Document 6.2

The West Midlands Rail Freight Interchange Order 201X
Technical Appendix 13.3 - Full Survey Results
Regulation 5(2)(a)
Resound - July 2018

West Midlands Interchange

Four Ashes Ltd

Technical Appendix 13.3: Full Survey Results

Table A13.3.1: Noise monitoring equipment – August 2016 Survey

Position	Model	Serial Number	Calibration Certificate Issue Date
N1	Larson Davis 820 Type 1 SLM	1350	2 June 2016
	Larson Davis PRM 828 Pre-amplifier	1568	
	GRAS 40AE Microphone	37024	
N2	Larson Davis 824 Type 1 SLM	824A1419	4 August 2016
	Larson Davis PRM902 Pre-amplifier	2732	
	GRAS 40AE Microphone	31817	
N3	01dB Cube Type 1 SLM	10692	18 February 2015
	GRAS 40CD Microphone	224253	
N5	01dB Black Solo Type 1 SLM	65682	28 April 2016
	01dB PRE21S Pre-amplifier	16310	
	MCE212 Microphone	153491	
N6[1]	Larson Davis 824 Type 1 SLM	824A1309	2 June 2016
	Larson Davis PRM902 Pre-amplifier	1924	
	GRAS 40AE Microphone	28488	
N7	Larson Davis 820 Type 1 SLM	A1144	2 June 2016
	Larson Davis PRM 828 Pre-amplifier	2054	
	GRAS 40AE Microphone	31825	
N8	01dB Cube Type 1 SLM	10694	12 March 2015
	GRAS 40CD Microphone	224223	
N9[2]	Rion NL52 SLM	00620964	9 November 2015
	NH-25 Pre-amplifier	21005	
	UC-59 Microphone	03884	
N5	01dB Cal21 calibrator	34134139	28 April 2016
N3, N8	01dB Cal21 calibrator	51030984	6 June 2016
N1, N7	Larson Davis CAL200 calibrator	3055	8 April 2016
N2, N6	Larson Davis CAL200 calibrator	3724	2 June 2016
V1	Rion VM-54 Vibration Meter	01150116	22 June 2016
	PV-83CW Tri-axial accelerometer	28068	
V2	Rion VM-54 Vibration Meter	00360140	23 June 2016
	PV-83CW Tri-axial accelerometer	85802	

Notes:
[1] – data not used. No calibration certificate included.
[2] – sound level meter has internal electrical calibration system, no external acoustic calibrator was used.

Table A13.3.2: Noise monitoring equipment – October 2016 Survey

Position	Model	Serial Number	Calibration Certificate Issue Date
N6	01dB Fusion Type 1 sound level meter	10919	12 January 2016
	GRAS 40CE Microphone	226375	
	01dB Cal21 Calibrator	35183004	23 February 2016

Table A13.3.3: Noise monitoring equipment – January 2017 Survey

Position	Equipment	Serial Number	Calibration Certificate Issue Date
N1	Larson Davis 824 Type 1 sound level meter	824A1309	2 June 2016
	Larson Davis PRM902 pre-amplifier	1924	
	GRAS 40AE microphone	28488	
N2	Larson Davis 824 Type 1 sound level meter	824A1419	4 August 2016
	Larson Davis PRM902 pre-amplifier	2732	
	GRAS 40AE microphone	31817	
N4	01dB Fusion Type 1 sound level meter	10919	12 January 2016
	GRAS 40CE microphone	226375	
N5	01dB Blue Solo Type 1 sound level meter	60582	8 January 2016
	01dB PRE21S pre-amplifier	13510	
	01dB MCE 212 microphone	90416	
N6	01dB Fusion Type 1 sound level meter	10325	6 May 2016
	GRAS 40CE microphone	207533	
N7	01dB Black Solo Type 1 SLM	65682	28 April 2016
	01dB PRE21S Pre-amplifier	16310	
	MCE212 Microphone	153491	
N8	01dB Duo Type 1 sound level meter	10522	19 May 2016
	01dB PRE22 pre-amplifier	10271	
	GRAS 40CD microphone	136978	
N9	01dB Duo Type 1 sound level meter	10507	9 May 2016
	01dB PRE22 pre-amplifier	10211	
	GRAS 40CD microphone	161946	
N4, N6, N8, N9	01dB Cal21 calibrator	51030984	6 June 2016
N5	01dB Cal01 calibrator	980058	5 January 2017
N7	01dB Cal21 calibrator	34134139	28 April 2016
N2	Larson Davis CAL200 calibrator	3055	8 April 2016
N1	Larson Davis CAL200 calibrator	3723	2 June 2016

