REPORT

Boston Alternative Energy Facility – Environmental Statement

Appendix 10.1 Baseline Noise Survey

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baef
Boston Alternative Energy Facility

Royal HaskoningDHV
Enhancing Society Together

HASKONINGDHV UK LTD.

Manchester One
53 Portland Street
Manchester
M1 3LF
Industry & Buildings
VAT registration number: 792428892

+44 161 2361018 **T**
email **E**
royalhaskoningdhv.com **W**

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Author(s):	Dean Curtis
Drafted by:	Dean Curtis
Checked by:	Alasdair Baxter
Date:	06/06/19 AB
Approved by:	Paul Salmon
Date:	18/02/21 PS

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A10 Appendix 10.1 Baseline Noise Survey

A10.1 Introduction

A10.1.1 A baseline sound survey was undertaken to characterise the existing soundscape within the Boston Alternative Energy Facility (the Facility) Study Area at sensitive receptor locations close to the Application Site boundary (agreed with Boston Borough Council (BBC) at a consultation meeting 7th November 2018) between 23rd and 28th November 2018.

A10.1.2 The surveys were conducted in accordance with current guidance including BS4142:2014 method for rating and assessing industrial and commercial sound and BS7445:2003 description and measurement of environmental noise. This data will be used within the assessment for the Facility.

A10.2 Measured Baseline Sound Data

A10.2.1 Baseline noise measurements were conducted at the nearest identified sensitive receptors and adjacent corresponding site boundary locations, detailed in **Table A10.1** and **Figure 10.2**.

Table A10.1 Baseline Noise Monitoring Locations

Usage	Location	Baseline Measurement Location ID	Receptor Identifier
Residential	Ivy House, Slippery Gowt Lane	ST R1	R1
Residential	Anacary, Marsh Lane	ST R2	R2
Residential	Beeston Farm, Nursery Road	ST R3	R3
Residential	Lodge/ Bank View, Powell Street	ST R4	R4
Residential	No. 21, River Way	ST R5	R5
Residential	No. 35 and 37 Rectory Road	ST R6	R6

A10.2.2 The noise measurements were conducted with Sound Level Meters (SLMs) mounted on tripods at a height of between 1.2 m and 1.5 m above ground level and 3.5 m away from any reflecting surface other than the ground, i.e. in free-field conditions. The instruments were calibrated before and after the survey using a portable calibrator. No significant deviation in the calibration level was observed.

A10.2.3 Portable weather stations were deployed alongside noise monitoring equipment during both survey periods at ST R2. In general surveys were conducted during

periods of weather favourable for noise measurements, i.e. no rainfall and wind speeds below 5 m/s.

A10.2.4 The equivalent continuous sound pressure level (L_{Aeq}) is the conventional descriptor of environmental noise and is defined below:

$$L_{eq,T} = 10 \times \log\left[\frac{1}{T}\int \frac{\rho^2(t)\partial t}{\rho_0^2}\right] dB$$

A10.2.5 Noise measurements are normally taken with an A-weighting (denoted by a subscript 'A') to approximate the frequency response of the human ear.

A10.2.6 For all measurement locations during the noise survey SLMs were set to record the following:

- L_{Aeq} – the equivalent continuous sound pressure level over the measurement period. This parameter was standardised as pertinent for land use within BS 7445;
- L_{Amax} – the maximum sound pressure level occurring within the defined measurement period;
- L_{A90} – the sound pressure level exceeded for 90% of the measurement period and is indicative of the background noise level; and
- L_{A10} - the sound pressure level exceeded for 10% of the measurement period. The L_{A10} index is used within the Calculation of Road Traffic Noise (CRTN) as an appropriate descriptor of traffic noise.

Data Analysis

A10.2.7 Samples of L_{A90} were cross-referenced against weather data recorded on site during the measurement period. Representative environmental noise measurements should be undertaken during favourable weather conditions, i.e. with windspeed <5 m/s and no precipitation.

A10.2.8 All samples influenced by adverse weather conditions (and therefore unsuitable for noise monitoring due to noise interference) have been removed from the final

results. This is evident in the disparity between samples collected against total possible samples within the measurement analysis tables.

A10.2.9 Statistical analysis methods have been applied to the resulting data sets to assess the background noise levels with a greater degree of scrutiny.

A10.2.10 **Table A10.2** to **Table A10.13** contain a summary of the long term measured baseline noise data (L_{Aeq}, L_{A10}, L_{AFmax}) at the receptor locations and a summary of the prevailing L_{A90} background analysis.

Table A10.2 Baseline Noise Data Analysis – ST R1 (LONG TERM)

Period and Date	Duration (hh:mm)	L_{Aeq} (dB)	L_{A10} (dB)	L_{AFmax} (dB)
Day 23/11/18	04:35	44.2	38.7	88.4
Night 23/11/18	08:00	36.8	34.6	66.7
Day 24/11/18	16:00	39.4	37.8	75.9
Night 24/11/18	08:00	35.3	32.6	65.6
Day 25/11/18	16:00	39.8	38.2	76.8
Night 25/11/18	08:00	40.2	39.7	67.7
Day 26/11/18	16:00	49.0	46.3	82.4
Night 26/11/18	08:00	40.6	38.5	67.9
Day 27/11/18	16:00	49.7	50.3	81.5
Night 27/11/18	08:00	41.2	41.2	69.0
Day 28/11/18	07:05	51.2	54.4	79.1

Table A10.3 Baseline L_{A90} Noise Data Analysis – ST R1 (LONG TERM)

Period	Total possible samples	Samples collected	% of potential samples	L_{A90} analytics (dB)			
				Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation
Day 23/11/18 to 28/11/18	952	865	91	29	35.0	28.5	41.6
Night 23/11/18 to 28/11/18	480	451	94	32	31.1	26.8	35.4

ST R1 Summary

A10.2.11 Statistical analysis of the measured daytime background noise levels demonstrate bimodal distribution centred at 29 and 42 dB L_{A90} at receptor ST R1. Therefore, the arithmetic average value, 35 dB L_{A90}, is deemed typical and is used in the assessment; values are rounded to the nearest integer as per BS 4142 8.6.

A10.2.12 Night time background noise levels at receptor ST R1 generally follow "normal distribution" around the modal average value, 32 dB L_{A90}. Therefore, the modal average is deemed typical and is used in the BS 4142 assessment.

Table A10.4 Baseline Noise Data Analysis – ST R2 (LONG TERM)

Period and Date	Duration (hh:mm)	L_{Aeq} (dB)	L_{A10} (dB)	L_{AFmax} (dB)
Day 23/11/18	04:35	45.9	40.4	78.1
Night 23/11/18	08:00	34.7	35.1	60.4
Day 24/11/18	16:00	45.6	39.9	77.9
Night 24/11/18	08:00	33.6	33.5	59.0
Day 25/11/18	16:00	42.9	40.8	83.2
Night 25/11/18	08:00	38.6	38.8	58.0
Day 26/11/18	16:00	48.0	46.5	80.6
Night 26/11/18	08:00	38.9	40.1	56.8
Day 27/11/18	16:00	49.6	50.3	77.9
Night 27/11/18	08:00	38.3	39.2	60.8
Day 28/11/18	07:05	49.9	53.1	77.8

Table A10.5 Baseline L_{A90} Noise Data Analysis – ST R2 (LONG TERM)

Period	Total possible samples	Samples collected	% of potential samples	L_{A90} analytics (dB)			
				Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation
Day 23/11/18 to 28/11/18	961	869	90	32	37.1	32.1	42.0
Night 23/11/18 to 28/11/18	480	451	94	31	33.1	29.7	36.4

ST R2 Summary

A10.2.13 Statistical analysis of the measured daytime background noise level demonstrate bimodal distribution centred at 32 and 44 dB L_{A90} at receptor ST R2. Therefore, the arithmetic average rounded to the nearest integer, 37 dB L_{A90}, is deemed typical as it lies between the two peaks and is used in the BS 4142 assessment.

