Noise Impact Assessment

West Springfield Solar & BESS EIA Report

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SLR Project No.: 428.P13383.00001

21 March 2025

Revision: Final

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
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1	21st March 2025	Alasdair Baxter	Gregor Massie	Alasdair Baxter

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Acronyms and Abbreviations

NSR	Noise Sensitive Receptor
NMP	Noise Monitoring Position
dB	Decibel
AC	Angus Council
BESS	Battery Energy Storage System
BPM	Best Practicable Means
CEMP	Construction Environmental Management Plan

1. Noise

1.1 Executive Summary

1.1.1 This assessment considers potential noise impacts from the Proposed Development on nearby noise sensitive receptors (NSRs). Noise impacts were assessed against the criteria outlined in BS4142 and Local Authority guidance.

1.1.2 A baseline noise survey was conducted at four noise monitoring positions (NMPs) and determined that the baseline noise environment is generally quiet, with limited influence from anthropogenic noise sources.

1.1.3 Operational noise from the Proposed Development has been predicted in noise modelling software CadnaA and it was found that the worst-case operational noise level at NSRs is below the representative daytime background and therefore noise impacts are not significant, and no additional mitigation is required.

1.1.4 Operational noise from the Proposed Development is less than 5 dB above the representative night-time background level and therefore noise impacts are not significant, and no additional mitigation is required.

1.1.5 As no additional mitigation is required, residual effects remain unchanged and are not significant.

1.2 Introduction

1.2.1 This assessment considers the potential effects of the Proposed Development on receptors sensitive to noise during the operational phase. Vibration associated with the Proposed Development will be negligible at sensitive receptors, given that the construction of solar and battery energy storage system (BESS) developments does not require the use of heavy plant and there are no significant sources of vibration during the operational phase, therefore assessment of vibration has been scoped out.

1.2.2 The scope of this assessment has comprised:

- Consultation with Fife Council (FC) Environmental Health Department to agree appropriate scope for the assessment;
- Baseline survey to characterise existing noise levels;
- Prediction of operational noise levels in modelling software CadnaA;
- Evaluation of predicted noise levels during operation of the Proposed Development against the adopted criteria; and
- Specification of appropriate mitigation (if required).

1.2.3 Noise emissions from the operational phase of the Proposed Development will predominantly arise from the BESS element. The Solar array will utilise inline

inverters, rather than centralised large inverters; inline inverters produce very little to no noise.

1.2.4 This Technical Assessment report is supported by the following Figures and Appendices:

- Figure 1 – Site Location, Noise Monitoring Positions and Noise Sensitive Receptors;
- Appendix 1 – Baseline data and analysis; and
- Appendix2 – Third Octave Predicted Noise Levels.

1.3 Legislation, Policy and Guidance

1.3.1 Relevant legislation and guidance documents have been reviewed and taken into account as part of this assessment. Documents of particular relevance are summarised below.

1.3.2 In lieu of any specific legislation, assessing the effect of operation of such a development must draw on information from a variety of sources. This assessment makes reference to a number of British Standards, official planning policy and advice notes and national guidance.

1.3.3 For a development of this nature, there is no specific all-encompassing legislation relating to the standards associated with noise emission/effects. Noise legislation, where it does exist, tends to be either EU-derived and focussed on specific items of noise-emitting plant or on more general nuisance, such as that addressed by the provisions of the Environmental Protection Act 1990 (UK Government, 1990).

Legislation

Environmental Protection Act 1990

1.3.4 Section 79 of the Environmental Protection Act 1990 defines statutory nuisance with regard to noise and determines that local planning authorities have a duty to detect such nuisances in their area and, where a complaint of statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint.

1.3.5 The Act also defines the concept of “Best Practicable Means” (BPM):

- practicable’ means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;
- the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;
- the test is to apply only so far as compatible with any duty imposed by law; and

- the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances.

1.3.6 Section 80 of the Environmental Protection Act 1990 provides local planning authorities with powers to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence. It is a potential defence against failure to comply with an abatement notice where BPM were used to prevent or counteract the effects of the nuisance.

Planning Policy

1.3.7 The Planning Statement associated with this Section 36 application sets out the planning policy framework that is relevant to the EIA. This section considers the relevant aspects of National Planning Framework 4 (NPF4), Planning Advice Notes, the Angus Council Local Development Plan (LDP) and other relevant guidance. Of relevance to the assessment presented within this chapter, regard has been had to the following policies:

NPF4:

1.3.8 NPF4 - Policy 11:

"a) Development proposals for all forms of renewable, low-carbon and zero emissions technologies will be supported. These include:

iii. energy storage, such as battery storage and pumped storage hydro;;

…

v. solar arrays;

…

e) In addition, project design and mitigation will demonstrate how the following impacts are addressed:

i. impacts on communities and individual dwellings, including, residential amenity, visual impact, noise and shadow flicker;"

1.3.9 NPF4 – Policy 23:

"Development proposals that are likely to raise unacceptable noise issues will not be supported. The agent of change principle applies to noise sensitive development. A Noise Impact Assessment may be required where the nature of the proposal or its location suggests that significant effects are likely."

Guidance

Planning Advice Note PAN 1/2011: Planning and noise

1.3.10 PAN 1/2011 (Scottish Government, 2011), sets out a series of noise issues for planning authorities to consider when making decisions on planning applications. A Technical Advice Note (TAN) on Assessment of Noise (Scottish Government,

2011) has been published to accompany PAN 1/2011. In Appendix 1 of the TAN are codes of practice for the assessment of various sources of noise. BS4142 is identified as appropriate guidance for the evaluation of industrial and commercial noise sources.

1.3.11 The TAN recommends that the daytime period includes the hours 07:00 – 23:00 and the night-time period 23:00 – 07:00.

1.3.12 The TAN suggests that equivalent continuous noise level over a time period, T ($L_{Aeq,T}$), is a good general purpose index for environmental noise; this index is commonly referred to as the "ambient" noise level. It further notes that road traffic noise is commonly evaluated using the $L_{A10,18hr}$ level, and the $L_{A90,T}$ index is used to describe the "background" noise level.

BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

1.3.13 BS4142:2019 describes methods for rating and assessing sound from industrial or commercial premises. The methods detailed in the standard use outdoor sound levels to assess the likely effects on people inside or outside a residential dwelling upon which sound is incident.

1.3.14 The standard provides methods for determining the following:

- Rating levels for sources of industrial and commercial sound;
- Ambient, background and residual sound levels; and
- The audibility of tones in sound: 1/3 octave method.

1.3.15 These may be used for assessing sound from proposed, new, modified or additional sources of sound of a commercial or industrial nature or to assess the suitability of introducing a receptor near an existing commercial or industrial site.

1.3.16 The standard makes use of the following terms:

- Ambient sound level, La = $L_{Aeq,T}$ – the equivalent continuous sound pressure level of the totally encompassing sound in a given situation at a given time, usually from multiple sources, at the assessment location over a given time interval, T.
- Background sound level, $L_{A90,T}$ – the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90 percent of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
- Specific sound level, Ls = $L_{Aeq,Tr}$ – the equivalent continuous sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T.
- Rating level, $L_{Ar,Tr}$ – the specific sound level plus any adjustment for the characteristic features of the sound.
- Residual sound level, Lr = $L_{Aeq,T}$ – the equivalent continuous sound pressure level at the assessment location when the specific sound source is

suppressed to such a degree that it does not contribute to the ambient sound, over a given reference time interval, T.

1.3.17 The standard determines the degree of noise impact by comparison of the background noise level at noise sensitive receptors (NSRs) in the absence of the industrial or commercial facility (the specific source) with the ambient sound level when the specific source is operational.

1.3.18 Where particular characteristics such as tones, intermittency or impulsivity are present in the noise emissions of the specific source and perceptible at the receptor, the standard requires that "penalties" be added to the specific sound level to account for the increased annoyance that these can cause.

