Port Dundas Battery Energy Storage System

Noise Impact Assessment

Client:	Fig Power
Project/Proposal No:	7645
Version:	1
Date:	2024-10-24

Document Information

Project Name:	Port Dundas Battery Energy Storage System
Document Title:	Noise Impact Assessment
Client Name:	Fig Power
Client Contact:	c/o Kerri McGuire, Graham & Sibbald
Client Address:	By email
Document Status:	Final for Issue
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Approved:	Alasdair Baxter
Date:	2024-10-24
Version:	1
Project/Proposal Number:	7645
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Revision History

Version	Date	Authored	Reviewed	Approved	Notes
1	2024-10-24	Alasdair Baxter	Gregor Massie	Alasdair Baxter	Issue

Contents

1. Introduction

1.1 Background

Fig Power ('the Applicant') is applying for planning permission to develop an energy storage facility ('the Facility') at land off Mary Street, Port Dundas, Glasgow. ITPEnergised has been appointed by the Applicant to undertake an assessment of potential noise impacts associated with operation of the facility.

The facility will comprise battery storage units and inverters in an open-air layout.

The surrounding area comprises predominantly industrial and commercial premises to the north and west with residential properties to the south and east, and major roads to the south. There are residential properties present to the south-east and north-east, the closest of which are approximately 30 m from the edge of the facility.

1.2 Scope of Assessment

The scope of this assessment comprised the following:

- Consultation with Glasgow City Council (GCC);
- Baseline noise survey;
- Modelling prediction of operational noise using proprietary software CadnaA;
- Evaluation of predicted noise levels with reference to the measured background (L_{A90}) noise levels and, where appropriate, to fixed rating noise level criteria of 35 dB(A) at the nearest noise sensitive receptor; and
- Specification of mitigation where necessary.

Additional traffic flows associated with the construction phase of the Facility will be minimal and of short duration and will occur during weekday daytimes only. Construction noise can be minimised through adoption of best practice methods and appropriate techniques. Noise associated with construction of the Facility has therefore been scoped out of the noise assessment.

1.3 Study Area and Noise Sensitive Receptors

Maps, aerial imagery and a site visit have informed the selection of an appropriate study area for the assessment. The closest noise sensitive receptors (NSRs) were identified, and a study area adopted which included these NSRs.

Noise levels due to the Facility at more distant NSRs will be lower than at the closest NSRs, therefore compliance with criteria at the closest NSRs will entail compliance at those more distant. The identified NSRs are provided in Table 1 and shown on Drawing 1.

Table 1 Representative NSRs Considered

NSR ID	NSR description
NSR1	Apartment Building on Harvey Street, approximately 30 m to the south-east of the facility
NSR2	Properties on Maltings Wynd, approximately 60 m to the northeast of the facility

2. Relevant Guidance and Advice

2.1 Planning advice note PAN1/2011: Planning and noise

PAN1/2011 (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.

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

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.

2.2 BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound[1]

BS4142:2014 describes methods for rating and assessing sound from industrial or commercial premises. The methods detailed in the standard use outdoor sound[2] levels to assess the likely effects on people inside or outside a residential dwelling upon which sound is incident.

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.

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.

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.

[1] BS4142:2014+A12019 Methods for Rating and Assessing Industrial and Commercial Sound (2019)

[2] The standard refers to sound levels, rather than noise levels, however, these terms can be used interchangeably, as noise is defined as "unwanted sound". This assessment uses the term "noise".

- **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.

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.

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.

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;
- A difference of around + 5 dB is likely to be an indication of a low adverse impact;
- 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.

The standard also makes the following comments:

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

   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:*

    i) facade insulation treatment;

    ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

    iii) acoustic screening."

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. 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 conclude that impacts at rating levels below 35 dB are unlikely. 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.

2.3 ISO 9613; Attenuation of sound during propagation outdoors, Part 1 and Part 2[3]

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.

3. Method

3.1 Consultation with Glasgow City Council (GCC)

ITPEnergised consulted in October 2024 with GCC Environmental Health, who agreed with the scope and approach of the noise assessment and requested assessment be undertaken with reference to their fixed limit criteria of NR35 during the daytime (07:00 – 22:00) and NR25 during the night-time internally to any nearby sensitive receptors, when assessed with windows closed.

A record of consultation is shown within Appendix 1.

