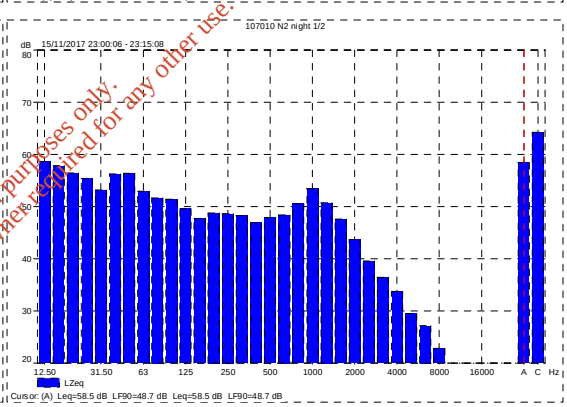


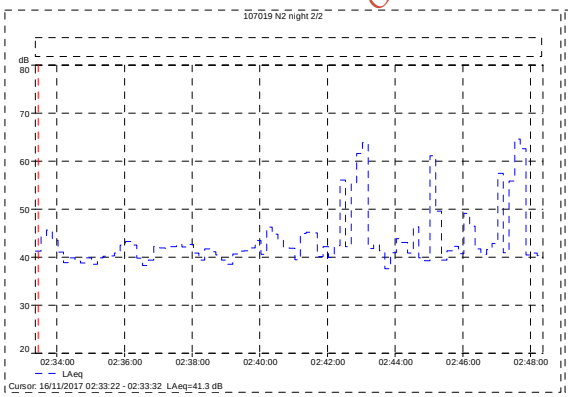


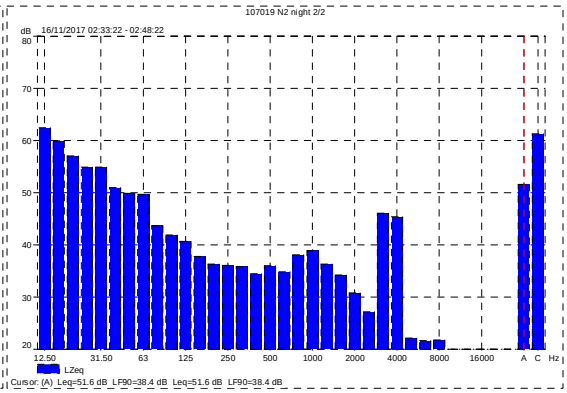


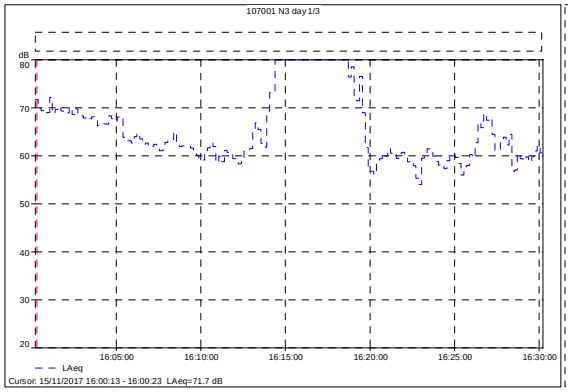


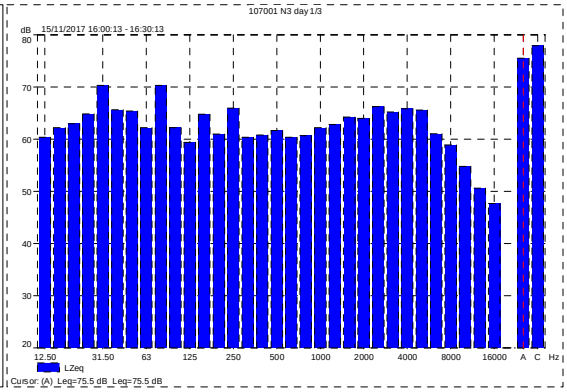


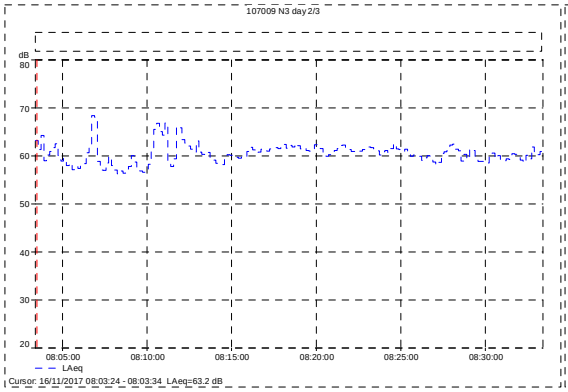


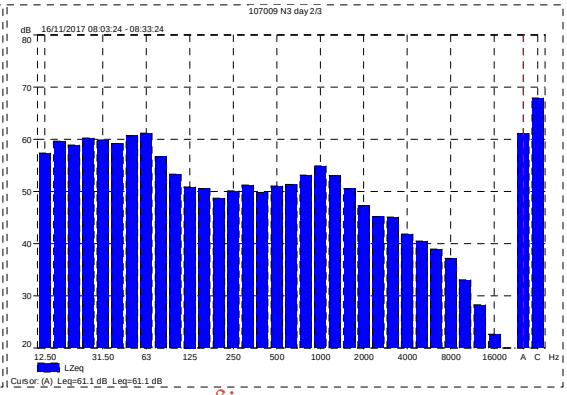


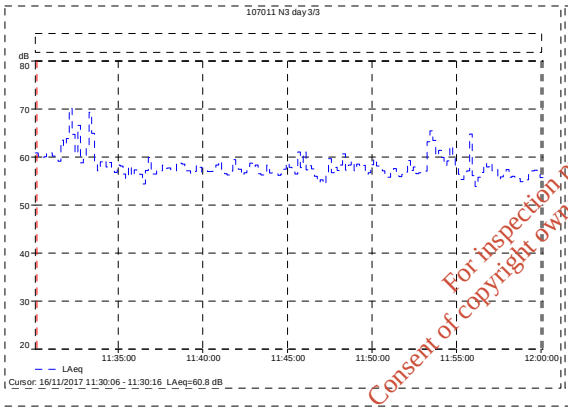


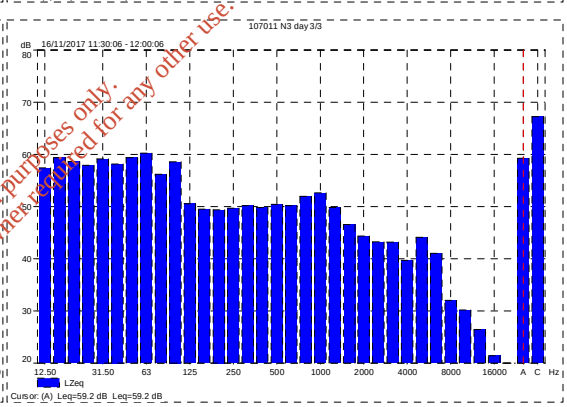


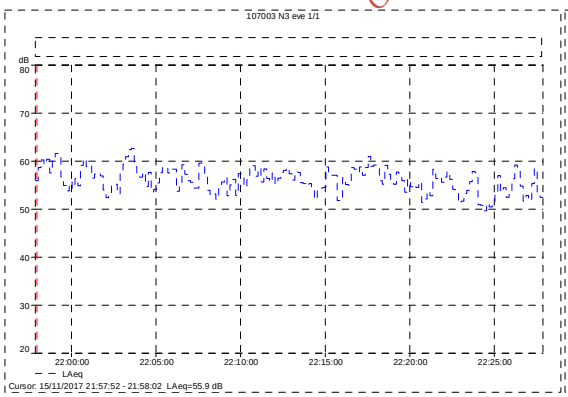


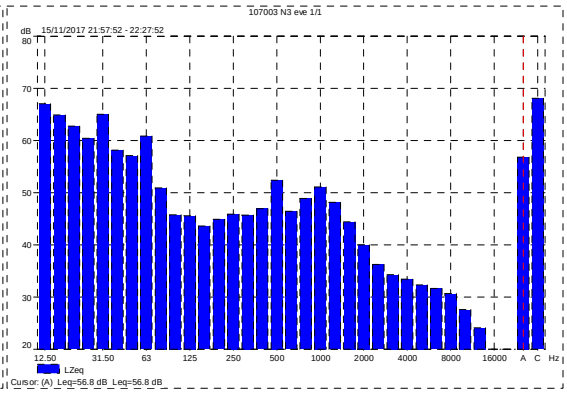