Figure A13.3.17: L_{A90} distribution, daytime, August 2016, Position N1

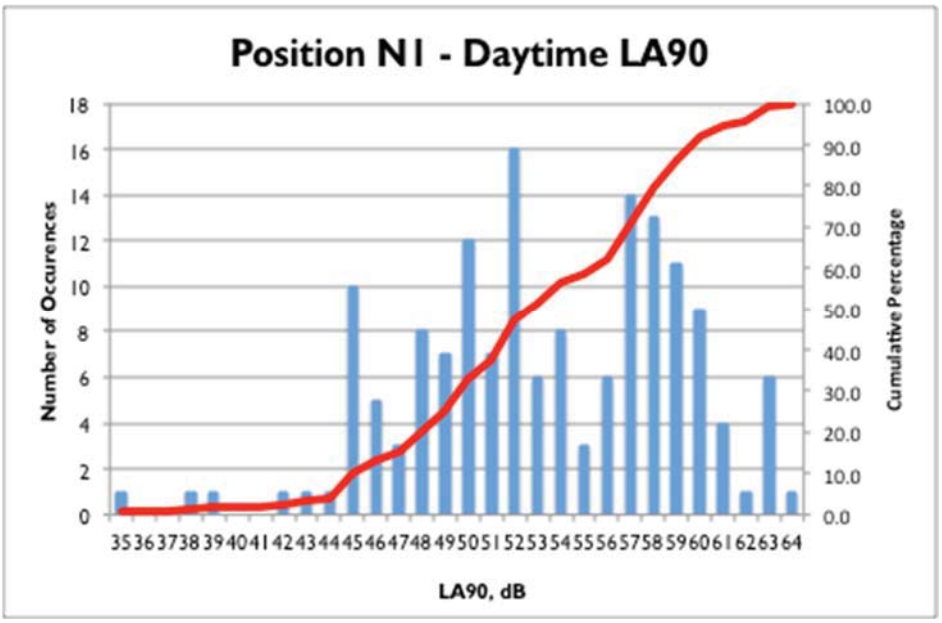

Figure A13.3.18: L_{A90} distribution, night-time, August 2016, Position N1

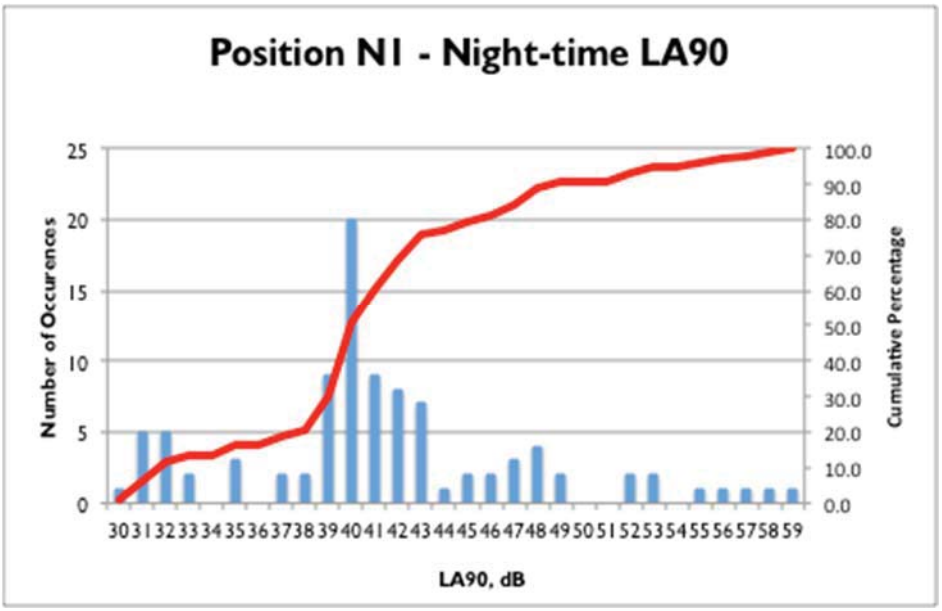

Figure A13.3.19: L_{A90} distribution, daytime, August 2016, Position N2

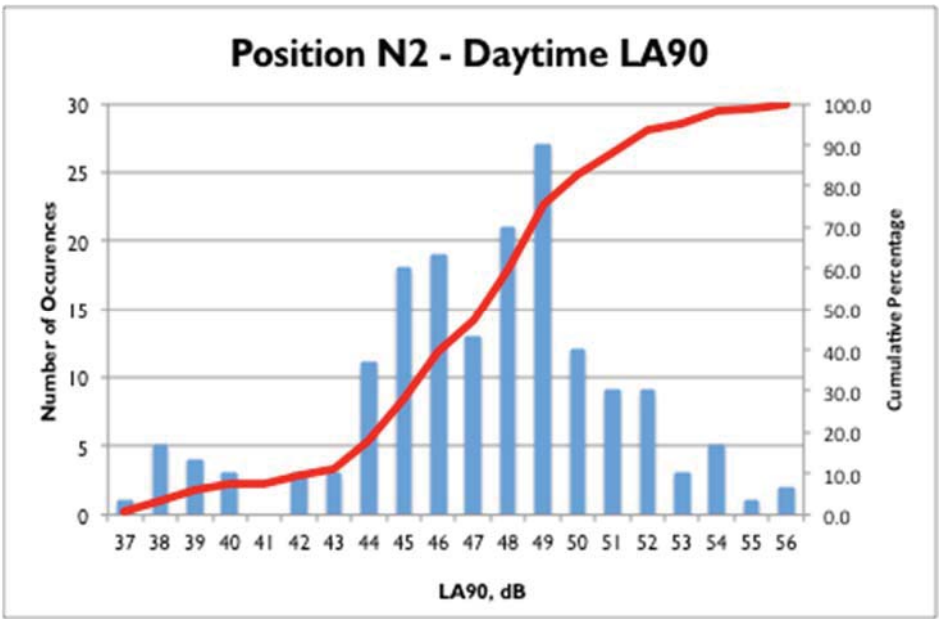

Figure A13.3.20: L_{A90} distribution, night-time, August 2016, Position N2

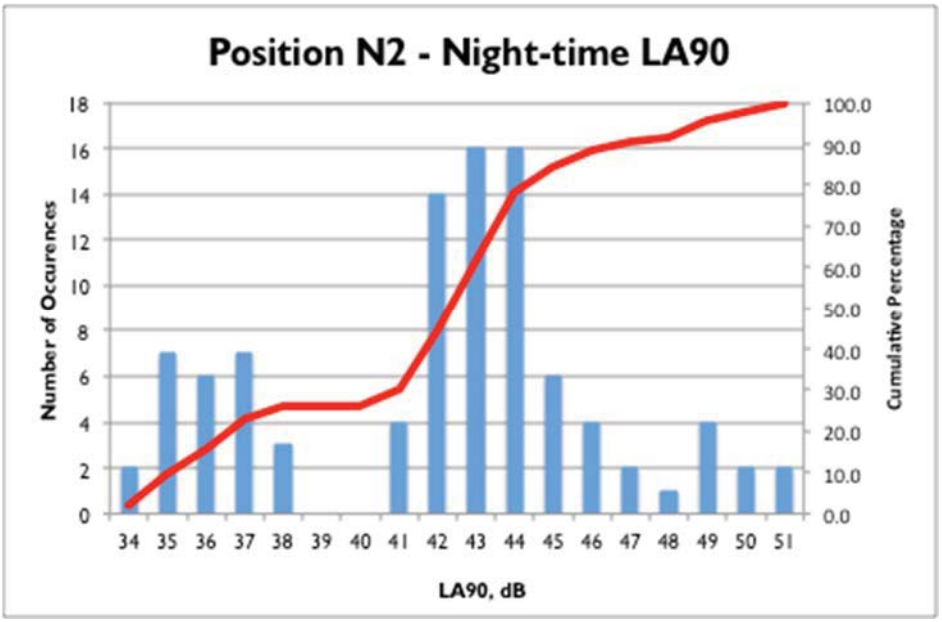

Figure A13.3.21: L_{A90} distribution, daytime, August 2016, Position N3

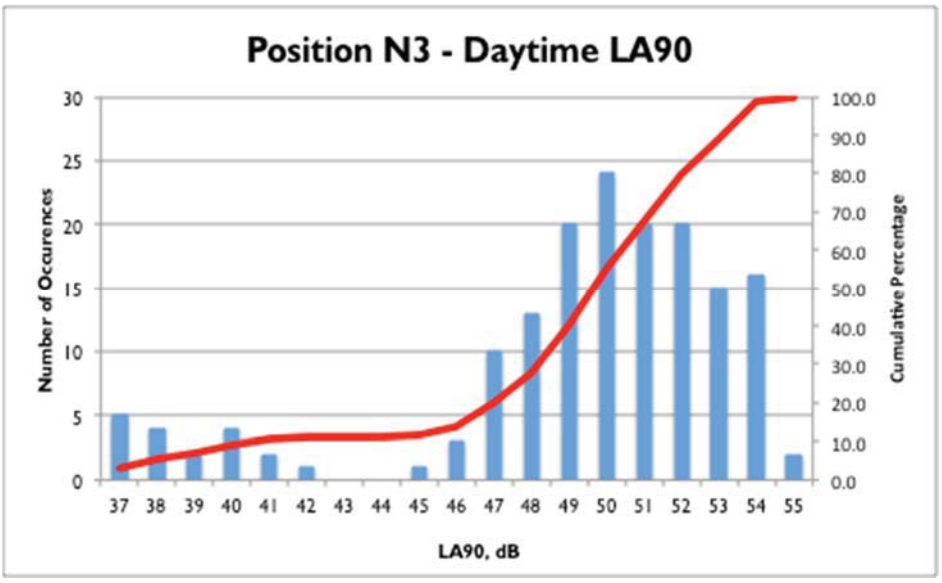

Figure A13.3.22: L_{A90} distribution, night-time, August 2016, Position N3

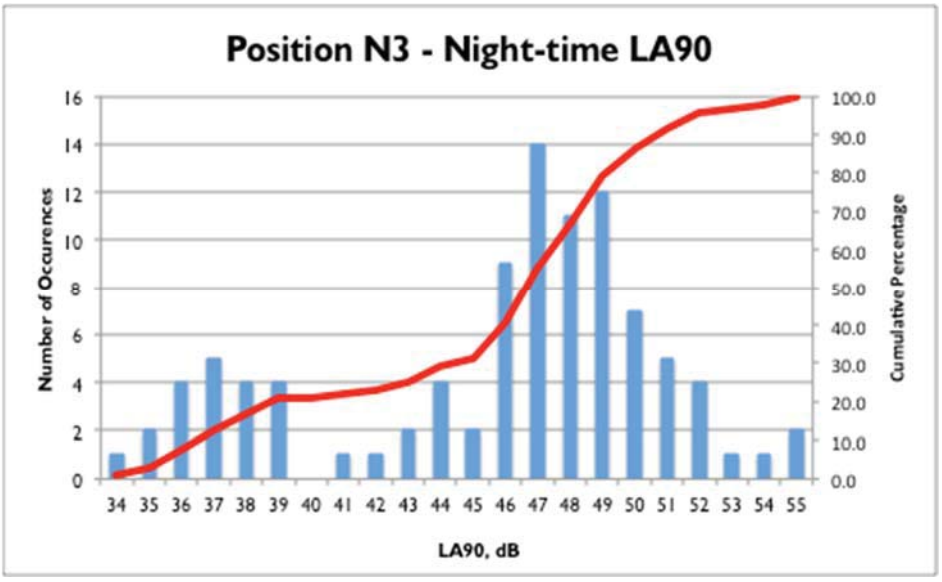

Figure A13.3.23: L_{A90} distribution, daytime, August 2016, Position N5

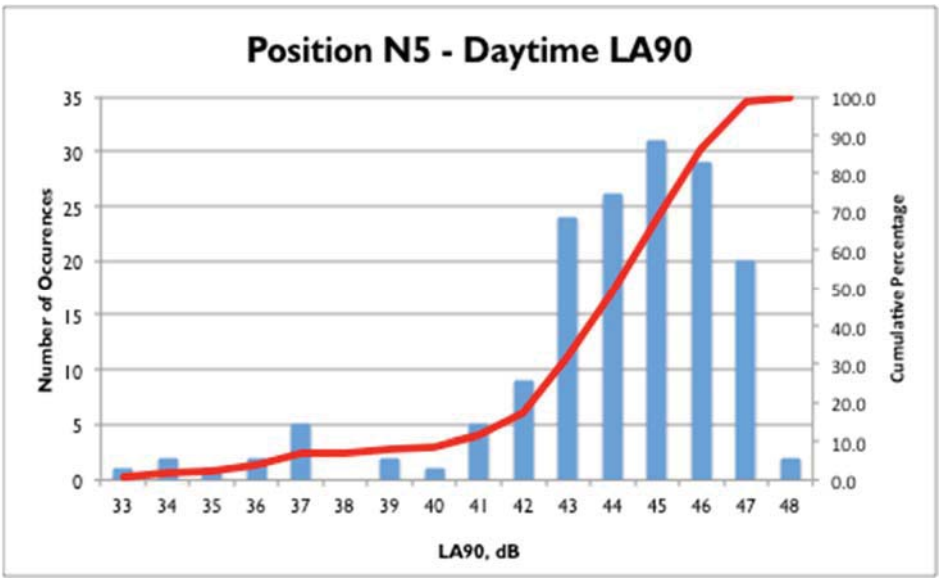

Figure A13.3.24: L_{A90} distribution, night-time, August 2016, Position N5

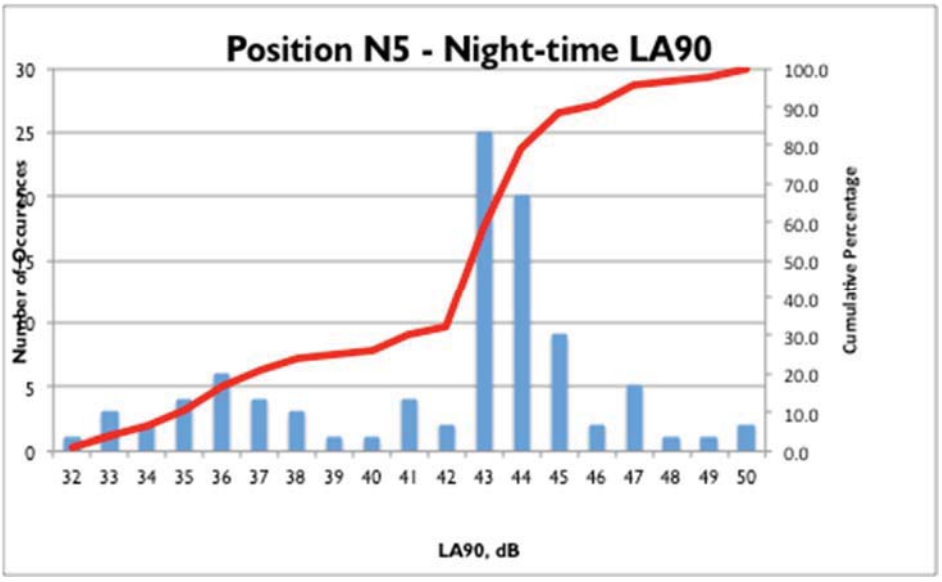

Figure A13.3.25: L_{A90} distribution, daytime, October 2016, Position N6

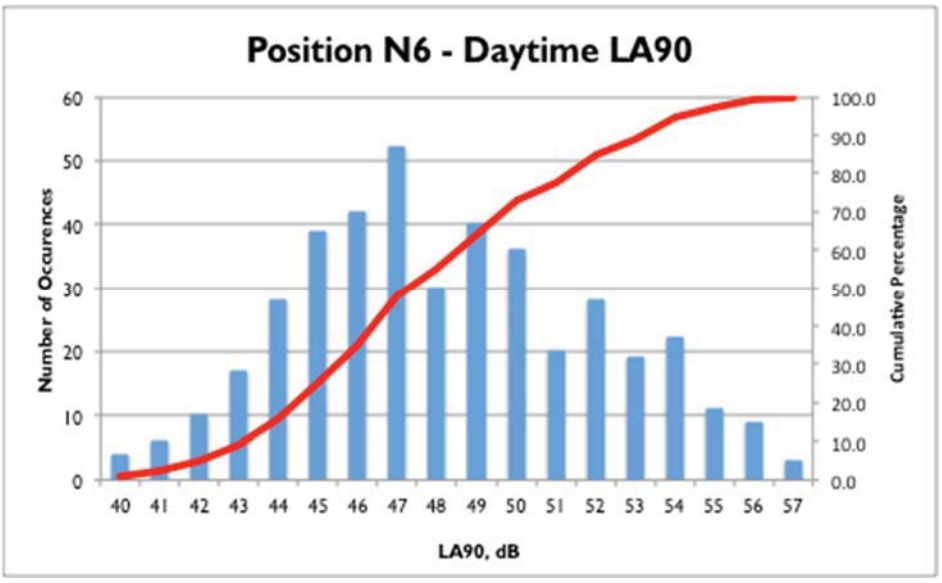

Figure A13.3.26: L_{A90} distribution, night-time, October 2016, Position N6

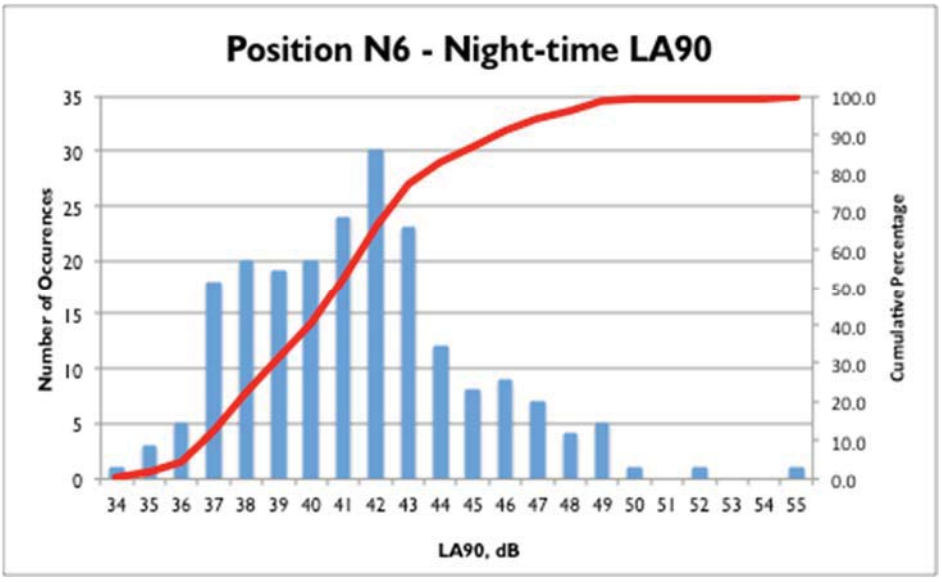

Figure A13.3.27: L_{A90} distribution, daytime, August 2016, Position N7

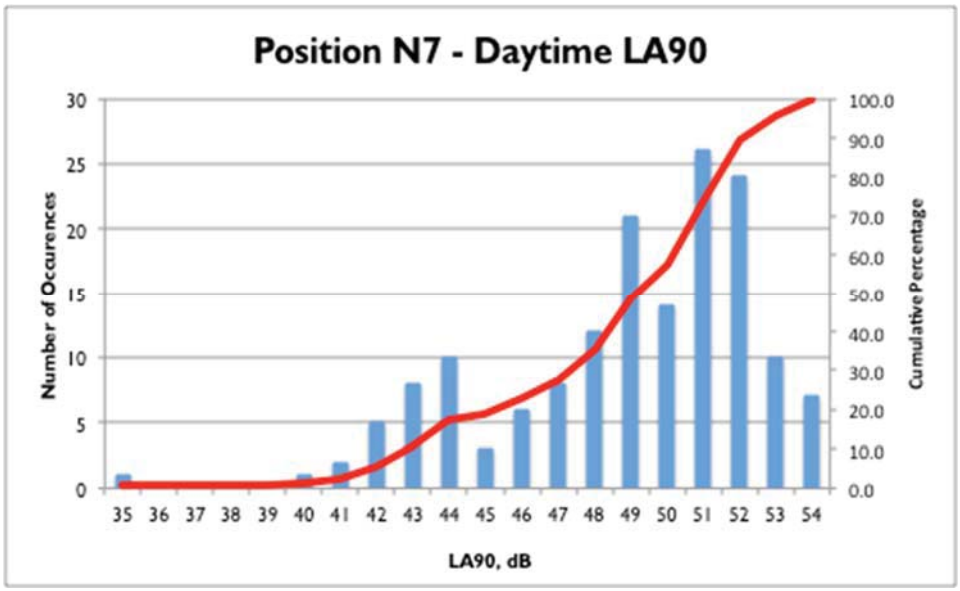

Figure A13.3.28: L_{A90} distribution, night-time, August 2016, Position N7

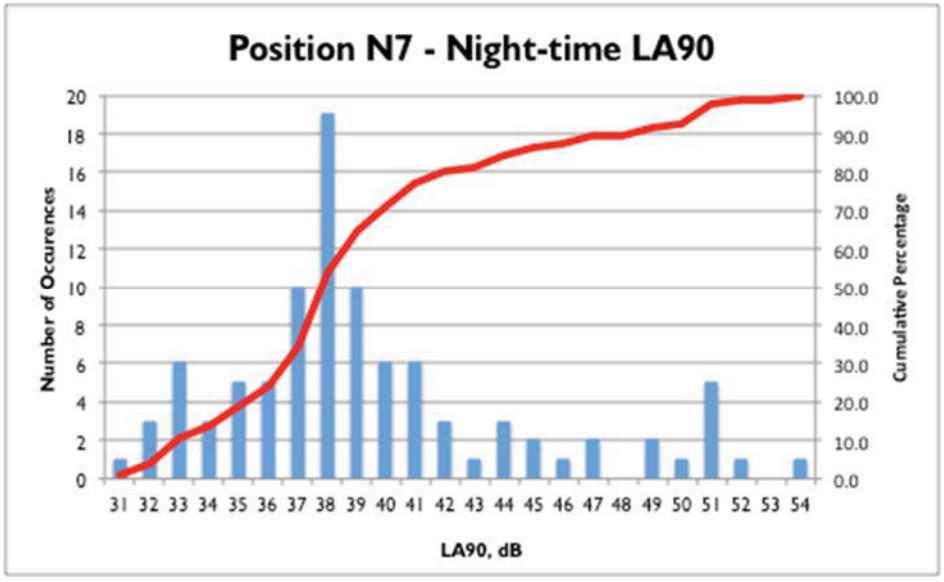

Figure A13.3.29: L_{A90} distribution, daytime, August 2016, Position N8

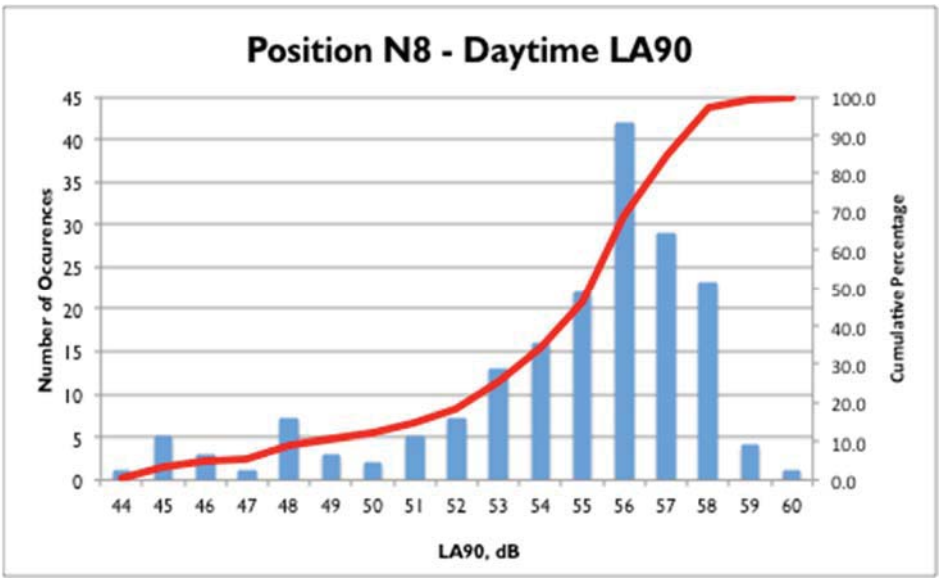

Figure A13.3.30: L_{A90} distribution, night-time, August 2016, Position N8

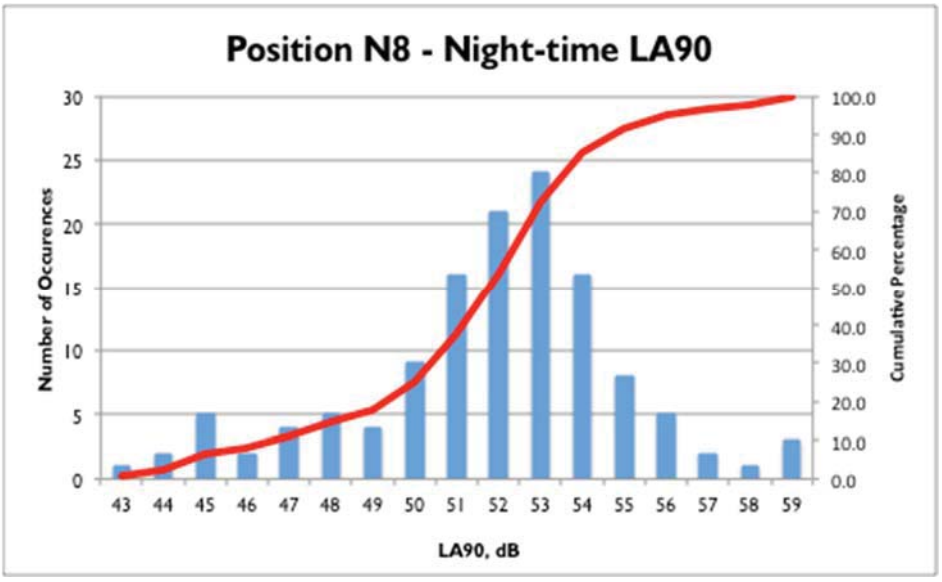

Figure A13.3.31: L_{A90} distribution, daytime, August 2016, Position N9

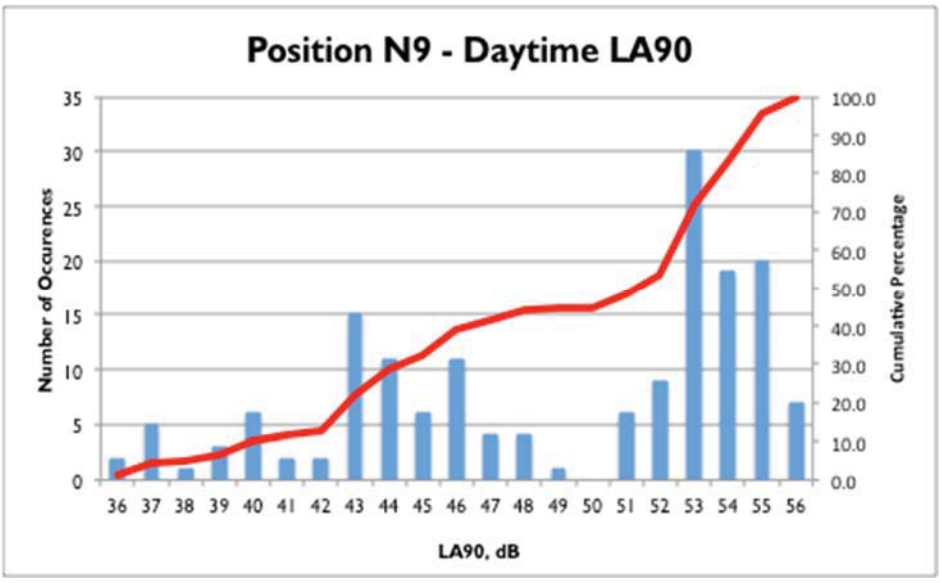