1.3.19 The following evaluation impact significance identifiers are provided in the standard, in which the difference between the specific sound level and measured background level are considered:

- the greater the difference, the greater the magnitude of impact;
- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- a difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context;
- the lower the rating level, relative to the measured background level, the less likely that the specific sound source will have an adverse (or significant adverse) impact; and
- where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

1.3.20 The standard also makes the following comments:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following:

1. *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2. The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound

source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/ or commercial nature is likely to be perceived and how people react to it.

3. The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

- *facade insulation treatment;*
- *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
- *acoustic screening."*

1.3.21 Whilst the latest revision of BS 4142 does not provide definition of low or very low background and rating levels the previous (1997) version considered that background levels of 30 dBA and rating levels of 35 dBA could be considered low.

1.3.22 Numerous studies by Moorhouse, Berry, Flindell, etc for the Health Protection Agency and for Defra (referenced within the Further Reading Section of BS 4142) and supported by the recent Association of Noise Consultants Working Group report on BS4142 application (Association of Noise Consultants, March 2020) conclude that impacts at rating levels below 35 dB are unlikely.

1.3.23 At night, particularly, where potential sleep disturbance is the key issue, a rating level of below 35 dB results in internal levels significantly below the BS 8233 guideline values.

ISO 9613; Attenuation of sound during propagation outdoors, Part 1 and Part 2

1.3.24 ISO 9613 1&2 describe a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a

distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions.

1.4 Consultation

1.4.1 Table1 provides details of consultations undertaken with relevant regulatory bodies, together with action undertaken by the Applicant in response to consultation comments.

Table1: Consultation Relevant to Noise and Vibration

Consultee	Key Consultee Comments	Application Action
Fife Council Environmental Health Department (FC EH) (17th March 2025)	FC EH responded in broad agreement with the proposed methodology and significance criteria but with a query on adverse impacts at +5 dB above background and requested that an assessment against NR25 at receptors be undertaken.	Noise Rating (NR) internal noise levels are assessed within Section 1.7 of this report.
	FC had no comment on the proposed approach of, where measured background noise levels are low (below 30dBA), to adopt 35 dB $L_{Ar,Tr}$ criterion	BS 4142 rating levels are assessed within Section 1.7 of this report.
	FC had no comment on the proposed approach, including scoping out detailed prediction and evaluation of construction noise and scoping out vibration	Construction Noise and Vibration scoped out of the assessment.

1.5 Assessment Methodology and Significance Criteria

Study Area

1.5.1 The Study Area considered in this assessment encompasses the land within the Proposed Development boundary and the nearest residential noise sensitive receptors (NSRs) which may be impacted upon by noise emissions from the site.

1.5.2 Noise levels due to the Proposed Development at more distant NSRs will be lesser than at the closest NSRs, therefore compliance with criteria at the closest NSRs will entail compliance at those more distant.

Receptors Requiring Assessment

1.5.3 The nearest residential noise sensitive receptors (NSRs) to the Proposed Development have been identified and are described in Table 2 and are shown in Figure 1.

Table 2: NSRs considered in this assessment

NSR ID	Description	X	Y
NSR1	Main Street	333837	712180
NSR2	Stable Cottage	332850	712001
NSR3	Peterhead	332979	711289
NSR4	Rankeilour Mansion House	332994	711805
NSR5	East Lodge	333689	712457

Desk Study

Prediction of Operational Noise Levels

1.5.4 Noise levels potentially generated by the Proposed Development have been predicted at identified representative NSRs within noise modelling software CadnaA, using the propagation method set out in ISO9613. The model assumes soft ground conditions, with absorption set to G=1.0. The model considers screening provided by local topography in the form of 50 m resolution digital terrain mapping (DTM) data. A typical air temperature of 10°C and relative humidity of 70% have been assumed within the model.

1.5.5 Although the exact equipment specification and technology provider is unknown at this time, the Applicant has confirmed that the CATL EnerC+ battery unit and PE GEN3 Inverter are appropriate for use as indicative items of plant for this assessment.

- Inverters, 12 no. – Power Electronics HEMK/PCSK GEN3 INVERTER, Sound Optimised, total modelled Sound Power Level 83.6 dB(A) per unit
- Batteries, 24 no. – CATL Ener C+, total modelled Sound Power Level 80.3 dB(A) per unit

- Transformers, 6 no. within the BESS and 12 within the solar array – total modelled Sound Power Level 79.7 dB(A) per unit

1.5.6 The batteries and inverters have been modelled as 3D objects, with their noise emissions coming from area sources and vertical area sources which represent the tops and sides of the units. Transformers have been modelled as point sources.

1.5.7 For the source data of the transformers, we have applied spectral data for a transformer, obtained during noise monitoring of an operational BESS site. Noise test reports for the batteries and inverter have been supplied by the manufacturer, and verification modelling undertaken in which the test scenario for each item of equipment has been recreated in CadnaA.

1.5.8 In the verification modelling, receivers have been placed at the same locations as the reported microphone positions. The reported 1/3 octave-band sound power levels of the equipment have been entered as source data, and where necessary the sound power levels of the individual area sources/vertical area sources have been adjusted equally in each frequency band so that the predicted sound pressure levels at the receivers match as closely as possible to the reported sound pressure levels during the tests.

1.5.9 NSRs have been modelled as a receiver placed on the closest approach to the Proposed Development.

1.5.10 The sound power levels for the BESS equipment are shown in Table 3 as octave-band data. The octave band spectra have been normalised within the model to the A-weighted sound power level, following the verification exercise.

Table 3: Sound Power Levels

Item	Octave Band Sound Power Level (centre frequency in Hz), dB								Normalised Sound Power Level, dB(A)
	63	125	250	500	1k	2k	4k	8k	
CATL EnerC+	75.3	78.6	79.7	77.8	76.5	71.7	67.2	67	80.3
PE Gen3 Inverter	80.5	91.5	78.5	71	70.1	68.7	69.3	68.4	83.6
Transformer	31.3	44.3	31.8	34.3	28.6	21	12.9	1.3	79.7

1.5.11 The actual model of battery and inverter plant installed will depend on the outcome of a tendering process. This assessment therefore considers representative candidate plant, noting that the installed plant may be different. Battery and inverter technology is currently developing at a rapid pace and noise is often a primary constraint in the UK market. Technology providers are therefore delivering units with increasingly improved noise performance. It is therefore reasonable to assume that by the time the Proposed Development is ready to

build, following planning consent and becoming operational, quieter plant than the candidate considered in this assessment will be available.

Rating Levels

1.5.12 BS4142 requires consideration of potential character corrections that may be applied to noise from the BESS. When determining whether any character corrections should apply to the Specific Level for deriving the Rating Level, in accordance with BS4142, this assessment notes the following:

- the 1/3 octave spectral data at each receptor has been tested for potential tonal components in accordance with the third octave method referenced in BS4142 and found to be non-tonal (see Appendix 2);
- operation of the BESS will not result in impulsive characteristics;
- the operational profile of the BESS was considered; the site will produce noise only whilst the batteries are charging or discharging and will be effectively silent at other times. Charging and discharging occurs for periods of >1 hour at a time, i.e. reasonably prolonged, and greater than the BS4142 reference periods for daytime and night-time.
- it is therefore considered that noise from the site will not have intermittent characteristics; and,
- on the basis of the above, no corrections have been applied and the Rating Level is therefore equal to the predicted Specific Level.

Baseline Noise Survey

1.5.13 SLR Consulting undertook a baseline survey between Friday 14th February 2025 and Tuesday 19th February 2025, encompassing weekday and weekend periods. Monitoring was undertaken in accordance with BS 4142 and BS 7445, using Rion NL-52 Class I integrating sound level meters (SLM). Conditions were cold, calm and dry at the time of the survey, with the surrounding road network also dry. The SLMs were within their laboratory calibration period, and a calibration check was performed before and after each measurement, with no drift in calibration noted.

1.5.14 Monitoring was undertaken at three noise monitoring positions (NMPs) to characterise the noise environments at the NSRs.