3.2 Characterisation of Baseline Environment

ITPEnergised attended the site to conduct a baseline noise survey between 11th and 15th July 2024. Monitoring was conducted in accordance with the method provided in BS7445:2003 and BS4142:2014+A1:2019, using Rion NL-52 Class I integrating sound level meters (SLM). The SLMs were within their laboratory calibration period, and before and after each measurement a calibration check was undertaken, which showed drift was within tolerance limits (not exceeding 0.1 dB).

Measurements were undertaken at two noise monitoring positions;

- NMP1 at the southeastern boundary of the facility, and
- NMP2 at the northeastern boundary of the facility.

The NMPs are shown on Drawing 1. The microphone height was 1.5m above ground level. The measurements covered a continuous 96-hour period including a weekend and four entire night-time periods.

[3] ISO 9613: Attenuation of sound during propagation outdoors, Part 1 and Part 2. ISO, December 1996.

The main noise source during daytime at both monitoring positions was noted to be the M8 road, with contributions from other roads in the local network, and activity at the operational concrete plant.

The current use of the site, Breedon Concrete, is operational between 07:00 and 17:00 weekdays and 07:00 and 12:00 Saturdays (closed on Sundays). These operational periods have been screened out of the measured baseline data in order to remove the influence of the current use of the site.

3.3 Prediction of Operational Noise Levels

3.3.1 General Prediction Method

Noise levels due to the Facility have been predicted at identified representative NSRs within noise modelling software CadnaA, using the propagation method set out in ISO9613.

This assessment has adopted representative sound power levels for batteries and inverters provided by the Applicant's technology provider Hithium for the battery and Power Electronics for the inverters. The following noise sources have been modelled:

- Battery Units (including Cooling System) – 90.9 dB L_{WA}; and
- Inverter Units (PCS) – 83.8 dB L_{WA} (including a noise attenuation kit)

The inverters and batteries were modelled as buildings with vertical area sources representing the coolers/chillers. The predicted rating levels represent the cumulative noise level of all modelled noise sources. A 1/3 octave spectrum, sourced from Hithium, was applied to the batteries. An octave spectrum for the inverters was sourced from ITPEnergised's database.

The effective heights of the noise sources are at 1.6 – 2.0 m. The distance from the site boundary to the receptors is approximately 30 m (NSR1) and 60 m (NSR2).

NSRs have been modelled at 4 m (NSR2) and 24 m (NSR1) above local ground level.

The noise model incorporates topographical detail from Ordnance Survey 50 m contour data.

Whilst the assessment is undertaken against fixed NR limits it is considered prudent to determine whether noise from the facility may contain any discernible characteristics that may make the noise more likely to cause disturbance. 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.
- Noise from the Facility will therefore not have intermittent characteristics;

A typical air temperature of 10°C and relative humidity of 70% have been assumed within the model. Ground absorption between the site and receptors has been assumed to be G=0, representative of acoustically hard surfaces such as made ground.

The model uses ISO9613 calculation methodology which uses a "downwind" propagation for all receptors.

4. Results

4.1 Summary of Baseline Noise Environment

A summary of measured levels is provided in Table 2, with the ambient (L_{Aeq}) and background (L_{A90}) being the most pertinent parameters.

Table 2 – Results of baseline noise survey

NMP / period	Measured noise level, dB		
	Ambient $L_{Aeq,T}$	Background, $L_{A90,T}$ (mode)	Background, $L_{A90,T}$ (mean)
NMP1 daytime*	47.3	43.0	44.8
NMP1 night-time	44.8	41.0	41.5
NMP2 daytime*	46.5	42.0	43.9
NMP2 night-time	45.1	41.0	40.9