Figure A13.3.32: L_{A90} distribution, night-time, August 2016, Position N9

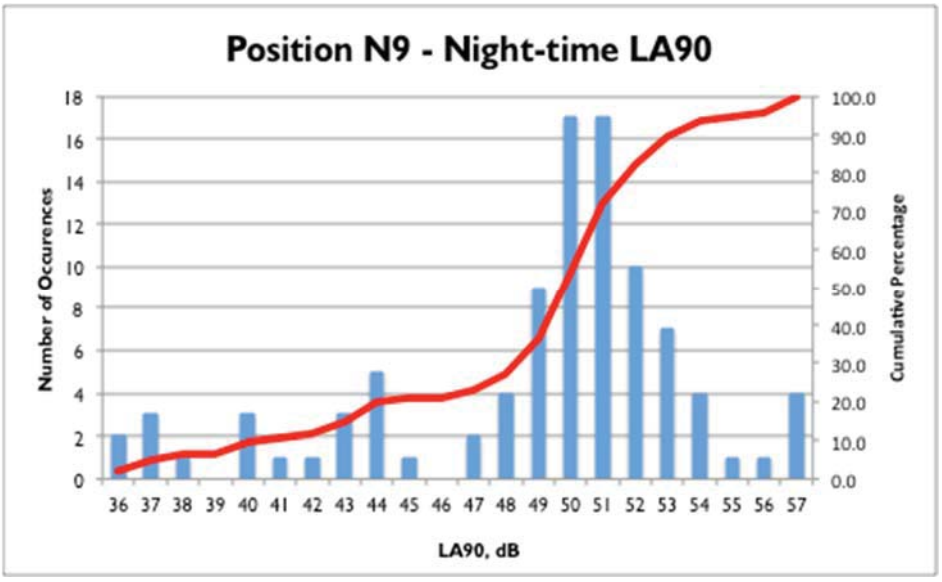

Figure A13.3.33: L_{Aeq} distribution, daytime, August 2016, Position N1

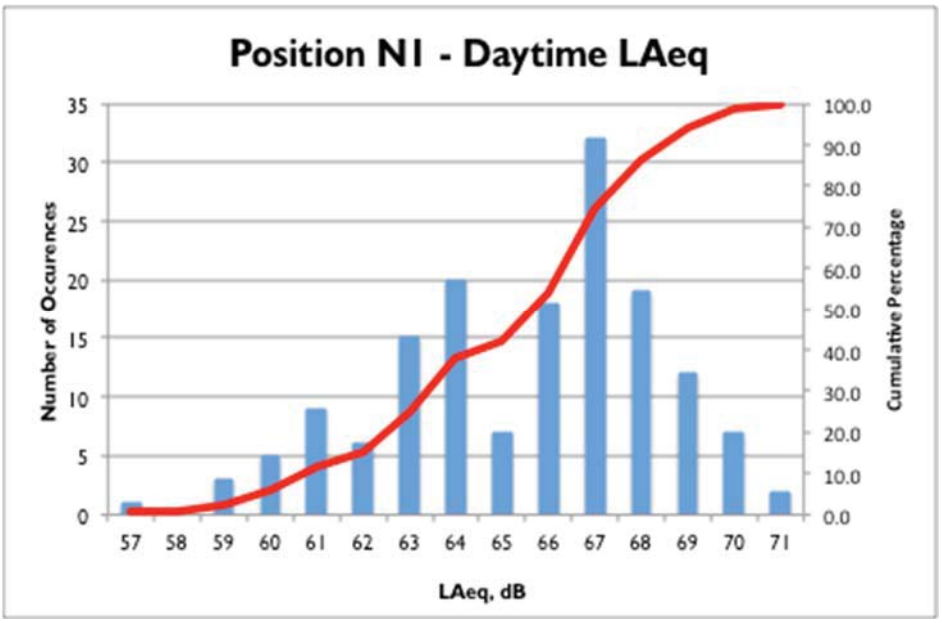

Figure A13.3.34: L_{Aeq} distribution, night-time, August 2016, Position N1

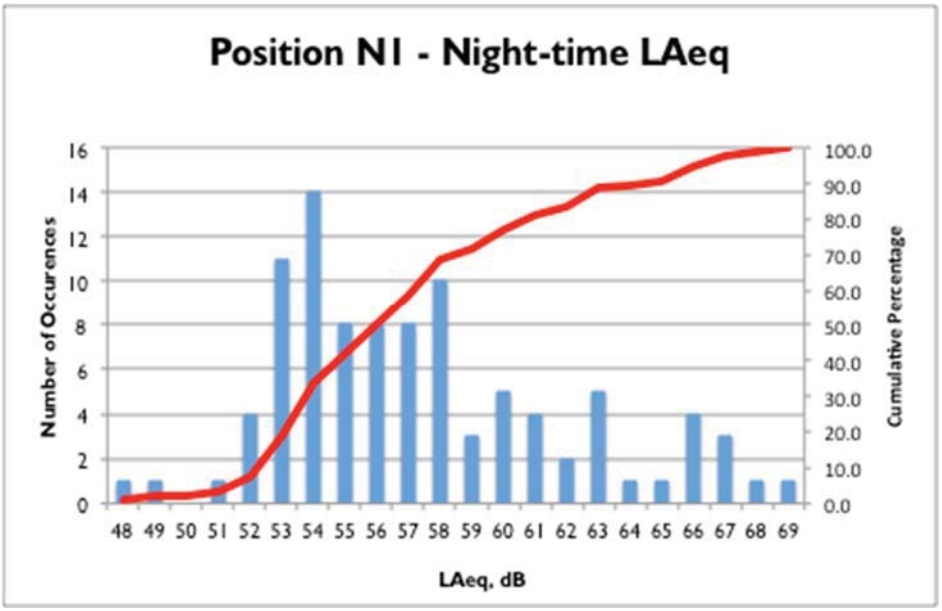

Figure A13.3.35: L_{Aeq} distribution, daytime, August 2016, Position N2

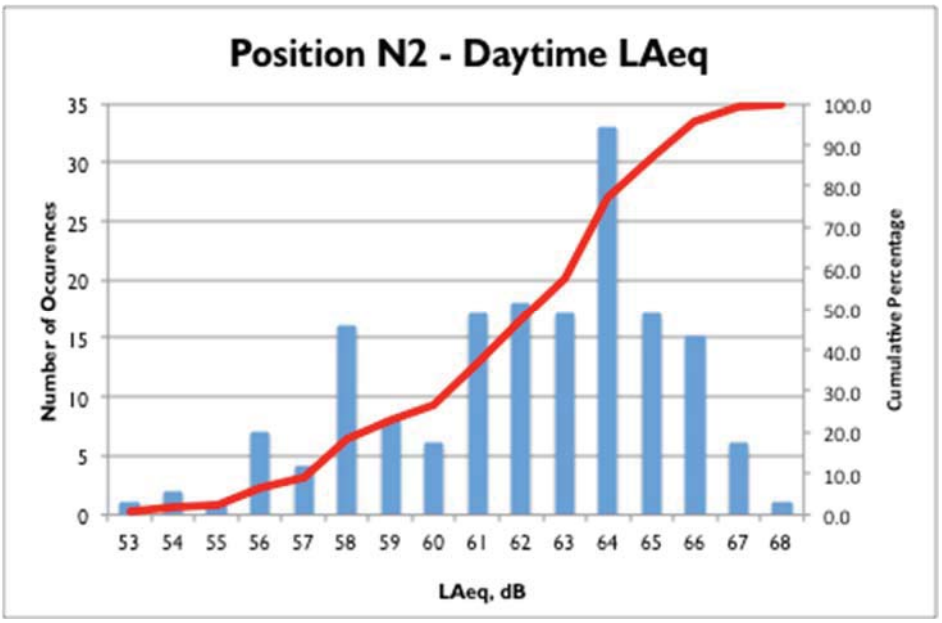

Figure A13.3.36: L_{Aeq} distribution, night-time, August 2016, Position N2

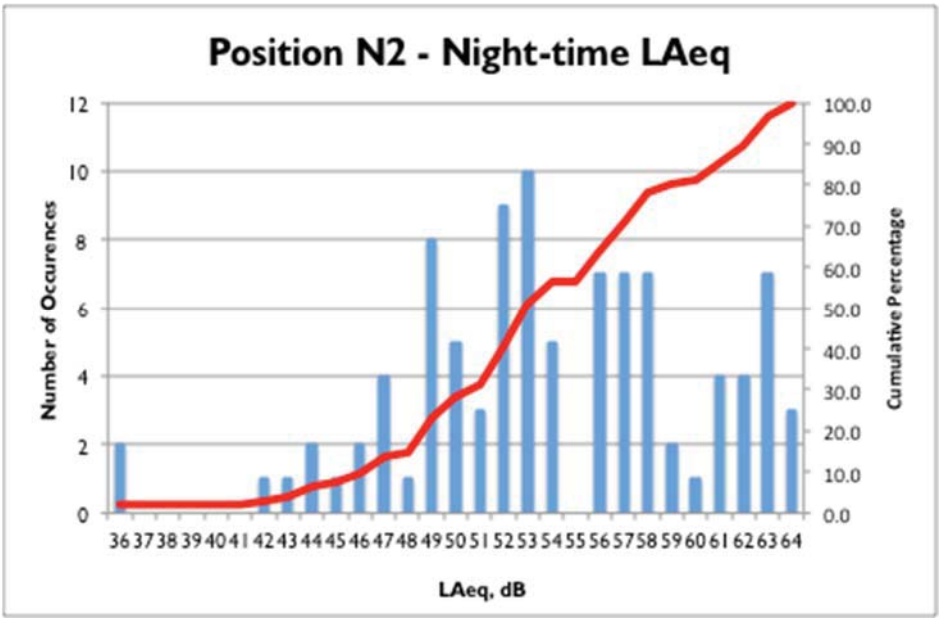

Figure A13.3.37: L_{Aeq} distribution, daytime, August 2016, Position N3

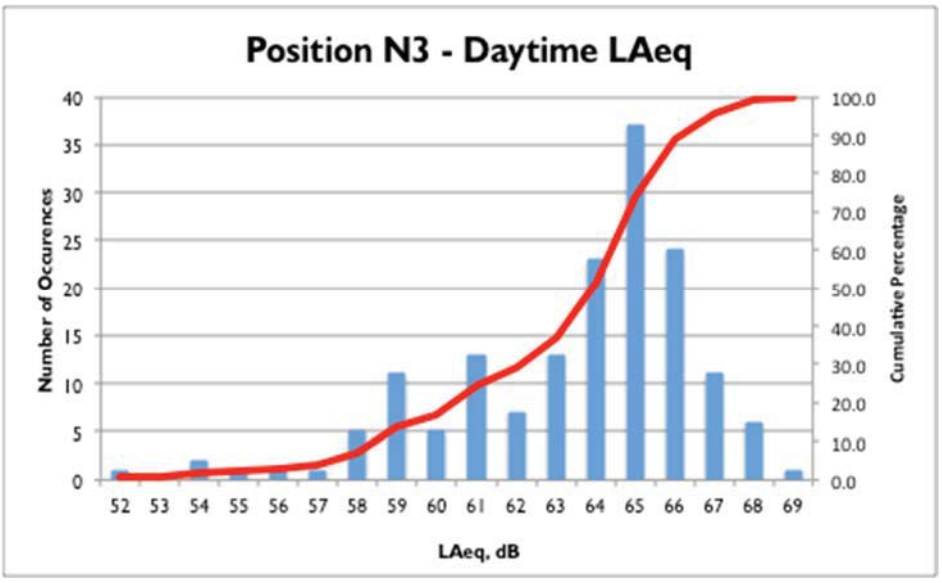

Figure A13.3.38: L_{Aeq} distribution, night-time, August 2016, Position N3

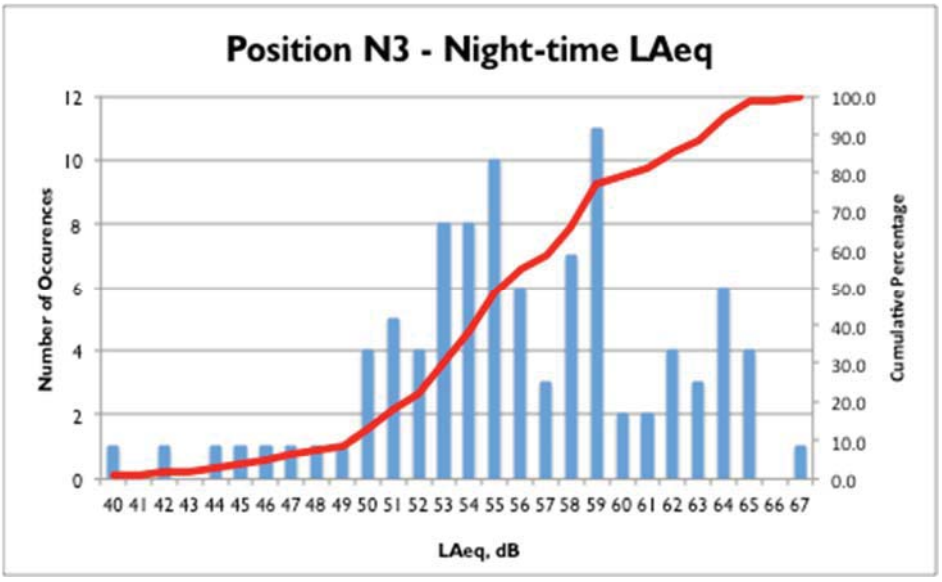

Figure A13.3.39: L_{Aeq} distribution, daytime, August 2016, Position N5

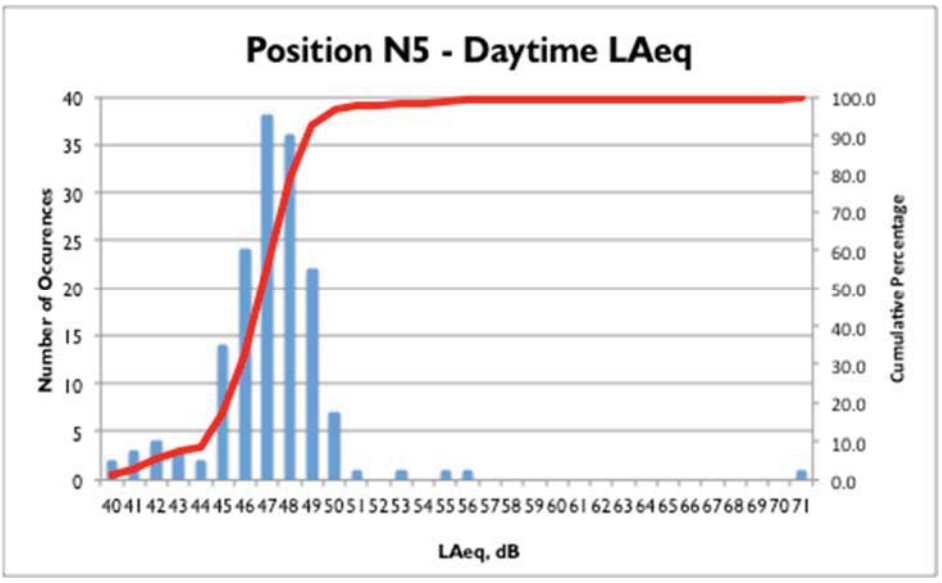

Figure A13.3.40: L_{Aeq} distribution, night-time, August 2016, Position N5

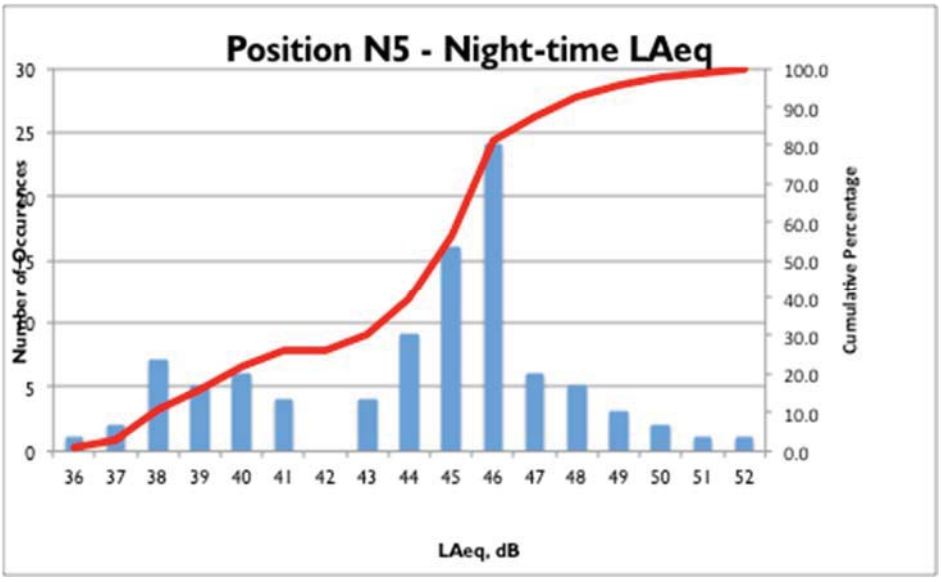

Figure A13.3.41: L_{Aeq} distribution, daytime, October 2016, Position N6

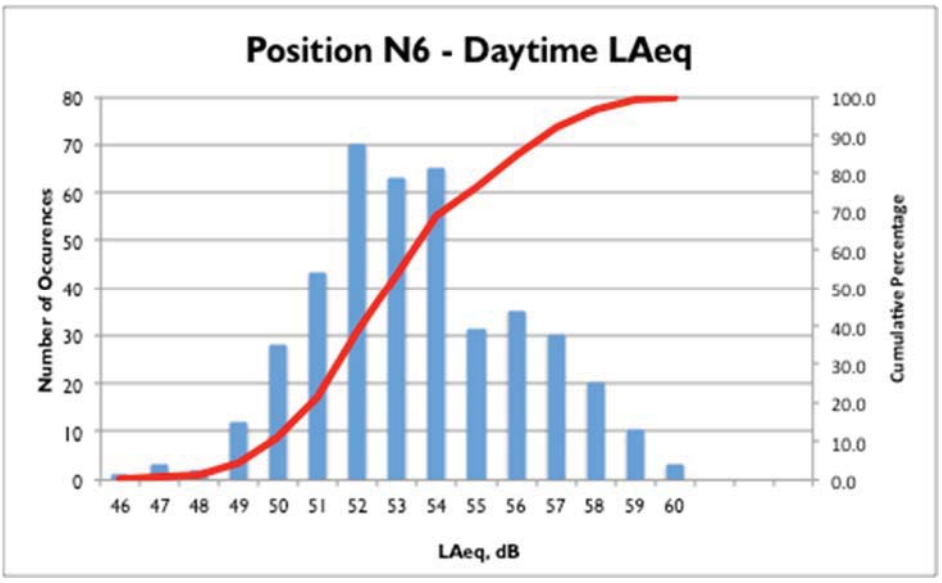

Figure A13.3.42: L_{Aeq} distribution, night-time, October 2016, Position N6

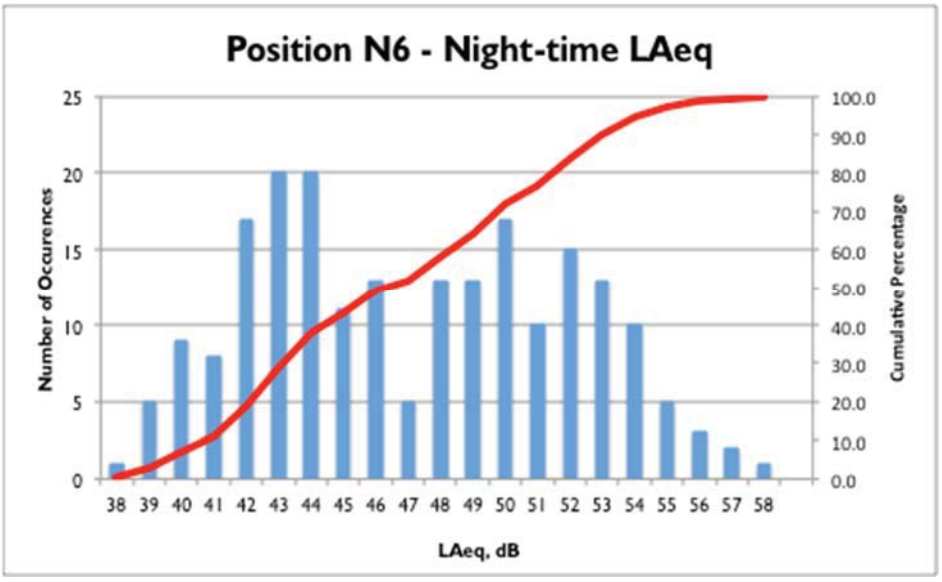

Figure A13.3.43: L_{Aeq} distribution, daytime, August 2016, Position N7

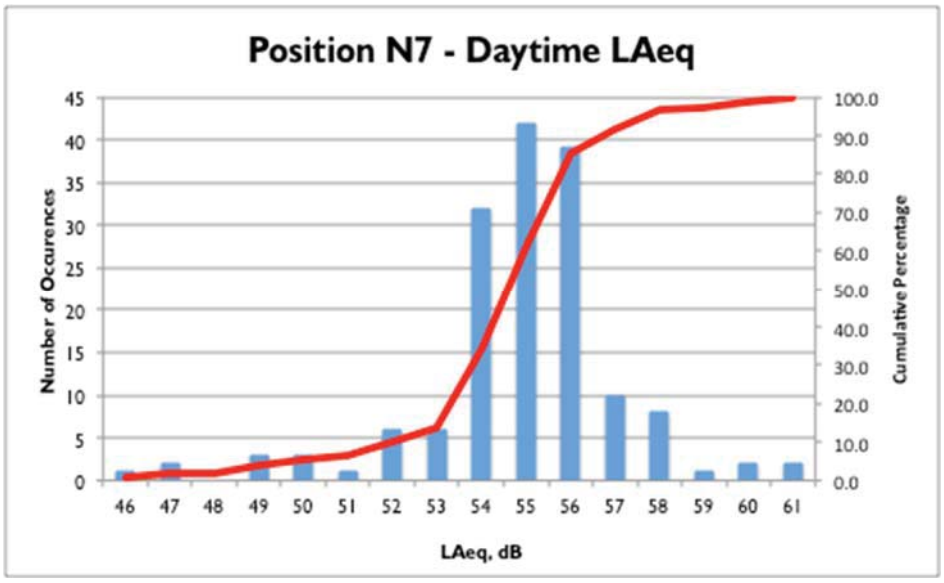

Figure A13.3.44: L_{Aeq} distribution, night-time, August 2016, Position N7

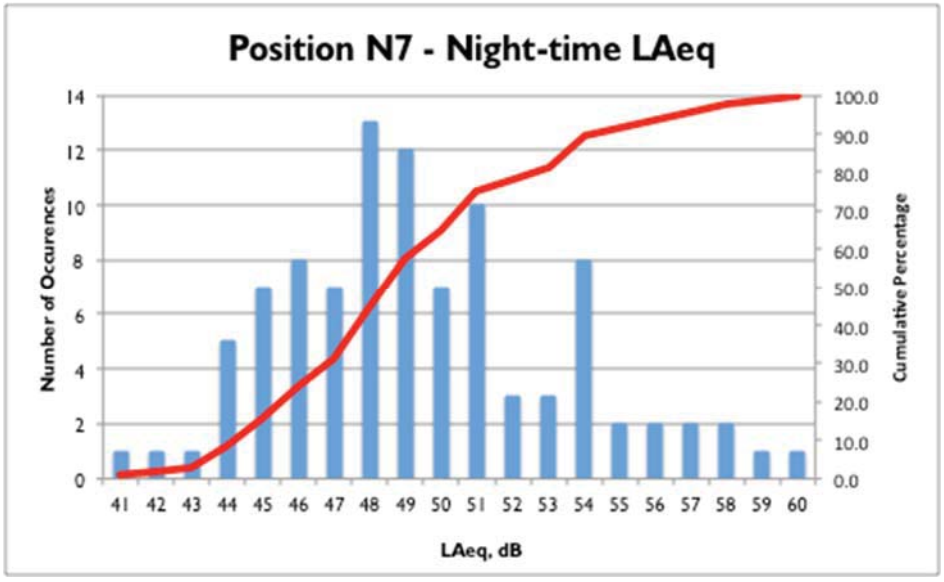

Figure A13.3.45: L_{Aeq} distribution, daytime, August 2016, Position N8

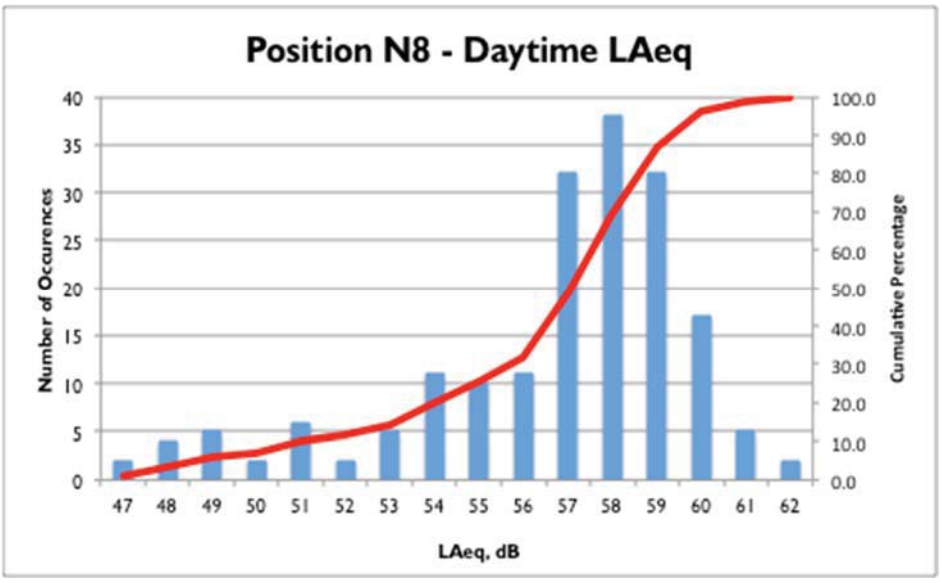

Figure A13.3.46: L_{Aeq} distribution, night-time, August 2016, Position N8

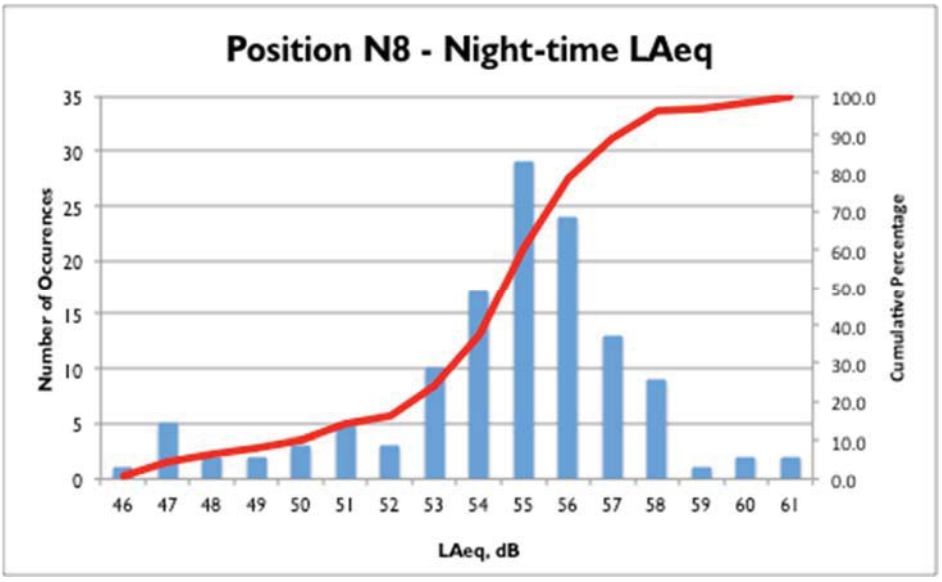

Figure A13.3.47: L_{Aeq} distribution, daytime, August 2016, Position N9