A10.2.14 Night time background noise levels at receptor ST R2 demonstrate bimodal distribution centred at 31 and 33 dB LA90. Therefore, the arithmetic average rounded to the nearest integer, 33 dB LA90, is deemed typical as it lies between the two peaks and is used in the BS 4142 assessment.

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Table A10.6 Baseline Noise Data Analysis – ST R3 (LONG TERM)

Period and Date	Duration (hh:mm)	L_{Aeq} (dB)	L_{A10} (dB)	L_{AFmax} (dB)
Day 23/11/18	06:05	46.2	43.5	84.4
Night 23/11/18	08:00	40.0	40.2	64.6
Day 24/11/18	16:00	42.6	41.6	74.1
Night 24/11/18	08:00	38.1	36.6	69.9
Day 25/11/18	16:00	45.4	44.5	81.2
Night 25/11/18	08:00	43.0	42.1	71.5
Day 26/11/18	16:00	49.9	48.3	80.9
Night 26/11/18	08:00	42.8	43.3	63.8
Day 27/11/18	16:00	51.9	53.1	87.5
Night 27/11/18	08:00	44.1	45.2	69.0
Day 28/11/18	07:05	53.0	55.5	75.8

Table A10.7 Baseline L_{A90} Noise Data Analysis – ST R3 (LONG TERM)

Period	Total possible samples	Samples collected	% of potential samples	L_{A90} analytics (dB)			
				Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation
Day 23/11/18 to 28/11/18	954	857	90	40	41.1	35.6	46.7
Night 23/11/18 to 28/11/18	480	451	94	41	38.4	34.3	42.4

ST R3 Summary

A10.2.15 Statistical analysis of the measured daytime background noise level distribution generally follows “normal distribution” centring around the modal average value, 40 dB L_{A90}. Therefore, the modal average is deemed typical and is used in the BS 4142 assessment.

A10.2.16 Night time background noise levels at receptor ST R3 demonstrate bimodal distribution centred at 37 and 41 dB LA90. Therefore, the arithmetic average rounded to the nearest integer, 38 dB LA90, is deemed typical as it lies between the two peaks and is used in the BS 4142 assessment.

Table A10.8 Baseline Noise Data Analysis – ST R4 (LONG TERM)

Period and Date	Duration (hh:mm)	L_{Aeq} (dB)	L_{A10} (dB)	L_{AFmax} (dB)
Day 23/11/18	04:35	53.4	48.3	88.8
Night 23/11/18	08:00	47.2	39.0	81.7
Day 24/11/18	16:00	53.4	47.7	88.3
Night 24/11/18	08:00	42.7	38.3	76.1
Day 25/11/18	16:00	48.8	47.1	78.8
Night 25/11/18	08:00	54.7	49.8	81.3
Day 26/11/18	16:00	57.4	55.2	84.6
Night 26/11/18	08:00	54.1	49.2	80.1
Day 27/11/18	16:00	57.0	56.0	90.8
Night 27/11/18	08:00	54.8	49.7	82.5
Day 28/11/18	07:05	57.7	57.4	89.9

Table A10.9 Baseline L_{A90} Noise Data Analysis – ST R4 (LONG TERM)

Period	Total possible samples	Samples collected	% of potential samples	L_{A90} analytics (dB)			
				Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation
Day 23/11/18 to 28/11/18	950	847	89	47	43.9	38.9	48.8
Night 23/11/18 to 28/11/18	480	451	94	44	39.3	32.2	46.5

ST R4 Summary

A10.2.17 Statistical analysis of the measured daytime background noise level demonstrate bimodal distribution centred at 44 and 47 dB LA90 at receptor ST R4. Therefore, the arithmetic average rounded to the nearest integer, 44 dB LA90, is deemed typical as it lies between the two peaks and is used in the BS 4142 assessment.

A10.2.18 Night time background noise levels at receptor ST R4 generally follow “normal distribution” centring around the modal average value, 44 dB L_{A90}. Therefore, the modal average is deemed typical and is used in the BS 4142 assessment.

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Table A10.10 Baseline Noise Data Analysis – ST R5 (LONG TERM)

Period and Date	Duration (hh:mm)	L_{Aeq} (dB)	L_{A10} (dB)	L_{AFmax} (dB)
Day 23/11/18	04:35	54.8	47.5	87.9
Night 23/11/18	08:00	50.7	43.6	85.0
Day 24/11/18	16:00	55.9	49.5	88.8
Night 24/11/18	08:00	44.9	42.4	77.1
Day 25/11/18	16:00	51.4	47.8	79.6
Night 25/11/18	08:00	57.5	51.8	85.1
Day 26/11/18	16:00	61.1	56.8	88.5
Night 26/11/18	08:00	57.6	50.0	88.1
Day 27/11/18	16:00	60.0	57.1	91.9
Night 27/11/18	08:00	57.3	49.8	88.4
Day 28/11/18	07:05	63.2	60.8	90.3

Table A10.11 Baseline L_{A90} Noise Data Analysis – ST R5 (LONG TERM)

Period	Total possible samples	Samples collected	% of potential samples	L_{A90} analytics (dB)			
				Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation
Day 23/11/18 to 28/11/18	945	839	89	42	44.0	41.3	46.6
Night 23/11/18 to 28/11/18	480	451	94	38	41.5	38.5	43.8

ST R5 Summary

A10.2.19 Statistical analysis of the measured daytime background noise level distribution generally follows “normal distribution” centring between 42 to 45 dB LA90 at receptor ST R5. Therefore, the arithmetic average rounded to the nearest integer, 44 dB L_{A90}, is deemed typical as it lies between the extremities of the other peaks and is used in the BS 4142 assessment.

A10.2.20 Statistical analysis of the measured night time background noise level distribution shows that there are three distinct peaks at 38, 41 and 43 dB L_{A90} at receptor ST R5. Therefore, the modal average value, 42 dB L_{A90}, is deemed typical as it lies between the extremities of the other peaks and is used in the BS 4142 assessment.

Table A10.12 Baseline Noise Data Analysis – ST R6 (LONG TERM)

Period and Date	Duration (hh:mm)	L_{Aeq} (dB)	L_{A10} (dB)	L_{AFmax} (dB)
Day 23/11/18	04:35	41.9	43.3	64.7
Night 23/11/18	08:00	39.4	39.8	67.3
Day 24/11/18	16:00	65.6	45.5	102.5
Night 24/11/18	08:00	51.8	36.8	96.8
Day 25/11/18	16:00	56.9	45.4	110.5
Night 25/11/18	08:00	41.6	40.6	79.7
Day 26/11/18	16:00	50.5	46.7	94.7
Night 26/11/18	08:00	43.0	43.7	72.4
Day 27/11/18	16:00	52.5	51.7	89.7
Night 27/11/18	08:00	44.4	45.3	73.6
Day 28/11/18	07:05	55.9	57.3	90.1

Table A10.13 Baseline L_{A90} Noise Data Analysis – ST R6 (LONG TERM)

Period	Total possible samples	Samples collected	% of potential samples	L_{A90} analytics (dB)			
				Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation
Day 23/11/18 to 28/11/18	947	826	87	39	42.2	37.8	46.6
Night 23/11/18 to 28/11/18	480	451	94	41	36.8	32.0	41.6

ST R6 Summary

A10.2.21 Statistical analysis of the measured daytime background noise level distribution shows that there are two distinct peaks at 39 and 43 dB L_{A90}. Therefore, the arithmetic average rounded to the nearest integer, 42 dB LA90, is deemed typical as it lies between the extremities of the other peaks and is used in the BS 4142 assessment.

A10.2.22 Statistical analysis of the measured night time background noise level distribution shows that there are two distinct peaks at 33 and 41 dB L_{A90} at receptor ST R6. Therefore, the arithmetic average rounded to the nearest integer, 37 dB L_{A90}, is deemed typical as it lies between the extremities of the other peaks and is used in the BS 4142 assessment.

A10.3 Summary

A10.3.1 A baseline noise survey was undertaken to characterise the existing noise climate within the Boston Alternative Energy Facility Study Area at agreed sensitive receptor locations in the vicinity of the site.