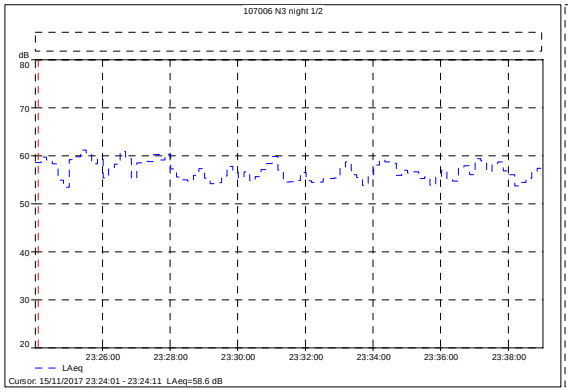


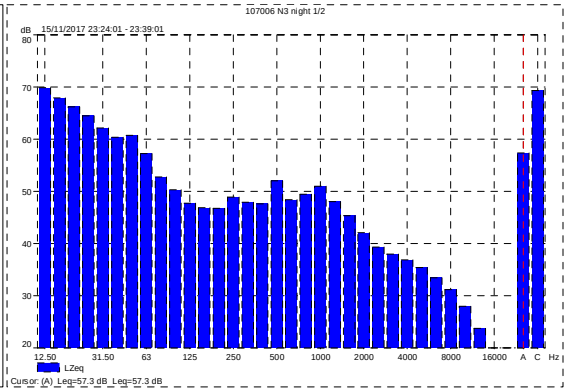


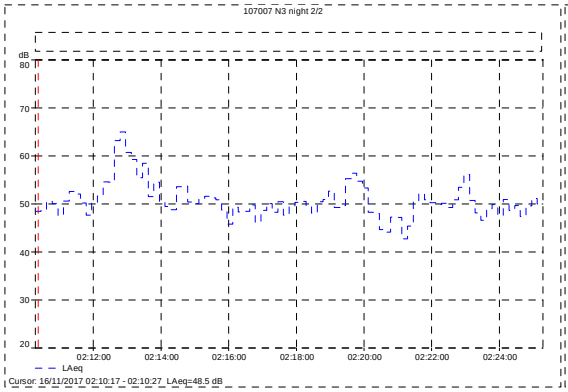


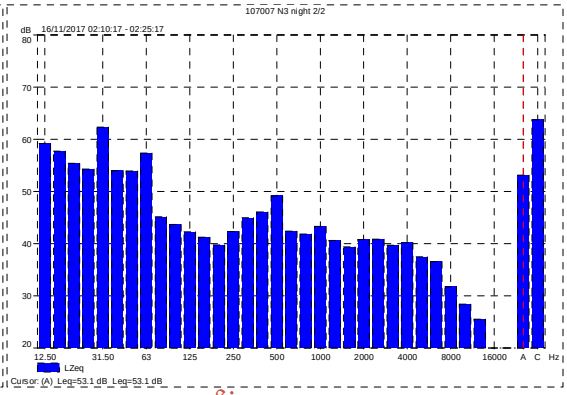


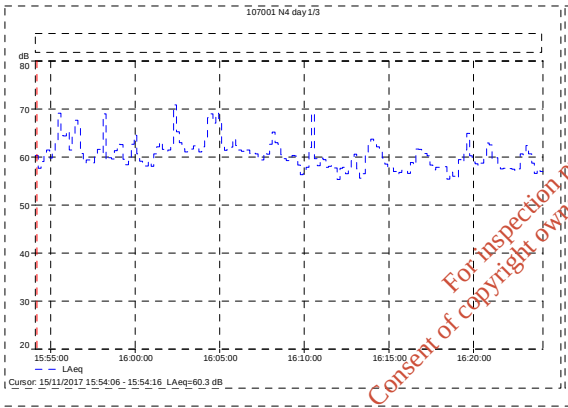


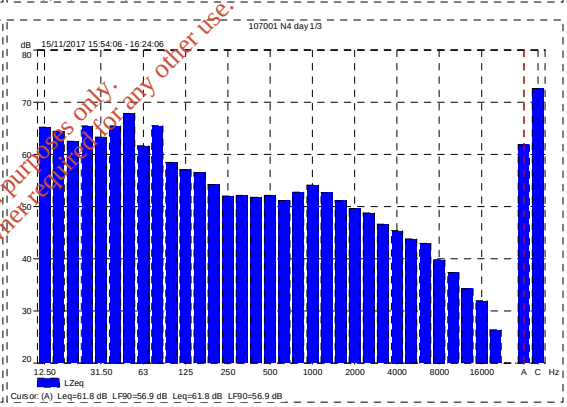


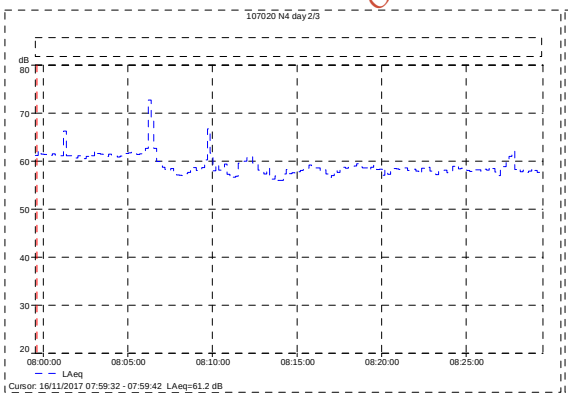


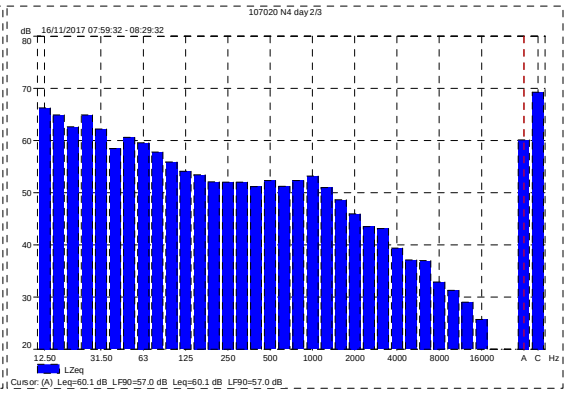


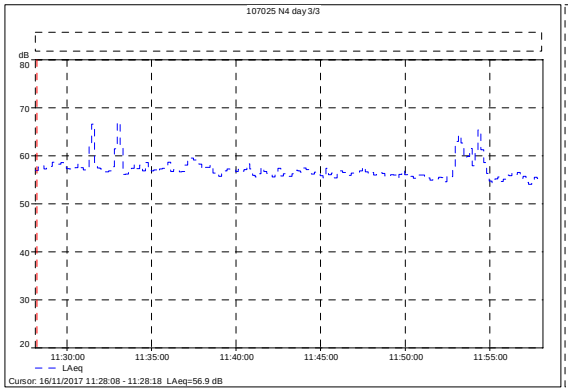


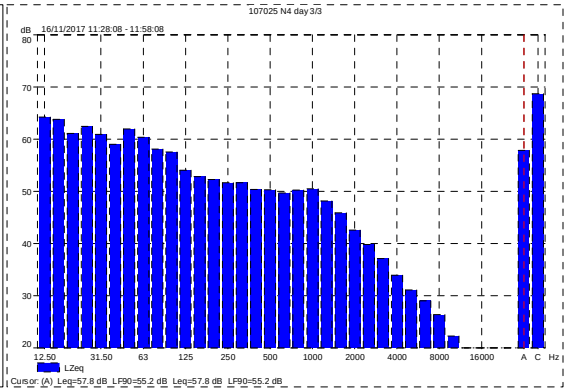


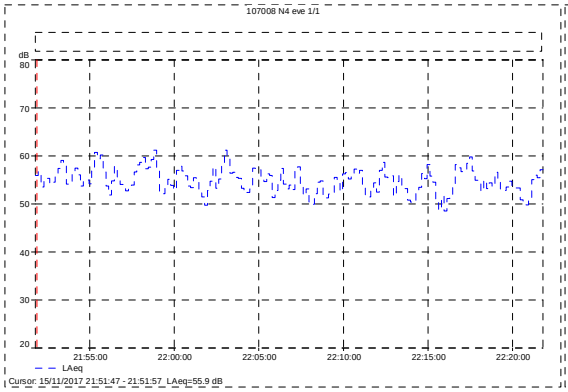


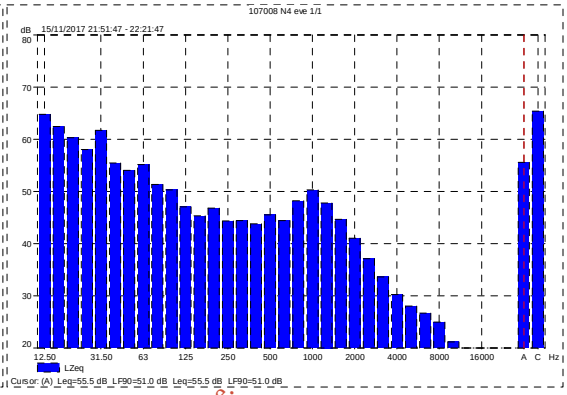