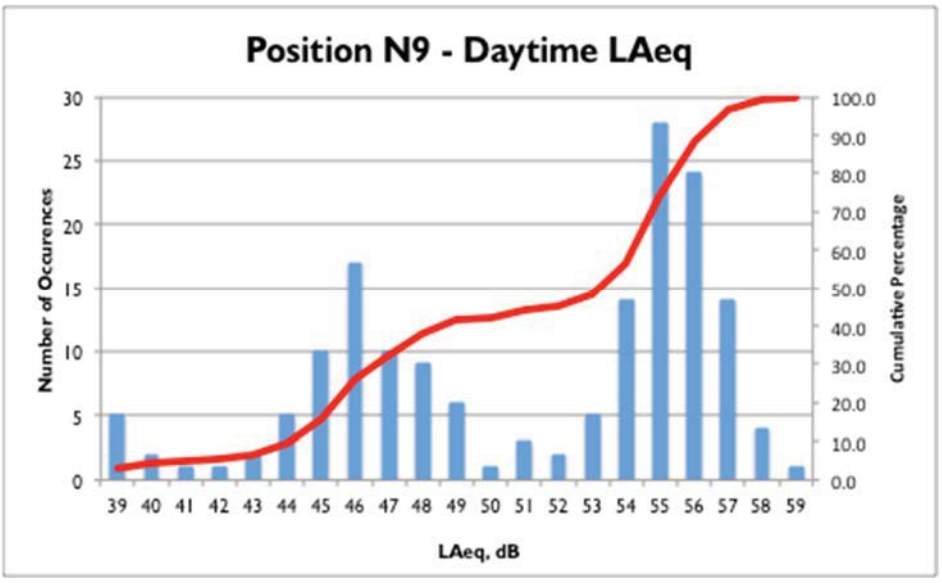

Figure A13.3.48: L_{Aeq} distribution, night-time, August 2016, Position N9

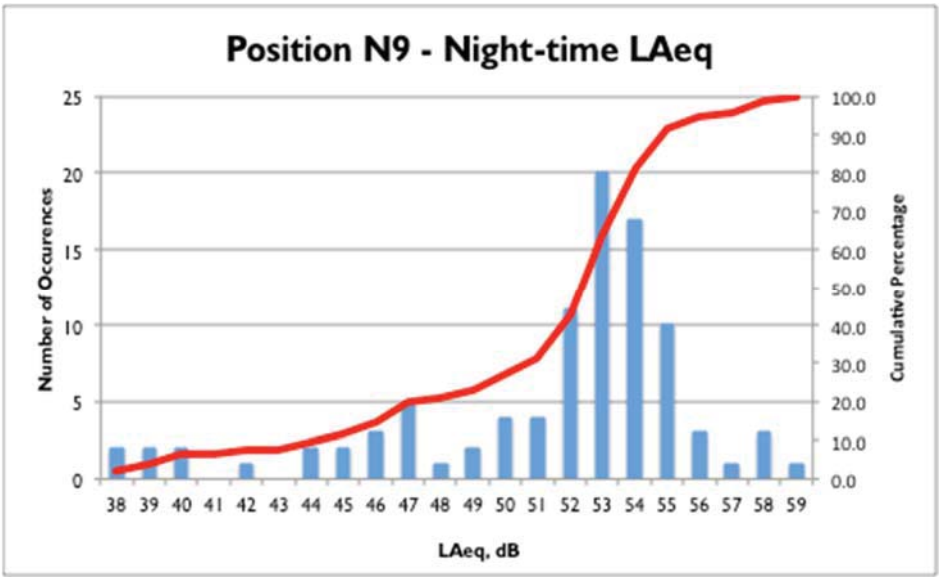

Figure A13.3.49: L_{A90} distribution, daytime, January 2017, Position N1

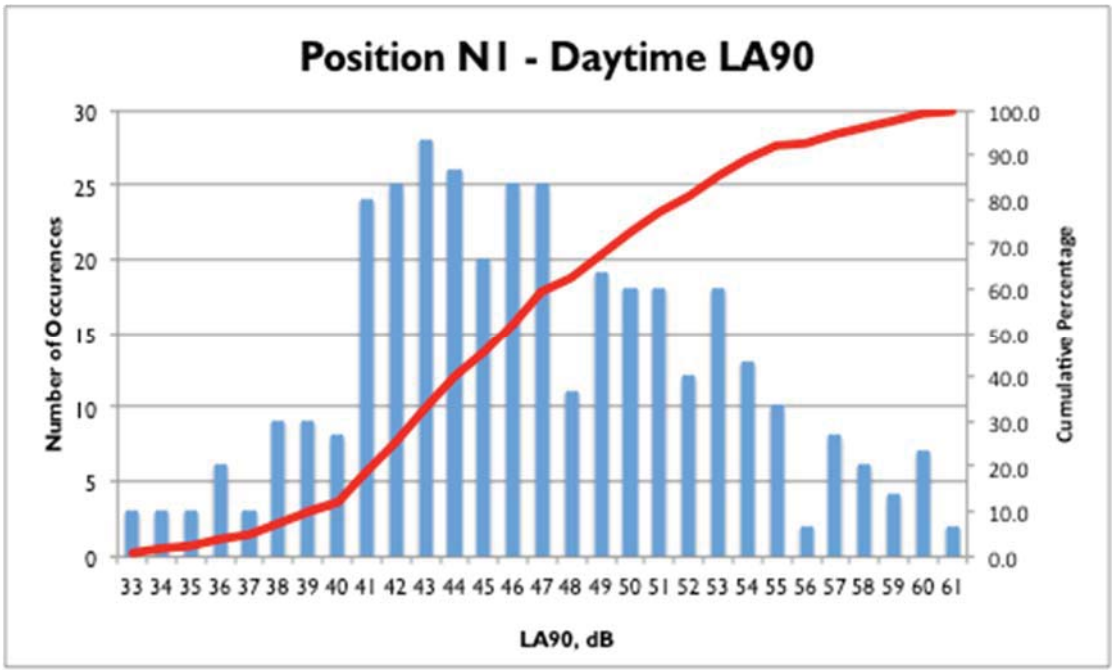

Figure A13.3.50: L_{A90} distribution, night-time, January 2017, Position N1

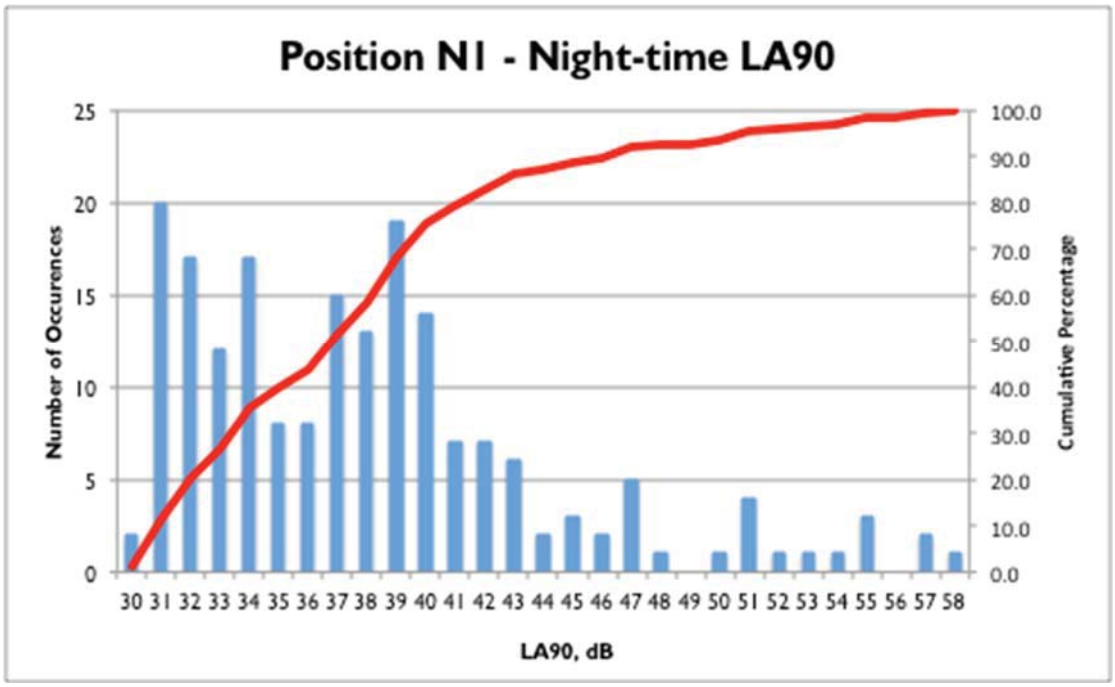

Figure A13.3.51: L_{A90} distribution, daytime, January 2017, Position N2

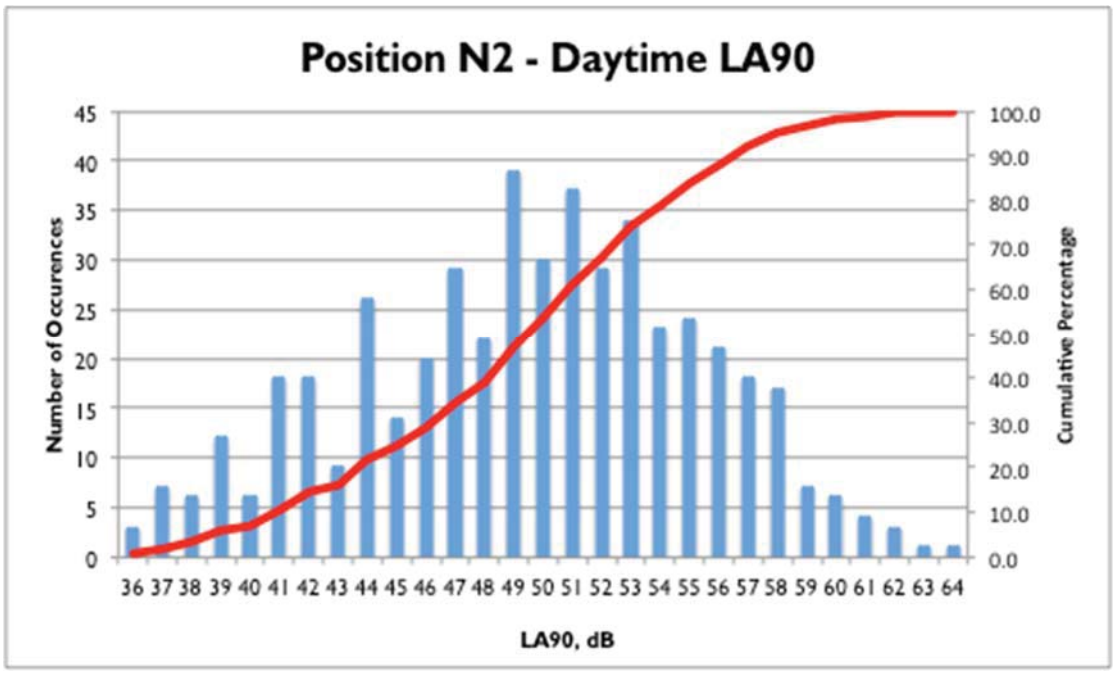

Figure A13.3.52: L_{A90} distribution, night-time, January 2017, Position N2

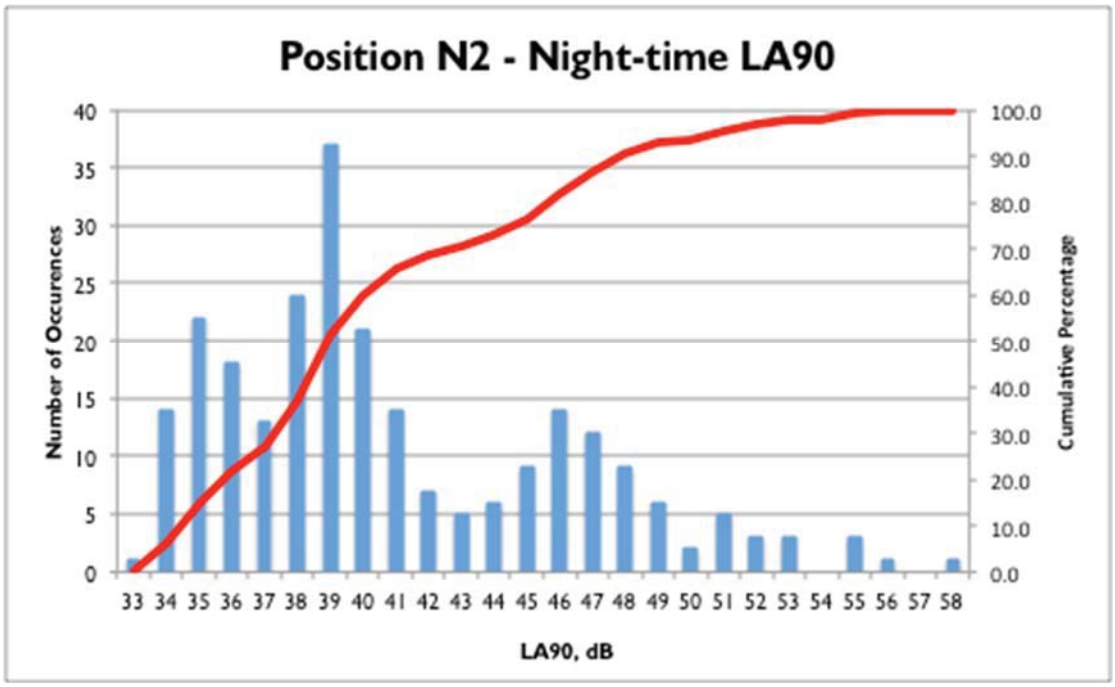

Figure A13.3.53: L_{A90} distribution, daytime, January 2017, Position N4

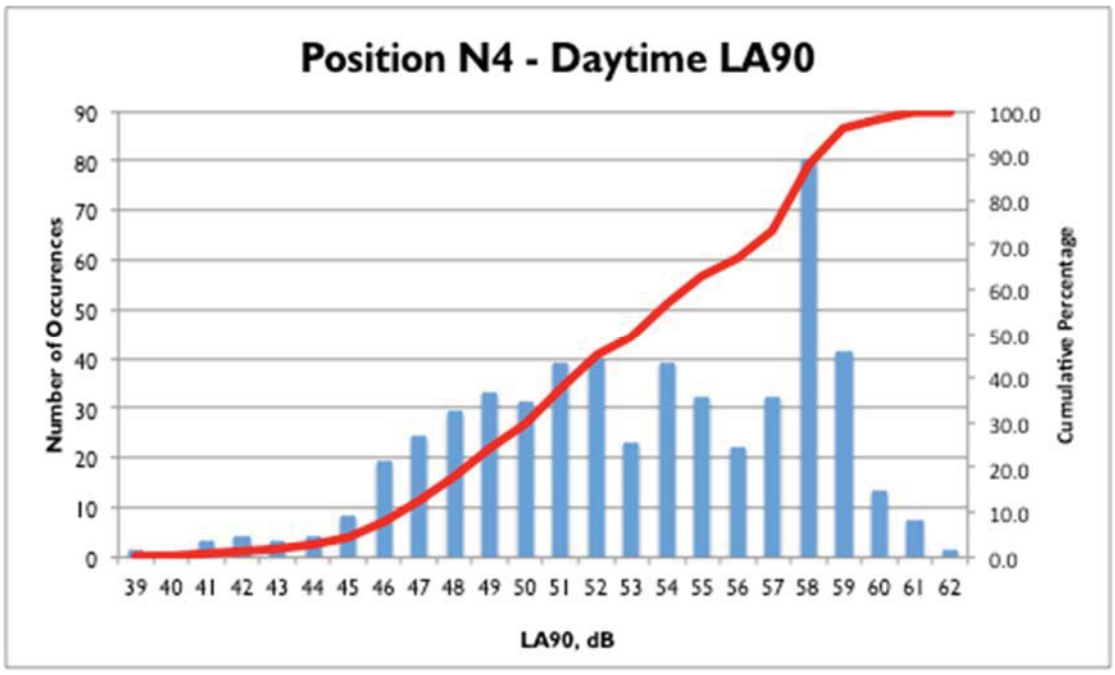

Figure A13.3.54: L_{A90} distribution, night-time, January 2017, Position N4

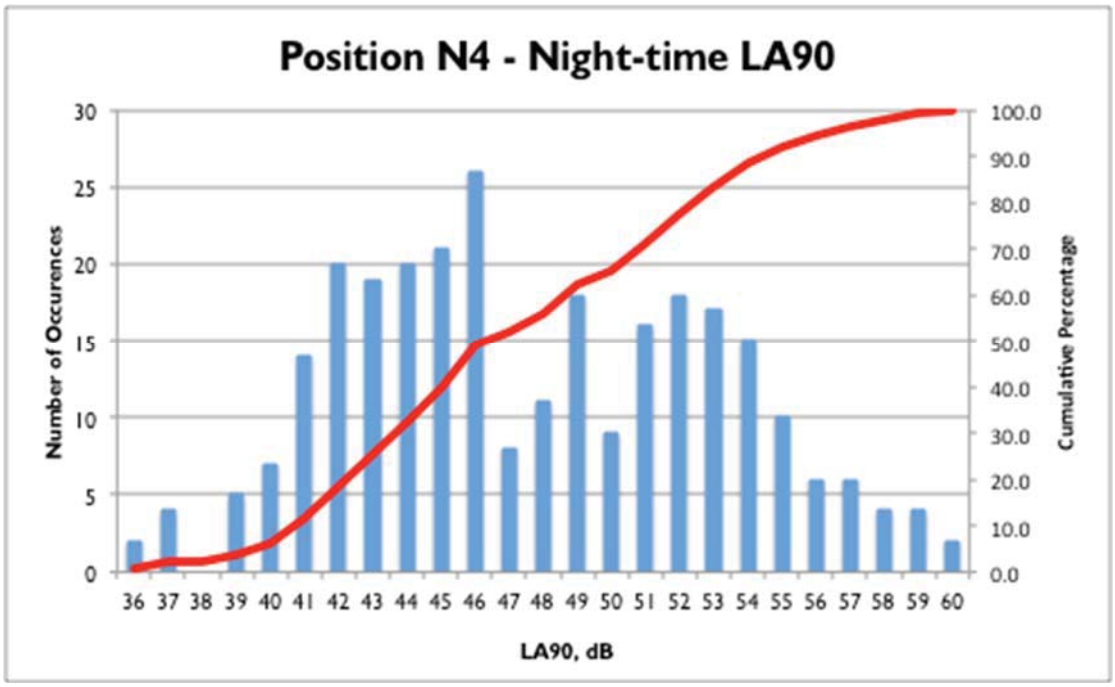

Figure A13.3.55: L_{A90} distribution, daytime, January 2017, Position N5

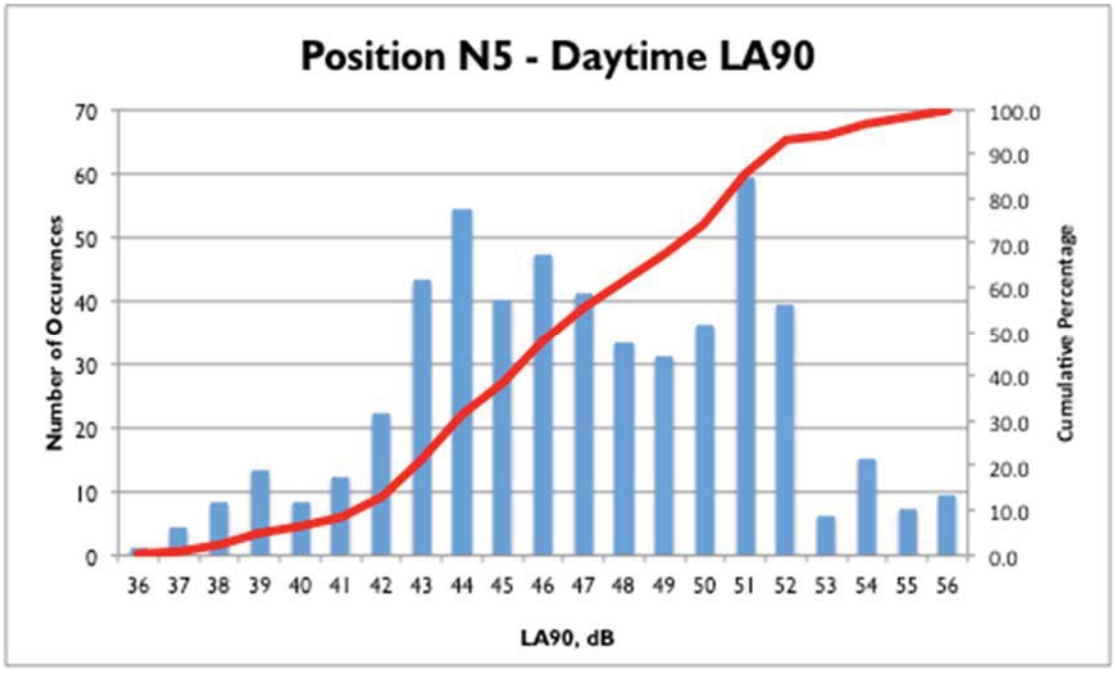

Figure A13.3.56: L_{A90} distribution, night-time, January 2017, Position N5

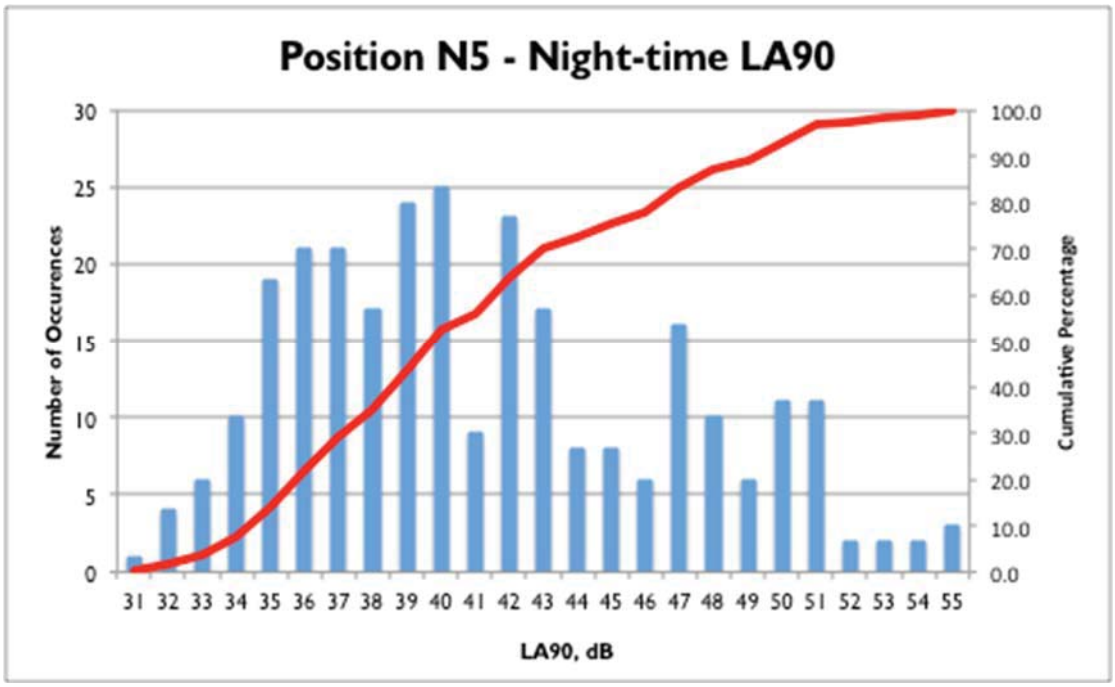

Figure A13.3.57: L_{A90} distribution, daytime, January 2017, Position N6

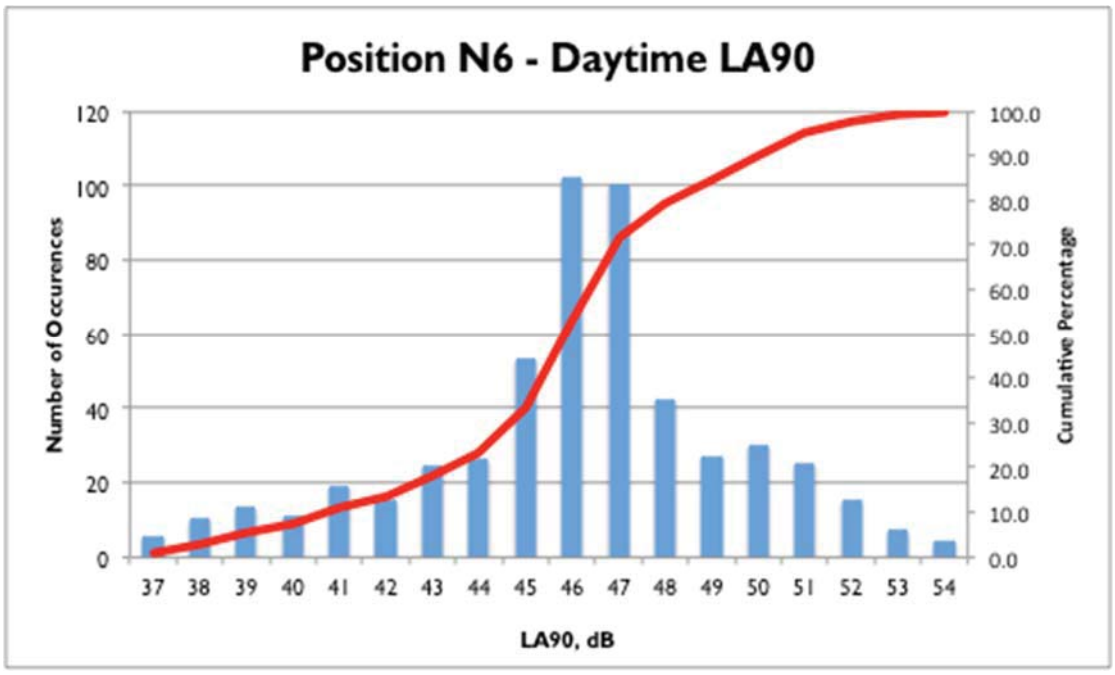

Figure A13.3.58: L_{A90} distribution, night-time, January 2017, Position N6

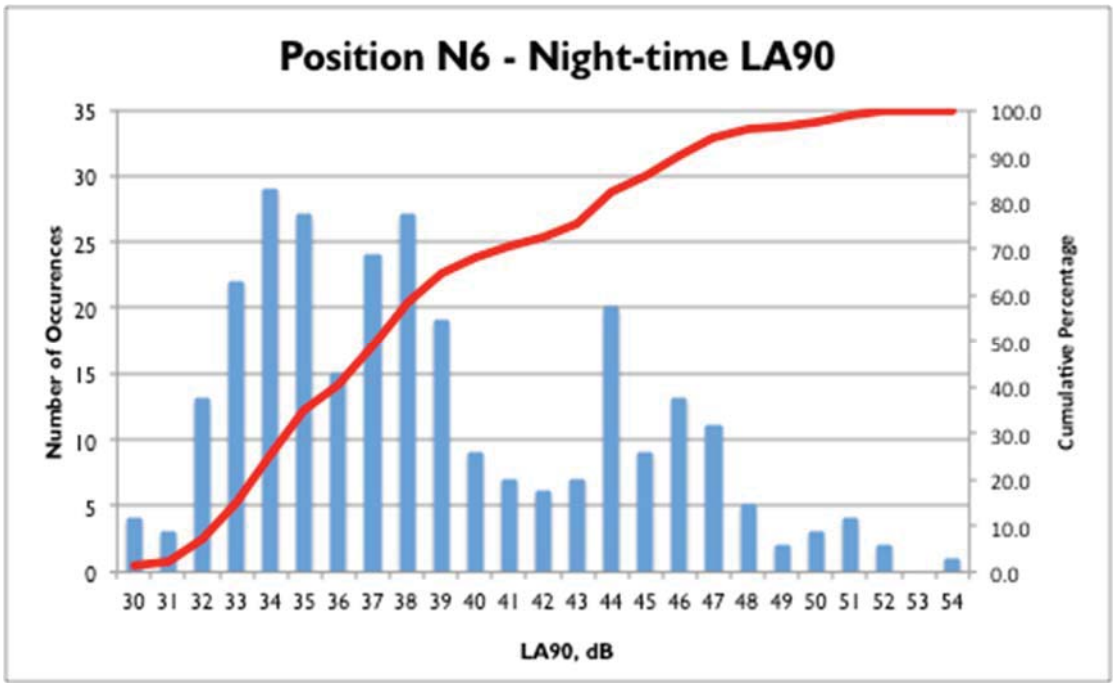

Figure A13.3.59: L_{A90} distribution, daytime, January 2017, Position N7

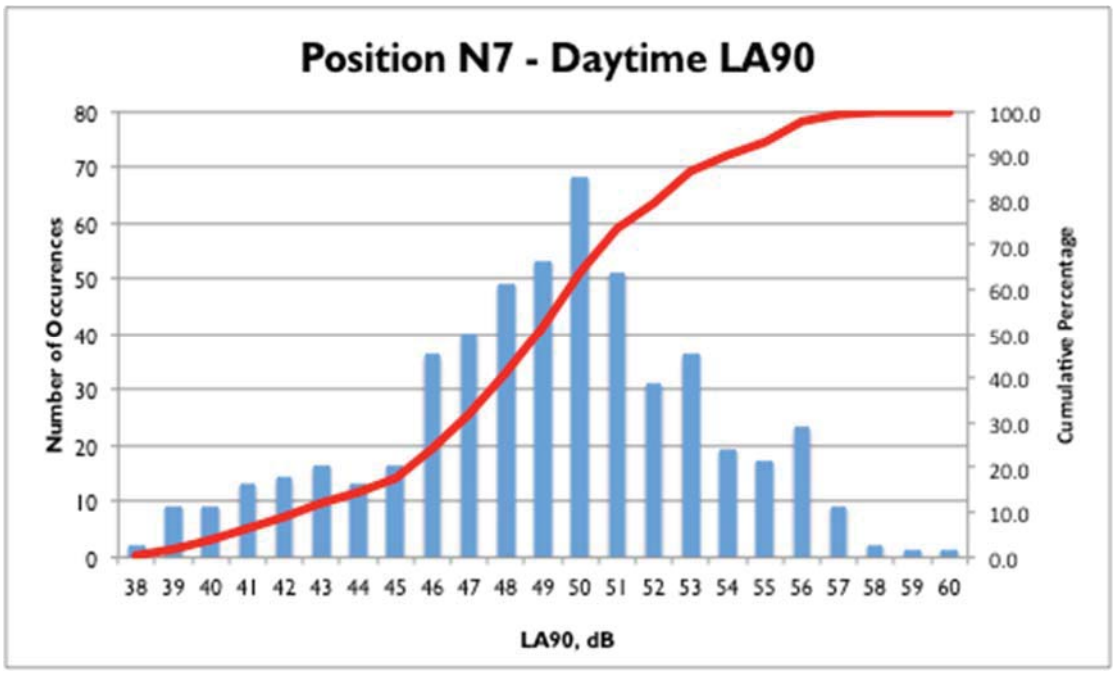

Figure A13.3.60: L_{A90} distribution, night-time, January 2017, Position N7

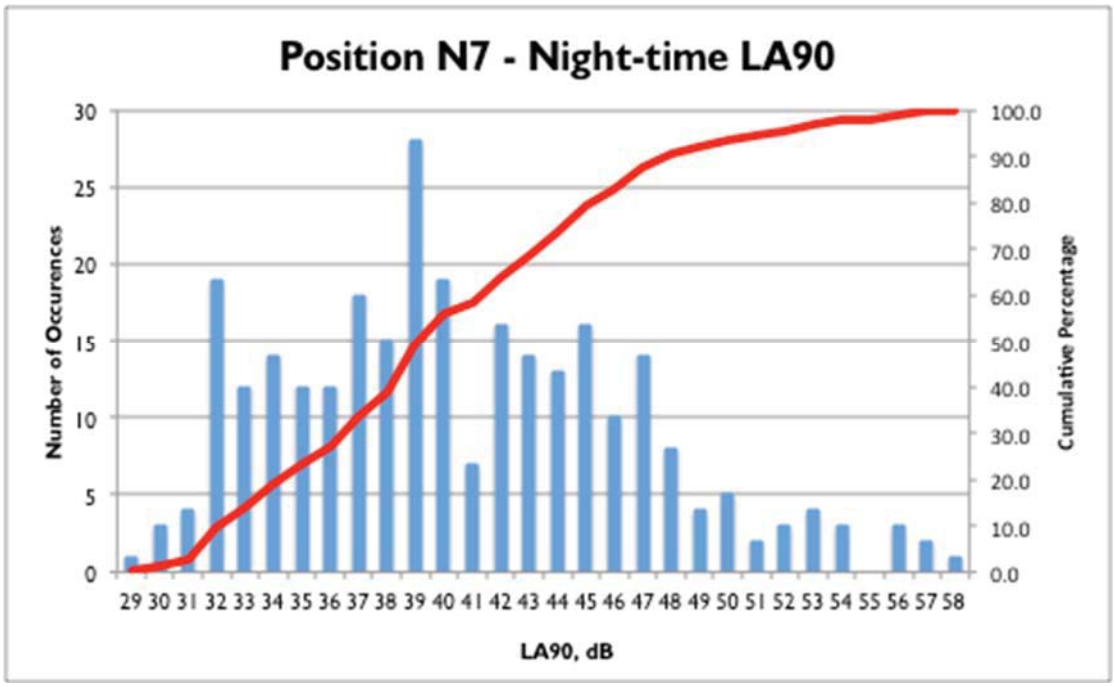

Figure A13.3.61: L_{A90} distribution, daytime, January 2017, Position N8

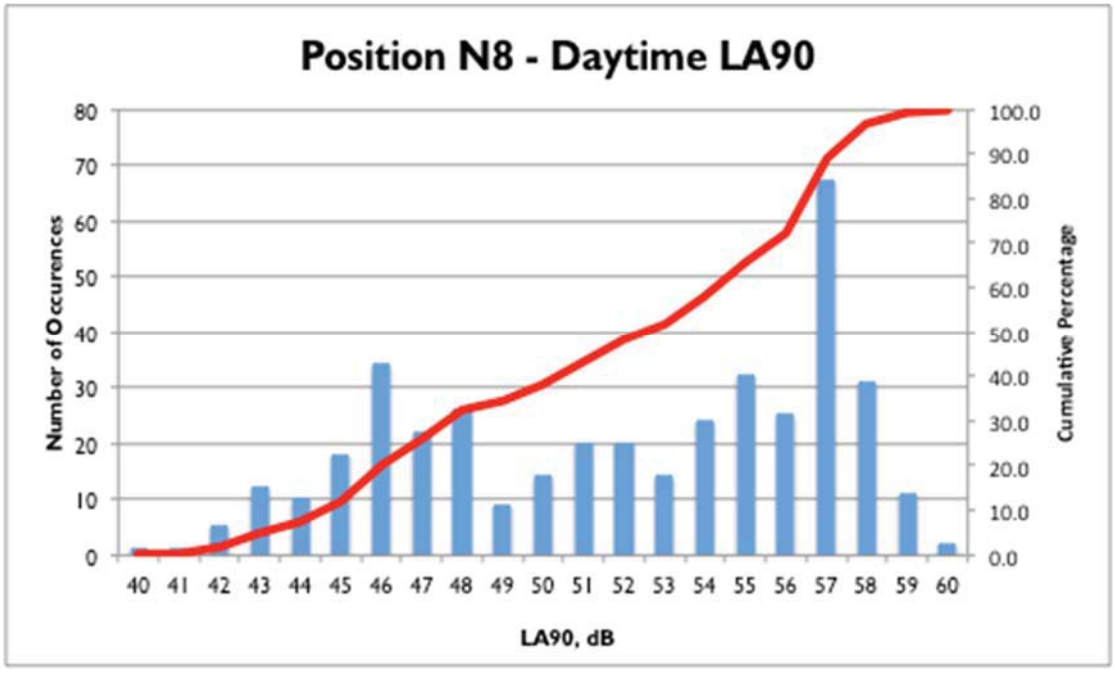

Figure A13.3.62: L_{A90} distribution, night-time, January 2017, Position N8

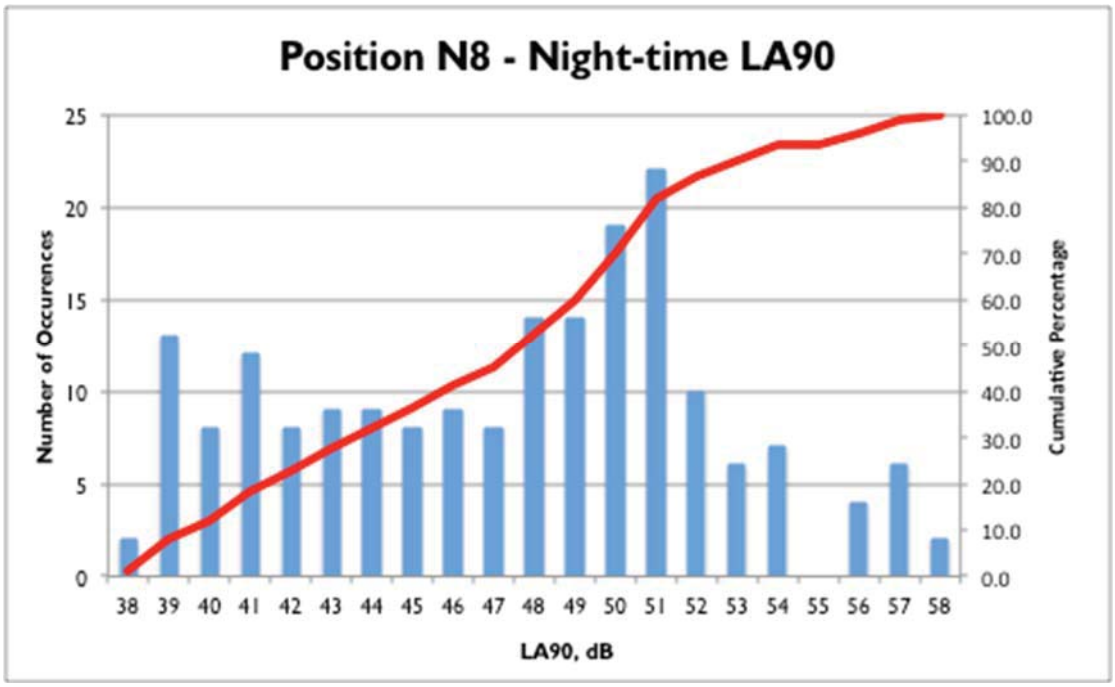