- NMP1, at the eastern boundary of the site, representative of NSR1 and NSR5
- NMP2, at the southwestern boundary of the site, representative of NSR3
- NMP3, in the centre of the site, representative of NSR2 and NSR4

1.5.15 Unattended long-term measurements were undertaken for a period of approximately six days.

1.5.16 Weather observations confirmed calm, dry weather conditions throughout the monitoring period. Details are contained within Appendix 1.

1.5.17 The long term NMPs were located at the closest points of the site to the NSRs and were positioned to provide security for the monitoring equipment.

Observations by the surveyor confirmed that the NMPs were suitably representative of the noise environment at the NSRs.

1.5.18 The monitoring positions are shown in Figure 1.

1.5.19 Table 4 presents a summary of the results of the baseline survey. Further details of the measured baseline noise are presented in Appendix 1.

Table 4: Measured sound levels

NMP	Period	$L_{Aeq,T}$ dB	$L_{Amax,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB
Daytime					
NMP1	17:04 14/02/2025 – 14:44 19/02/2025	42	90	40	33
NMP2	17:39 14/02/2025 - 14:29 19/02/2025	51	90	46	33
NMP3	18:34 14/02/2025 - 14:44 19/02/2025	50	94	43	33
Night					
NMP1	23:00 14/02/2025 - 07:00 19/02/2025	33	69	31	25
NMP2	23:00 14/02/2025 - 07:00 19/02/2025	45	79	34	26
NMP3	23:00 14/02/2025 - 07:00 19/02/2025	38	75	31	26

1.5.20 Statistical analysis examining the cumulative distribution of the measured background sound levels, L_{A90}, has been undertaken in order to derive a representative background sound level (see Appendix 1) at each NSR.

Table 5: Representative background sound level

NMP/NSR	Daytime, $L_{A90,T}$, dB	Night-time, $L_{A90,T}$, dB
NMP1 / NSR1 & NSR5	34	25
NMP2 / NSR3	34	24
NMP3 / NSR2 & NSR4	33	26

Assessment of Likely Significance

1.5.21 Noise impacts have been determined with reference to BS4142 guidance. The specific noise level resulting from the operation of the Proposed Development has been predicted at identified representative NSRs.

1.5.22 The guidance contained within Technical Advice Note to PAN 1/2011 has been used to adopt an appropriate set of significance criteria. The receptor sensitivity criteria considered in this assessment are presented in Table 6.

Table 6: NSR Sensitivity

Receptor Sensitivity	Description	Examples
High	Receptors where people or operations are particularly susceptible to noise.	Residential, quiet outdoor recreational areas, schools and hospitals.
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance.	Offices and restaurants.
Low	Receptors where distraction or disturbance from noise is minimal.	Buildings not occupied, factories and working environments with existing levels of noise.

1.5.23 This assessment considers all identified NSRs to be of high sensitivity, given that they are residential dwellings.

1.5.24 The significance of operational noise from the Proposed Development has been determined based on the guidance contained within BS4142, i.e. by consideration of the difference between the rating level and the prevailing background sound levels, with respect to context and the resulting sound levels in absolute terms.

1.5.25 The impact magnitudes associated with operational noise from the Proposed Development are presented in Table 7.

Table 7: Noise Impact Magnitude

Difference, d, Between Rating Level ($L_{Ar,Tr}$) and Background Sound Level (L_{A90})	BS4142 Guidance	Adopted Impact Magnitude
d >+10	Indication of significant adverse impact	High
d >+5, ≤10	Indication of adverse impact	Medium
d ≤+5, >0	Indication of no adverse Impact	Low
d ≤0	Indication of low impact	Negligible
Where the rating level ($L_{Ar.Tr}$) is below 35dB the impact magnitude is classified as 'Low' or lesser, regardless of the relationship to the background noise level.		

Difference, d, Between Rating Level ($L_{Ar,Tr}$) and Background Sound Level (L_{A90})	BS4142 Guidance	Adopted Impact Magnitude
Where predicted internal levels at NSRs are below NR25 with windows open impact magnitude is classified as low.		

1.5.26 The effect significance for operational noise has been determined by consideration of both the receptor sensitivity and the impact magnitude according to the matrix detailed in Table 8.

Table 8: Effect Significance Matrix

Impact Magnitude	Receptor Sensitivity		
	High	**Medium**	**Low**
High	Major	Moderate	Minor
Medium	Moderate	Minor	Negligible
Low	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible

1.5.27 Effects with a significance of moderate and major are considered **significant**. Effects with a significance of negligible and minor are considered **not significant**.

Requirements for Mitigation

1.5.28 Mitigation will be specified where significant adverse effects are identified.

Assessment of Residual Effect Significance

1.5.29 Where mitigation is proposed, residual effect significance has also been determined with reference to the adopted noise criteria following specification of appropriate mitigation.

Assessment of Cumulative Effects

1.5.30 No schemes with the potential for cumulative noise effects have been identified within 5 km of the Proposed Development.

Limitations to Assessment

1.5.31 The assessment of operational noise impacts associated with the Proposed Development has been undertaken adopting representative source noise levels for batteries, inverters and transformers. The actual plant installed will be subject to the outcome of the tendering process, however, the equipment chosen will be

selected to ensure compliance with the adopted noise criteria outlined in this assessment.

1.6 Scope of the Assessment

Receptors Requiring Assessment

1.6.1 The nearest residential noise sensitive receptors (NSRs) to the Proposed Development have been identified and are described in Table 9 and are shown in Figure 1.

Table 9: NSRs considered in this assessment

NSR ID	Description	X	Y
NSR1	Main Street	333837	712180
NSR2	Stable Cottage	332850	712001
NSR3	Peterhead	332979	711289
NSR4	Rankeilour Mansion House	332994	711805
NSR5	East Lodge	333689	712457

Impacts Scoped Out of Assessment

1.6.2 It is considered that construction noise impacts may be minimised by appropriate controls on working hours, specification of appropriate plant and methods and implementation of best practices and, therefore, the prediction and evaluation of construction noise has been scoped out.

1.6.3 No significant sources of vibration are expected, and we have therefore scoped out further consideration of vibration during the construction and operational phases.

Environmental Measures Embedded into the Development Proposals

1.6.4 The Applicant is committed to meeting appropriate noise limits, during the construction and decommissioning phase and the operational phase.

1.6.5 Appropriate noise limits for construction noise have been derived from measured baseline data, in accordance with methods provided in BS5228 as follows:

- Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00) – 65 dB $L_{Aeq,T}$;
- Evenings and weekends (19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00 – 23.00 Sundays) – 55 dB $L_{Aeq,T}$; and
- Night-time (23:00 – 07:00) – 45 dB $L_{Aeq,T}$.

1.6.6 The limits detailed above will inform the Construction Environmental Management Plan (CEMP). Construction and environmental management plans are introduced

in Chapter 3: Project Description with an outline CEMP provided in Technical Appendix 3.1: Outline CEMP.

1.6.7 Inverters for the solar array will be in-line inverters, rather than large, centralised inverters. In-line inverters produce little to no noise emissions.

1.7 Assessment of Potential Effects

Construction Effects

1.7.1 As noted above, noise impacts during the construction phase will be limited by the implementation of a CEMP. Compliance with the noise limits will result in construction phase noise effects being **not significant**.

Operational Effects

1.7.2 The predicted operational noise levels are provided and evaluated against BS4142 criteria in Table 10.

Table 10: Evaluation of Operational Noise Levels

NSR ID	Predicted Specific Noise Level, dB $L_{Aeq,T}$	Character correction, rationale	Derived rating level, $dBL_{Ar,Tr}$	Limiting rating noise level, $dBL_{Ar,Tr}$, (background +5 dB)	Comparison with criterion, (predicted level minus limiting level), dB(A)
Daytime period (1hr)					
NSR1	25	0, no tonality, intermittency or impulsivity	25	39	-14
NSR2	28		28	38	-10
NSR3	28		28	39	-11
NSR4	29		29	38	-9
NSR5	25		25	39	-14
Night-time period (15 mins)					
NSR1	25	0, no tonality, intermittency or impulsivity	25	30	-5
NSR2	28		28	31	-3
NSR3	28		28	29	-1
NSR4	29		29	31	-2
NSR5	25		25	30	-5

1.7.3 Predicted rating levels are below the BS 4142 criteria of background +5 dB at all receptors and the initial assessment of impacts, with reference to Table 7, indicates a low impact.