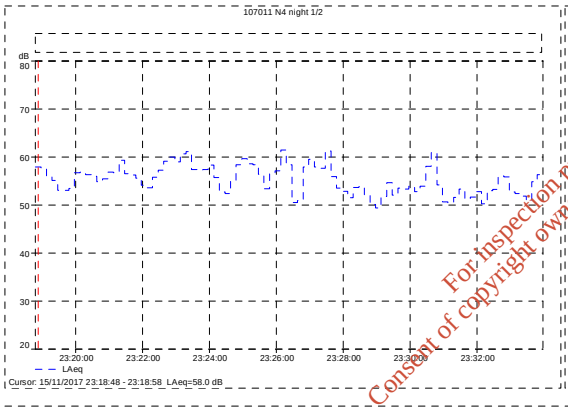


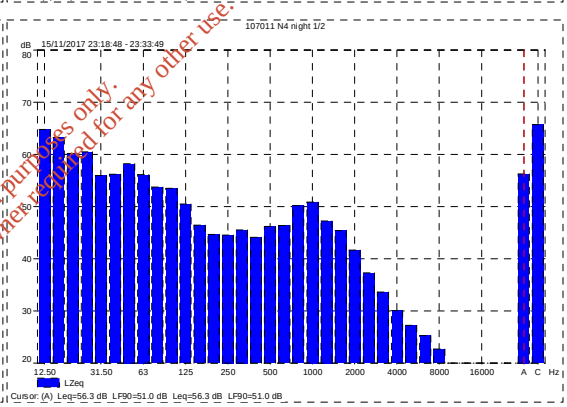


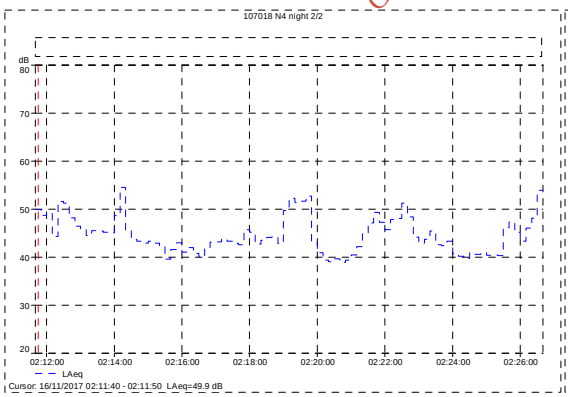


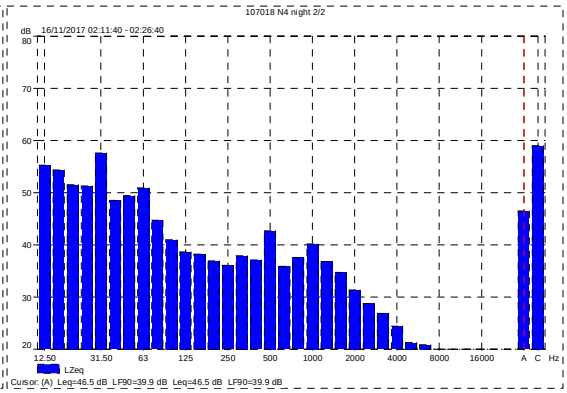


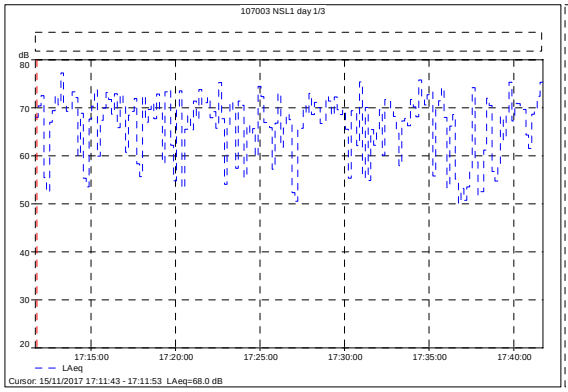


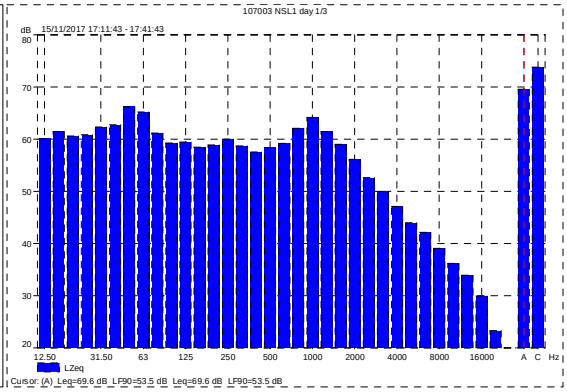


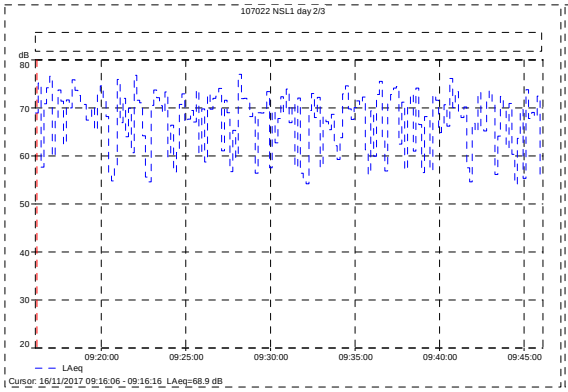


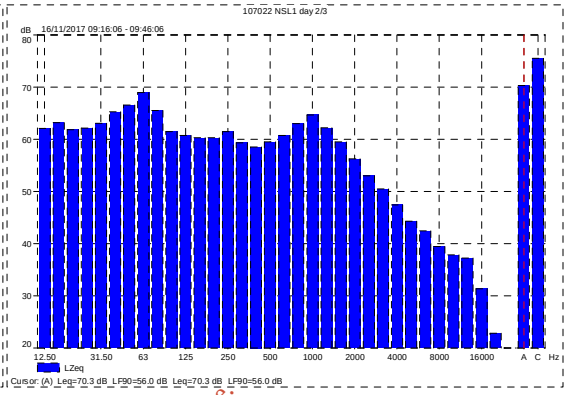


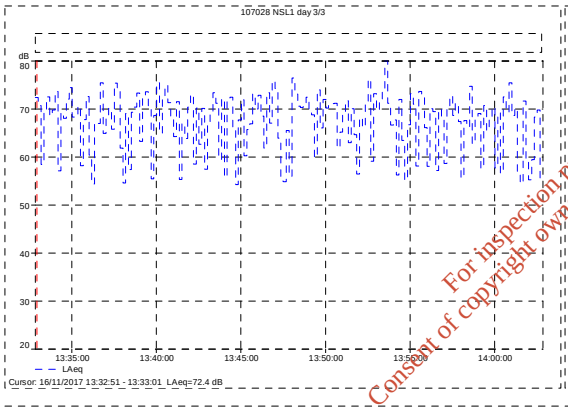


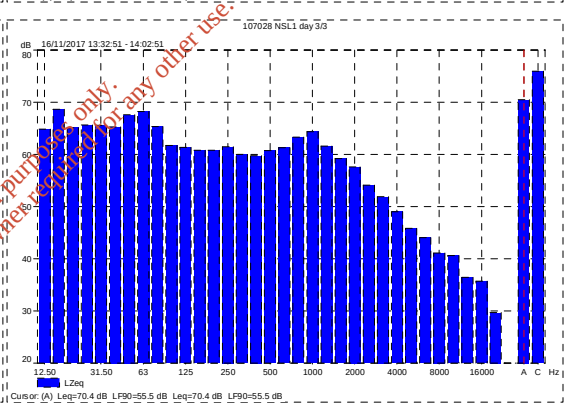


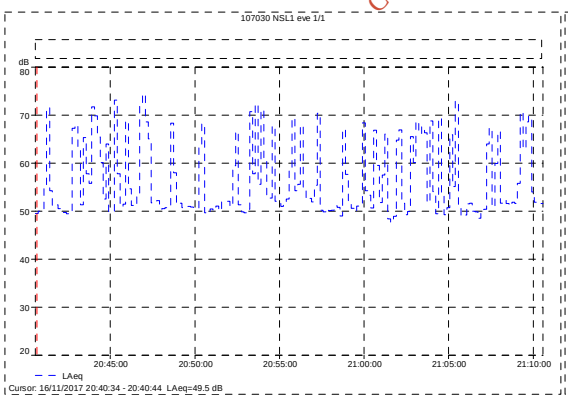