Figure A13.3.63: L_{A90} distribution, daytime, January 2017, Position N9

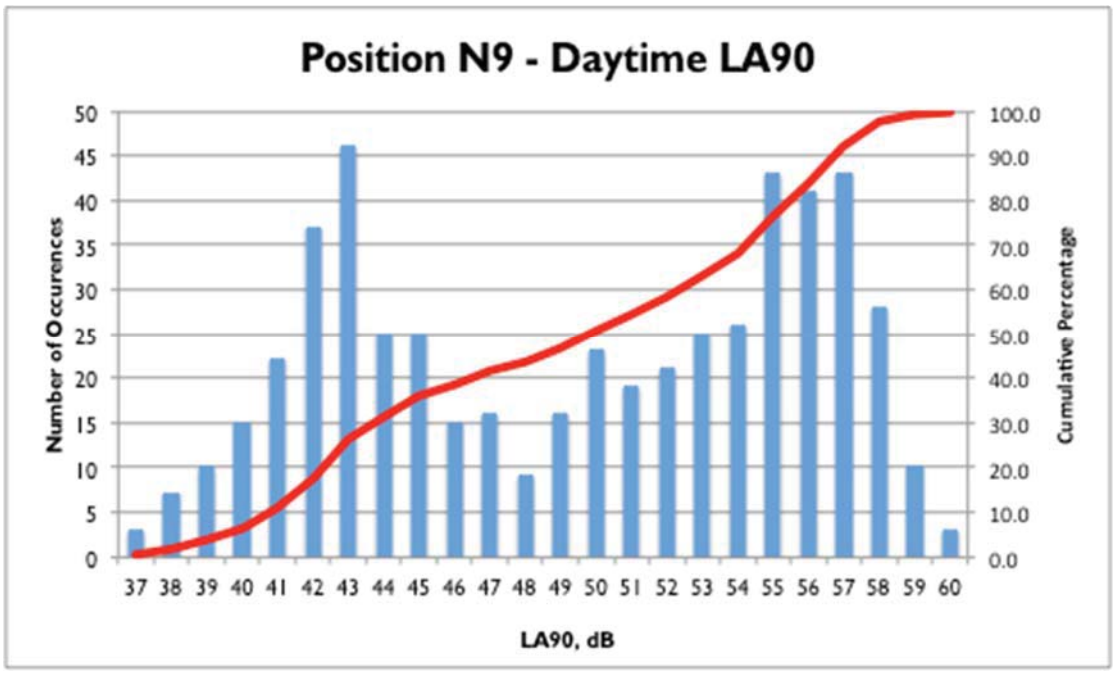

Figure A13.3.64: L_{A90} distribution, night-time, January 2017, Position N9

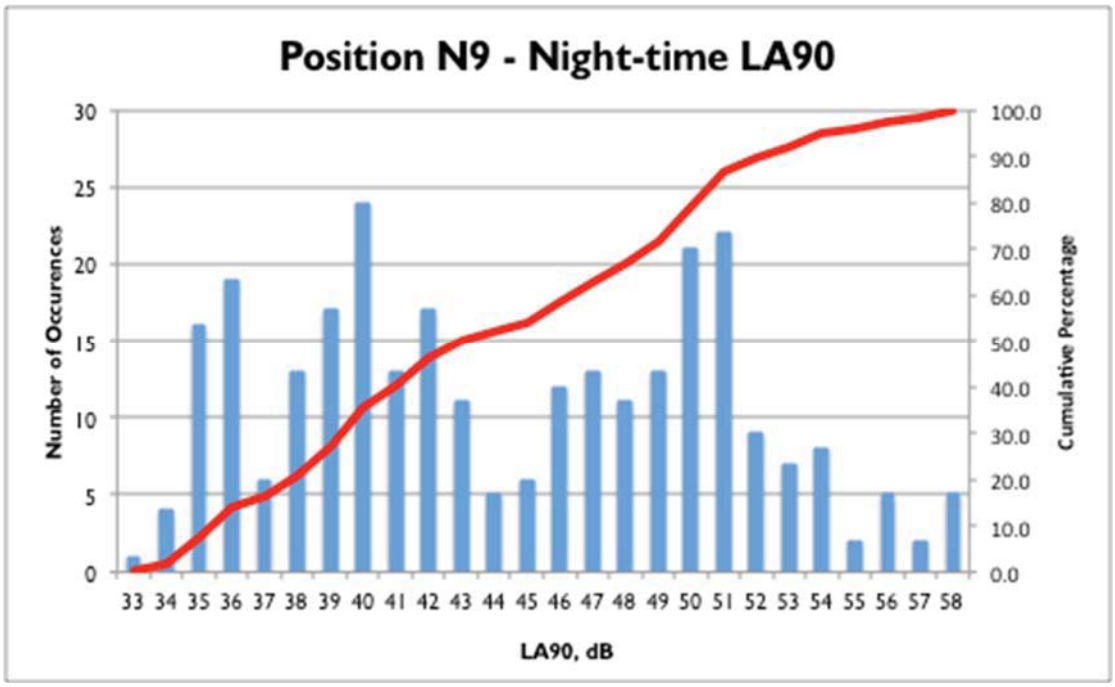

Figure A13.3.65: L_{Aeq} distribution, daytime, January 2017, Position N1

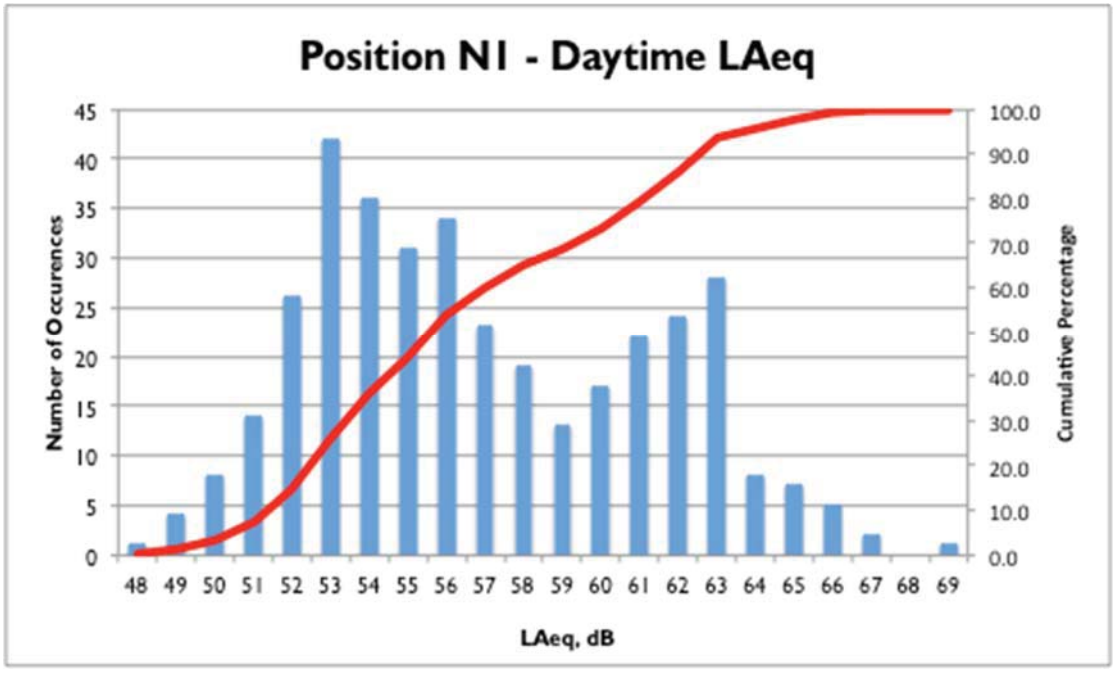

Figure A13.3.66: L_{Aeq} distribution, night-time, January 2017, Position N1

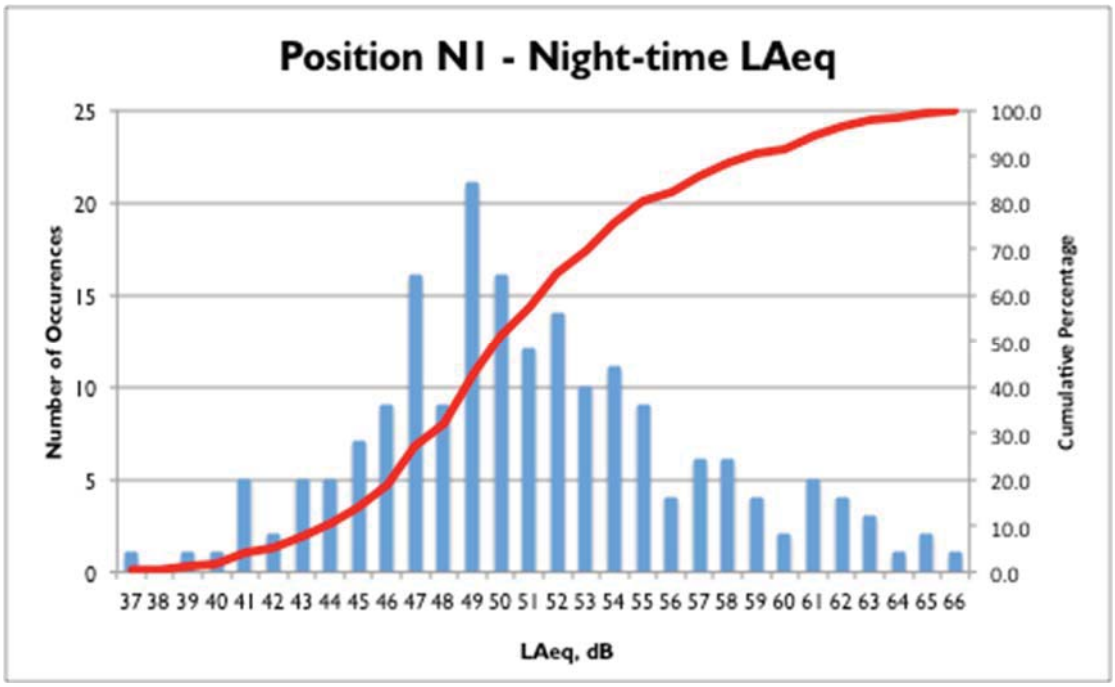

Figure A13.3.67: L_{Aeq} distribution, daytime, January 2017, Position N2

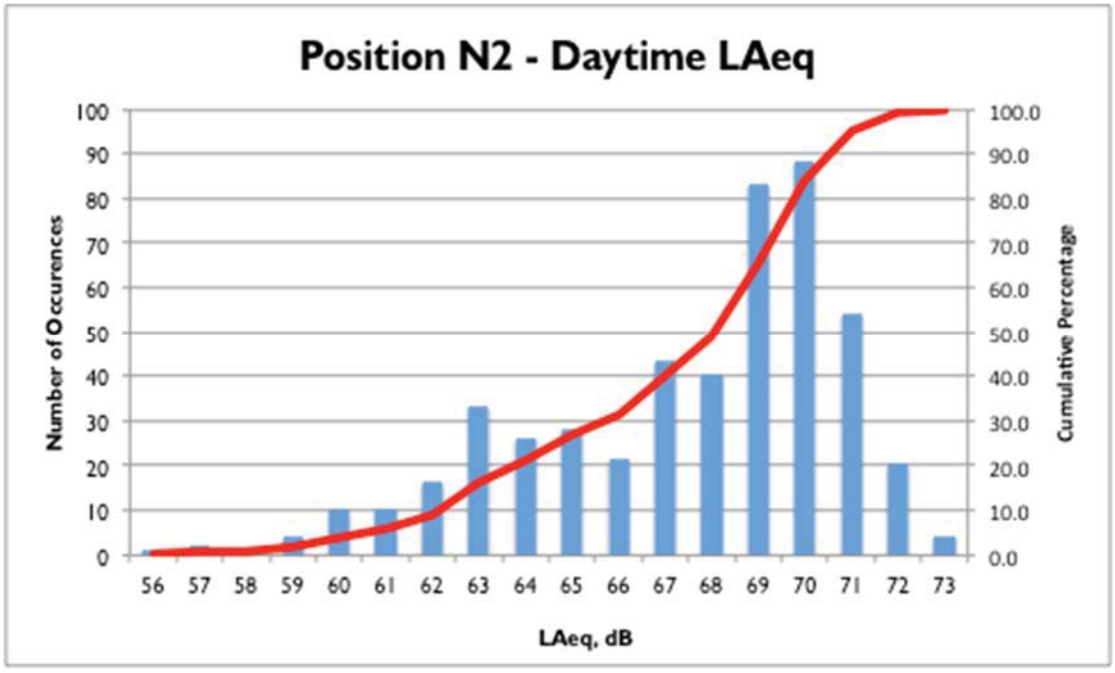

Figure A13.3.68: L_{Aeq} distribution, night-time, January 2017, Position N2

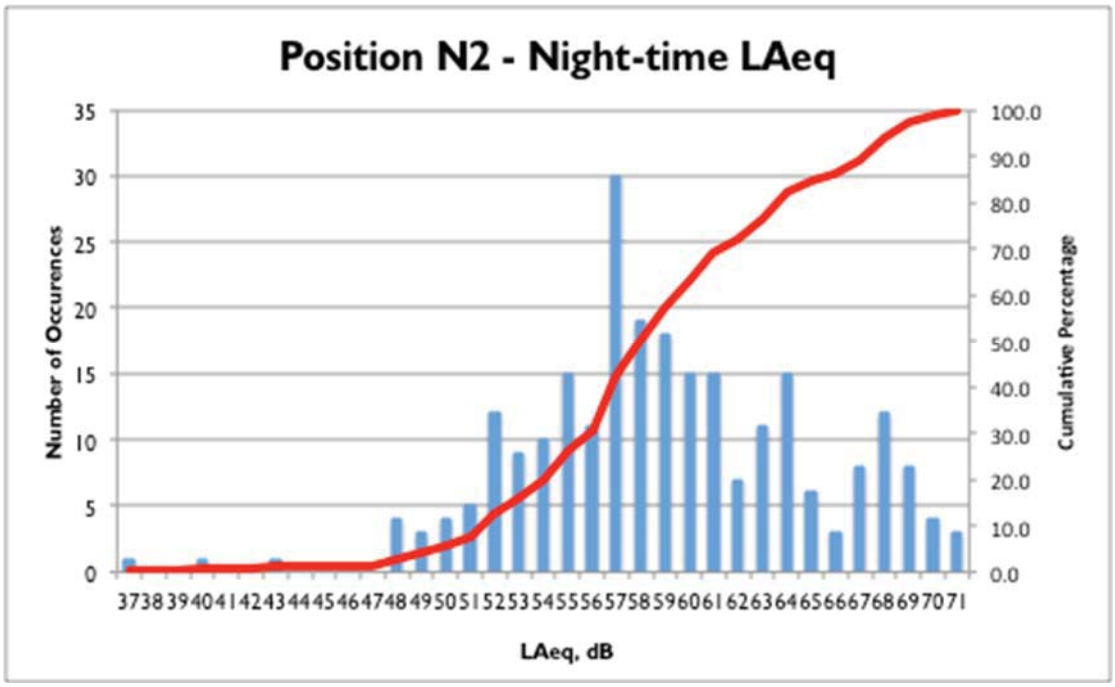

Figure A13.3.69: L_{Aeq} distribution, daytime, January 2017, Position N4

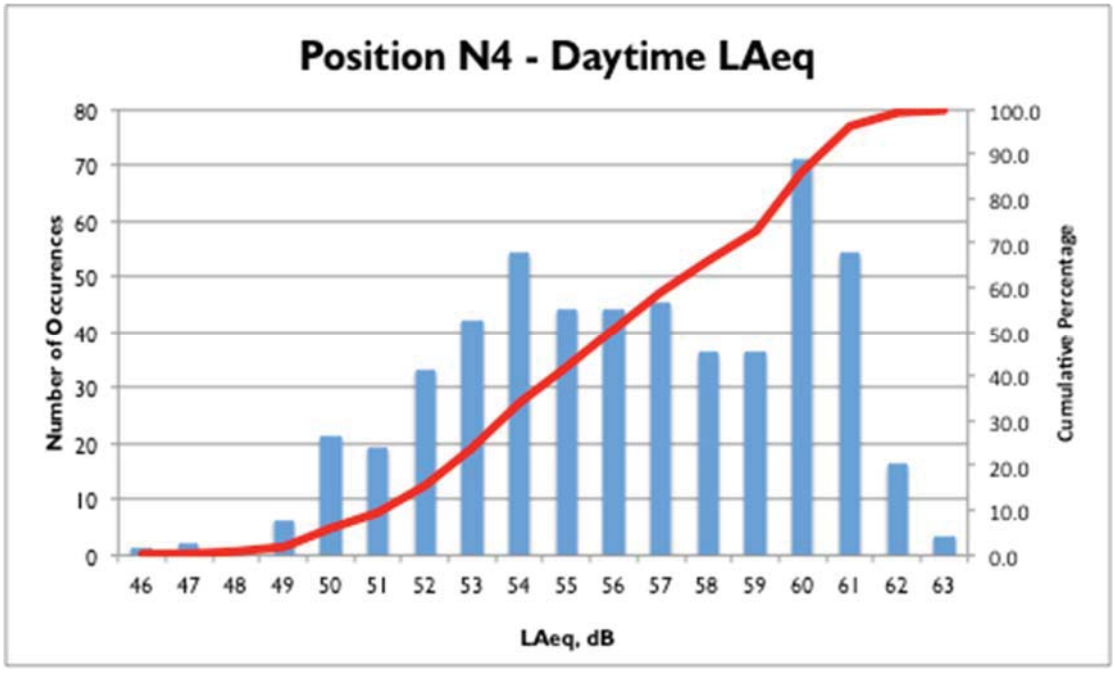

Figure A13.3.70: L_{Aeq} distribution, night-time, January 2017, Position N4

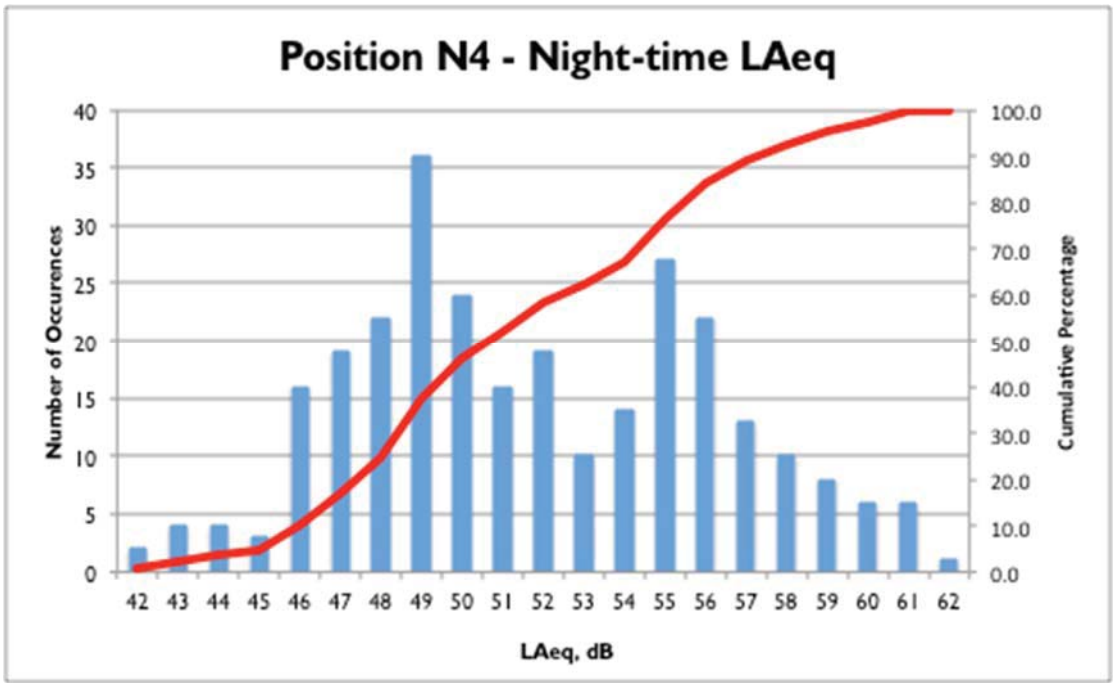

Figure A13.3.71: L_{Aeq} distribution, daytime, January 2017, Position N5

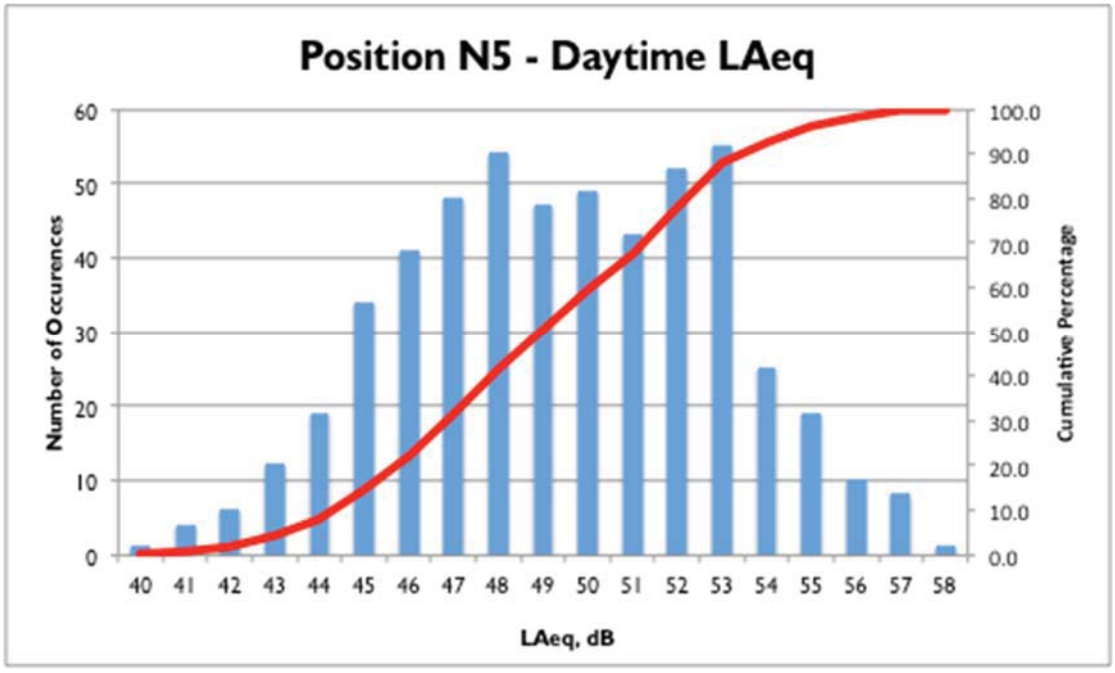

Figure A13.3.72: L_{Aeq} distribution, night-time, January 2017, Position N5

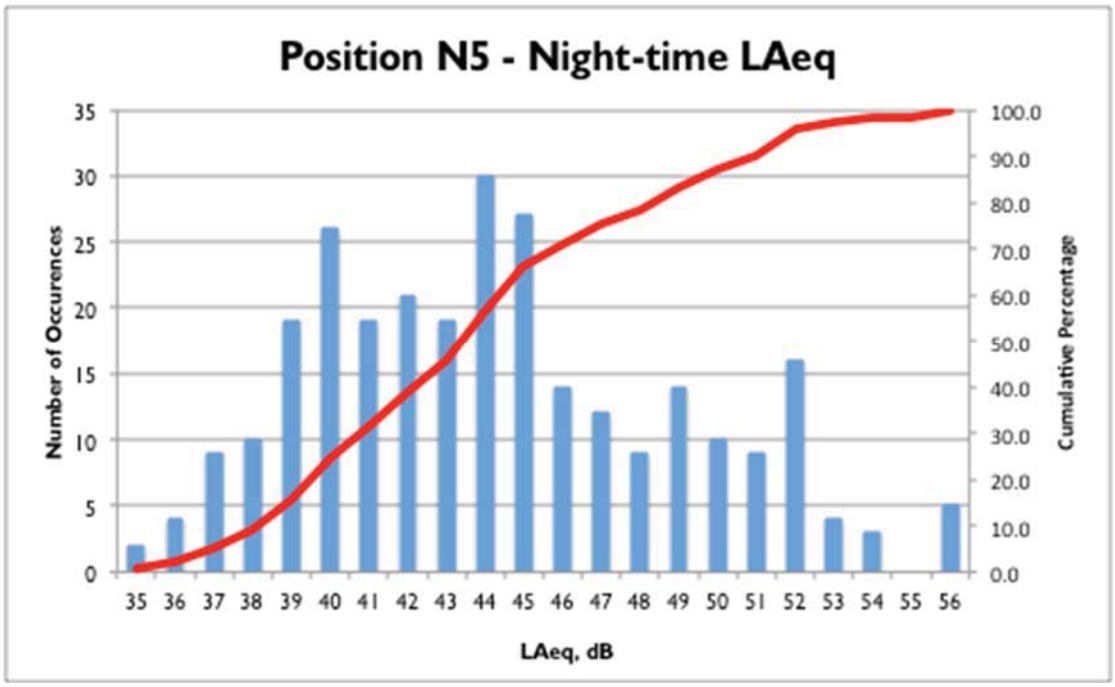

Figure A13.3.73: L_{Aeq} distribution, daytime, January 2017, Position N6

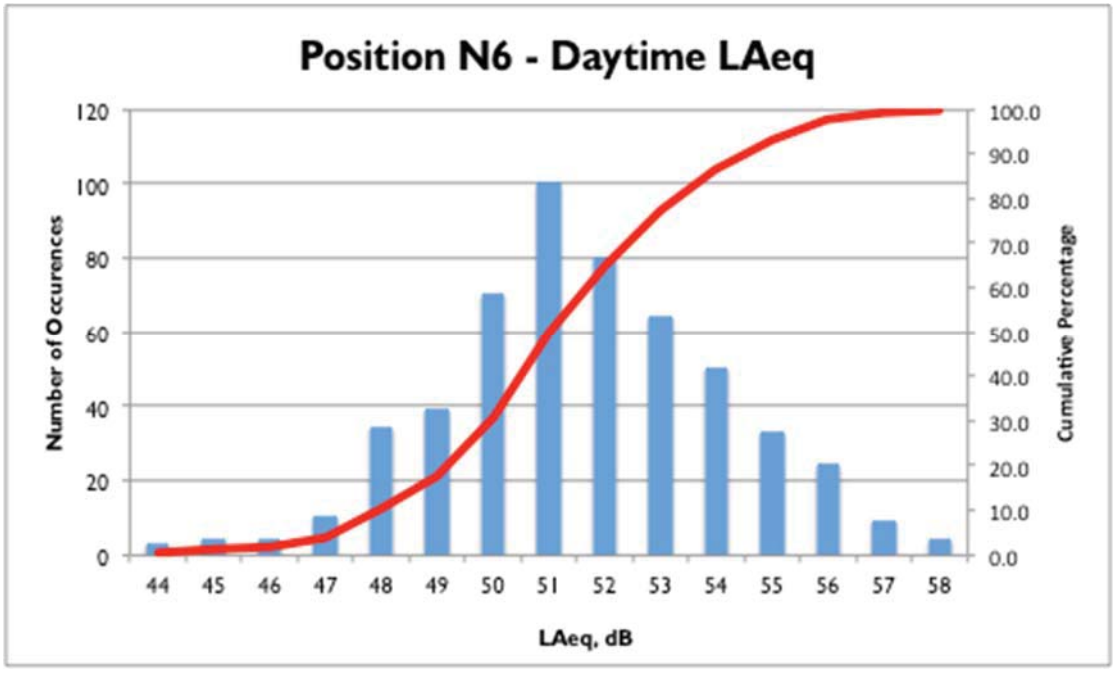

Figure A13.3.74: L_{Aeq} distribution, night-time, January 2017, Position N6

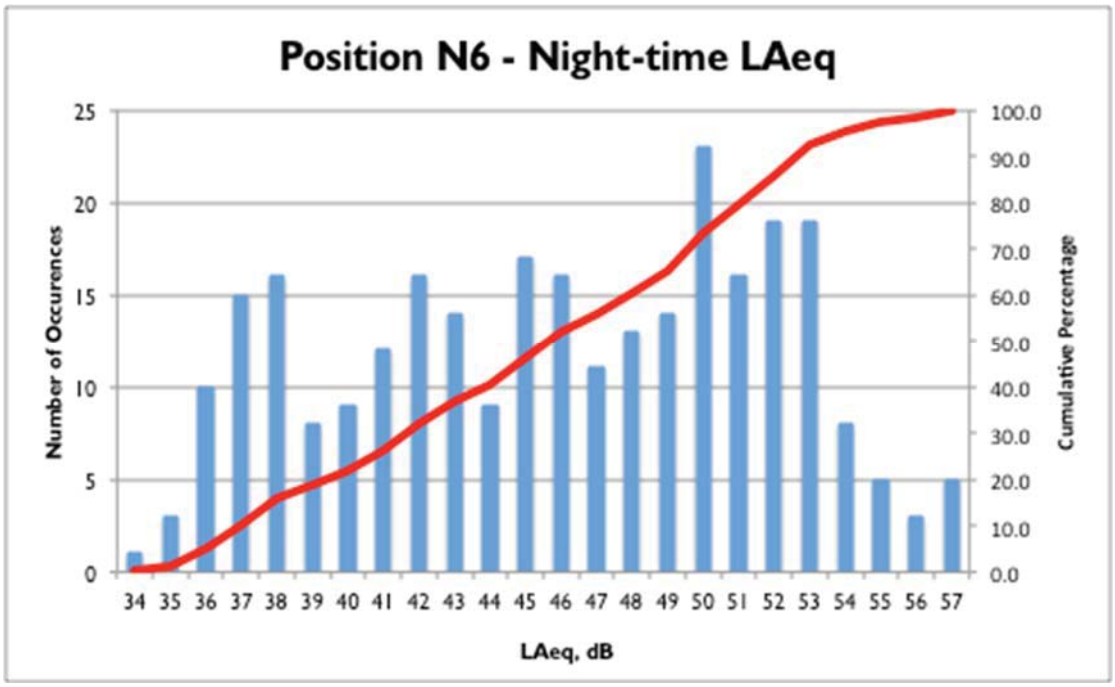

Figure A13.3.75: L_{Aeq} distribution, daytime, January 2017, Position N7

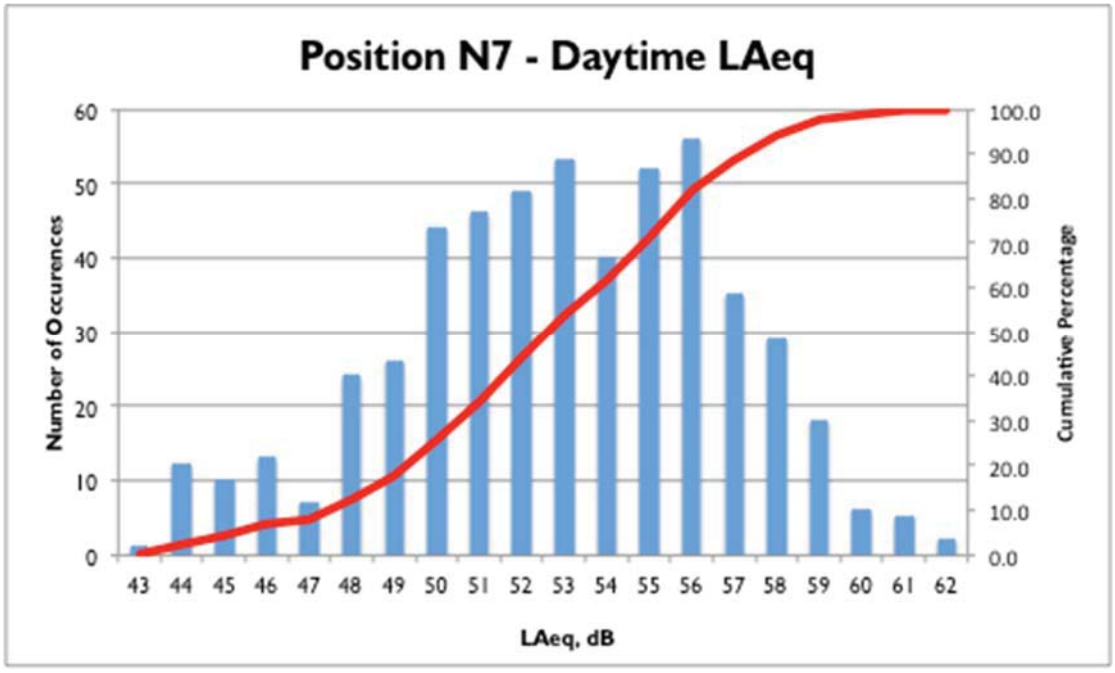

Figure A13.3.76: L_{Aeq} distribution, night-time, January 2017, Position N7

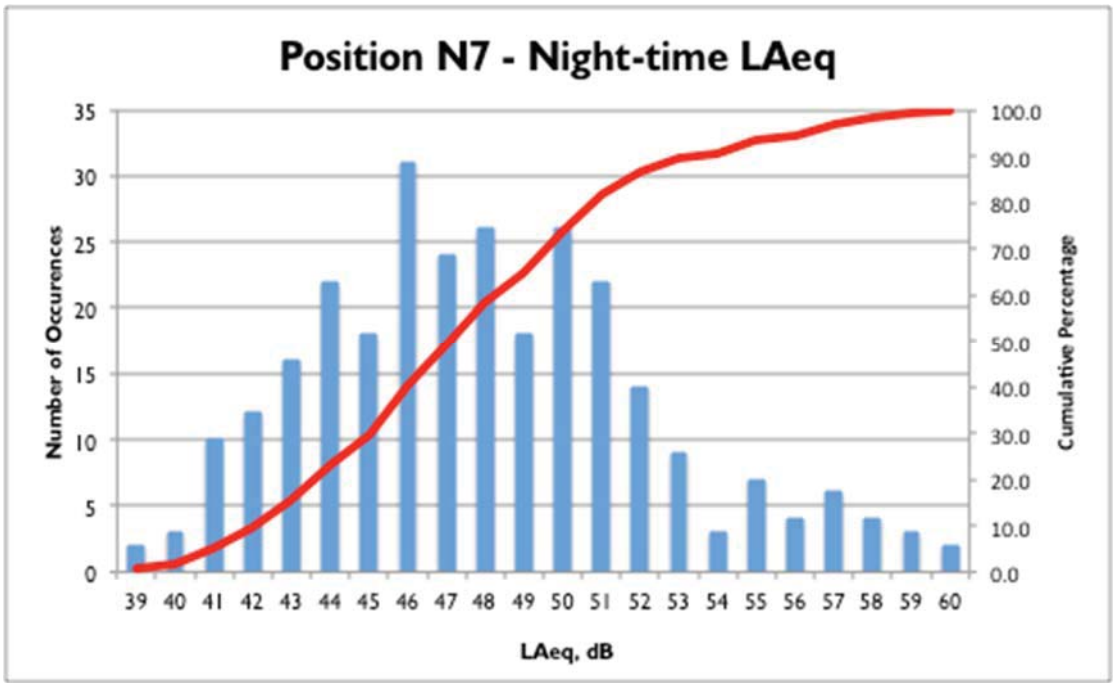

Figure A13.3.77: L_{Aeq} distribution, daytime, January 2017, Position N8

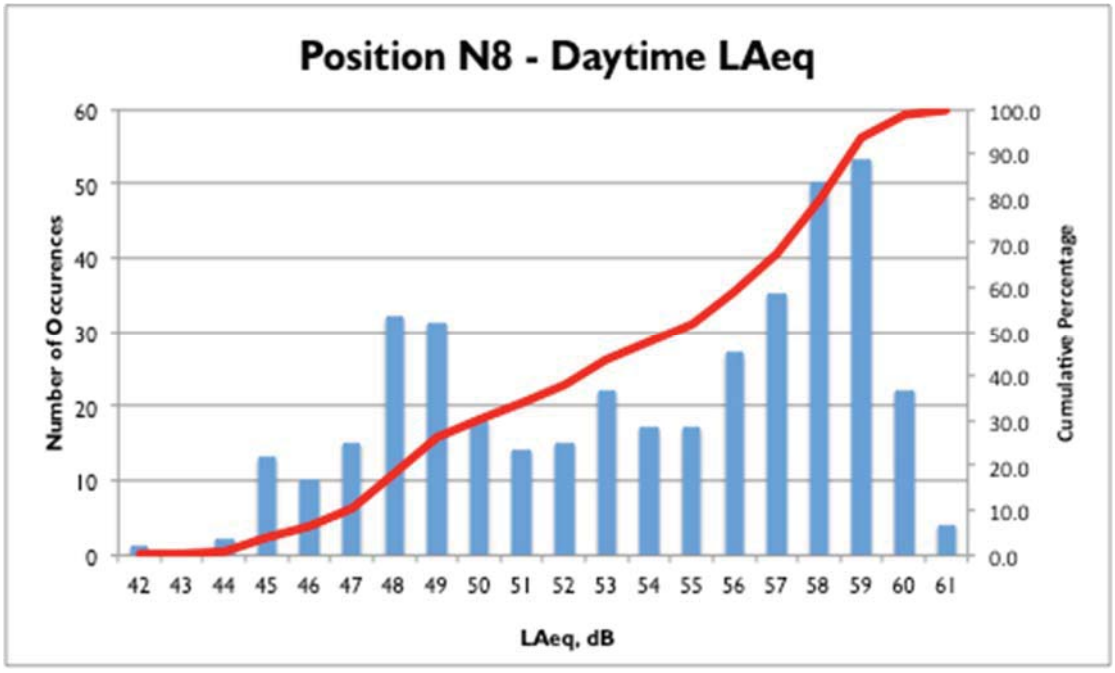