1.7.4 Predicted rating levels are also substantially below 35 dB and, with reference to Table 7, this also indicates a low impact.

1.7.5 Predicted operational noise levels are considered in the context of a NR25 target maximum noise level for bedrooms during the night time period in Table 11.

1.7.6 Predictions are undertaken for receptor NSR4 only as the highest predicted octave band façade levels are at this receptor.

1.7.7 Façade corrections of +2 dB have been included within the predicted facade levels and an open window has been assumed (15 dB reduction in each octave band).

Table 11 - Evaluation of predicted internal noise levels, NSR1

	Octave Band Level, dB						
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Predicted Façade Level	43.2	43.3	25.8	23.5	26.8	21.9	11.5
Open Window reduction (conservative)	15	15	15	15	15	15	15
Predicted Internal Level	28.2	28.3	10.8	8.5	11.8	6.9	-3.5
NR 25 curve	54.0	45.0	38.0	31.0	27.0	24.0	22.0
Margin of Compliance	-25.8	-16.7	-27.2	-22.5	-15.2	-17.1	-25.5

1.7.8 The predicted level due to operation of the facility within bedrooms of NSR1 meets the target NR level at each octave band by a substantial margin.

1.7.9 As demonstrated in Table 11, the operation of the facility meets the fixed criteria for a night-time indoor noise limit of NR25. This assessment therefore considers that noise from the operation of the facility will have low impact.

1.7.10 This assessment therefore considers that noise impacts will be **not significant**.

Decommissioning Effects

1.7.11 As noted above, noise impacts during the decommissioning phase will be limited by the implementation of a CEMP. Compliance with the noise limits will result in decommissioning phase noise effects being **not significant**.

1.8 Mitigation

1.8.1 The assessment has demonstrated that the Proposed Development will meet the derived criteria, therefore no additional mitigation is proposed.

1.9 Assessment of Residual Effects

Construction

1.9.1 No requirement for specific additional mitigation has been determined for the construction phase, therefore no additional mitigation is proposed, and residual effects remain unchanged and are **not significant**.

Operation

1.9.2 No specific additional mitigation has been determined to be required for the operational phase; therefore no additional mitigation is proposed and residual effects remain unchanged and are **not significant**.

1.10 Assessment of Cumulative Effects

1.10.1 No potentially cumulative developments have been identified within the study area and therefore no cumulative effects are anticipated.

1.11 Summary

1.11.1 Information on noise and vibration within the noise and vibration study area was collected through desktop review, site surveys and consultation.

1.11.2 Overall, it is concluded that there will be no likely significant residual effects arising from the Proposed Development during the construction, operational and maintenance or decommissioning phases.

1.11.3 Mitigation during construction will be secured within the CEMP. Mitigation measures for operational noise are not considered necessary.

1.12 References

BSI Publications. 2019. “BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound.”

BSI Publications. 2003. “BS7445:2003 Description and measurement of environmental noise, Guide to quantitites and procedures.”

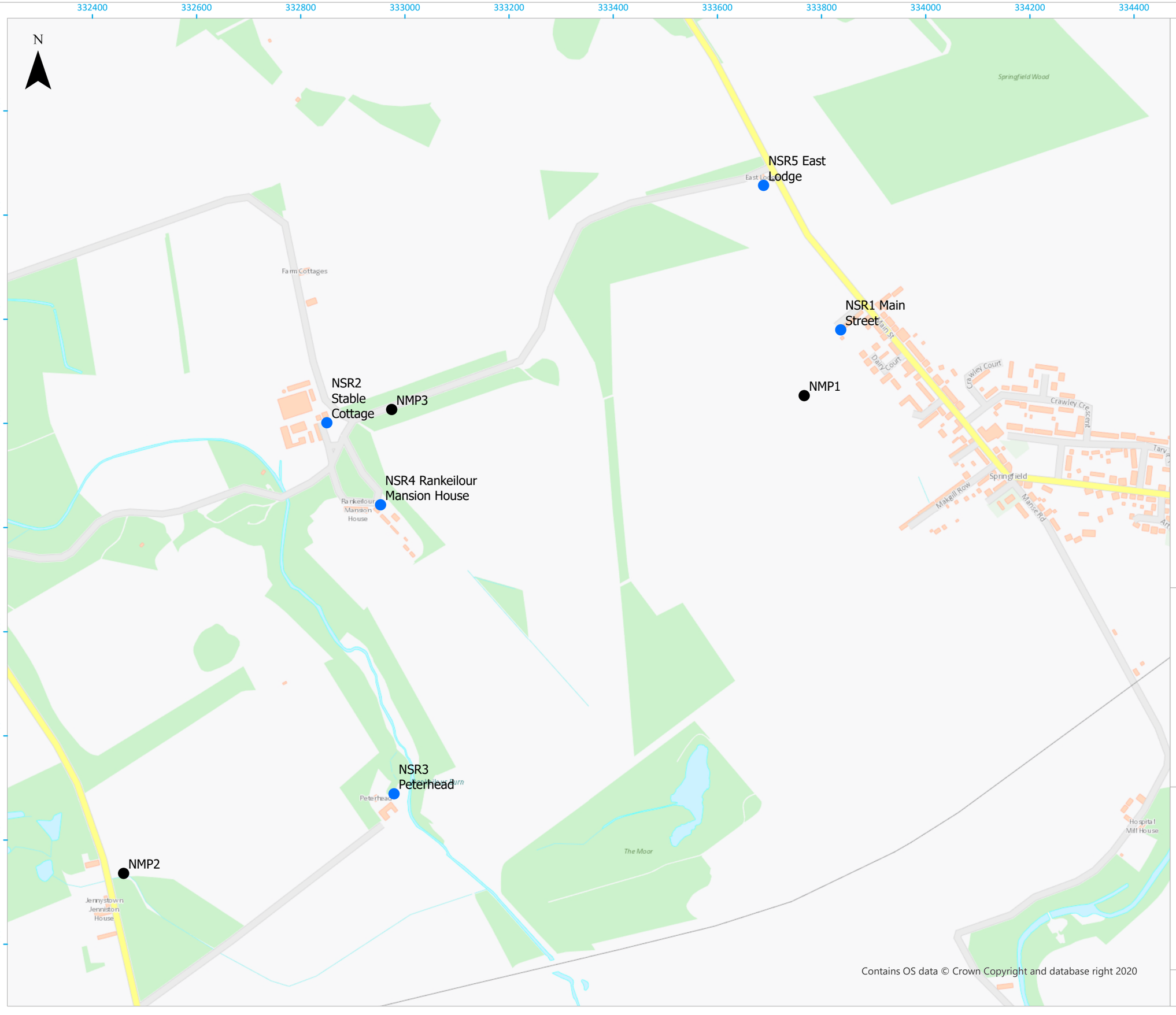
BSI Publications. 2014. “BS8233:2014 Guidance on sound insulation and noise reduction in buildings.”

ISO. 1993. “ISO 9613 Acoustics - Attenuation of sound during propagation outdoors, Part 1: Calcualtion of the absorption of sound by the atmosphere, Part2: General method of calculation.”

Scottish Government. 2024. *National Planning Framework 4.* Scottish Government.

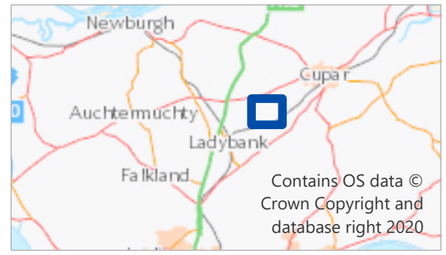
Scottish Government. 2011. *Planning Advice Note 1, PAN1/2011.* Scottish Government.