A10.3.2 The baseline noise survey is considered representative of the Facility Study Area and was undertaken at the nearest (agreed with BBC) sensitive receptors.

A10.3.3 Measured data were collated for each location with L_{Aeq}, L_{A90}, L_{A10}, L_{AFmax} levels determined from each specific measurement period. Background noise levels used in the assessment were obtained from the baseline measurements. The background noise levels for the unattended measurement periods were assessed using statistical analysis of the measured L_{A90} values.

A10.3.4 Assessment values for receptor locations at the facility have been derived from long term measurements.

A10.4 Graphical Analysis

A10.4.1 The baseline noise survey graphical analysis figures can be seen in the **Plate A10.1.1 - A10.1.12** below.

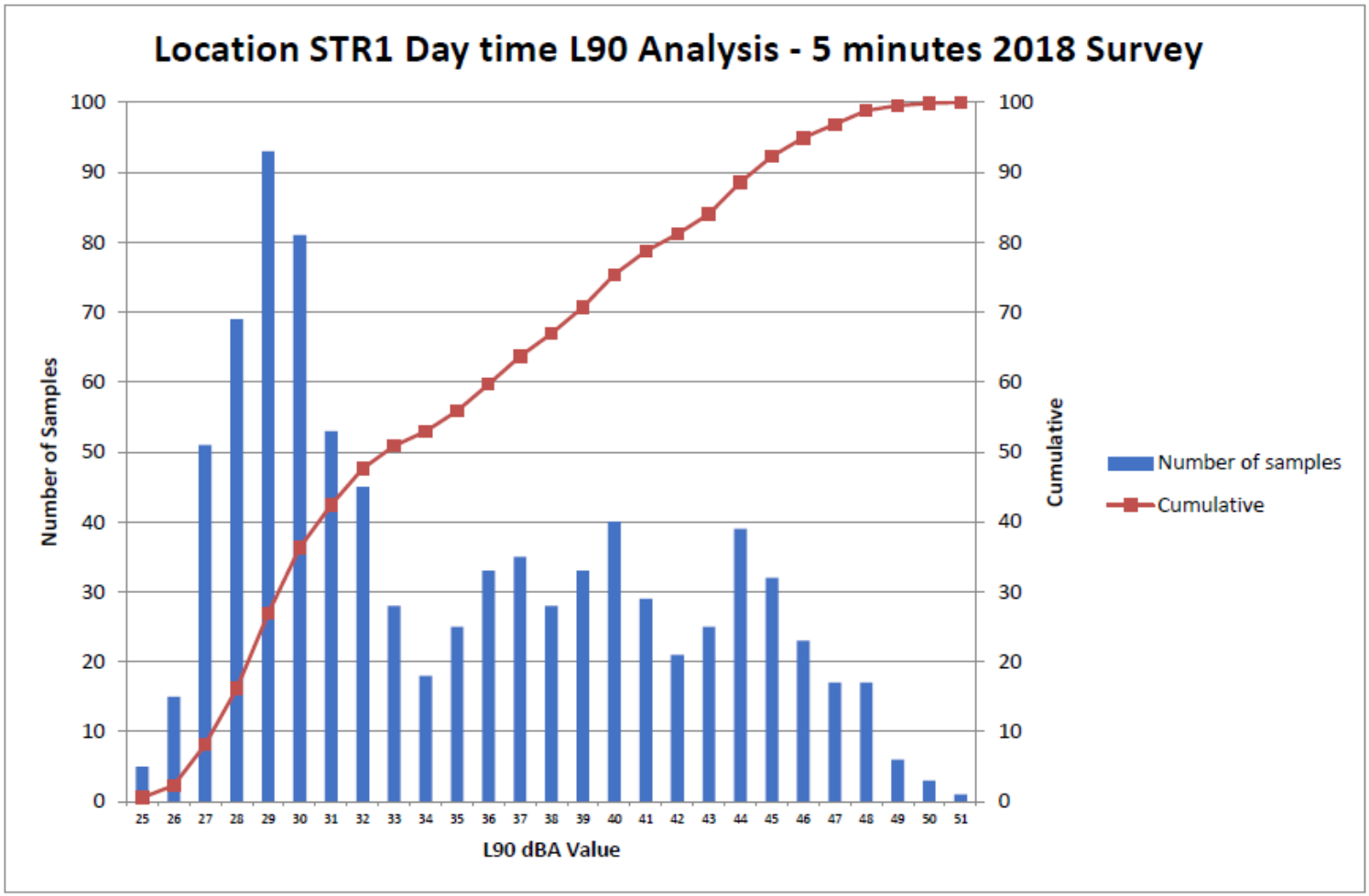