Figure A13.3.78: L_{Aeq} distribution, night-time, January 2017, Position N8

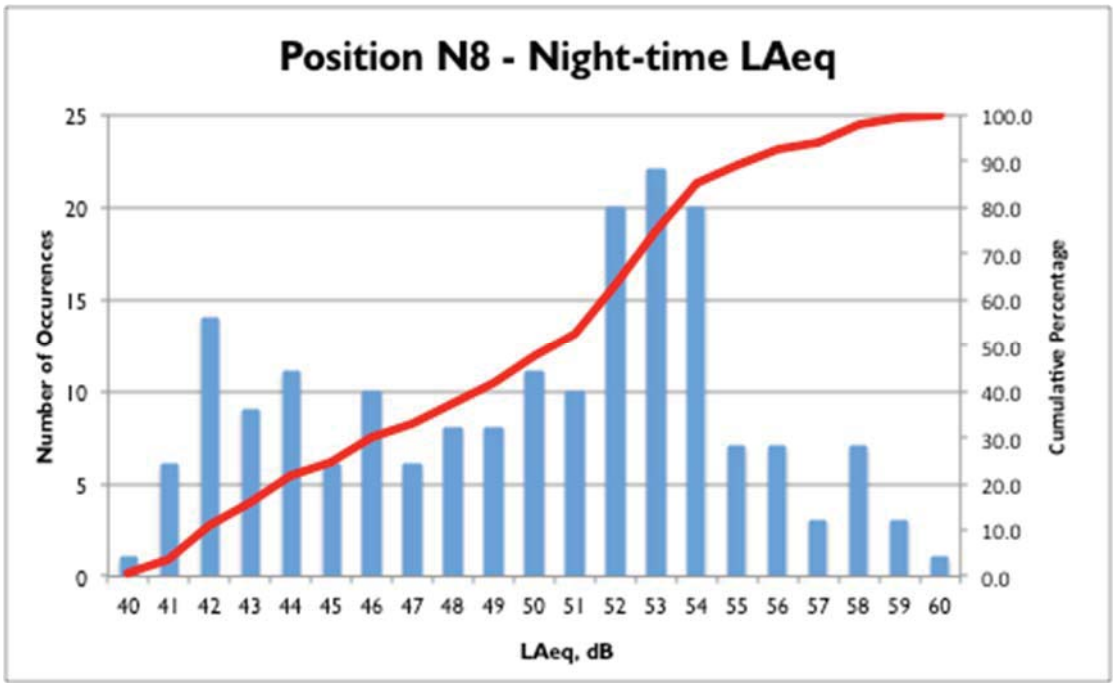

Figure A13.3.79: L_{Aeq} distribution, daytime, January 2017, Position N9

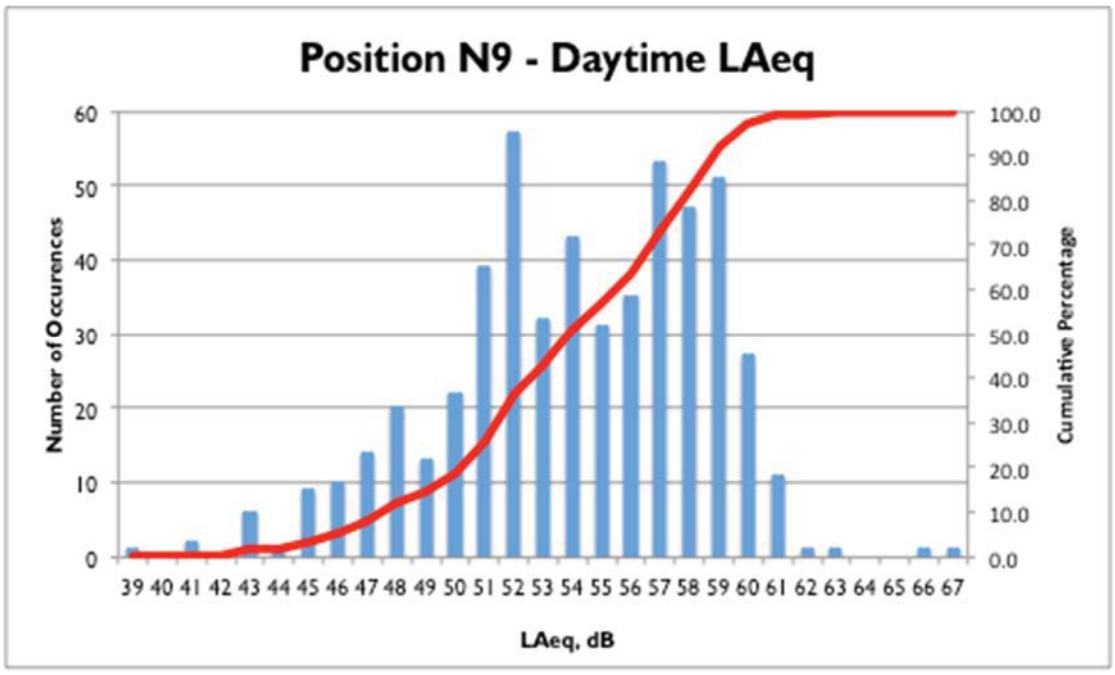

Figure A13.3.80: L_{Aeq} distribution, night-time, January 2017, Position N9

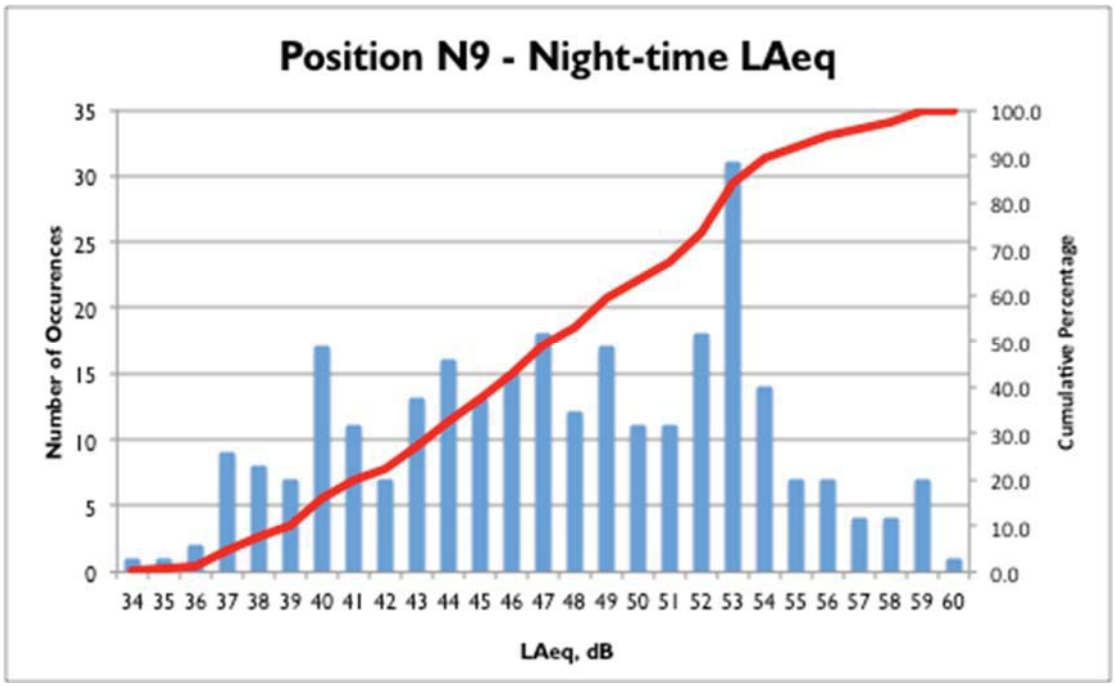

Table A13.3.4: Vibration monitoring equipment – August 2016 Survey

Position	Model	Serial Number	Calibration Date
V1	Rion VM-54 Tri-axial Vibration Meter	01150116	22 June 2016
	PV-83CW Accelerometer	28068	
V2	Rion VM-54 Tri-axial Vibration Meter	00360140	23 June 2016
	PV-83CW Accelerometer	85802	

Table A13.3.5: Noise monitoring equipment – Widnes Terminal Survey

Position	Model	Serial Number	Calibration Date
Widnes Terminal	01dB Blue Solo Type 1 SLM	60582	8 January 2016
	01dB PRE21S Pre-amplifier	13510	
	MCE212 Microphone	90416	
	01dB Cal01 Calibrator	950058	7 January 2016

Table A13.3.6: Survey Results

Start Time	Duration (Secs)	$L_{Aeq,T}$	L_{AFmax}	Source	Distance (metres)
11:54	41.4	62.2(1)	73.3	Train backing into holding	3.15
12:09	8	74.1(1)	79.5	HGV passing	1.5
12:09	10	75.6(1)	82.4	HGV passing	1.5
12:12	17.8	78.9(1)	83.3	HGV idling	1.5
12:12	17.2	79.7(1)	89.8	Idling HGV pulling away	1.5
12:14	25.2	67.9(1)	71.4	Crane lowering container on to HGV in Bay	6.7
12:15	28.4	75.2(1)	90.4	Container down on to HGV trailer	6.7
12:15	2.6	73.7(1)	79.6	Crane disconnecting from container	6.7
12:15	2.8	68.6(1)	70.5	Crane moving	13.5
12:18	1.7	69.9(1)	73.2	HGV starting up	6.7
12:18	10	67.9(1)	69.5	HGV idling	6.7
12:19	8.7	71.4(1)	74.0	HGV pulling away	6.7
12:19	7.5	71.3(1)	74.9	HGV pulling up	6.7
12:20	1	74.4(1)	76.1	HGV air brakes	6.7
12:20	23.2	70.7(1)	73.4	HGV idling	6.7
12:22	8	76.7(1)	85.8	Container being loaded onto trailer	20