Association of Noise Consultants Good Practice Working Group, BS4142:2014+A1:2019 Technical Note, 2020



KEY

- Noise Monitoring Positions
- Noise Sensitive Receptors



Coordinate System: British National Grid
Projection: Transverse Mercator

Attributions: <attributions>

0 0.04 0.07 0.14 0.21 0.28 0.35
Kilometres

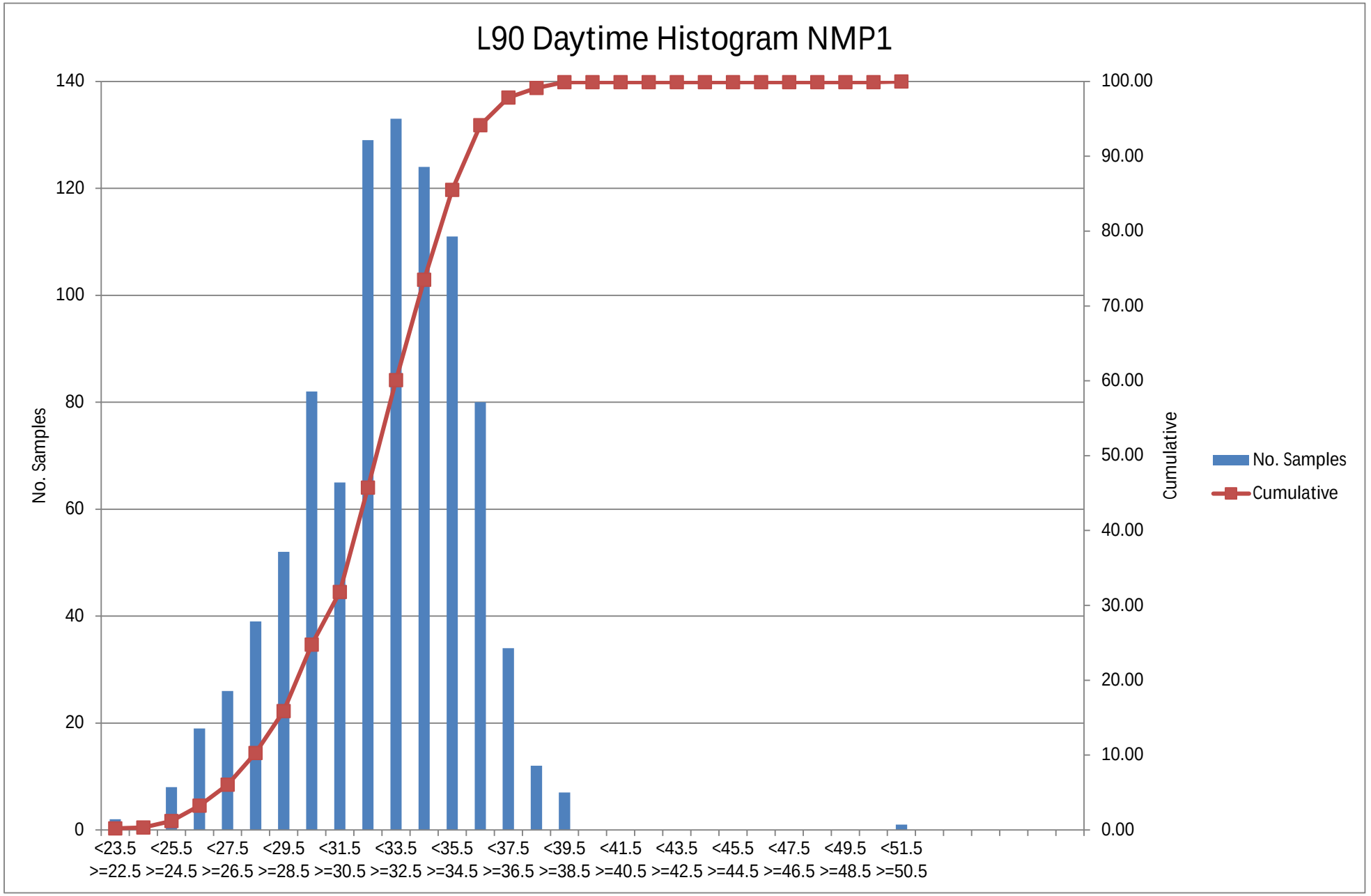
1:6,809

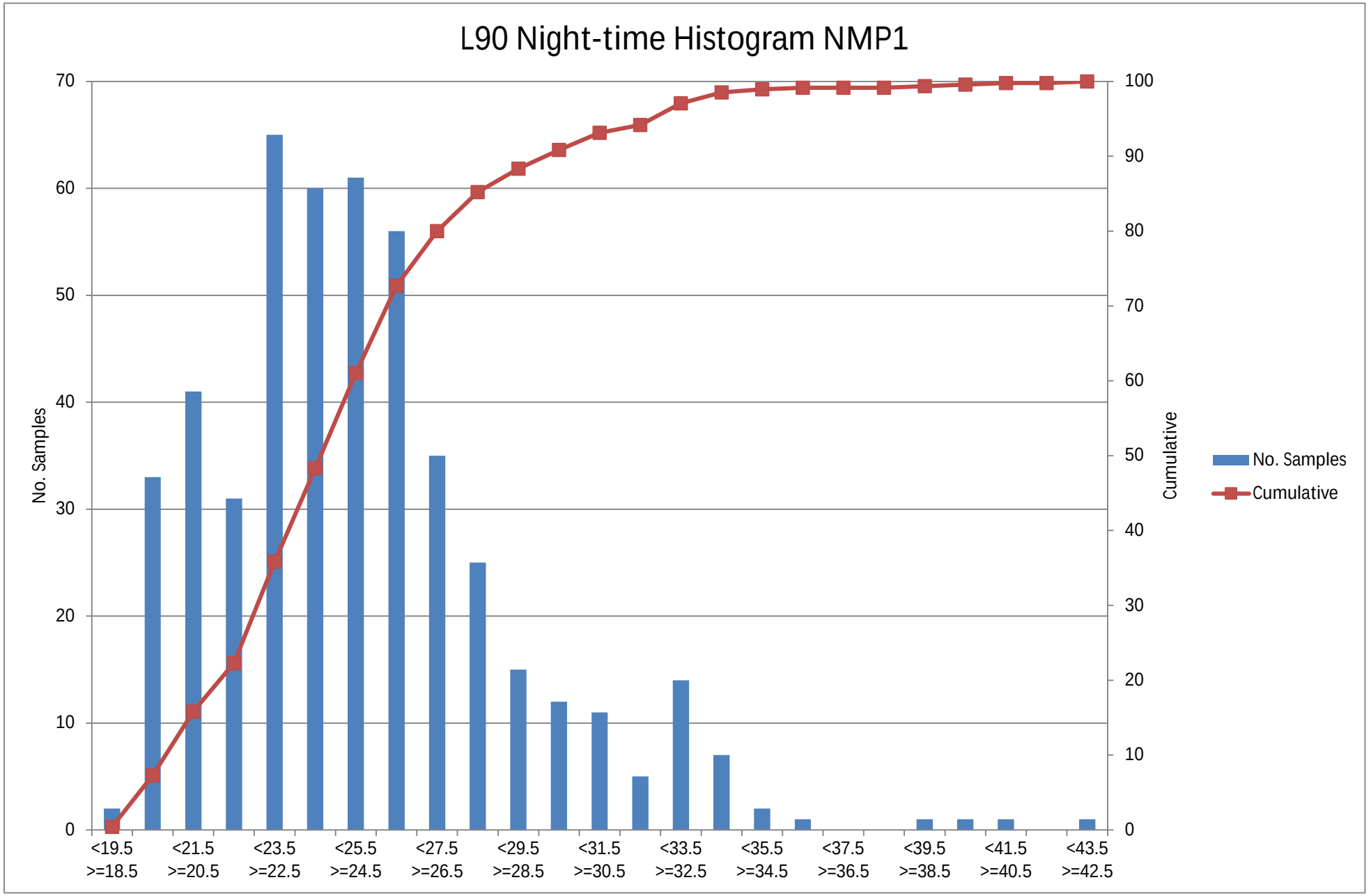
SLR

West Springfield Solar and BESS
Noise Impact Assessment

Figure 1
Noise Sensitive Receptors and Noise Monitoring Positions

Date:	Lead:	Review:	Version:
28/04/2025	AB	EQ	1


L90 Daytime Histogram NMP1
No. Samples
Cumulative
140
120
100
80
60
40
20
0
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
<23.5 <25.5 <27.5 <29.5 <31.5 <33.5 <35.5 <37.5 <39.5 <41.5 <43.5 <45.5 <47.5 <49.5 <51.5
>=22.5 >=24.5 >=26.5 >=28.5 >=30.5 >=32.5 >=34.5 >=36.5 >=38.5 >=40.5 >=42.5 >=44.5 >=46.5 >=48.5 >=50.5
No. Samples
Cumulative