Plate A10.1.1 STR1 L90 Daytime Analysis

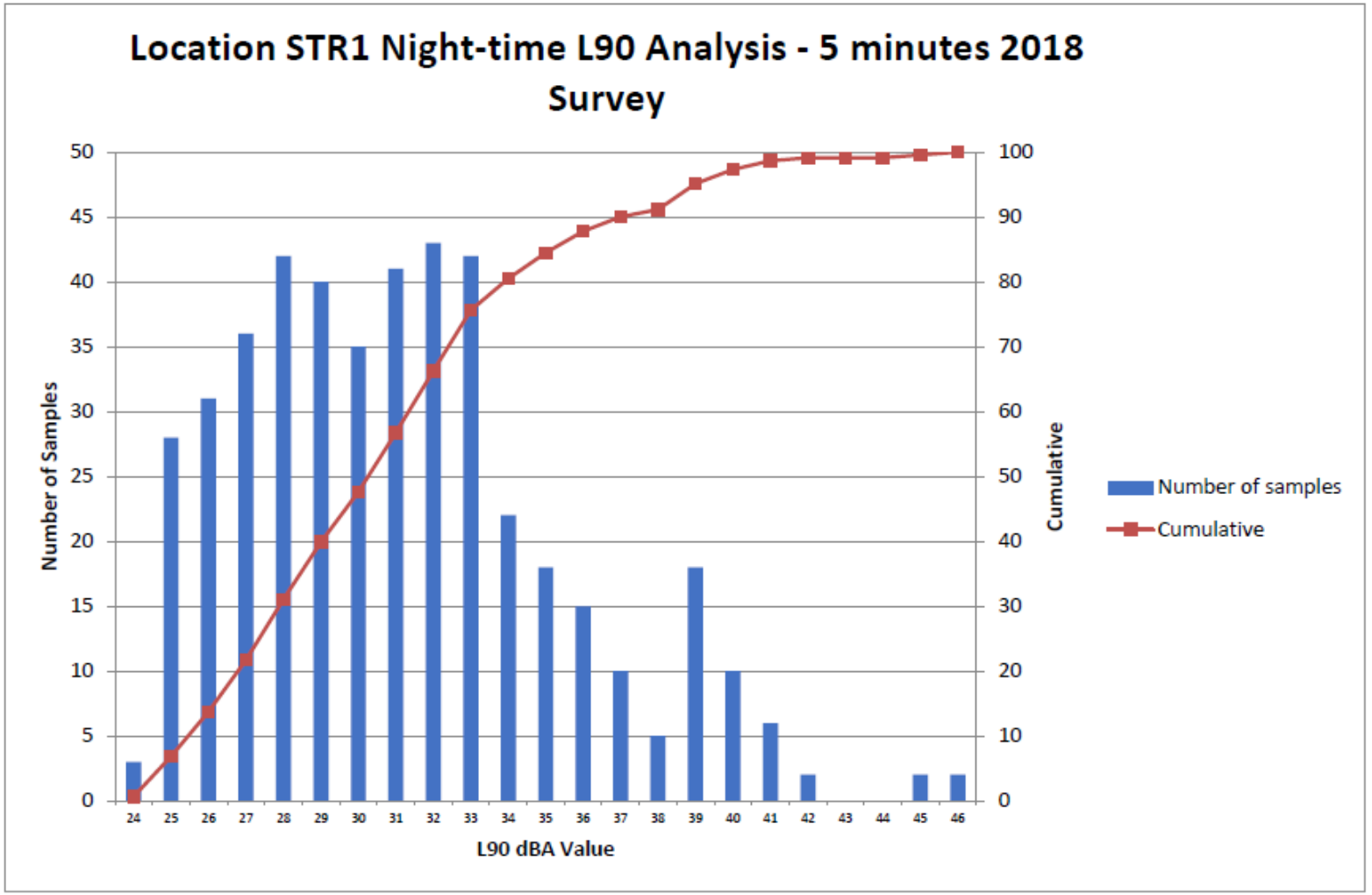


Plate A10.1.2 STR1 L90 Night-time Analysis

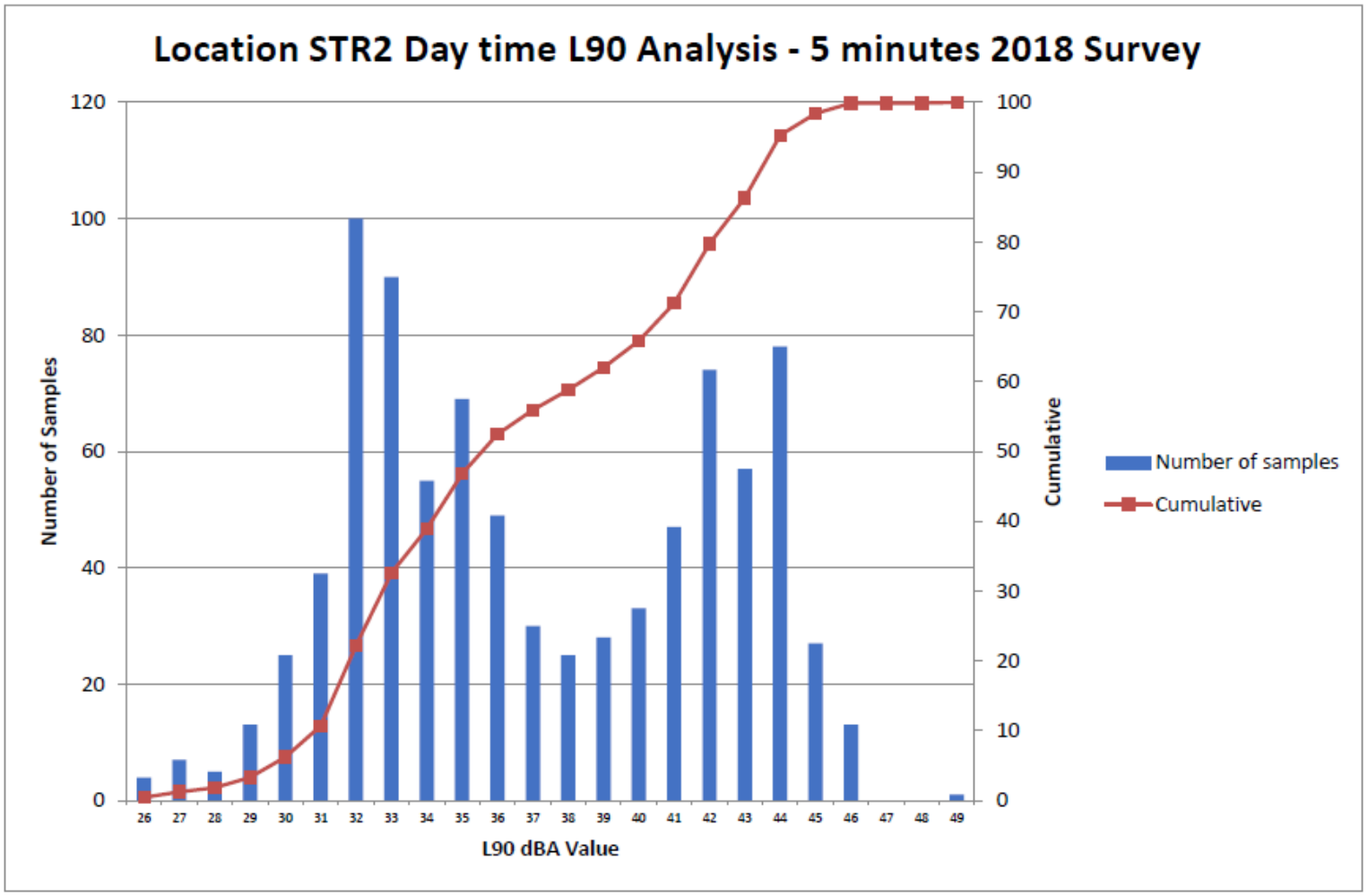


Plate A10.1.3 STR2 L90 Daytime Analysis

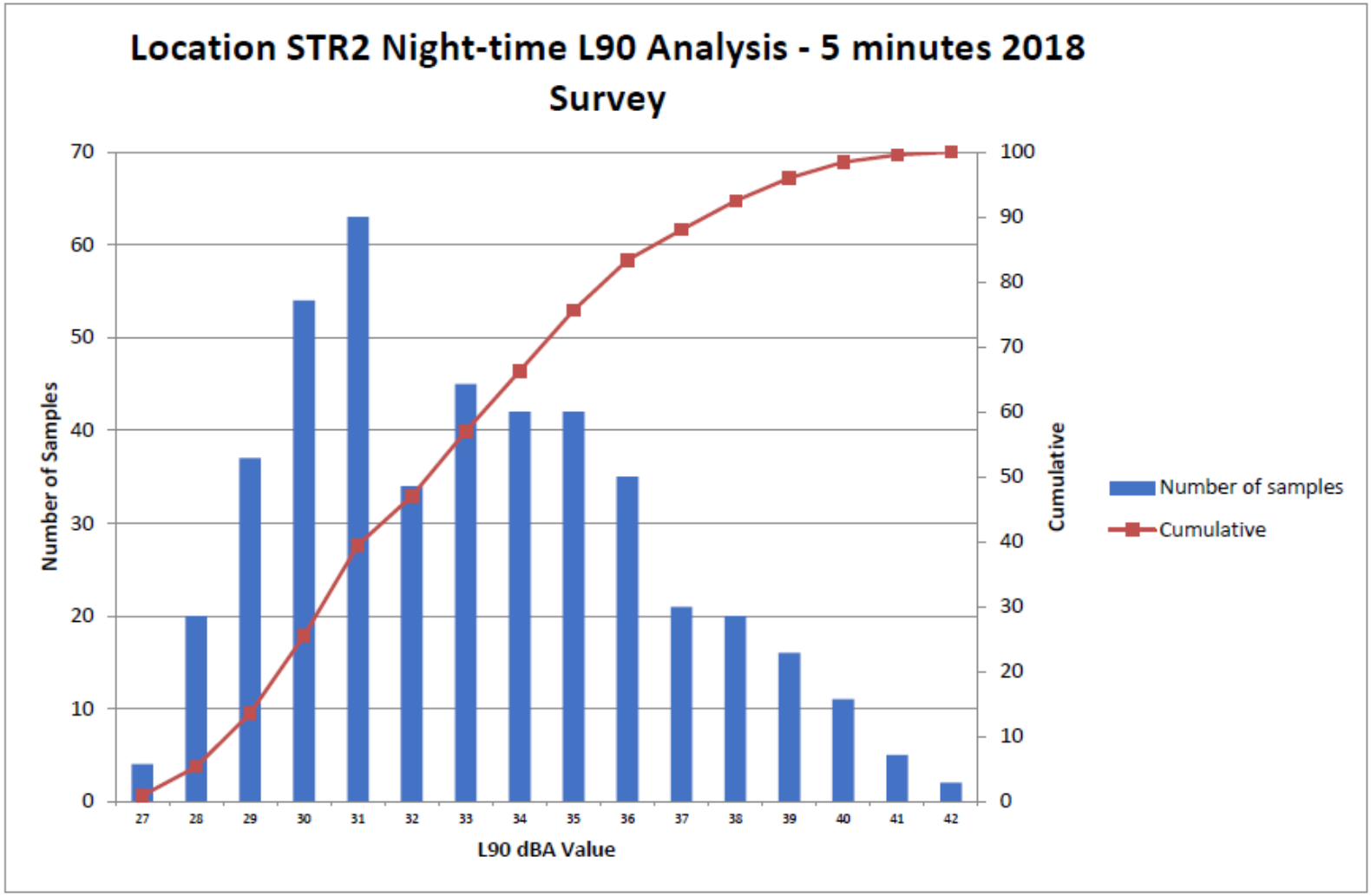
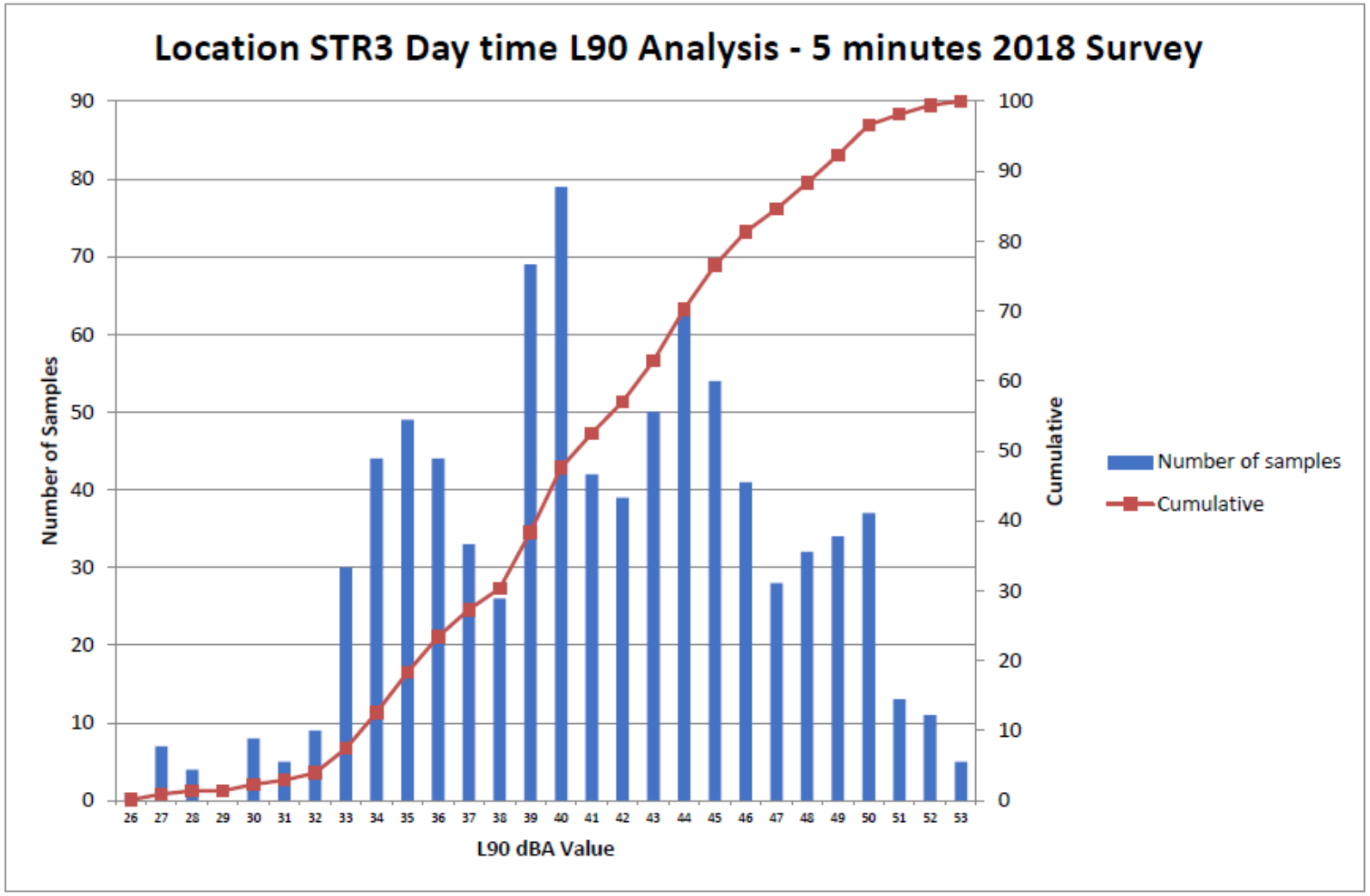


Plate A10.1.4 STR2 L90 Night-time Analysis



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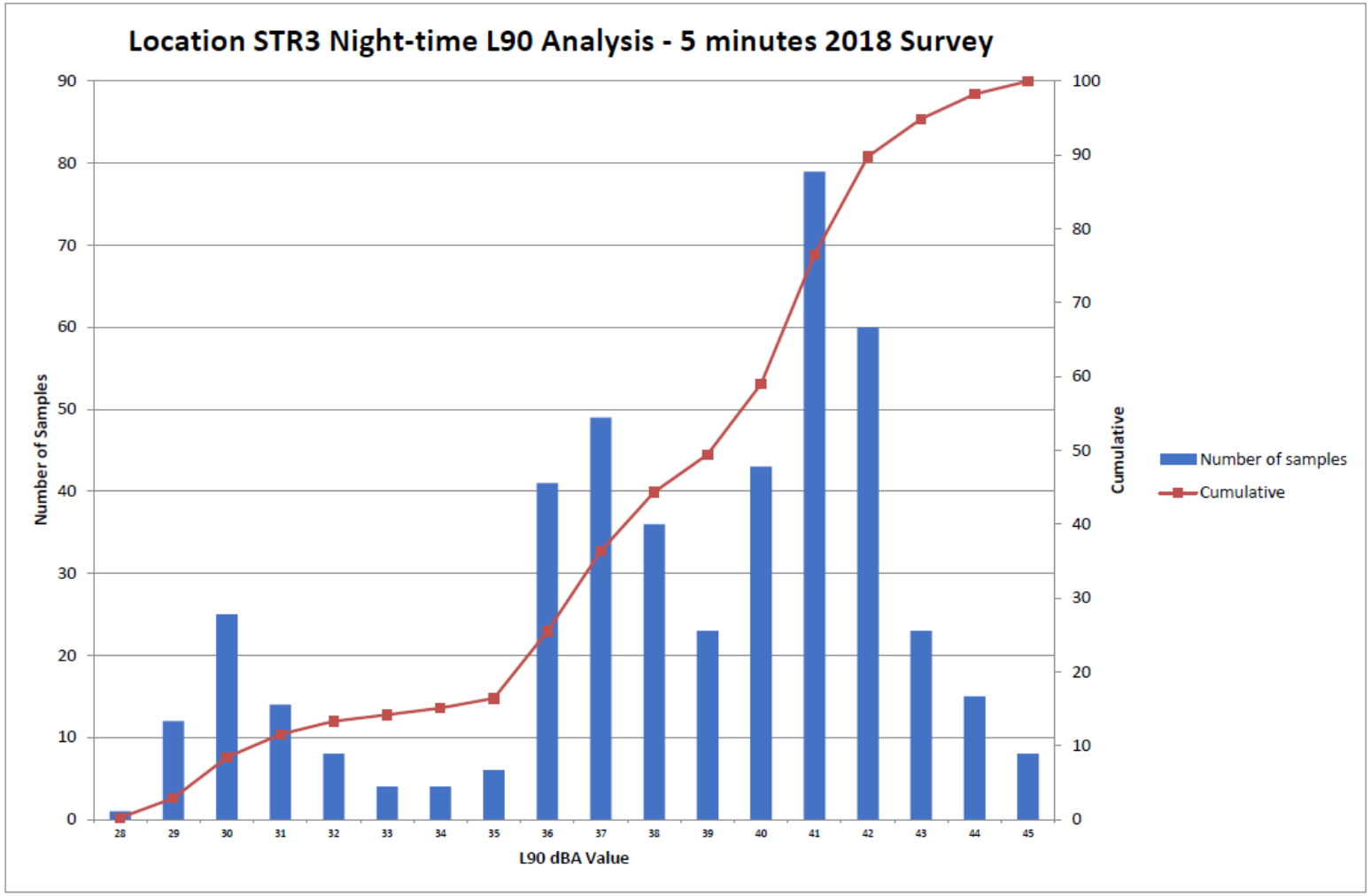