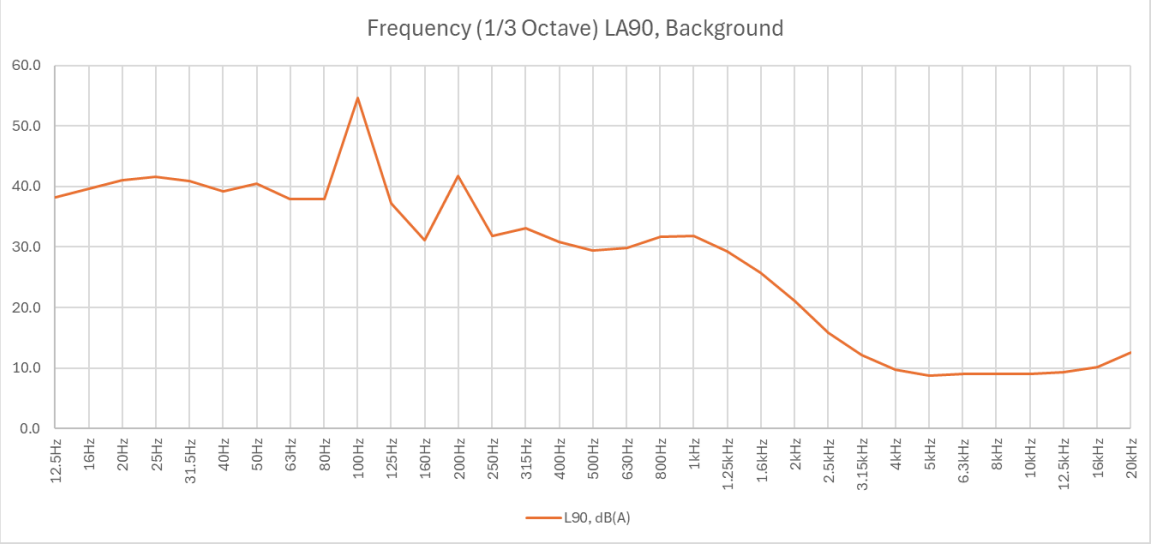
* - noise from current site operational periods removed

The noise climate at NMP1 and NMP2 was similar, with road traffic noise from the M8 to the south and west being dominant and continuous. Noise from the Port Dundas substation bounding the north of the site was also audible and was the secondary noise source within the area. A tonal hum from the substation was audible and noticeable at both monitoring locations.

The measured ambient and background are close to each other indicative of a very steady noise climate, with continuous noise that varies only slightly.

A tonal hum from the existing substation to the north was identified by the surveyor, considered likely to be due to transformers at the substation. Further analysis of the third octave noise levels at NMP1 has therefore been undertaken and the third octave background noise levels (log average, night-time) at NMP1 are presented in Chart 1.

Chart 1 – Third Octave Measured Background Noise, NMP1



The chart shows a distinctive peak at the 100 Hz third octave band, and analysis shows that the peak displays tonal qualities.

4.2 Evaluation of Impacts, GCC Guidance

Throughout the majority of reference period (daytime/night-time) the facility will operate at a negligible level and will be silent/inaudible at all NSRs.

During the early morning hours, when the BESS is likely to operate on a charging basis, most people are likely to be inside their houses sleeping and noise levels within properties may therefore be more relevant than outdoor noise levels. This assessment therefore considers fixed evaluation criteria, as suggested in GCC consultation, to determine the likelihood of operation of the BESS giving rise to sleep disturbance, based on worst-case internal noise levels.

Predicted operational noise levels are considered in the context of the NR25 target maximum noise levels for bedrooms during the night time period. Predictions are undertaken for receptor NSR1 only as this is the closest receptor to the scheme and compliance at this receptor will demonstrate compliance at more distant receptors.

Table 3 Predicted indoor noise levels at NSR1, comparison with NR25

Frequency	Octave Band Level, dB							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Predicted Façade Level	36.2	53.2	54.0	52.7	49.9	47.0	39.5	36.2
Reduction across a closed window	24.0	24.0	21.0	29.0	40.0	38.0	37.0	24.0
Predicted Internal Level	12.2	29.2	33.0	23.7	9.9	9.0	2.5	12.2
NR 25 curve	55.2	43.8	35.3	29.1	25.0	22.0	19.7	18.0
Margin of Compliance	-43.0	-14.6	-2.3	-5.4	-15.1	-13.0	-17.2	-43.0

The predicted level due to operation of the facility within bedrooms of NSR1 during the night-time period meets the target NR level across each octave band.

As demonstrated in Table 3, the operation of the BESS meets the GCC fixed criteria for a night-time indoor noise limit of NR25. This assessment therefore considers that noise from the operation of the BESS during this period will have a low or negligible impact.

4.3 Uncertainty

We note the following:

- Source data uncertainty; Source data uncertainty has been minimised by the use of manufacturer supplied sound level data.
- Baseline uncertainty; This assessment considers background noise levels measured over an approximately 96 hour period minimising uncertainty associated with short term noise measurements.

5. Conclusion

ITPEnergised has undertaken a noise assessment of a proposed BESS at Port Dundas, Glasgow. The assessment has comprised consultation with GCC, characterisation of the baseline noise environment, prediction of operational noise levels and evaluation against fixed limit criteria.