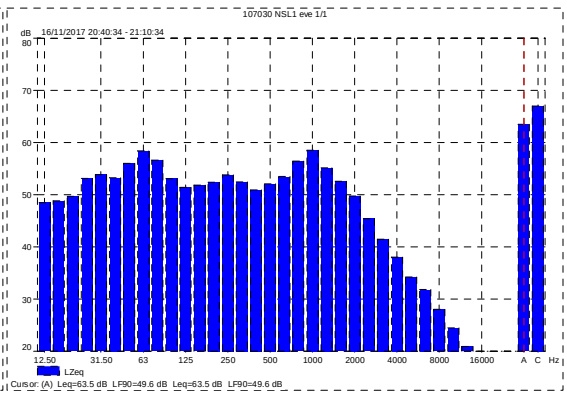


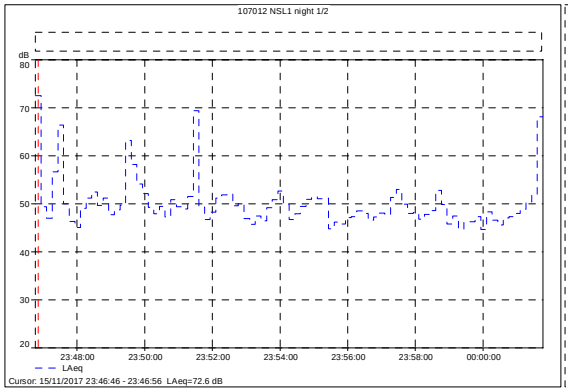


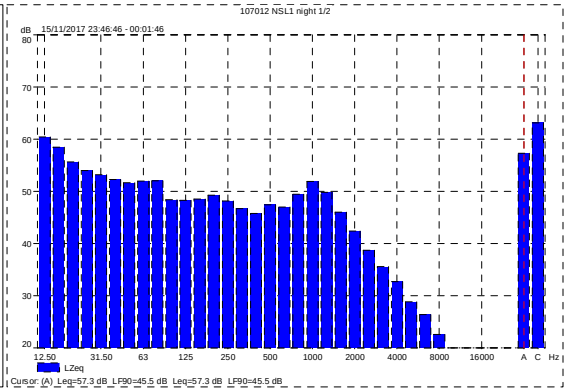


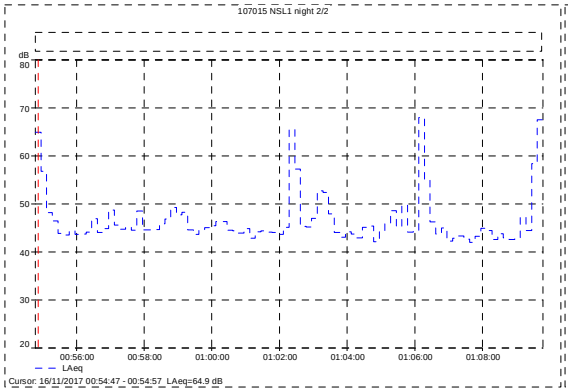


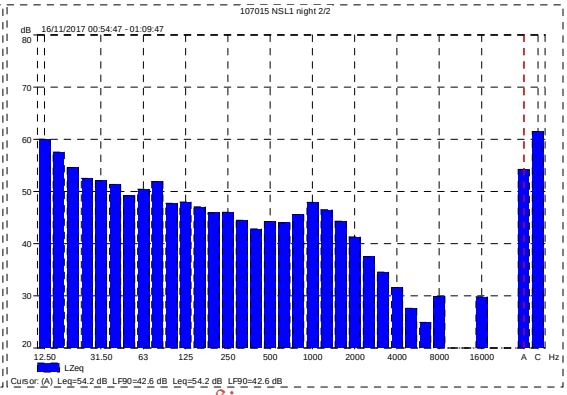


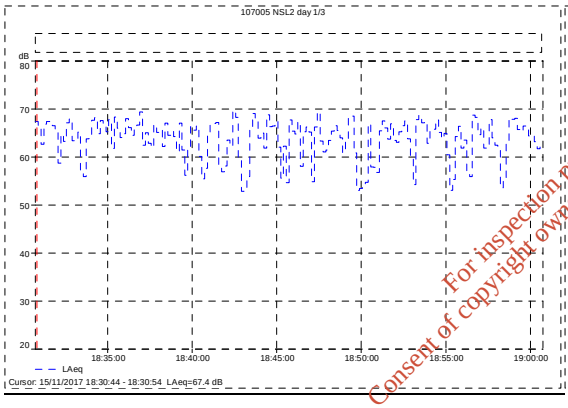


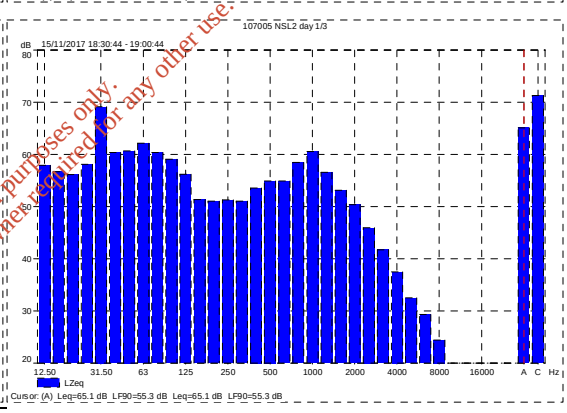


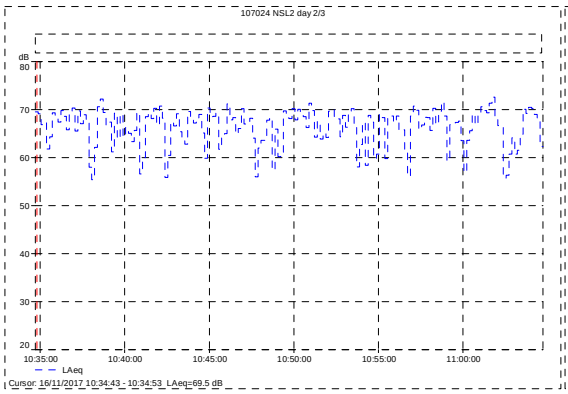


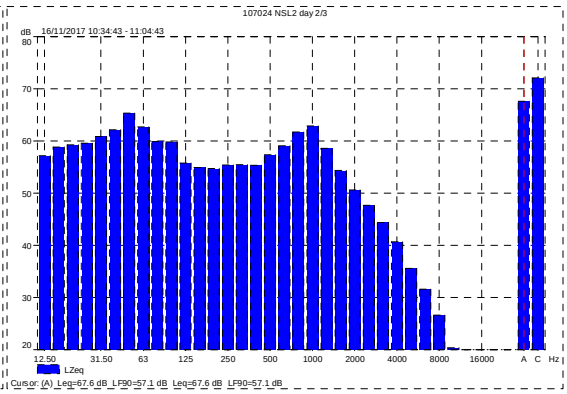


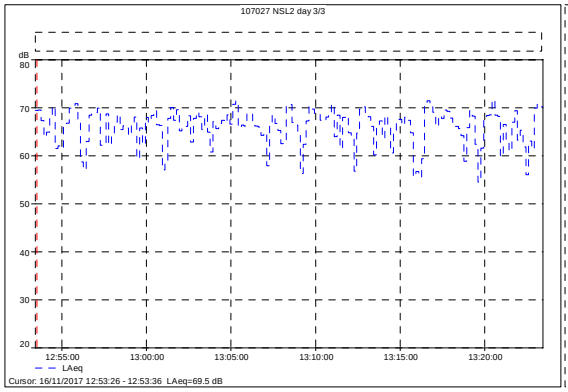


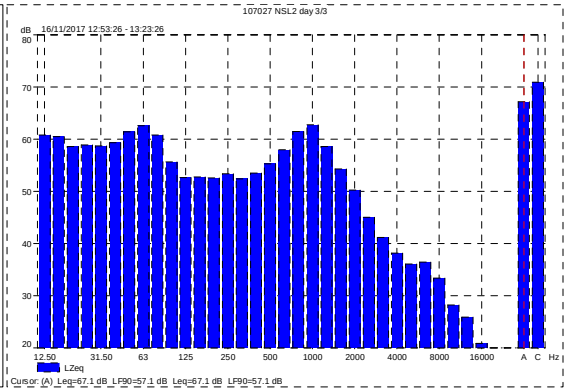


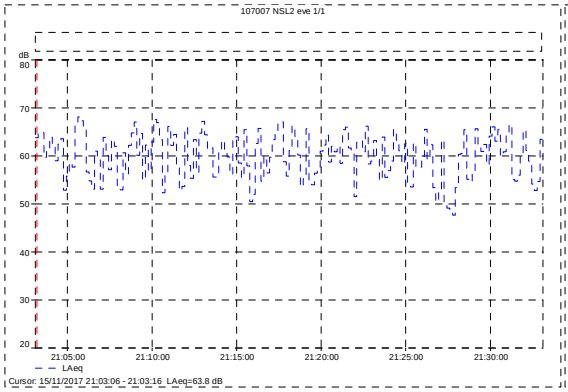