L90 Night-time Histogram NMP1
No. Samples
Cumulative
No. Samples
Cumulative
0
10
20
30
40
50
60
70
0
10
20
30
40
50
60
70
80
90
100
<19.5
>=18.5
<21.5
>=20.5
<23.5
>=22.5
<25.5
>=24.5
<27.5
>=26.5
<29.5
>=28.5
<31.5
>=30.5
<33.5
>=32.5
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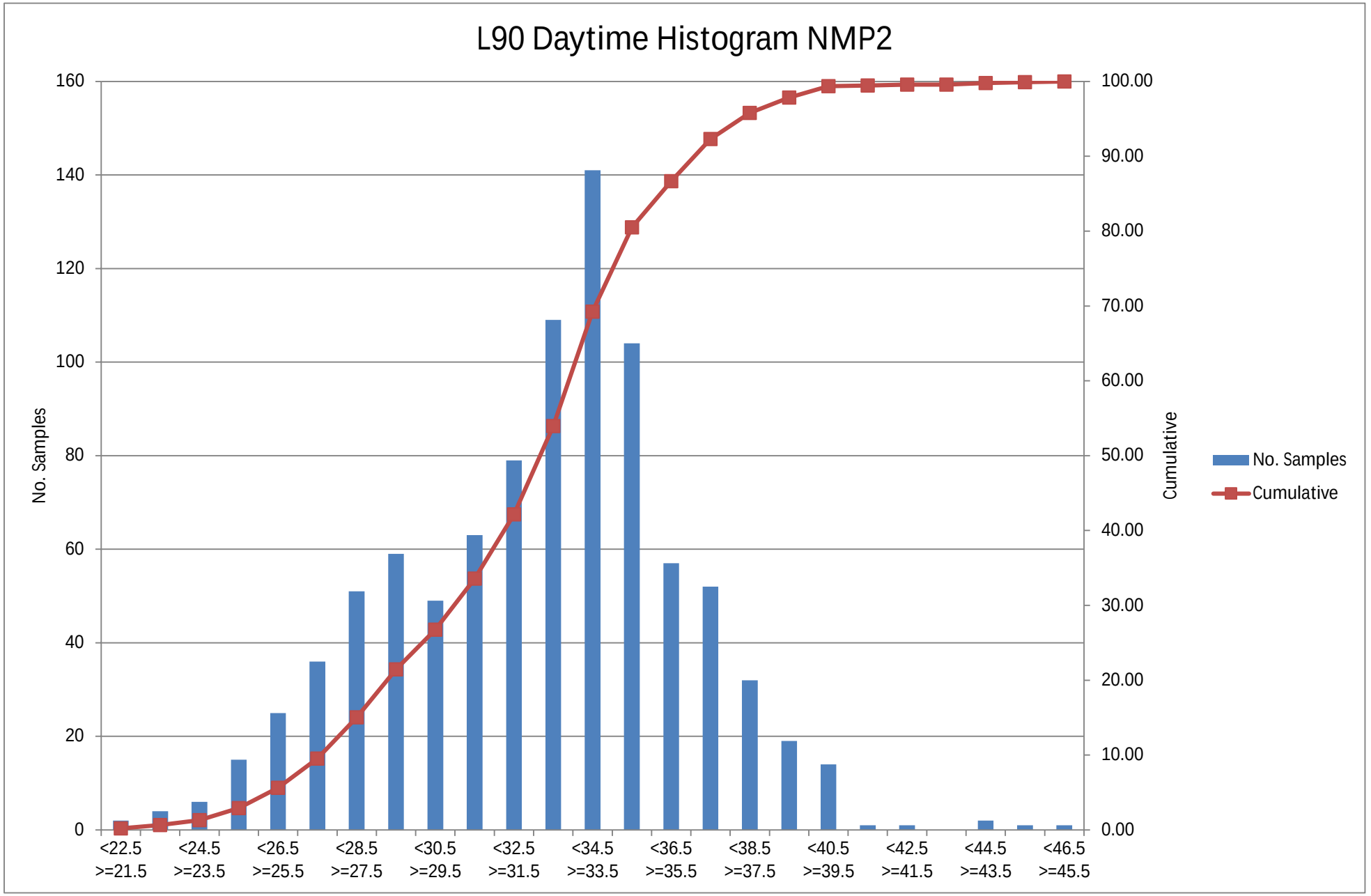
>=38.5
<41.5
>=40.5
<43.5
>=42.5


L90 Daytime Histogram NMP2
No. Samples
Cumulative
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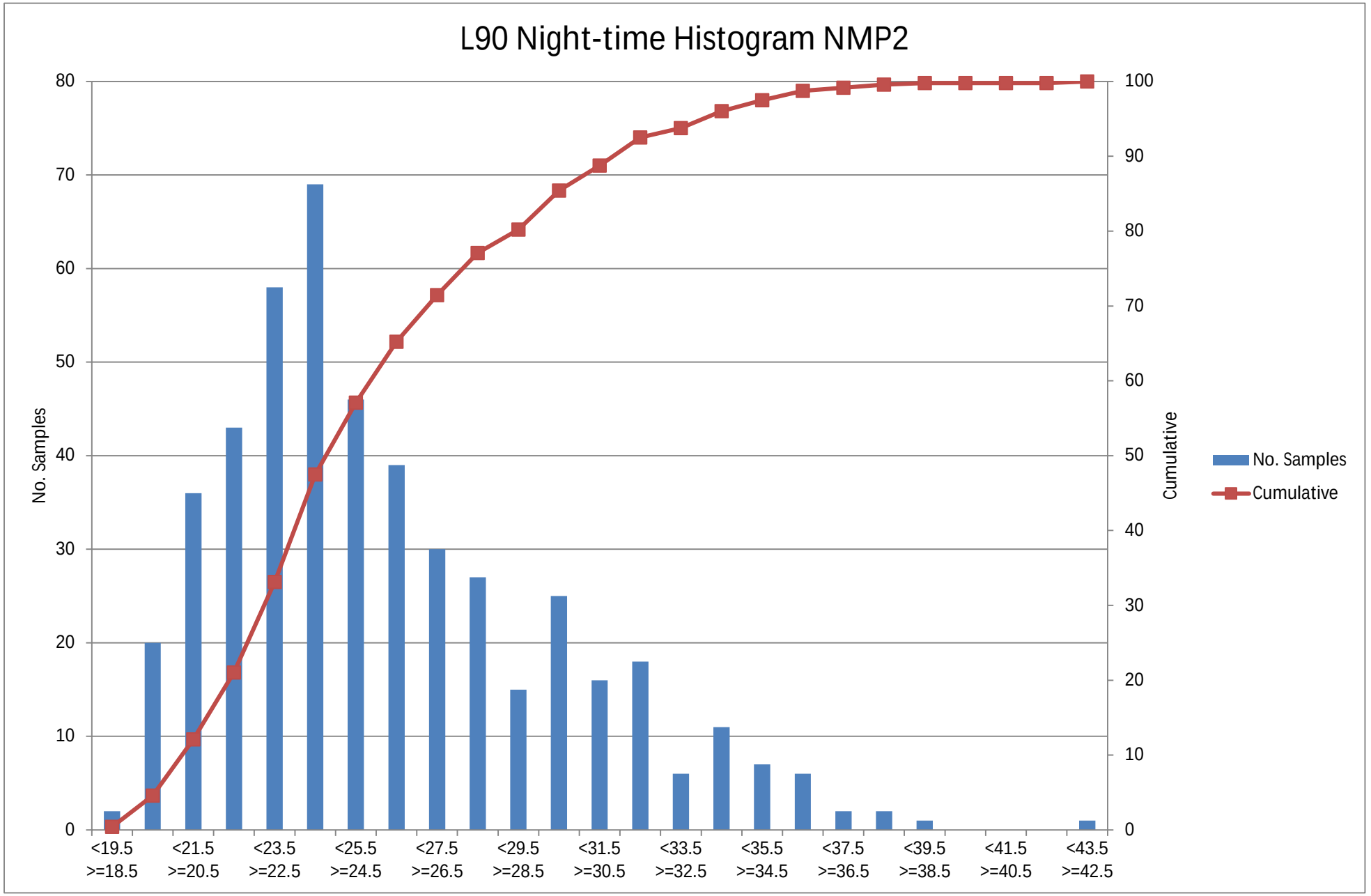
140
120
100
80
60
40
20
0
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
<22.5 >=21.5
<24.5 >=23.5
<26.5 >=25.5
<28.5 >=27.5
<30.5 >=29.5
<32.5 >=31.5
<34.5 >=33.5
<36.5 >=35.5
<38.5 >=37.5
<40.5 >=39.5
<42.5 >=41.5
<44.5 >=43.5
<46.5 >=45.5
No. Samples
Cumulative