Predicted operational noise levels are below the adopted criteria at the most-affected NSR during the night-time period.

Drawings

KEY

- Noise Sensitive Receptors
- Noise Monitoring Positions
- Site Boundary

Coordinate System: British National Grid
Projection: Transverse Mercator

Attributions: <attributions go here>

0 0.0075 015 0.03 0.045 0.06 0.075
Kilometres

1:1,391

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Port Dundas BESS Noise Assessment

Drawing 1
Noise Monitoring Positions and Noise Sensitive Receptors

Date:	Lead:	Review:	Version:
24/10/2024	AB	SW	1.0

Project Number: XXXX

Document Path: F:\GIS\Clients\G\Graham & Sibbald\7645 - Port Dundas BESS\Port Dundas Figure 1.mxd

Appendix 1 – Record of Consultation

From: Lavelle, Peter (NRS)
Sent: 10 October 2024 15:18
To: Alasdair Baxter
Cc: Innes, Gordon (NRS)
Subject: RE: Port Dundas Battery Energy Storage Facility - Noise Impact Assessment (OFFICIAL)

OFFICIAL

Good afternoon Alasdair,

I have managed to peruse the proposed Noise Assessment criteria that shall be adopted for the above site and can advise that the proposed scope and methodology outlined is satisfactory to progress the conditions of the application from an Environmental Health perspective. Once the Assessment has been completed and conclusions made then this Service will have sight of the final report to make comment to the Planning Department.

Thank you again for this information .

From: Alasdair Baxter
Sent: Wednesday, October 9, 2024 1:15 PM
To: Lavelle, Peter (NRS)
Subject: Port Dundas Battery Energy Storage Facility - Noise Impact Assessment

Good afternoon Peter,

We are undertaking a noise impact assessment for a proposed Battery Energy Storage Scheme (BESS) on the site currently occupied by the Breedon Glasgow (Port Dundas) Concrete Plant, off Mary Street and Craighall Road in the Port Dundas area and wish to agree with you an appropriate scope and approach to the noise assessment. The site is in a predominantly industrial area but with some newly built apartments to the southeast and northeast of the site.

We have undertaken some research of recently consented BESS developments within Glasgow City Council area in order to tailor our methodology to GCC requirements and note a recent scheme (planning ref 22/00637/FUL | Installation of battery energy storage facility. | 322 Broomloan Road Glasgow G51 2JQ) had a condition attached to the permission stating:

"Noise from or associated with the completed development (the building and fixed plant) shall not give rise to a noise level, assessed with windows closed, within any dwelling or noise sensitive building in excess of that equivalent to Noise Rating Curve 35 between 0700 and 2200, and Noise Rating Curve 25 at all other times."

We propose to adopt this methodology for our assessment as below.

Overall Approach

Our proposed scope includes the following:

- A baseline noise survey was undertaken by ITPEnergised to determine the baseline noise within the area;
- Prediction of operational noise levels from the proposed BESS and associated electrical infrastructure within noise modelling software CadnaA;
- Assessment of operational noise against a proposed fixed limit of NR35 (0700 – 2200) and NR25 at all other times, internally within any nearby receptor, with windows closed;

- Specification of outline mitigation where necessary; and
- Report on findings.

We consider that construction noise impacts may be minimised by appropriate controls on working hours, specification of appropriate plant and methods and implementation of best practices. On this basis and given that the construction schedule is unlikely to be available at this stage, we propose to scope out prediction and evaluation of construction noise. No significant sources of vibration are expected, and we propose to scope out further consideration of vibration during the construction phase.

Baseline Noise Survey

ITPEnergised undertook unattended monitoring at the site (considered conservatively representative of identified receptors) to characterise both daytime and night-time background noise levels. Monitoring was undertaken at 2 locations for approximately 48 hrs

The noise monitoring positions (NMP) and approximate location of the battery site are shown in figure one below.

Figure 1 - Monitoring positions site location

Prediction of Operational Noise

Operational noise from the Proposed Development will be predicted using noise modelling software CadnaA and assessed against the appropriate Noise Rating Curve. Noise impacts will be assessed at nearby noise sensitive receptors (NSRs), representative of upper floor windows of the nearest residential dwellings.

Request for Comment

Please can you confirm if you agree with our proposed scope and methodology?