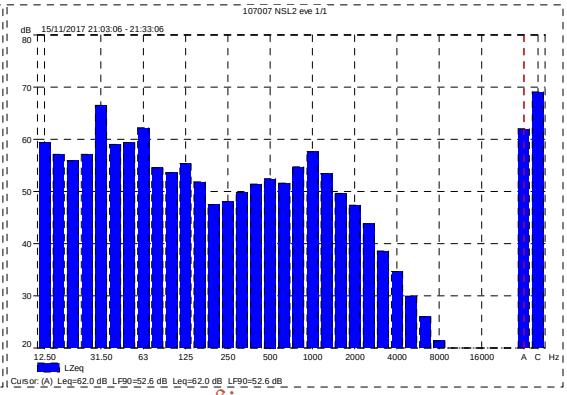


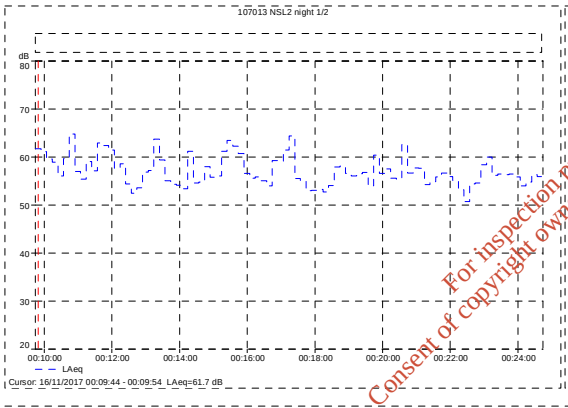


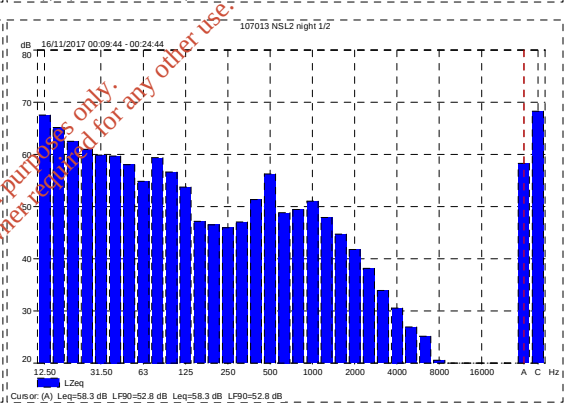


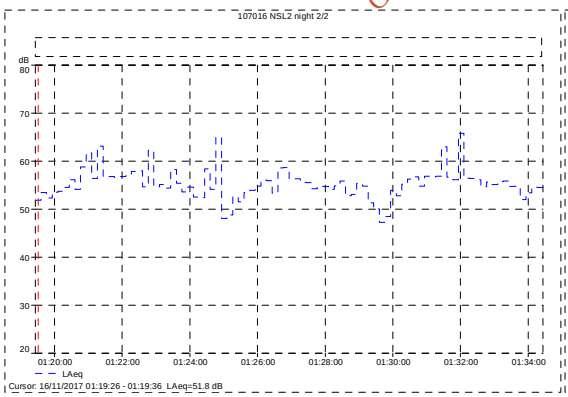


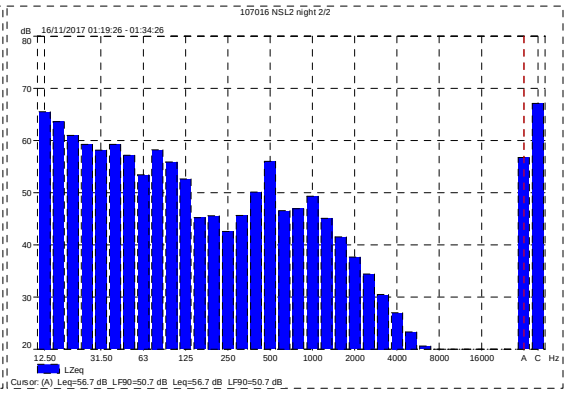


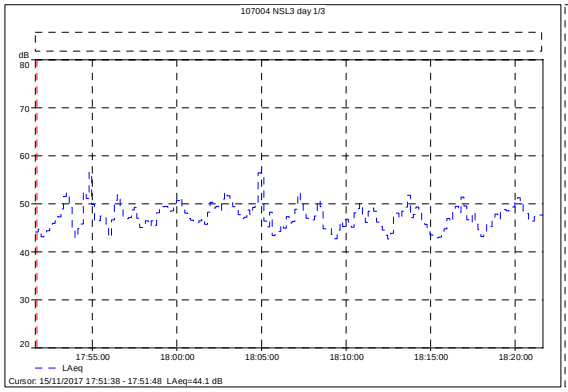


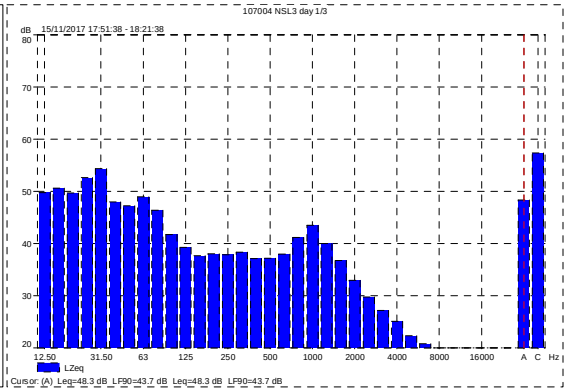


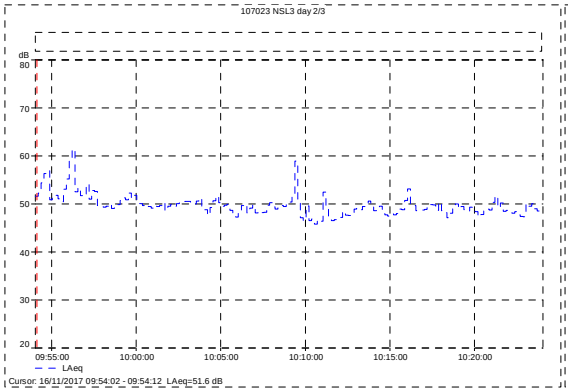


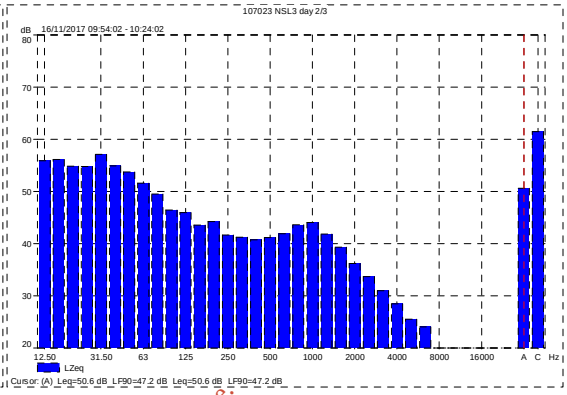


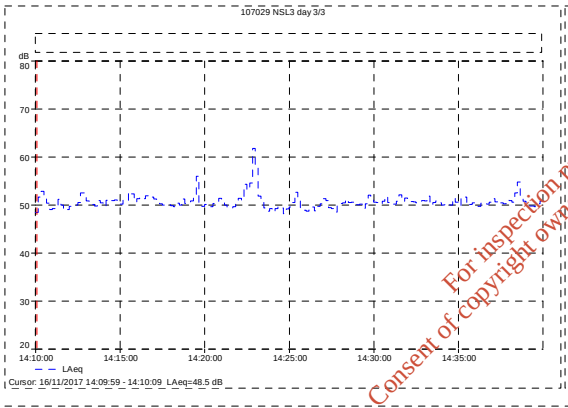


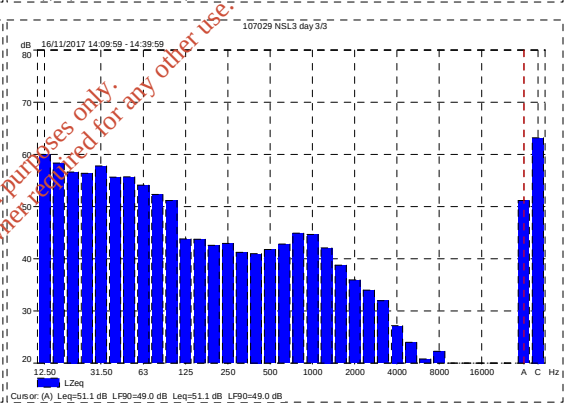