Plate A10.1.6 STR3 L90 Night-time Analysis

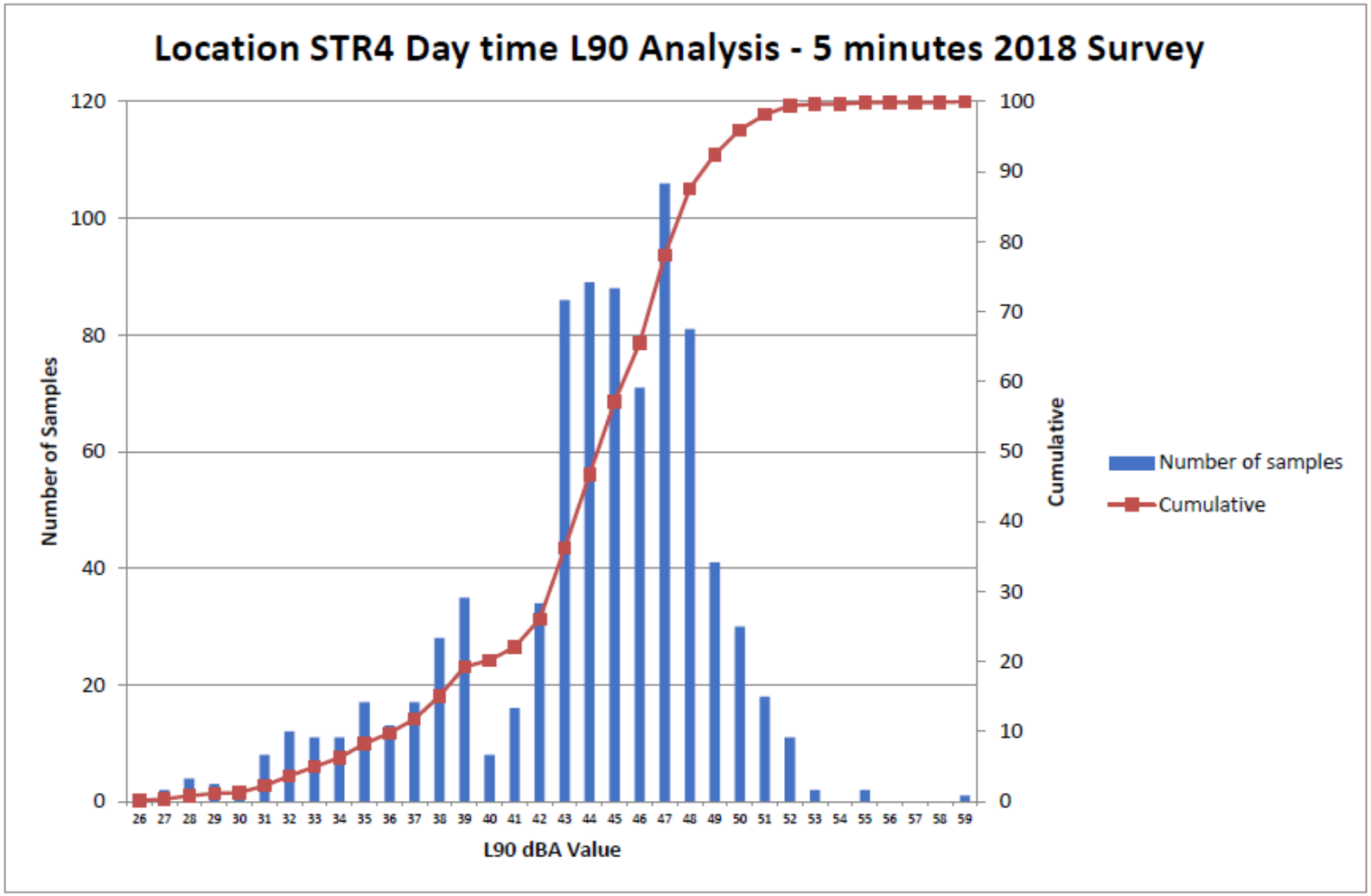


Plate A10.1.7 STR4 L90 Daytime Analysis

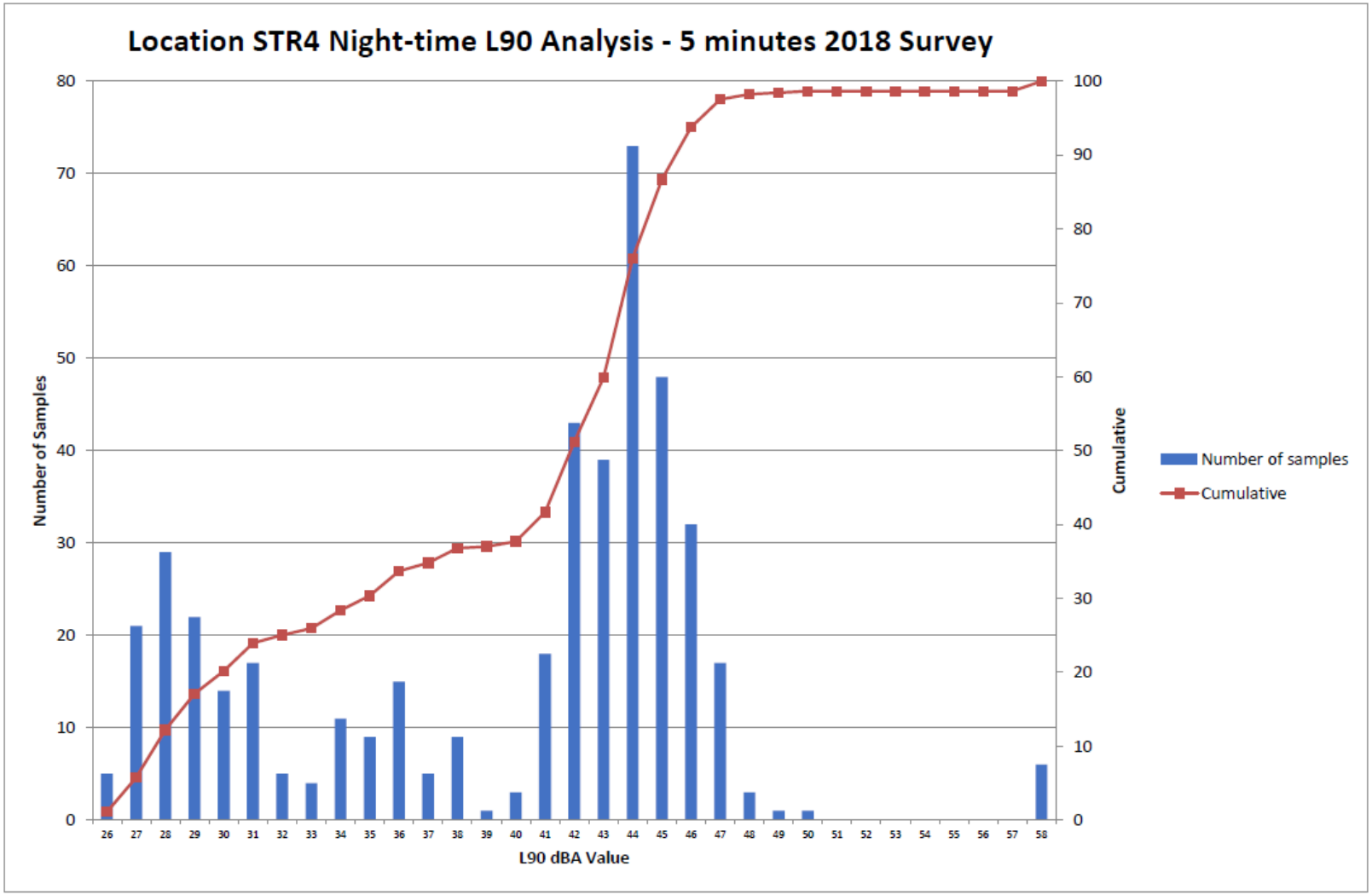