I hope the above is clear, however if you have any questions or concerns I am more than happy to discuss over the phone

Kind regards

Alasdair Baxter | Associate, Technical Lead, Noise and Vibration | ITPEnergised

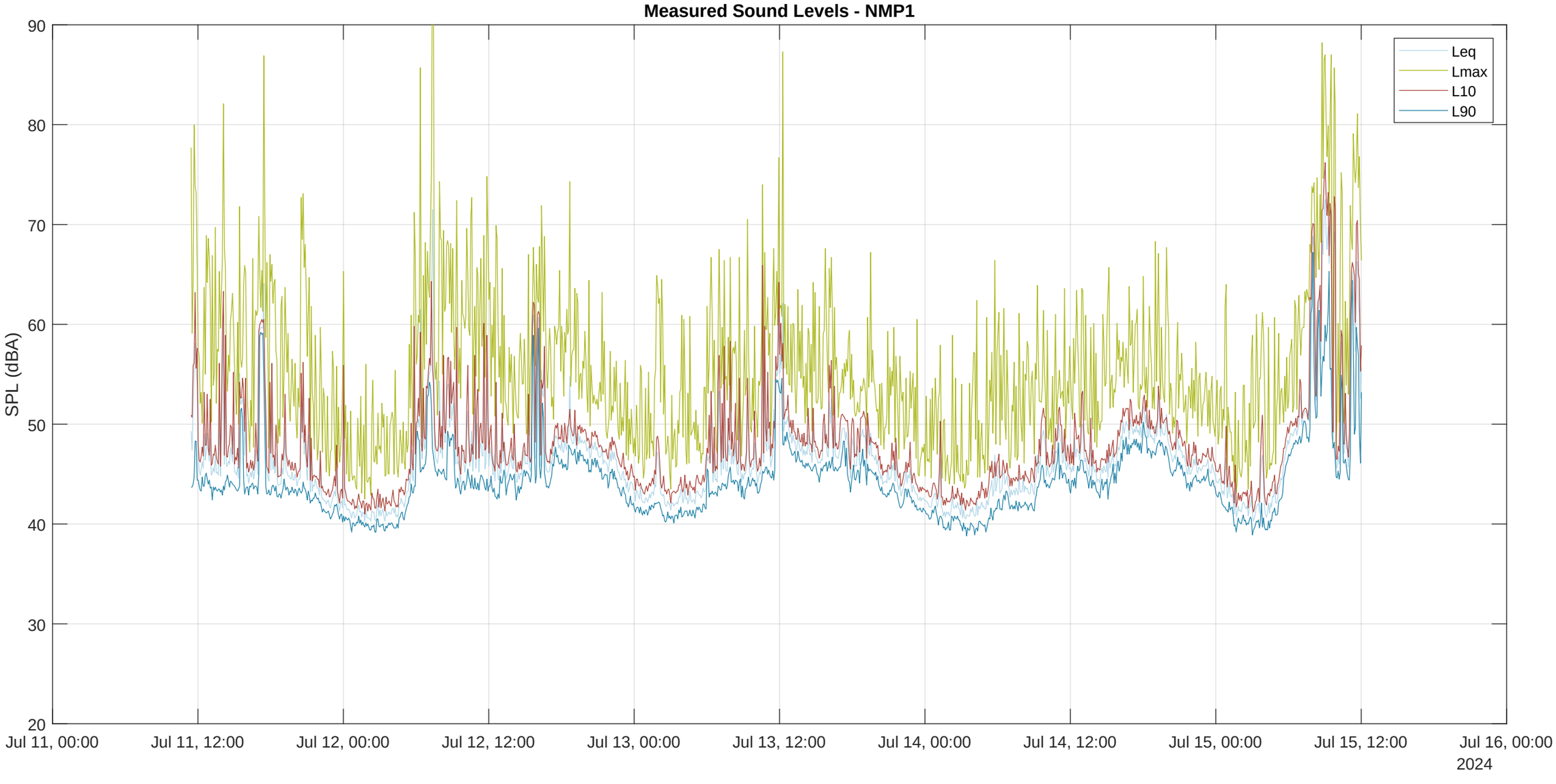
www.itpenergised.com

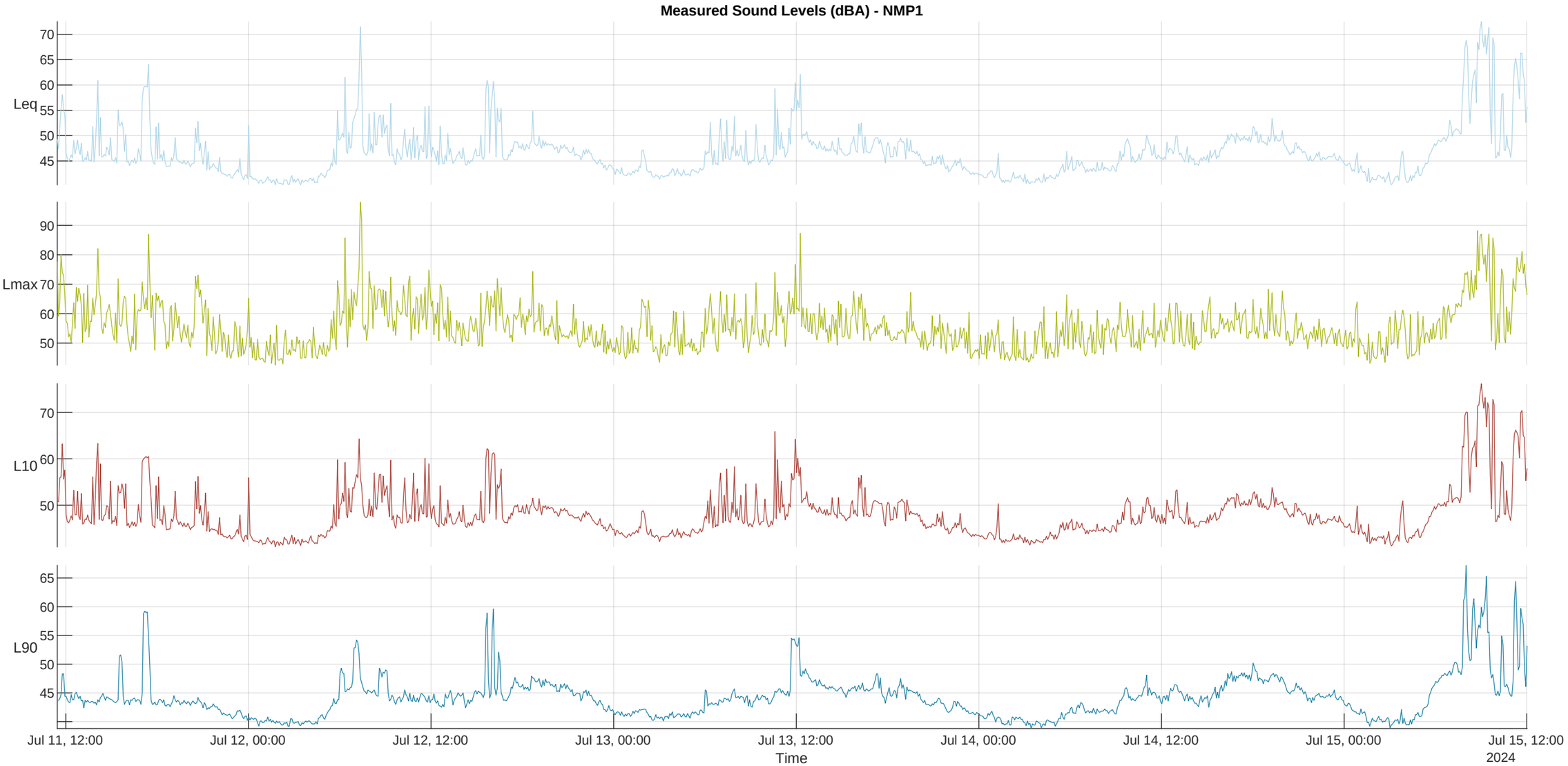
ITPEnergised is part of SLR Consulting Limited and incorporates Energised Environments Limited, ITPE Ltd & Xero Energy Limited.