L90 Night-time Histogram NMP2
No. Samples
Cumulative
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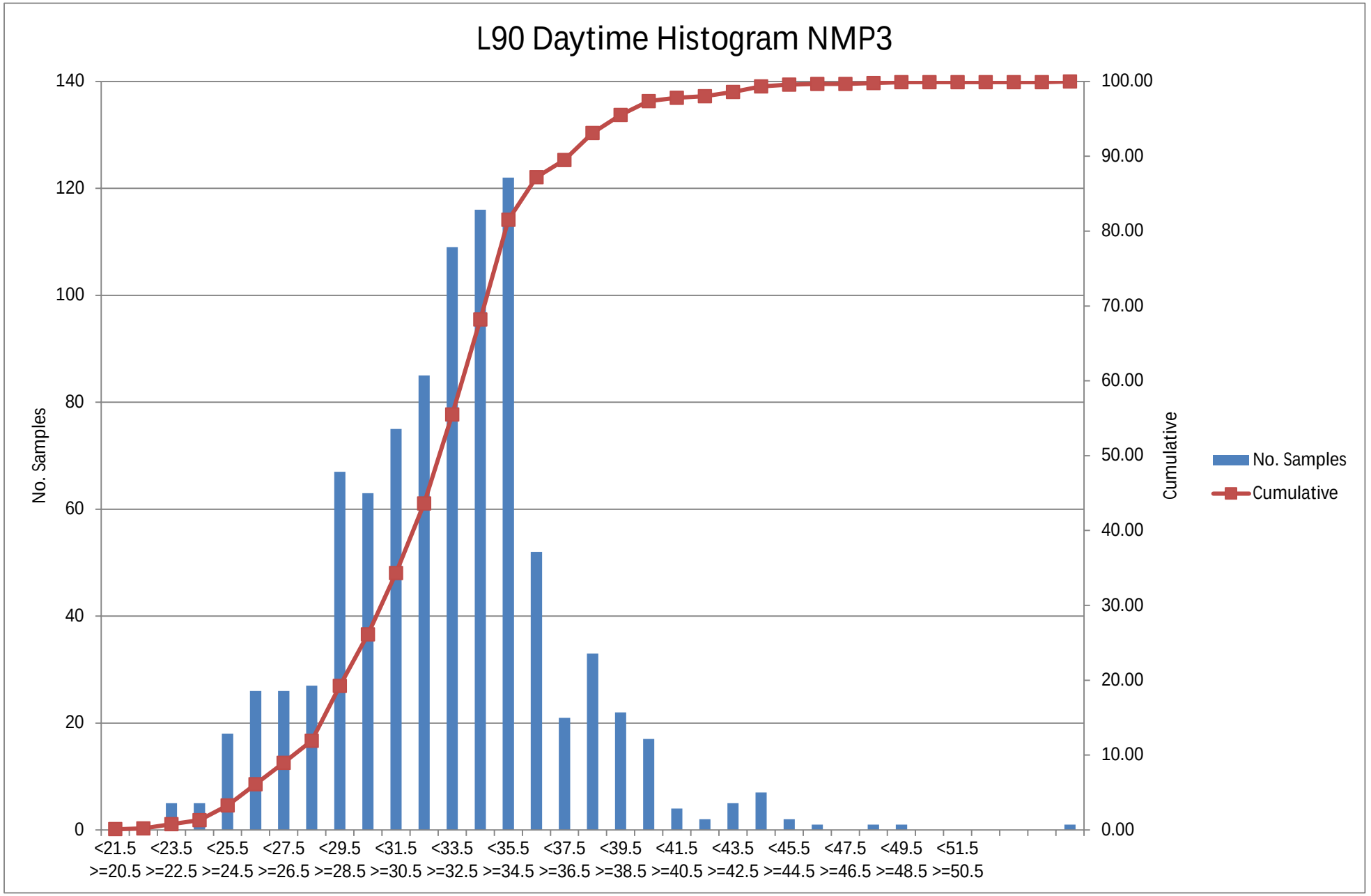
10
20
30
40
50
60
70
80
0
10
20
30
40
50
60
70
80
90
100
<19.5 >=18.5
<21.5 >=20.5
<23.5 >=22.5
<25.5 >=24.5
<27.5 >=26.5
<29.5 >=28.5
<31.5 >=30.5
<33.5 >=32.5
<35.5 >=34.5
<37.5 >=36.5
<39.5 >=38.5
<41.5 >=40.5
<43.5 >=42.5
No. Samples
Cumulative