12:27	70	73.9(1)	87.3	HGV passing	1.5
12:28	8.6	77.4(1)	82.1	HGV passing	1.5
12:30	34	71.4(1)	75.2	Crane lowering container on to HGV in Bay	13.5
12:30	6.4	79.4(1)	89.4	Container down on to HGV trailer	13.5
12:31	12	69.9(1)	74.4	Crane grab releasing container and moving up	13.5
12:31	33	68.0(1)	79.2	Crane moving without container	13.5
13:01	3	82.4(1)	91.6	Crane grab connecting to container	11.5
13:01	1.6	72.9(1)	78.6	Crane lifting container from trailer	11.5
13:09	17.2	75.5(1)	83	HGV passing	1.5
13:12	13.2	71.1(1)	76.0	HGV passing	6.7
13:13	40.6	85.3(1)	95.1	Reach Stacker drive past	2
14:06	163.4	92.9(2)	107.8	Train pulling away	4.4
14:12	1.8	79.0(2)	85.5	Crane connecting to container	3.7

Start Time	Duration (Secs)	$L_{Aeq,T}$	L_{AFmax}	Source	Distance (metres)
14:13	5.4	86.2(2)	94.3	Crane drop and disconnect of container	3.7
14:13	3.8	81.3(2)	88.4	Crane connecting to container	3.7
14:13	5.4	85.6(2)	96.8	Crane drop and disconnect of container	3.7
14:13	2.8	82.4(2)	91.7	Crane connecting to container	3.7
14:14	28.2	64.6(2)	73.8	Crane moving with container	3.7
14:24	8.8	81.0(3)	88.2	Reach stacker revving up	16
14:25	10.2	82.7(3)	89.4	Reach stacker accelerating	16
14:25	1.2	93.3(3)	99.3	Reach stacker connecting to container	16
14:25	7.4	83.4(3)	89.6	Reach stacker reversing with container	16
14:25	6.4	83.5(3)	86.1	Reach stacker moving forward with container	16
14:25	4	82.5(3)	87.3	Reach stacker putting down container	9
14:26	5.8	80.5(3)	84.4	Reach stack reversing and accelerating without container	9
14:27	13	84.7(3)	95.0	Reach stacker connecting to container	16
14:27	1	89.8(3)	95.0	Reach stacker putting down container	16
14:27	8.2	80.0(3)	82.7	Reach stacker reversing with container	16
14:27	16.6	77.6(3)	85.6	Reach stacker putting down container	16