Appendix 2 – Third Octave Receptor Noise Levels

	Noise Level, Linear, dB																										
Freq. Hz	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
NSR1	38.3	33.7	33.1	33.2	27.2	31.4	52.2	38.9	49.4	51.8	47.1	49	50.3	47.1	46.6	46.3	44.8	44.5	43	42.4	41.1	37	34.6	31.7	27.2	21.9	16.9

Appendix 3 – Baseline Survey


Measured Sound Levels - NMP1
Leq
Lmax
L10
L90
SPL (dBA)
90
80
70
60
50
40
30
20
Jul 11, 00:00
Jul 11, 12:00
Jul 12, 00:00
Jul 12, 12:00
Jul 13, 00:00
Jul 13, 12:00
Jul 14, 00:00
Jul 14, 12:00
Jul 15, 00:00
Jul 15, 12:00
Jul 16, 00:00
2024


Measured Sound Levels (dBA) - NMP1
Leq
70
65
60
55
50
45
Lmax
90
80
70
60
50
L10
70
60
50
L90
65
60
55
50
45
Jul 11, 12:00
Jul 12, 00:00
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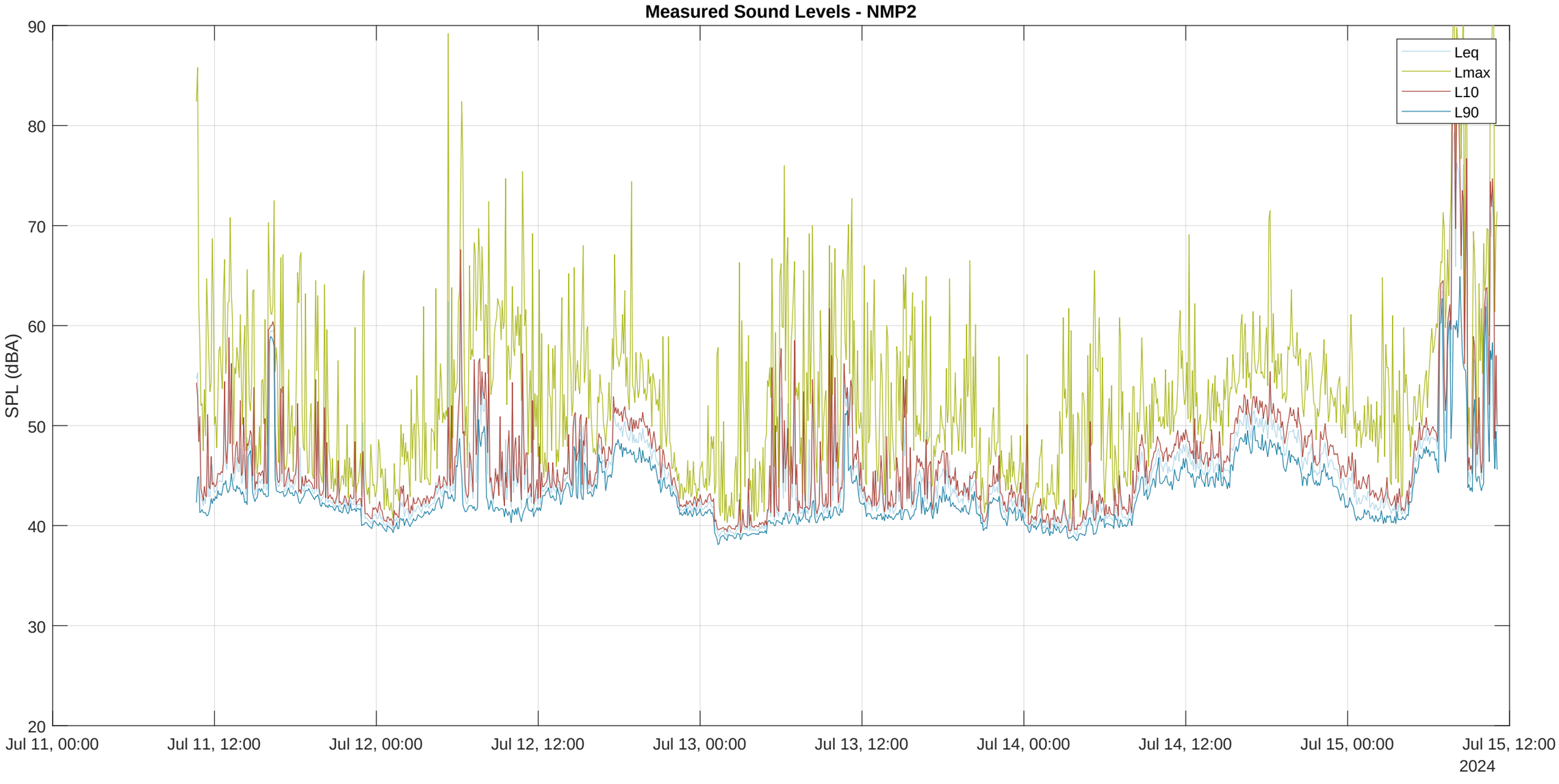
Jul 15, 00:00
Jul 15, 12:00
2024
Time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SPL (dBA)
90
80
70
60
50
40
30
20
Leq
Lmax
L10
L90
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Jul 11, 12:00
Jul 12, 00:00
Jul 12, 12:00
Jul 13, 00:00
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Jul 14, 00:00
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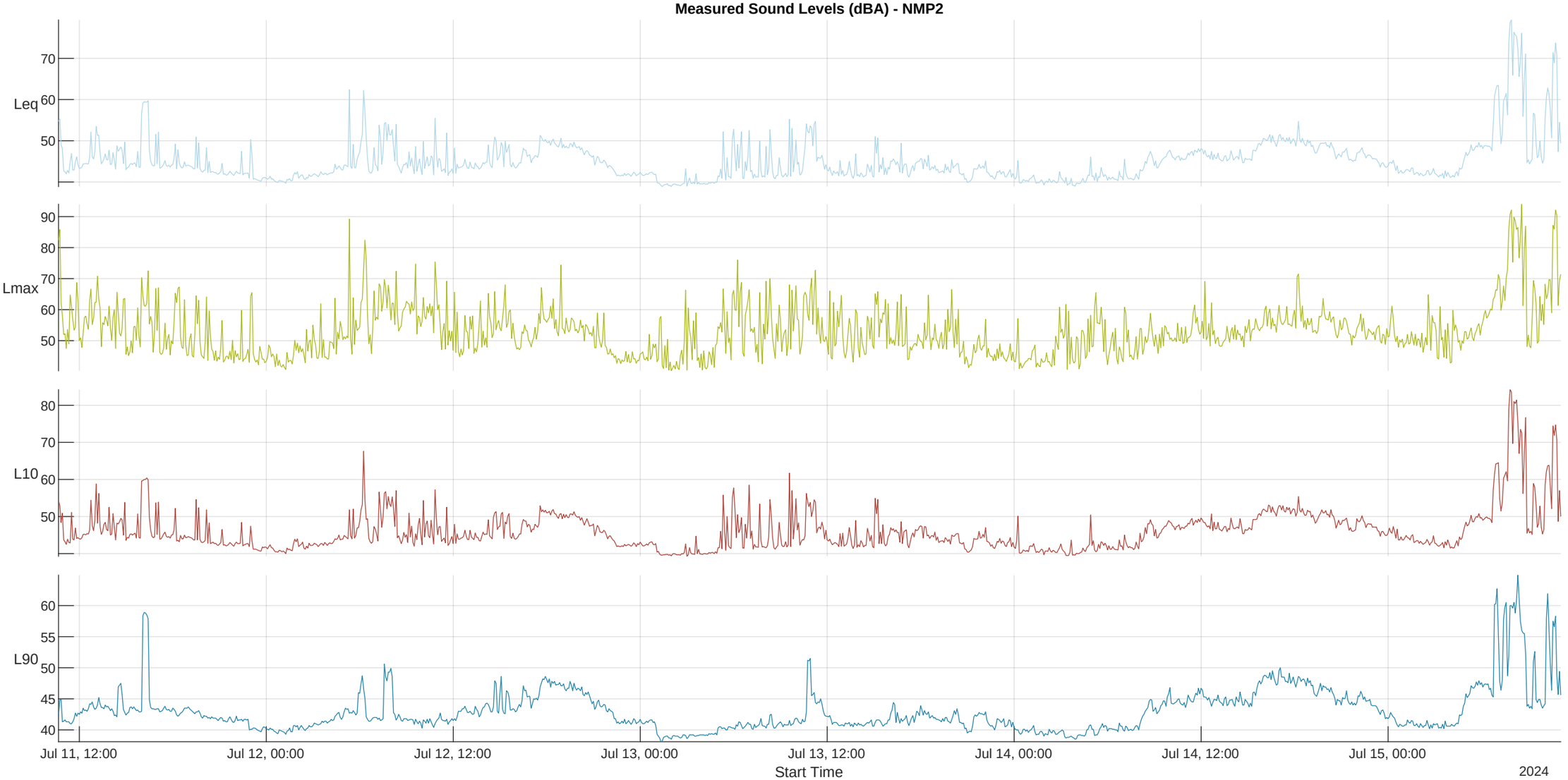
Jul 15, 00:00
Jul 15, 12:00
2024

Measured Sound Levels (dBA) - NMP2



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