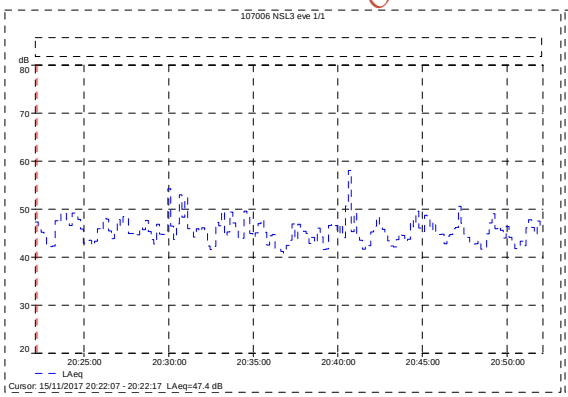


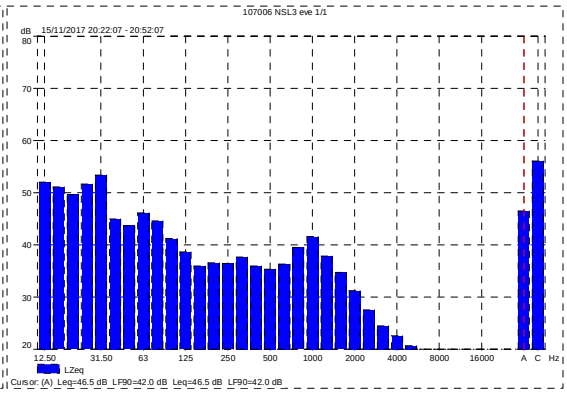


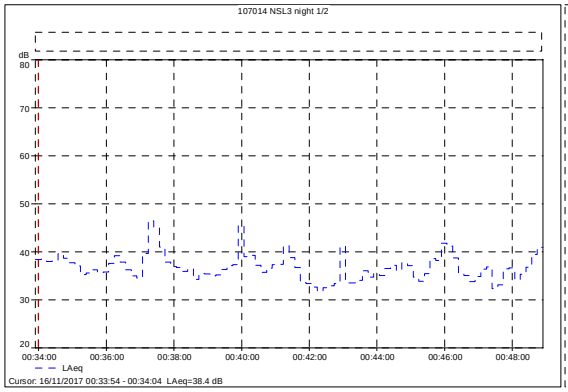


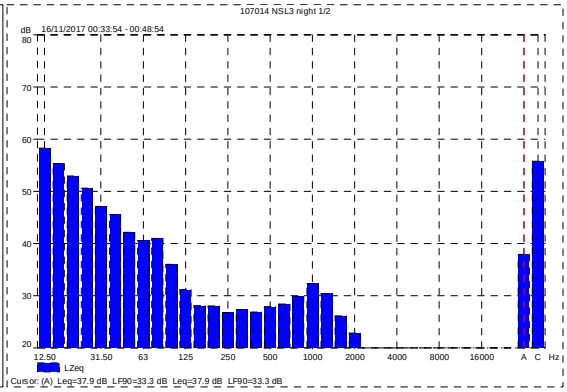


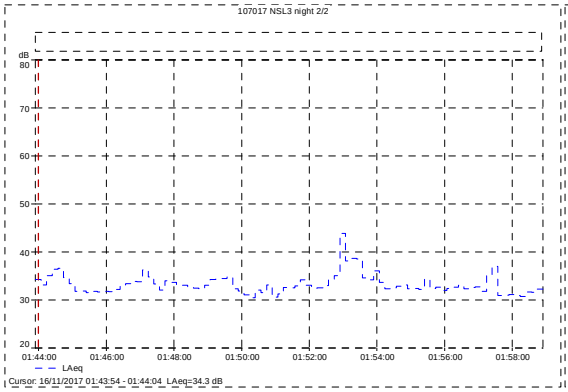


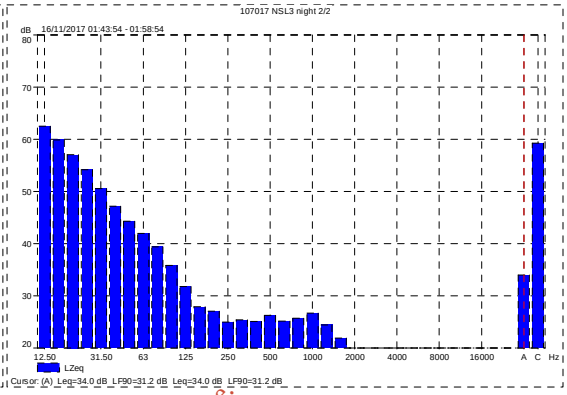












Appendix 6: Frequency data

Frequency data are tabulated over as required by Environmental Protection Agency document *NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities* (2016). Spectra are shown in **appendix 5**.