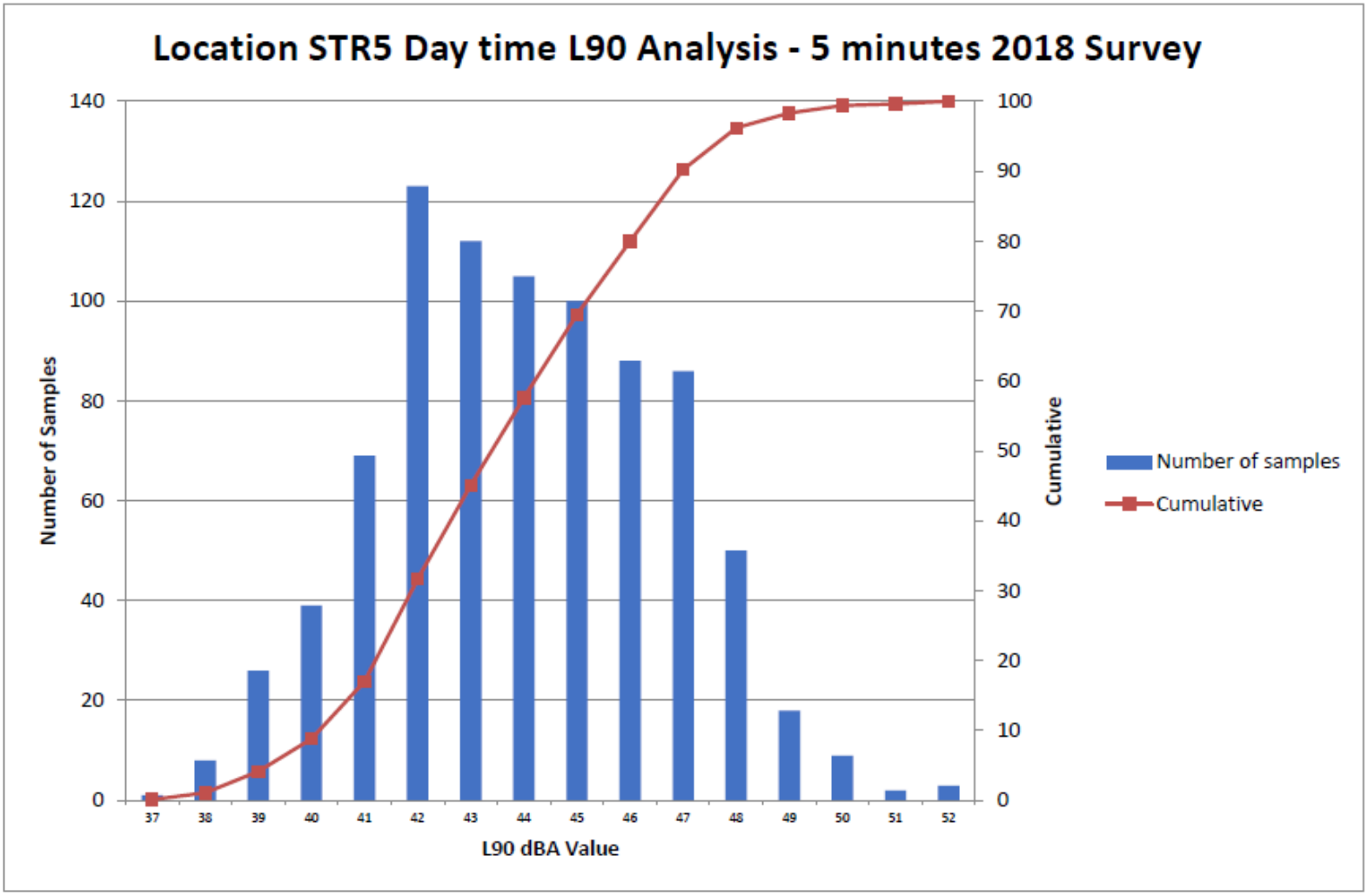


Plate A10.1.8 STR4 L90 Night-time Analysis



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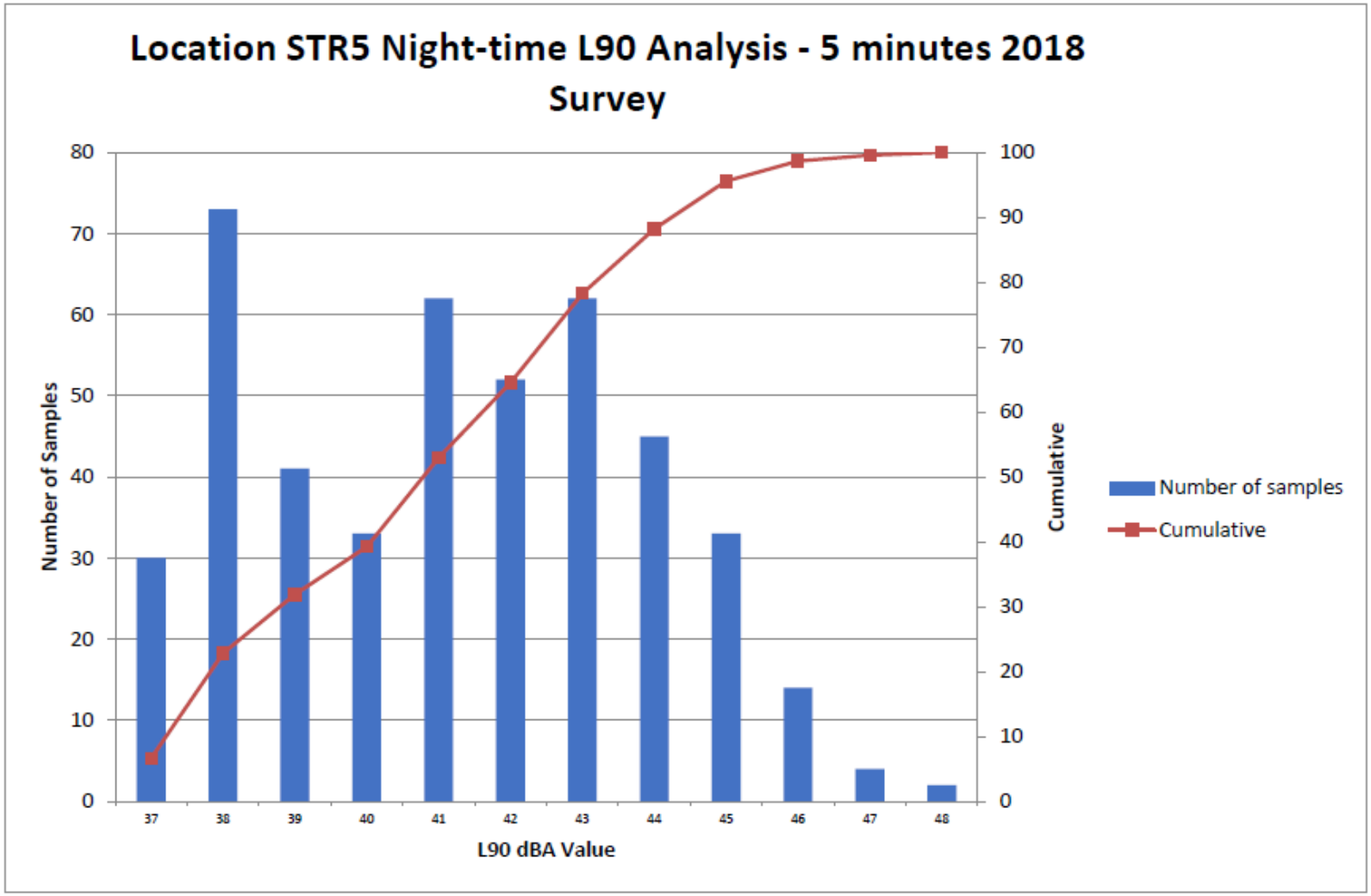