14:27	10.6	80.5(3)	84.2	Reach stacker reversing without container	16
14:28	8.6	81.4(3)	85.0	Reach stacker accelerating without container	16
14:28	1.4	85.2(3)	91.2	Reach stacker connecting to container	16
14:28	6.6	81.1(3)	85.0	Reach stacker reversing with container	16
14:28	7.6	80.8(3)	83.1	Reach stacker accelerating with container	16
14:28	1.2	86.8(3)	90.4	Reach stacking putting down container	16
14:28	9.8	83.5(3)	87.5	Reach stacker reversing without container	10
14:29	8.4	73.8(3)	76.8	Reach stacker moving towards HGV	16
14:29	4.2	81.3(3)	88.5	Reach stacker connecting to container	16
14:30	1.8	83.9(3)	87.4	Reach stacker putting container down	10
14:46	12.4	66.7(4)	69.9	Crane lower container down	11.5
14:46	8.8	88.0(4)	103.1	Container onto HGV	11.5
14:46	21.4	68.8(4)	79.4	crane grabber disconnect and back up	11.5
14:47	25	69.2(4)	80.0	crane grabber lower	11.5
14:47	4.8	75.9(4)	84.6	connect to container on trailer	11.5
14:47	17.6	69.2(4)	75.5	crane lift up container	11.5
14:51	15.2	74.2(4)	79.3	HGV pull away	2

Start Time	Duration (Secs)	$L_{Aeq,T}$	L_{AFmax}	Source	Distance (metres)
14:52	45.6	71.0[4]	76.8	Crane lower container down	13.5
14:53	12.6	75.7[4]	88.3	Container onto HGV	13.5
14:54	35.2	70.2[4]	77.5	Grabber disconnect and back up	13.5
14:55	19	68.4[4]	71.2	Crane moving	15
12:48	24	56.4	61.4	Residual 1	-
13:39	57	58.0	60.4	Residual 2	-
14:00	35	46.1	53.7	Residual 3	-
14:56	40	57.5	60.4	Residual 4	-

Notes:
[1] Stated L_{Aeq} levels corrected from measured level by logarithmically subtracting Residual 1
[2] Stated L_{Aeq} levels corrected from measured level by logarithmically subtracting Residual 2
[3] Stated L_{Aeq} levels corrected from measured level by logarithmically subtracting Residual 3
[4] Stated L_{Aeq} levels corrected from measured level by logarithmically subtracting Residual 4