Tonality may be assessed using level differences suggested by annex D of *International Standard ISO 1996-2 Acoustics – Description, measurement and assessment of environmental noise, Part 2: Determination of environmental noise levels* (2007) as follows:

- 15 dB in the third octave bands 25-125 Hz.
- 8 dB in the third octave bands 160-400 Hz.
- 5 dB in the third octave bands 500-10000 Hz.

Level differences in the 10-160 Hz range which exceed the above criteria will not be of tonal significance if L_{Zeq} values in those bands are lower than hearing threshold levels as follows:

Band (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
L_{Zeq} (dB)	92	87	83	74	64	56	49	43	42	40	38	36	34

No tones were detected. Third octave band analysis detected acoustic energy in certain bands during several intervals, the most prominent of which are as follows:

Station	Time	Bands	Comment
N2	2033-0248	3150 4000	Passing vehicle at Ferrero gate. Not tonal.
N3	1600-1630	31.5 80 160 250	31.5 Hz signal not traced. Remainder most likely due to onsite trucks. Not tonal.
N3	2157-2227	31.5 63 500	Generally present throughout. 63 Hz signal most likely inbuilding plant. 31.5 Hz signal not traced. 500 Hz signal most likely attributable to Ferrero facility. Not tonal.
N3	0210-0225	31.5 63 500	Generally present throughout. 63 Hz signal most likely inbuilding plant. 31.5 Hz signal not traced. 500 Hz signal most likely attributable to Ferrero facility. Not tonal.
N4	0211-0226	31.5 500	Generally present throughout. 31.5 Hz signal not traced. 500 Hz signal most likely attributable to Ferrero facility. Not tonal.
NSL1	0054-0109	16000	Traced to nearby offsite squeaking gate. Tonal.
NSL2	1830-1900	31.5	Not traced, although possibly due to Ferrero facility. Not tonal.
NSL2	2103-2133	31.5	Not traced, although possibly due to Ferrero facility. Not tonal.
NSL2	0009-0024	500	Present throughout. Most likely attributable to Ferrero facility. Not tonal.
NSL2	0119-0134	500	Present throughout. Most likely attributable to Ferrero facility. Not tonal.

Band (Hz)	N1 (dB)						N2 (dB)					
	Day			Eve	Night		Day			Eve	Night	
	1/3	2/3	3/3	1/1	1/2	2/2	1/3	2/3	3/3	1/1	1/2	2/2
	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min
12.5	60	60	62	59	59	59	60	60	66	60	59	62
16	62	60	62	58	58	57	61	60	65	59	58	60
20	59	58	60	55	55	54	61	60	63	57	56	57
25	60	58	60	55	55	51	61	59	62	56	55	55
31.5	62	60	61	55	55	56	62	62	62	54	53	55
40	63	61	63	57	58	48	61	61	63	54	56	51
50	62	63	64	58	59	46	63	62	64	54	56	50
63	61	63	62	55	55	50	62	64	64	53	53	50
80	58	60	59	55	55	42	59	63	61	51	52	44
100	58	57	57	53	56	40	55	61	58	50	51	42
125	56	58	55	54	55	41	55	60	58	49	50	41
160	54	55	54	50	50	39	53	59	57	47	48	38
200	54	55	54	49	52	37	53	58	56	47	49	36
250	54	54	55	50	51	39	54	57	56	47	49	36
315	53	54	53	49	50	36	53	56	54	47	48	36
400	52	53	52	47	48	35	52	55	53	46	47	34
500	54	55	53	48	49	36	53	56	53	46	48	36
630	54	56	54	48	49	34	54	56	54	47	48	35
800	56	57	56	50	51	35	56	58	56	49	51	38
1000	57	58	56	51	53	37	58	60	57	51	53	39
1250	55	56	53	49	51	35	56	57	54	49	51	36
1600	53	54	51	46	49	34	53	55	52	45	48	34
2000	50	51	48	44	46	32	49	52	49	42	44	31
2500	47	48	45	41	44	30	46	49	46	38	40	27
3150	45	45	44	38	41	36	43	46	43	35	36	46
4000	42	42	43	35	38	35	40	43	41	33	34	45
5000	40	39	39	32	34	28	37	40	39	28	29	22
6300	37	35	35	28	30	27	35	38	38	27	27	22
8000	34	32	31	25	27	27	32	35	36	22	23	22
10000	30	29	29	22	24	25	30	33	30	18	18	15
12500	27	26	29	18	19	23	27	30	23	13	13	10
16000	26	21	22	15	16	19	23	28	20	10	10	8
20000	-	-	-	-	-	-	17	20	17	8	8	8
A	63	65	63	57	59	46	64	66	63	57	59	52

Band (Hz)	N3 (dB)						N4 (dB)					
	Day			Eve	Night		Day			Eve	Night	
	1/3	2/3	3/3	1/1	1/2	2/2	1/3	2/3	3/3	1/1	1/2	2/2
	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min
12.5	60	57	57	67	70	59	65	66	64	65	65	55
16	62	60	59	65	68	58	64	65	64	62	63	54
20	63	59	59	63	66	55	62	63	61	60	60	52
25	65	60	58	60	64	54	65	65	62	58	60	51
31.5	70	60	59	65	62	62	63	62	61	62	56	58
40	66	59	58	58	60	54	65	58	59	55	56	49
50	65	61	59	57	61	54	68	61	62	54	58	49
63	62	61	60	61	57	57	62	60	60	55	56	51
80	70	57	56	51	53	45	65	58	58	51	54	45
100	62	53	59	46	50	44	58	56	58	50	54	41
125	59	51	51	46	48	42	57	54	54	47	50	39
160	65	51	49	44	47	41	56	53	53	45	46	38
200	61	49	49	45	47	40	54	52	52	47	45	37
250	66	50	50	46	49	42	52	52	52	44	45	36
315	60	51	50	46	48	45	52	52	52	44	46	38
400	61	50	50	47	48	46	52	51	50	44	44	37
500	62	51	50	52	52	49	52	52	50	46	46	43
630	60	51	50	46	48	42	51	51	50	44	46	36
800	61	53	52	49	49	42	53	52	50	48	50	38
1000	62	55	53	51	51	43	54	53	50	50	51	40
1250	63	53	50	48	48	41	53	51	48	48	47	37
1600	64	50	47	44	45	39	51	49	46	45	45	35
2000	64	47	44	40	42	41	50	46	43	41	42	31
2500	66	45	43	36	39	41	49	43	40	37	37	29
3150	65	45	43	34	38	40	47	43	37	34	34	27
4000	66	42	40	33	37	40	45	39	34	30	30	24
5000	66	40	44	32	35	37	44	37	31	28	27	21
6300	61	39	41	32	33	37	43	37	29	27	25	21
8000	59	37	32	31	31	32	40	33	26	25	23	16
10000	55	33	30	28	28	28	37	31	22	21	20	13
12500	51	28	26	24	24	26	34	29	18	17	16	10
16000	48	23	21	20	20	20	32	26	14	15	12	8
20000	-	-	-	-	-	-	26	20	10	13	9	8
A	76	61	59	57	57	53	62	60	58	56	56	47

Band (Hz)	NSL1 (dB)						NSL2 (dB)					
	Day			Eve	Night		Day			Eve	Night	
	1/3	2/3	3/3	1/1	1/2	2/2	1/3	2/3	3/3	1/1	1/2	2/2
	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min
12.5	60	62	65	48	60	60	58	57	61	59	67	65
16	61	63	69	49	58	58	57	59	60	57	65	64
20	61	62	65	50	56	55	56	59	59	56	62	61
25	61	62	66	53	54	53	58	60	59	57	61	59
31.5	62	63	66	54	53	52	69	61	59	66	60	58
40	63	65	65	53	52	51	60	62	59	59	60	59
50	66	67	68	56	52	49	61	65	61	59	58	57
63	65	69	68	58	52	50	62	63	63	62	55	53
80	61	65	65	57	52	52	60	60	61	55	59	58
100	59	61	62	53	48	48	59	60	56	54	57	56
125	59	61	61	51	48	48	56	56	53	55	54	53
160	58	60	61	52	49	47	51	55	53	52	47	45
200	59	60	61	52	49	46	51	55	53	47	46	46
250	60	61	61	54	48	46	51	55	53	48	46	43
315	59	59	60	52	47	44	51	55	52	50	47	46
400	58	59	60	51	46	43	54	55	53	51	51	50
500	58	59	61	52	47	44	55	57	55	52	56	56
630	59	61	61	53	47	44	55	59	58	52	49	47
800	62	63	63	56	49	46	58	62	61	55	49	47
1000	64	65	64	59	52	48	61	63	63	58	51	49
1250	61	62	62	55	50	46	57	59	59	53	48	45
1600	59	59	59	53	46	44	53	54	54	50	45	42
2000	56	56	58	50	42	41	50	51	50	47	42	38
2500	53	53	54	45	39	38	46	48	45	44	38	34
3150	50	50	52	41	36	35	42	44	41	39	34	30
4000	47	47	49	38	33	32	37	41	38	35	31	27
5000	44	44	46	34	29	28	33	36	36	30	27	23
6300	42	42	44	32	26	25	29	32	36	26	25	21
8000	39	39	41	28	23	30	24	27	33	21	21	18
10000	36	38	41	24	19	17	20	20	28	17	17	15
12500	34	37	36	21	15	17	15	15	26	17	14	12
16000	30	31	36	18	12	30	10	12	21	12	11	10
20000	23	23	30	14	9	10	8	9	16	8	9	8
A	70	70	70	64	57	54	65	68	67	62	58	57

Band (Hz)	NSL3 (dB)					
	Day			Eve	Night	
	1/3	2/3	3/3	1/1	1/2	2/2
	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min	L_{Zeq} 30 min
12.5	50	56	60	52	58	62
16	51	56	58	51	55	60
20	50	55	57	50	53	57
25	53	55	56	52	51	54
31.5	54	57	58	53	47	51
40	48	55	56	45	46	47
50	47	54	56	44	42	44
63	49	52	54	46	41	42
80	46	49	52	45	41	39
100	42	46	51	41	36	36
125	39	46	44	39	31	32
160	38	44	44	36	28	28
200	38	44	43	37	28	27
250	38	42	43	36	27	25
315	38	41	41	38	27	25
400	37	41	41	36	27	25
500	37	41	42	35	28	26
630	38	42	43	36	28	25
800	41	44	45	40	30	26
1000	44	44	45	42	32	27
1250	40	42	42	38	30	24
1600	37	39	39	35	26	22
2000	33	36	36	31	23	19
2500	30	34	34	28	20	17
3150	27	31	32	25	16	15
4000	25	28	27	23	14	14
5000	22	26	24	21	11	12
6300	21	24	21	19	11	11
8000	19	20	22	17	10	10
10000	18	15	12	14	8	8
12500	15	12	10	12	8	8
16000	13	10	9	10	8	8
20000	10	9	8	9	8	8
A	48	51	51	47	38	34

Appendix 7: Glossary

Air overpressure	Intensity of air pressure wave caused by blasting. Expressed as decibels without any A-weighting ie. linear or Z-weighting.
Ambient	Total noise environment at a location, including all sounds present.
Amplitude	Maximum extent of oscillation in a noise signal. Greater amplitude results in louder signal.
A-weighting	Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq\ T}$, $L_{AF10\ T}$, etc.
Background level	A-weighted sound pressure level of residual noise exceeded for 90 % of time interval T. Denoted $L_{AF90\ T}$.
Broadband	Noise which contains roughly equal energy across frequency spectrum. Does not contain tones, and is generally less annoying than tonal noise.
Decibel (dB)	Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub. **Throughout this report noise levels are presented as decibels relative to 20 µPa**.
Fast response	0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10\ T}$, $L_{AF90\ T}$, etc.
Free field	Noise environment away from all surfaces other than ground ie. outside near field.
Frequency	Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.
Hertz (Hz)	Unit of frequency measurement.
Impulse	Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.
Interval	Time period T over which noise parameters are measured at position. Denoted by T in $L_{Aeq\ T}$, $L_{AF90\ T}$, etc.
L_{AE}	Sound exposure level. Measure of noise level of an event, standardised to interval of one second, and containing same acoustical energy as actual event.
$L_{Aeq\ T}$	Equivalent continuous sound pressure level during interval T, effectively representing average A-weighted noise level of ambient noise environment.
L_{AF}	Sound pressure level averaged over one second, and changing each second in fluctuating noise environment.
$L_{AF10\ T}$	Sound pressure level exceeded for 10% of interval T, usually used to quantify traffic noise.
$L_{AF90\ T}$	Sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.
L_{AIeq}	Sound pressure level at particular instant, measured using impulse time response. May be used in assessment of impulse noise.
L_{AFmax}	Maximum A-weighted sound pressure level occurring during measurement interval.
$L_{AReq\ T}$	Rating noise level, derived from $L_{Aeq\ T}$ plus specified adjustments for tonal and impulsive characteristics. Equivalent to $L_{Ar\ T}$ used by EPA.
L_{den}	Day-evening-night noise level. Calculated from separate daytime, evening and night-time $L_{Aeq\ T}$ levels using formula specified in *EU Directive 2002/49/EC*.
$L_{EX\ 8h}$	Daily noise exposure level. Time weighted average of cumulative noise exposure normalised over 8 hour working day.

L_{pCpeak}	Peak C-weighted sound pressure level recorded during measurement interval. Highest peak on sound pressure wave before time response is applied. C-weighting used to reflect altered ear response at louder levels. Used to quantify impulsive sounds in the workplace such as bangs, clangs and thumps.
L_{WA}	Sound power level generated by source due to conversion of work energy into noise energy.
Masking	The rendering inaudible of one noise source by another noise source(s) which may be louder, or may contain significant acoustic energy in the same part of the frequency spectrum. In the latter case, any tone(s) in the original source emissions may become inaudible.
Near field	Noise levels recorded near walls or other surfaces, artificially increased due to reflections. Levels near walls may be increased by up to 3 dB, and up to 6 dB near corners. Free field conditions may be achieved by maintaining separation distance of at least 3.5 m from walls.
Noise sensitive location	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.
1/3 octave band	Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit. Each octave may be subdivided into thirds, allowing greater analysis of tones.
Peak particle velocity (PPV)	Rate of change of displacement of particles in solid medium due to vibration, measured as mm/s. Usually used to assess vibration in relation to activities such as blasting as correlates well with human perception of vibration and property damage.
Residual level	Noise level remaining when specific source is absent or does not contribute to ambient.
Reverberant level	Sound pressure level in room where emitted acoustic energy is balanced by room surface absorption, resulting in steady noise level.
R_w	Overall sound reduction index provided across a range of frequencies, determined from laboratory measured sound insulating properties of material or building element in each frequency band.
Specific level	$L_{Aeq\ T}$ level produced by specific noise source under consideration during interval T, measured directly or by estimation or calculation.
Tone	Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.
Wind vector	May be positive (+), negative (-), neutral (0) or crosswind (x). Positive wind vector blows from source to receptor, within angular range of ±45°, creating conditions more favourable to propagation. During certain conditions, this range may increase to ±60° by day and ±90° at night. Negative wind vector occurs when receptor is upwind of source. Neutral vector arises during still conditions, or upwind when in close proximity to source. Crosswinds typically result in negative vector.
Z-weighting	Standard weighting applied by sound level meters to represent linear scale. Denoted by suffix Z in parameters such as $L_{Zeq\ T}$, $L_{ZF90\ T}$, etc. used to describe 1/3 octave band levels in frequency spectra.

In this report units are generally presented using US National Institute Of Standards & Technology guidelines.