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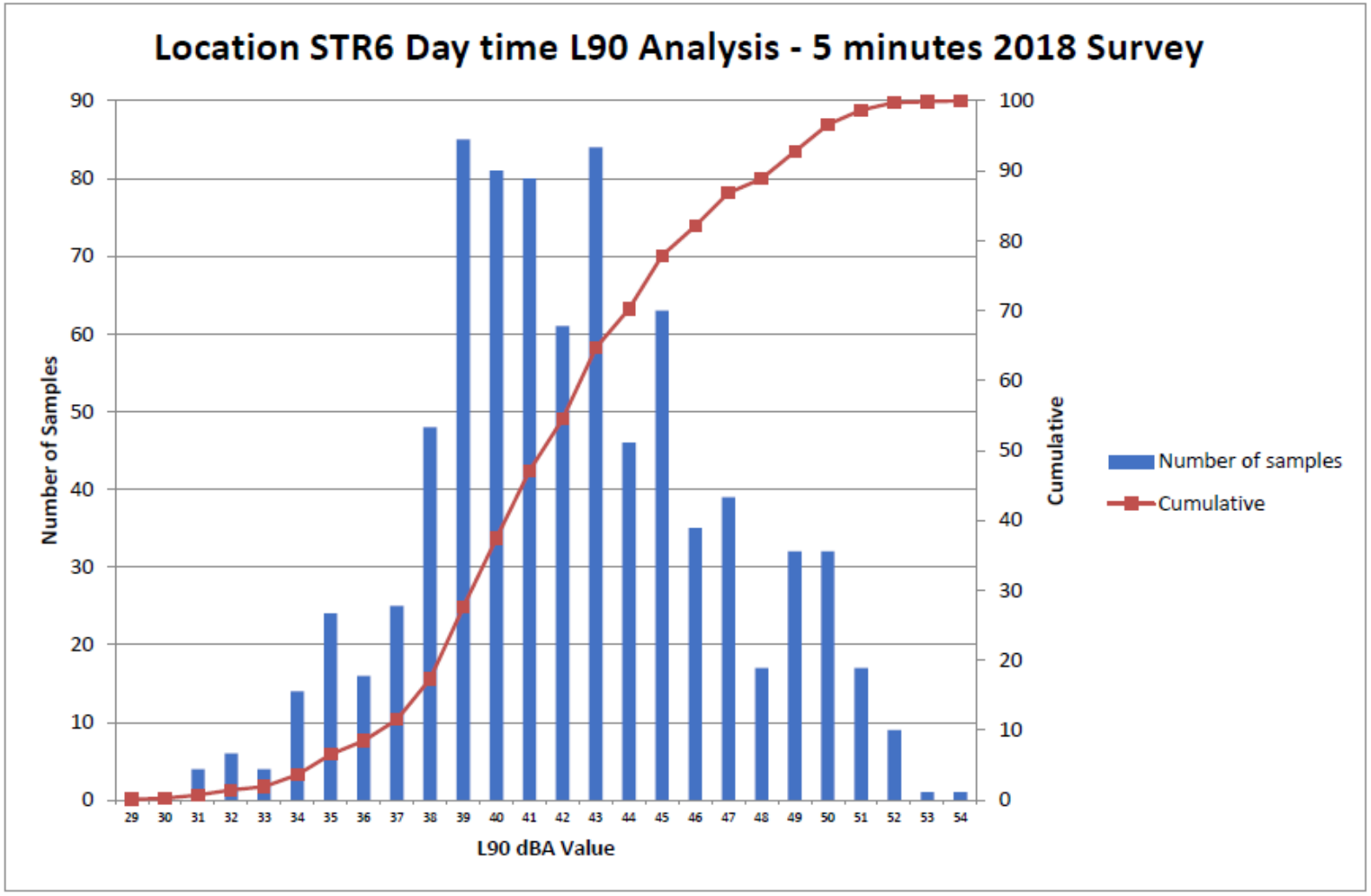

Plate A10.1.11 STR6 L90 Daytime Analysis

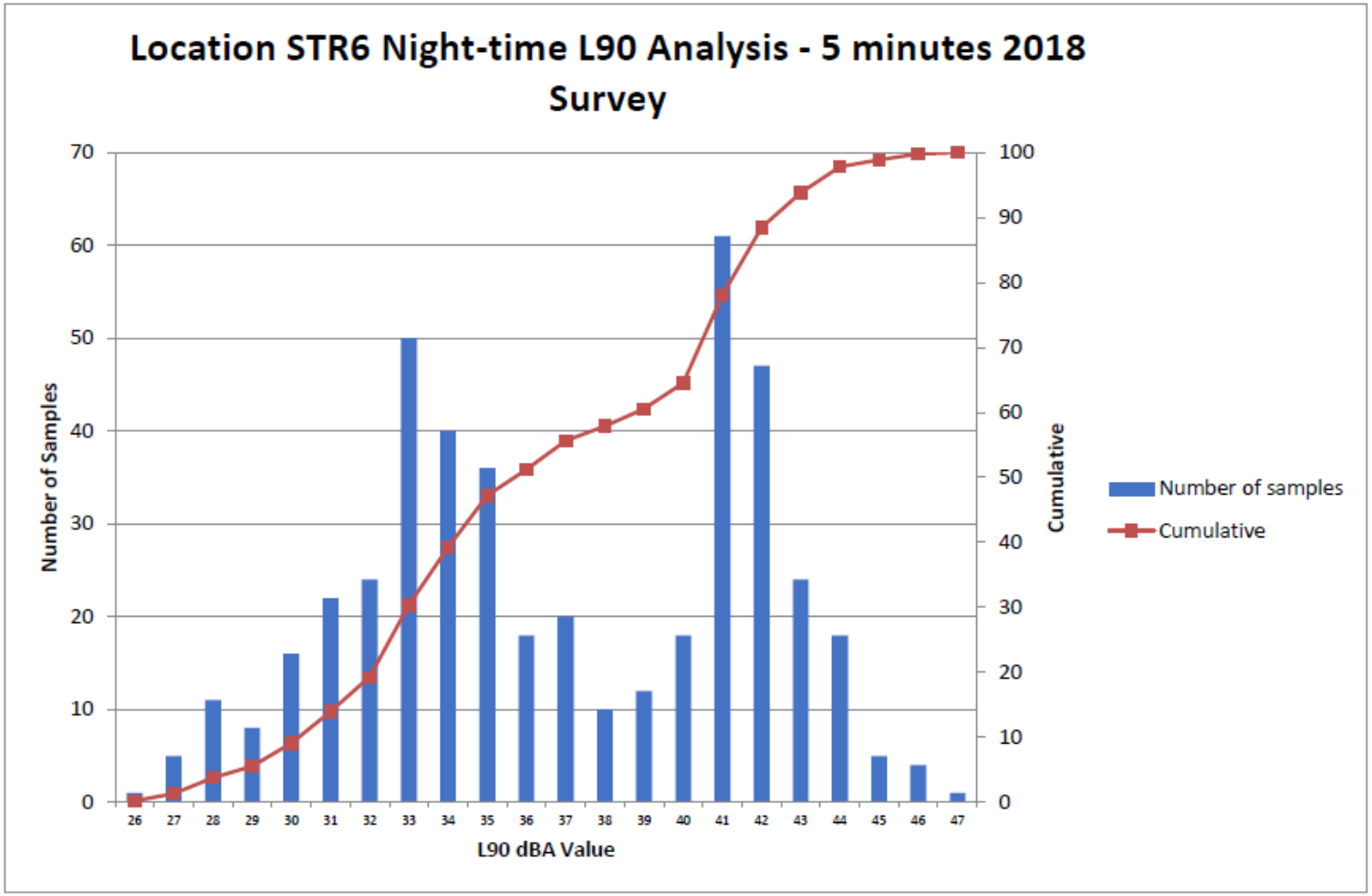

Plate A10.1.12 STR6 L90 Night-time Analysis

A10.5 References

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