L90 Daytime Histogram NMP3
No. Samples
Cumulative
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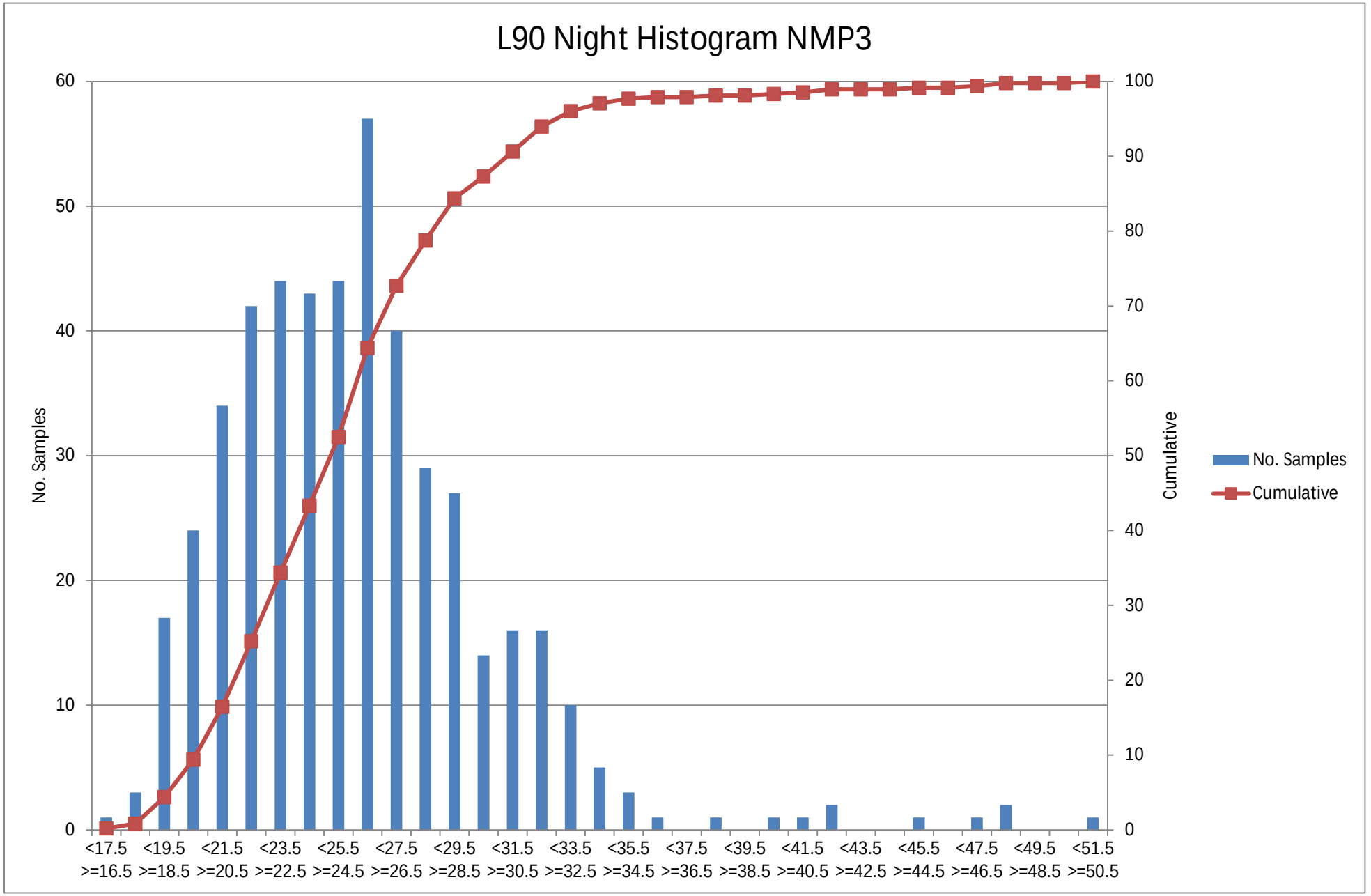
120
100
80
60
40
20
0
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
No. Samples
Cumulative
<21.5 <23.5 <25.5 <27.5 <29.5 <31.5 <33.5 <35.5 <37.5 <39.5 <41.5 <43.5 <45.5 <47.5 <49.5 <51.5
>=20.5 >=22.5 >=24.5 >=26.5 >=28.5 >=30.5 >=32.5 >=34.5 >=36.5 >=38.5 >=40.5 >=42.5 >=44.5 >=46.5 >=48.5 >=50.5


L90 Night Histogram NMP3
No. Samples
Cumulative
No. Samples
Cumulative
0
10
20
30
40
50
60
0
10
20
30
40
50
60
70
80
90
100
<17.5 >=16.5
<19.5 >=18.5
<21.5 >=20.5
<23.5 >=22.5
<25.5 >=24.5
<27.5 >=26.5
<29.5 >=28.5
<31.5 >=30.5
<33.5 >=32.5
<35.5 >=34.5
<37.5 >=36.5
<39.5 >=38.5
<41.5 >=40.5
<43.5 >=42.5
<45.5 >=44.5
<47.5 >=46.5
<49.5 >=48.5
<51.5 >=50.5

NSR1 Third Octave Tonality Test

15dB								8dB					5dB												
25 to 125								160 to 400					500 to 10,000												
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
35	33	29.8	33.5	31.1	32.1	34.4	31.2	25.6	18.3	13.5	11.9	14.1	14	13.1	18.9	17.3	15.3	14.4	11.7	9.8	4.4	-1.6	-9.3	-24.3	-48.5	-77.6
	-2	-3.2	3.7	-2.4	1	2.3	-3.2	-5.6	-7.3	-4.8	-1.6	2.2	-0.1	-0.9	5.8	-1.6	-2	-0.9	-2.7	-1.9	-5.4	-6	-7.7	-15	-24.2	-29.1
2	3.2	-3.7	2.4	-1	-2.3	3.2	5.6	7.3	4.8	1.6	-2.2	0.1	0.9	-5.8	1.6	2	0.9	2.7	1.9	5.4	6	7.7	15	24.2	29.1	

FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz

NSR2 Third Octave Tonality Test

15dB								8dB					5dB												
25 to 125								160 to 400					500 to 10,000												
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
37.4	35.3	32.1	36.7	34.4	35	36.7	34.3	28.5	19.9	15.1	13.5	15.5	15.1	14	20.8	19.4	17.6	17	14.7	13	8.2	2.8	-3.5	-16.6	-37.7	-66
	-2.1	-3.2	4.6	-2.3	0.6	1.7	-2.4	-5.8	-8.6	-4.8	-1.6	2	-0.4	-1.1	6.8	-1.4	-1.8	-0.6	-2.3	-1.7	-4.8	-5.4	-6.3	-13.1	-21.1	-28.3
2.1	3.2	-4.6	2.3	-0.6	-1.7	2.4	5.8	8.6	4.8	1.6	-2	0.4	1.1	-6.8	1.4	1.8	0.6	2.3	1.7	4.8	5.4	6.3	13.1	21.1	28.3	
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz

NSR3 Third Octave Tonality Test

15dB								8dB					5dB												
25 to 125								160 to 400					500 to 10,000												
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
33.7	32.4	28.5	33.5	29.5	33.3	43.9	29.9	30	21.7	13.2	13.5	15.5	16.8	14.3	17.7	16.9	15.6	13.2	9.4	6.3	0.2	-5	-11.4	-20.3	-29	-37.2
	-1.3	-3.9	5	-4	3.8	10.6	-14	0.1	-8.3	-8.5	0.3	2	1.3	-2.5	3.4	-0.8	-1.3	-2.4	-3.8	-3.1	-6.1	-5.2	-6.4	-8.9	-8.7	-8.2
1.3	3.9	-5	4	-3.8	-10.6	14	-0.1	8.3	8.5	-0.3	-2	-1.3	2.5	-3.4	0.8	1.3	2.4	3.8	3.1	6.1	5.2	6.4	8.9	8.7	8.2	
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz

NSR4 Third Octave Tonality Test

15dB								8dB					5dB												
25 to 125								160 to 400					500 to 10,000												
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
37.1	34.8	31.3	36	33.5	34.5	39.2	36.1	30.5	21.7	17.3	15.6	17.2	17	16.3	21	19.6	18.1	17.3	15.7	14.8	10.8	7	2.5	-8.6	-27.3	-50.9
	-2.3	-3.5	4.7	-2.5	1	4.7	-3.1	-5.6	-8.8	-4.4	-1.7	1.6	-0.2	-0.7	4.7	-1.4	-1.5	-0.8	-1.6	-0.9	-4	-3.8	-4.5	-11.1	-18.7	-23.6
2.3	3.5	-4.7	2.5	-1	-4.7	3.1	5.6	8.8	4.4	1.7	-1.6	0.2	0.7	-4.7	1.4	1.5	0.8	1.6	0.9	4	3.8	4.5	11.1	18.7	23.6	
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz

NSR5 Third Octave Tonality Test

15dB								8dB					5dB												
25 to 125								160 to 400					500 to 10,000												
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
34.4	32.1	28.8	33	30.6	31.5	33	30.6	24.8	17.7	13.5	11.7	13.6	13.2	12.3	17.6	15.9	14	12.7	9.9	7.9	2.2	-4.4	-12.4	-28.3	-54	-79.6
	-2.3	-3.3	4.2	-2.4	0.9	1.5	-2.4	-5.8	-7.1	-4.2	-1.8	1.9	-0.4	-0.9	5.3	-1.7	-1.9	-1.3	-2.8	-2	-5.7	-6.6	-8	-15.9	-25.7	-25.6
2.3	3.3	-4.2	2.4	-0.9	-1.5	2.4	5.8	7.1	4.2	1.8	-1.9	0.4	0.9	-5.3	1.7	1.9	1.3	2.8	2	5.7	6.6	8	15.9	25.7	25.6	
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz