Public

Connah's Quay: Environmental Noise Assessment – Autumn/Winter 2023

Uniper, Connah's Quay

March 2024

UTL/23/PSP/EC/3631/R

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Executive Summary

A series of continuous and attended measurement surveys have been completed at residential and site perimeter locations to characterise the environmental noise impact from the Connah's Quay Power Station site. Unattended continuous monitoring took place at on- and off-site locations between 11/08/2023 and 01/09/2023 and an attended monitoring survey was completed overnight 21-22/11/2023.

A series of continuous and attended measurement surveys have been completed at residential and site perimeter locations to characterise the environmental noise impact from the Connah's Quay Power Station site. Due to the prevailing electricity market conditions, unit load operation was commonly limited to day and evening time periods and a unit remained on-load overnight on only three occasions. For the attended survey in the wider community all units were off-load by midnight.

For both surveys, the purge pond cooling tower and main cooling towers continued to operate throughout the period, irrespective of unit load. These towers are the main source of sound from the site affecting residential properties to the north and west of the site. Consequently, the survey circumstances cannot be considered to be a 'worst-case', however this noise assessment quantifies the impact from a very common type of overnight site state.

The dominance of the traffic noise in the area meant that the plant noise was only discernible at the more remote locations when there were lulls in vehicle movements. Although road traffic noise is the dominant noise source affecting the ambient L_{Aeq} and L_{A90} level throughout the period, between midnight and 4am there were sufficiently long lulls in the traffic for the ambient/background sound to subside to a level that is representative of the plant's contribution. The specific noise level from the plant has therefore been estimated from the L_{A90} levels that subjectively appeared to be attributable to the site's operation.

Although sound from the cooling tower plant become discernible off-site overnight and was aurally identifiable in the spectrum, the character was not overly distinctive. Visual inspection did not identify any major tones worthy of detailed prominence analysis hence appropriate rating penalties (2-4dB) have been selected based on subjective perceptions of tonal audibility.

A direct numeric comparison between rating levels and historic background levels indicates an 'adverse' or 'significant adverse' impact from the site at three of the residential locations for periods in the middle of the nights. However, this is considered to be an over-simplification of the situation. In the context of intermittent and significant contributions from traffic noise, it is argued that the plant's impact at the time of the survey was considerably lower than suggested by basic decibel subtraction. It is considered that lesser impacts of "adverse" or even "low" would be more appropriate and furthermore the rating differences are within the ranges of previous assessments corresponding to public complaint-free periods. At all other times of the day (including early night or early morning periods), the specific noise from the plant's operation will be significantly lower than the background L_{A90} so a low or negligible impact is likely.

Recommendation

The presence of aurally distinctive features in the site's emission can have a significant effect on the noise impact at night. It is recommended that the power station management continue to monitor and control the noise from those plant components that could degrade and give rise to tonal signatures at off-site locations (i.e. by undertaking: plant observations; vibration monitoring; removing faulty units from service; routine maintenance; repair and replacement as necessary).

Report Distribution

Black, A	Environmental Advisor, Connah's Quay Power Station
Higgins, A	Production Manager, Connah's Quay Power Station
Plage, J	HSSE Manager, Connah's Quay Power Station
Landers, A	Plant Manager, Connah's Quay Power Station
Rogers, H	Lead Engineer, MNZP Low Carbon New Build & LTE
Hook, J	Project Engineering, Connah's Quay Power Station

Abbreviations & Nomenclature

PPCT	Purge Pond Cooling Tower
GT	Gas Turbine
AGI	Above Ground Installation
GTP	Gas Treatment Plant
CT	Cooling Tower
NSR	Noise Sensitive Receptors
CW	Cooling Water

Also see glossary of acoustic terminology in Appendix A1.

CONTENTS

1 Introduction

At the request of Connah's Quay Power Station, Uniper Technologies have undertaken environmental noise measurements to characterise the ambient sound levels and quantify the noise impact of the plant's operation upon the community.

The surveys were taken in accordance with Clause 3.4.3 of the plant's permit:

> *3.4.3 The operator shall carry out a noise monitoring and assessment exercise from the site (over a calendar year period) at the nearest sensitive receptors during daytime and nighttime hours as per BS 4142:2014 at least every 4 years. A full report together with any recommendations shall be submitted to Natural Resources Wales as soon as reasonably practicable following the report being made available.*

Unattended continuous monitoring took place at on- and off-site locations between 11/08/2023 and 01/09/2023 and an attended monitoring survey was completed overnight 21-22/11/2023.

2 Situation

Details of the residential receptors considered in this survey are given in Table 2-1 and shown in Figure 2-1.

Table 2-1 Residential Monitoring and Assessment Locations

Position	Grid Reference Easting, Northings	Distance to Power Station centre/m (Approx.)
102 Kelsterton Road	327960, 370700	380
Rockcliffe Cottages	327150, 371265	830
Kelsterton Farm	327565, 370800	480
Cae Coch/Woodfield 'Railway' Cottages	327415, 371110	540
Kelsterton Gatehouse[#]	327905, 370720	360

Note: Kelsterton Hostel Gatehouse was stated within the power station's original Operational Noise Programme. However, due to it and other properties on Kelsterton Road being screened by the A548 carriageway, surveys have historically concentrated on quantifying the nearby noise climate with measurements based at 102 Kelsterton Road only.

Supplementary noise monitoring was also undertaken near the The Sheiling/Wenlo properties, however subsequent assessments concentrate on the key residential properties stated in the Operational Noise Programme where historic trend data exist.

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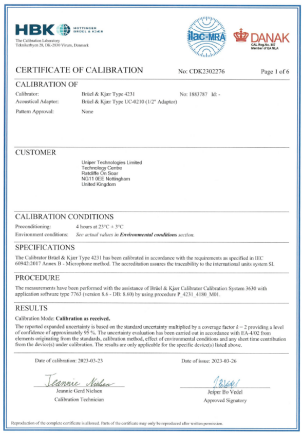
Figure 2-1 Map showing on- and off-site monitoring locations for Connah's Quay Power Station

3 Measurements

Unattended continuous monitoring took place at on- and off-site locations between 11/08/2023 and 01/09/2023 and an attended monitoring survey was completed overnight 21-22/11/2023.

Precision sound level meters were used meeting the requirements of BS EN 60651 and 60804 Type 1 or BS EN 61672 Class 1 [1]. All measurement apparatus used are maintained to a traceable national standard through periodic calibration and certification by an accredited laboratory. Each set of measurements was preceded and followed by a calibration check using the sound level meter's acoustic calibrator [2]. No significant drift in meter response was detected during the exercise. Calibration certificates for the equipment used in the survey are given in Figure 3-1 and summarised in Table 3-1.



HBK

CERTIFICATE OF CALIBRATION

No: CDK2302276

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CALIBRATION OF

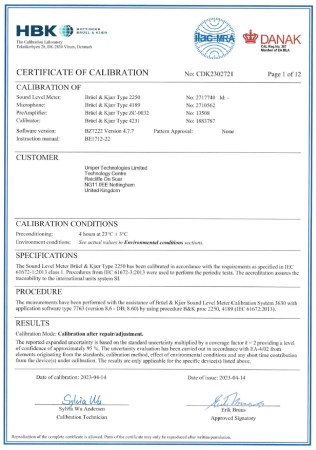
CUSTOMER

CALIBRATION CONDITIONS

SPECIFICATIONS

PROCEDURE

RESULTS



HBK

CERTIFICATE OF CALIBRATION

No: CDK2302721

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CALIBRATION OF

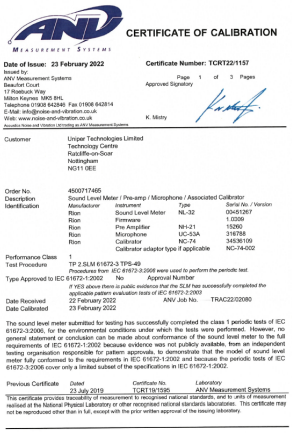
CUSTOMER

CALIBRATION CONDITIONS

SPECIFICATIONS

PROCEDURE

RESULTS



CERTIFICATE OF CALIBRATION

Date of Issue: 23 February 2022

Certificate Number: TCRT22/1157

Page 1 of 3 Pages

Approved Signatory

K. Mistry

Customer

Uniper Technologies Limited
Technology Centre
Ratcliffe-on-Soar
Nottingham
NG11 0EE

Order No. 4500717465

Description / Identification: Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Manufacturer	Instrument Type	Serial No. / Version
Rion	Sound Level Meter NL-32	00451267
Rion	Firmware	1.0200
Rion	Pre Amplifier NH-21	15260
Rion	Microphone UC-53A	316788
Rion	Calibrator NC-74	34536109
	Calibrator adaptor type if applicable	NC-74-002

Performance Class 1

Test Procedure: TP 2:SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic test.

Type Approved to IEC 61672-1:2002: No — Approval Number:

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received: 22 February 2022 — ANV Job No.: TRAC22/02080

Date Calibrated: 23 February 2022

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2002 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002 and because the periodic tests of IEC 61672-3:2006 cover only a limited subset of the specifications in IEC 61672-1:2002.

Previous Certificate	Dated	Certificate No.	Laboratory
	23 July 2019	TCRT19/1595	ANV Measurement Systems

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION

Date of Issue: 27 January 2022

Certificate Number: TCRT22/1069

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer

Uniper Technologies Limited
Technology Centre
Ratcliffe on Soar
Nottingham
NG11 0EE

Order No. 4500706798/D52122

Description / Identification: Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Manufacturer	Instrument Type	Serial No. / Version
Rion	Sound Level Meter NL-52	00122529
Rion	Firmware	2.0
Rion	Pre Amplifier NH-25	10528
Rion	Microphone UC-59	03245
Rion	Calibrator NC-74	34536109
	Calibrator adaptor type if applicable	NC-74-002

Performance Class 1

Test Procedure: TP 2:SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002: YES — Approval Number: 21.21 / 13.02

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

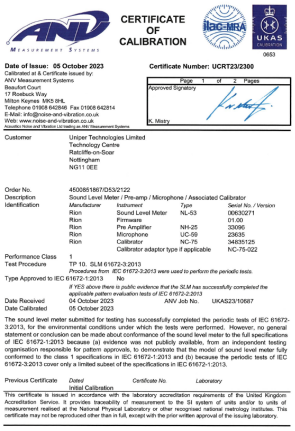
Date Received: 20 January 2022 — ANV Job No.: TRAC22/01030

Date Calibrated: 27 January 2022

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	Dated	Certificate No.	Laboratory
	05 July 2020	TCRT20/1372	ANV Measurement Systems

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.



CERTIFICATE OF CALIBRATION

0653

Date of Issue: 05 October 2023

Certificate Number: UCRT23/2300

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Calibrated at & Certificate issued by:

ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk

Customer

Uniper Technologies Limited
Technology Centre
Ratcliffe-on-Soar
Nottingham
NG11 0EE

Order No. 4500851867/D53/2122

Description / Identification: Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Manufacturer	Instrument Type	Serial No. / Version
Rion	Sound Level Meter NL-53	00632071
Rion	Firmware	01.00
Rion	Pre Amplifier NH-25	33096
Rion	Microphone UC-59	23635
Rion	Calibrator NC-75	34835125
	Calibrator adaptor type if applicable	NC-75-022

Performance Class 1

Test Procedure: TP 10 . SLM 61672-3:2013

Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2013: No

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013

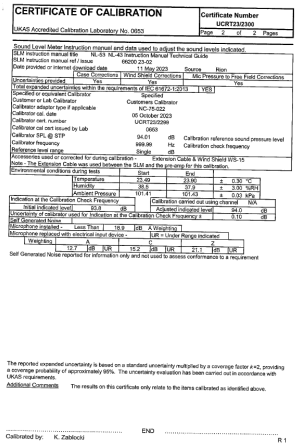
Date Received: 04 October 2023 — ANV Job No.: UKAS23/10687

Date Calibrated: 05 October 2023

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Previous Certificate	Dated	Certificate No.	Laboratory
	Initial Calibration		

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.



CERTIFICATE OF CALIBRATION

Certificate Number UCRT23/2300

UKAS Accredited Calibration Laboratory No. 0653

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Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual ref no.	NL-53 'IE-45 Instruction Manual Technical Guide
PLM instruction manual ref / issue	69200 23-02
Date provided or internal	Original date: 11 May 2023 — Source: Rion

Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections	
Uncertainties provided	Yes		Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013 — YES

Specified or equivalent Calibrator — Specified

Customer or Lab Calibrator — Customers Calibrator

Calibrator adaptor type if applicable — NC-75-022

Calibrator cal. date — 05 October 2023

Calibrator cert. number — UCRT23/2299

Calibrator cal cert issued by Lab — 0659

Calibrator SPL @ STP — 94.01 dB — Calibration reference sound pressure level

Calibrator frequency — 999.99 Hz — Calibration check frequency

Reference level range — Single dB

Accessories used or corrected for during calibration — Extension Cable & WS2 Shield WS-15

Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.

Environmental conditions during tests

	Start	End	
Temperature	20.90	20.90	± 0.30 °C
Humidity	58.9	58.9	± 3.00 %RH
Ambient Pressure	101.41	101.49	± 0.03 kPa

Indication at the Calibration Check Frequency — Calibration carried out using channel N/A

Nominal Indicated level	93.8 dB	Adjusted Indicated level	94.0 dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±			0.10 dB

Self Generated Noise

Microphone installed — Less Than 1 — 19.9 — (dB) A Weighting

Microphone replaced with electrical input device - — (dB) = Under Range indicated

Weighting	A	C	Z
	12.7 dB (UR)	15.2 dB (UR)	21.1 dB (UR)

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k*=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Additional Comments: The results on this certificate only relate to the items calibrated as identified above.

END

Calibrated by: K. Zablocki

R 1

Figure 3-1 Calibration Certificates for Equipment used in surveys.

Table 3-1 Details of Equipment used in continuous and attended surveys.

Equipment	Serial Number	Calibration Date
Bruel & Kjaer 4231 Acoustic Calibrator	1883787	23/03/2023
Bruel & Kjaer 2250 Sound Level Meter	2717740	14/04/2023
RION NL32 Sound Level Meter	00451267	23/2/2022
RION NL52 Sound Level Meter	00120529	27/01/2022
RION NL53 Sound Level Meter	00630271	05/10/2023
RION NC75 Acoustic Calibrator	34835125	05/10/2023
Larson Davis 820 Sound Level Meter	Indication purposes only. Deployed at Kelsterton Farm	

3.1 General Operational Conditions

Theoretically, the highest steady noise levels will be generated when all four generating units are at full load. Due to the prevailing electricity demand and market, those circumstances are an infrequent occurrence, and it is more usual for the units to be off-load from late evening through to early morning.

However, for operational and plant integrity reasons, some of the main cooling tower pumps (circulating water causing broadband waterfall noise from the wet stages of the towers) and main cooling tower fans (broadband airflow and tonal motor/gearbox noise) remain operational after units cease generation.

3.2 Continuous Monitoring – August 2023

The Access Road and Near Railway positions have previously been chosen for on-site monitoring that is close to the residential receptors – with broadly similar specific level contributions from the plant but reduced contributions from residual traffic sources.

The continuous unattended sound level meters were configured to measure overall L_{Aeq}, L_{A10} and L_{A90} levels over 15-minute intervals. Photographs of the three continuous monitoring locations are shown in Figure 3-2 below.

Access Road

Near Railway

Kelsterton Farm

Figure 3-2 Photographs of locations used in August 2023 continous noise monitoring exercise

General wind speed and direction and precipitation information have been sourced from nearby Harwarden observation station https://skylinkweather.com/metar/metar-show-data.php?stationid=EGNR. See time-series of windspeed, precipitation state and wind sectors in Figure 3-3 and Figure 3-4. This data has been used to exclude atypical sound level data collected during wet and/or windy conditions. (Winds above 6m/s at 10m height (≈ 5m/s at microphone height) are assumed to be too high for reliable sound monitoring, see horizontal lines in figure).

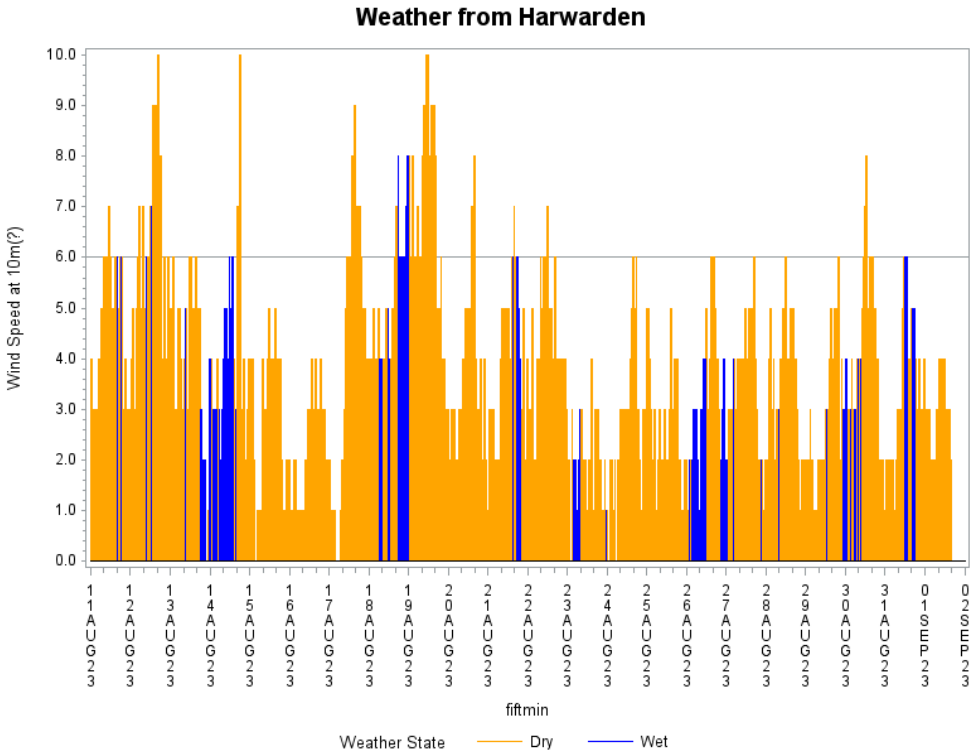


Figure 3-3 Harwarden wind speed (m/s)- colour coded for general weather state.

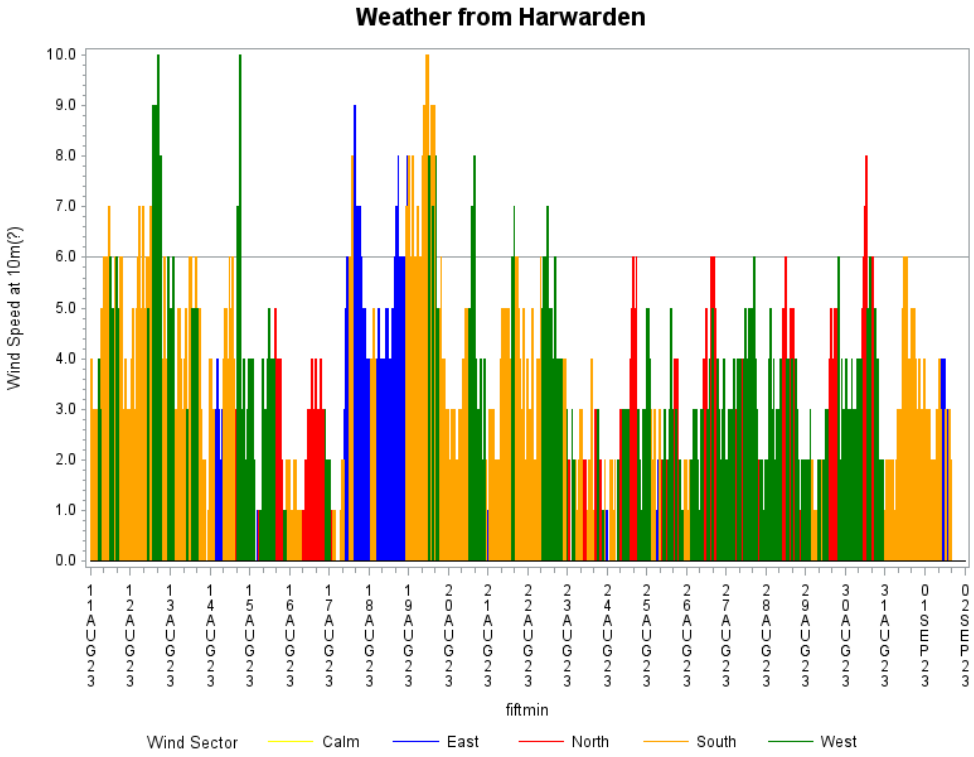


Figure 3-4 Harwarden wind speed (m/s) colour coded for general wind quadrant.

A wide range of plant operational states arose during the continuous monitoring on August 2023, with generation mainly arising during daytime periods. Plant were typically shutdown by late evening, however there were a limited number of periods (23, 24 & 25 Aug) when a single unit, U3, remained on-load overnight. The general pattern of unit operations is shown in Figure 3-5.

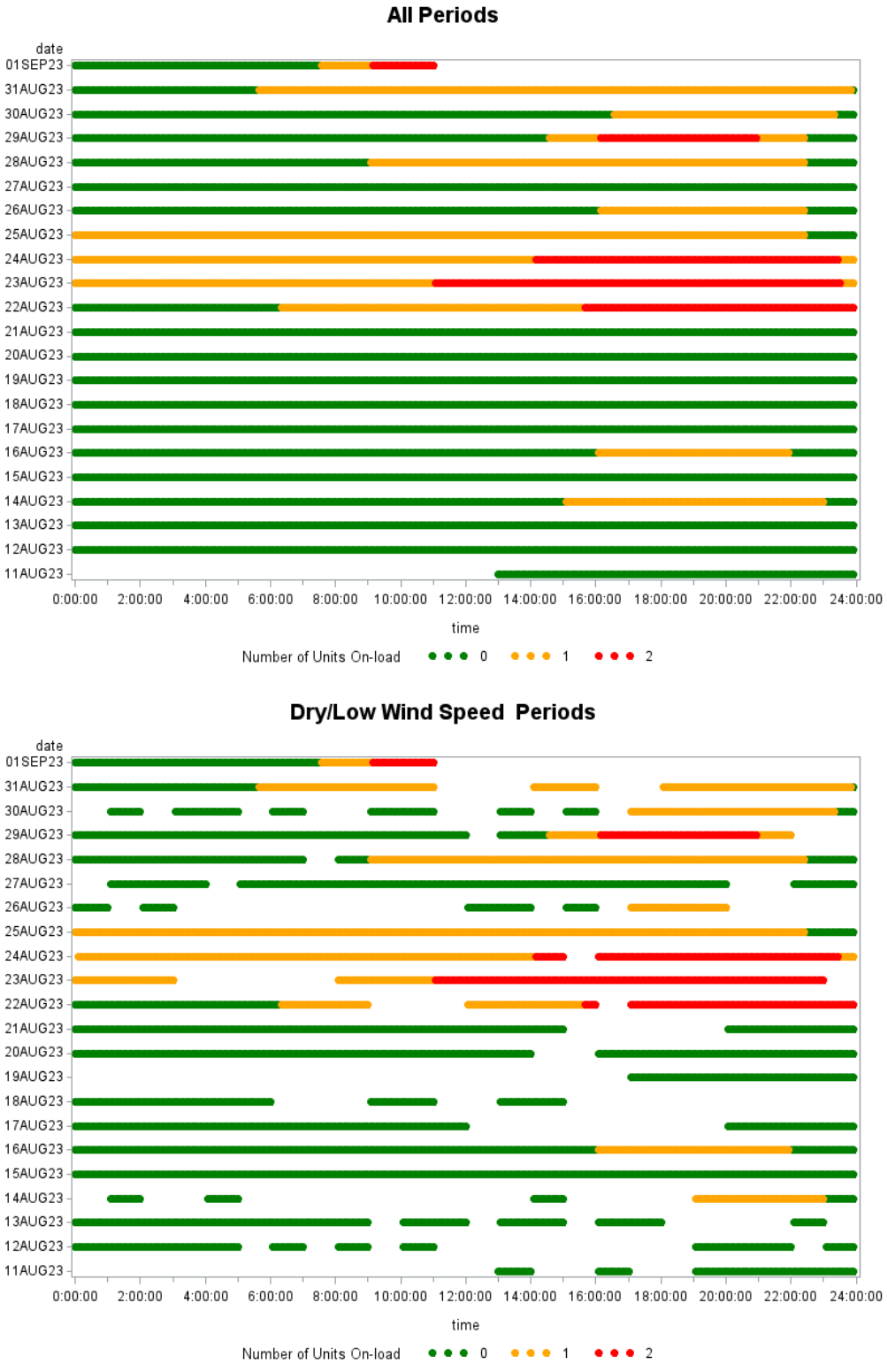


Figure 3-5 Pattern of unit operation during continuous monitoring period.

3.3 Attended Survey – 21-22 November 2023

The attended survey was specifically timetabled to coincide with a period of low wind speed/dry weather when multiple units were expected to remain on-load into the late evening. The pattern of unit operations during the attended monitoring survey is shown in Figure 3-6.

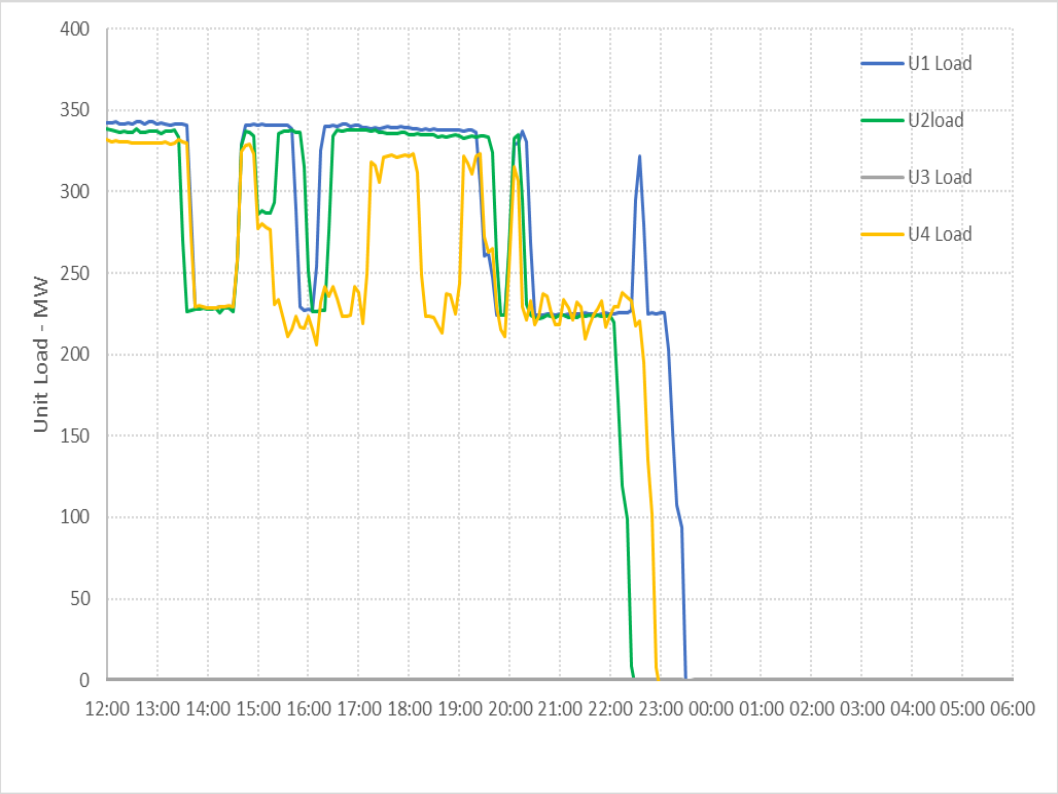


Figure 3-6 Unit operational pattern during attended survey period 21-22/11/2023

Although the generation only extended into the nighttime period for a short amount of time, the continued operation of the cooling towers means that, once the background and residual ambient noise levels from traffic are diminished, it is feasible to quantify the impact of that type of operation. Whilst these measurements cannot be considered to be representative of the maximum noisiest possible plant state, they are broadly typical of a much more common pattern of operation that occurs after units have been on-load in the preceding afternoon/evening period.

The meter used for the attended off-site survey in November was configured to measure 1/3rd octave band L_{Aeq}, L_{A10}, L_{A90} and L_{A99} levels and $L_{Aeq,1s}$. Narrow band Fast Fourier Transform (FFT) measurements were also made to support the subjective noise signature observations. The survey consisted of performing 5- to 10-minute duration samples at each of the residential receptor locations during the evening and night periods. No measurements were made during the day period of 22/11/2023 as all units remained off-load, plus the day-time residual and background noise levels are considerably higher than evening and nighttime periods.

Note: strictly speaking BS 4142 requires that day and evening measurements be an hour duration and 15 minutes duration at night, but to allow measurements to be undertaken at several receptors in turn, shorter duration measurements were taken. As the noise emission from the power station is typically steady, as

indicated by the August 2023 continuous monitoring results, these shorter sampling measurements are still considered to be representative of the noise climate.

4 Results

4.1 Continuous Monitoring – August 2023

Time series graphs of the L_{A90} and $L_{Aeq,15min}$ levels measured at the three locations are shown in Figure 4-1 below.

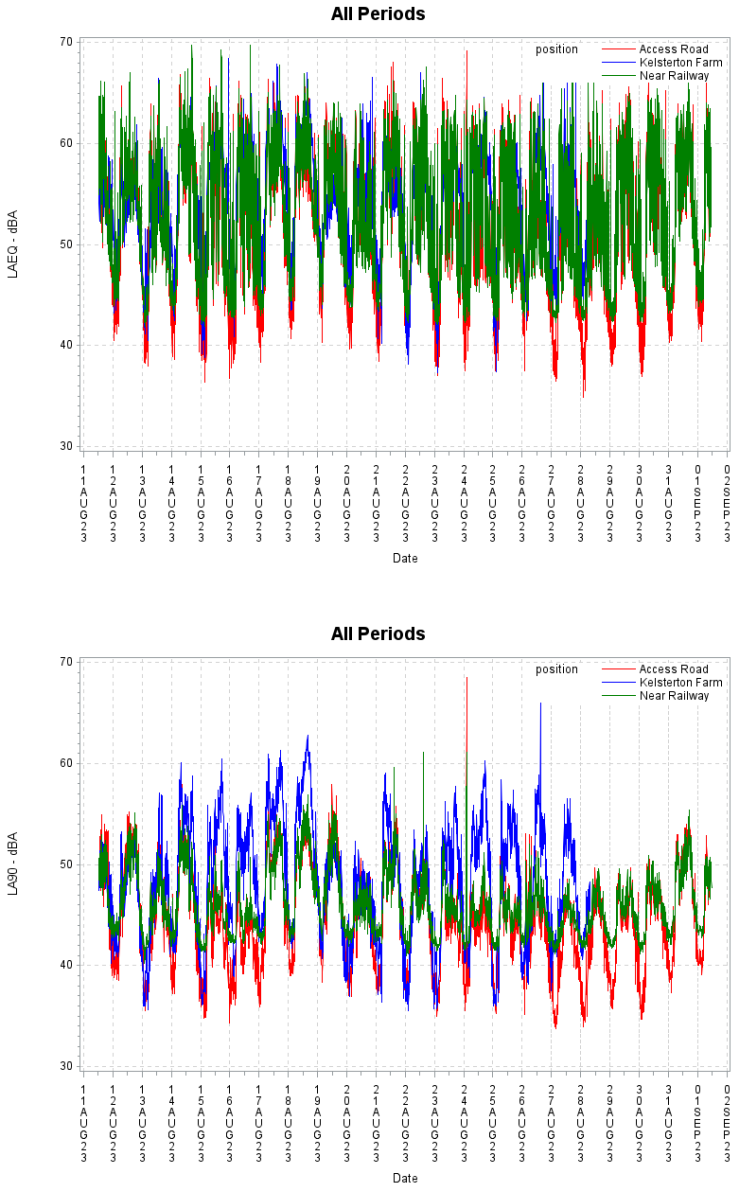


Figure 4-1 Time-series of L_{Aeq} and L_{A90} at Access Road, Near Railway and Kelsterton Farm locations

4.1.1 Atypical Noise Emissions

A preliminary inspection of the continuous monitoring results identified unusually high noise levels occurring simultaneously across all three locations on the 24 August 2023 between 02:08 to 02:50, see Figure 4-2.

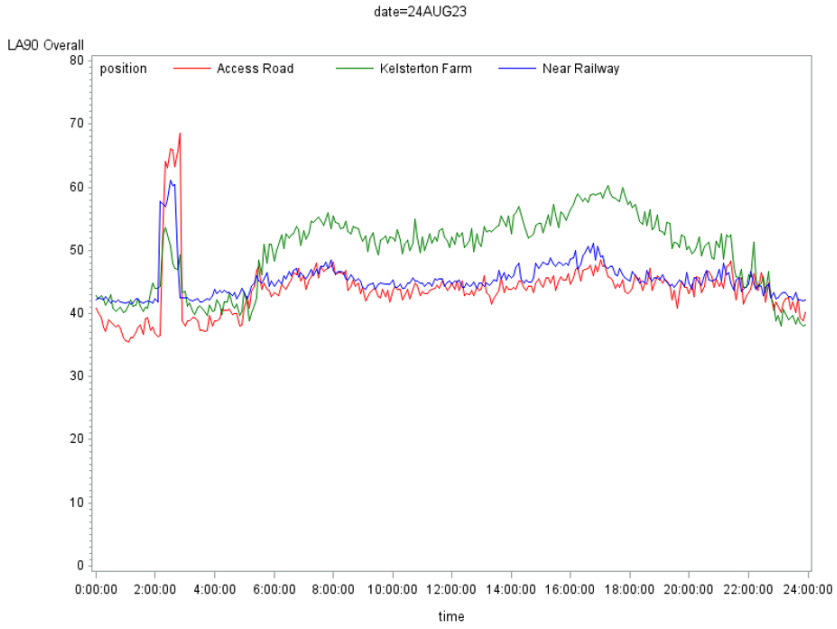


Figure 4-2 Short-term high L_{A90} dB noise levels 24 August 2024

Digital recordings taken at the access road suggested that the high noise levels were associated with a prominent alarm/siren-type sound. A review of station operational logs has subsequently indicated that it was associated with false triggering of the emergency alarm system across the site. At the time, this level of noise is likely to have had a significant adverse impact in the nearby community, however it was an isolated occurrence. No further alarms were detected by the meters during the period of the continuous monitoring and the specific contribution from the plant operation appears to have been otherwise relatively steady in level. The data collected during the sounding of the site alarm has been excluded from any subsequent results and assessment.

4.1.2 Steady/Normal Noise Emission

Diurnal variations in L_{Aeq} and L_{A90} levels at the three monitoring locations are shown in Figure 4-3, colour coded for whether the plant was on- or off-load.

It should be noted that the purge pond cooling tower (PPCT) and main unit cooling tower (CT) fans remained operational following each shutdown to provide further cooling to the circulating and purge cooling water. Consequently, there were no periods when the plant can be considered to be completely shutdown – so it is not appropriate to treat the off-load results as background/residual sound levels. Instead, the L_{Aeq} and L_{A90} levels should be viewed as indication of the ambient sound (cooling towers and residual sound (traffic etc) contributions) circumstances that would commonly arise.

For the continuous monitoring results, the diurnal variation of the L_{Aeq} and L_{A90} levels registered at the three locations are shown in Figure 4-1, colour coded by load operation state.

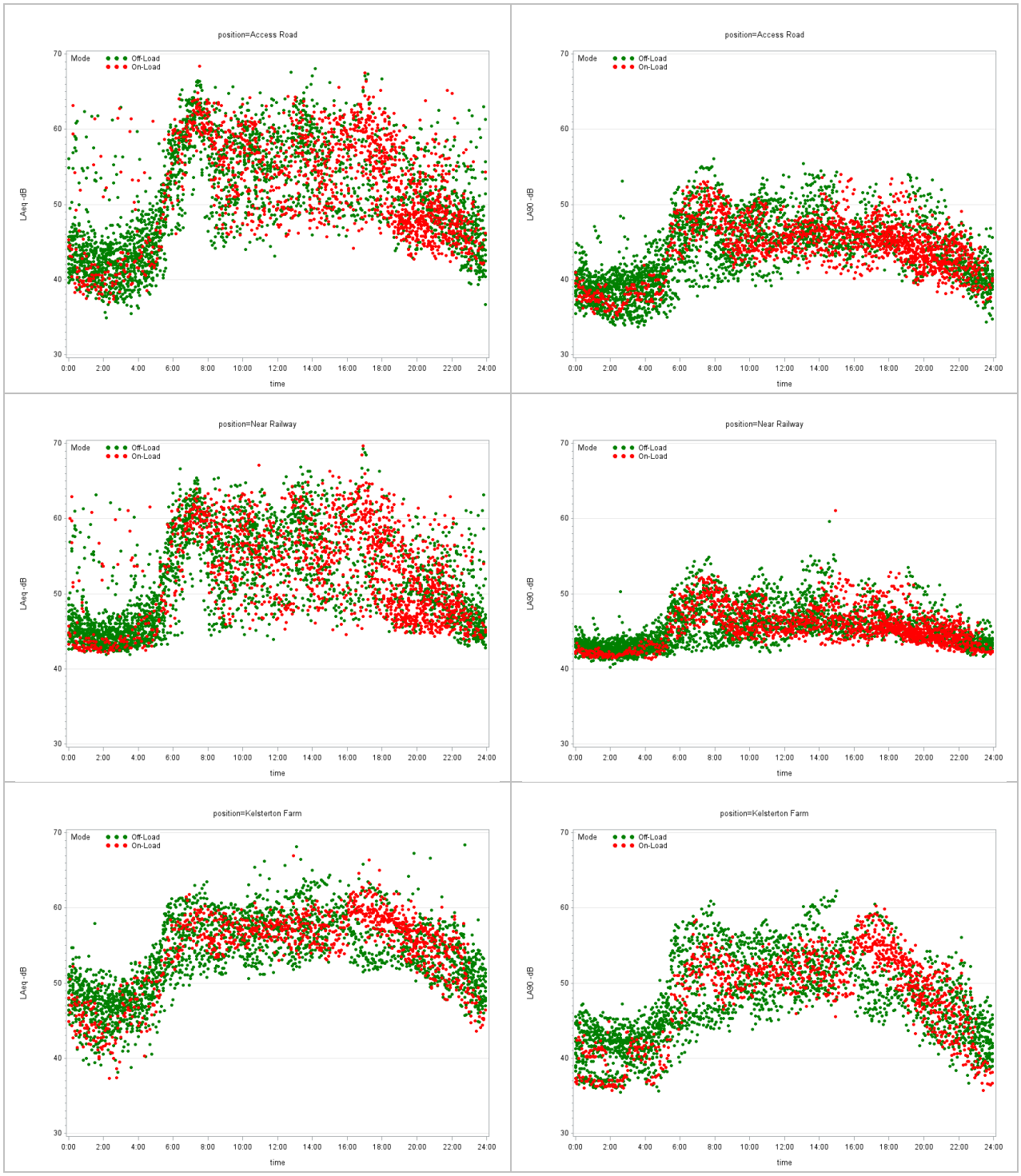


Figure 4-3 Diurnal variation in $L_{Aeq,5min}$ (Left) and $L_{A90,5min}$ (Right) for Access Road, Near Railway and Kelsterton Farm continuous monitoring locations.

Observations:

- At all three locations the L_{Aeq} and L_{A90} sound levels with the plant on-load are largely indistinguishable from those levels that arose when the plant was off-load, indicating that the noise level contribution from non-cooling tower plant items is relatively minor.

- The diurnal trends clearly show that the ambient sound level during day and evening periods is significantly higher than during nighttime period, with the lowest levels typically occurring between 00:00 and 04:00.
- Due to its proximity to the cooling tower plant and the meter being partially screened from traffic noise contributions, the Near Railway diurnal pattern in L_{A90} is considerably less variable than other locations. Between 00:00 and 04:00 the levels are consistently between 41 and 44 dB L_{A90} and appear largely insensitive to the operational status of the plant –indicating that the nearby cooling towers are the most dominant steady site contributor to the environmental noise level at this location.

A summary of the continuous monitoring results is shown in below, categorised by time of day and basic operational state of the site.

Table 4-1 Summary of mean L_{Aeq} dB and L_{A90} dB Continuous Monitoring Results

		Day				**Deep Night**				Evening				Night			
		07:00 - 19:00				00:00 - 04:00				19:00 - 23:00				23:00 - 00:00 & 04:00 - 07:00			
		Mean		Std		**Mean**		Std		Mean		Std		Mean		Std	
		L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Access Road	Off-load	56	46.5	5.2	3.2	42.4	**38.5**	3.8	2.4	49.8	43.9	4.2	3.4	47.9	41.5	6.5	3.9
	On-load	55.8	46.3	4.8	2.5	42.7	**37.4**	6.2	1.3	49	43.3	4	2.3	49.2	42.4	7.1	4.4
Kelsterton Farm	Off-load	57.2	51.7	3.1	3.9	46.5	**41.3**	2.8	2.5	53.8	46.5	3.2	3.5	51.1	44.6	4.3	4.9
	On-load	57.7	52.6	2.1	2.6	44.6	**39.3**	3.1	2.4	54.7	47.3	2.9	3.7	49.9	42.9	5	5.6
Near Railway	Off-load	56.1	47.1	5.2	2.5	45	**42.7**	2.8	1	50.3	45	3.8	2.1	49.3	44.3	5.6	2.3
	On-load	56.1	46.8	4.9	2.1	45.2	**42.1**	4.8	0.4	49.6	44.6	3.9	1.3	50.3	44.7	6.3	2.8

Since the noise emission from the power station is predominantly steady and measurements include significant contributions from traffic noise, the measured L_{Aeq} is not considered to be a robust indicator of the power station's contribution, even at on-site locations. The L_{A90} levels arguably provide a more reliable indication of the plant's contribution to the ambient sound level at these locations.

For the continuous monitoring at the Access Road position, the meter was capable of measuring 1/3rd octave band L_{Aeq} and L_{Axx} percentile statistics. The L_{Aeq} and L_{A90} spectra for the "Deep-Night" 00:00 to 04:00 period are shown in Figure 4-4 (the boxes indicate the interquartile 25-75% range and the lines join the median 50% levels).

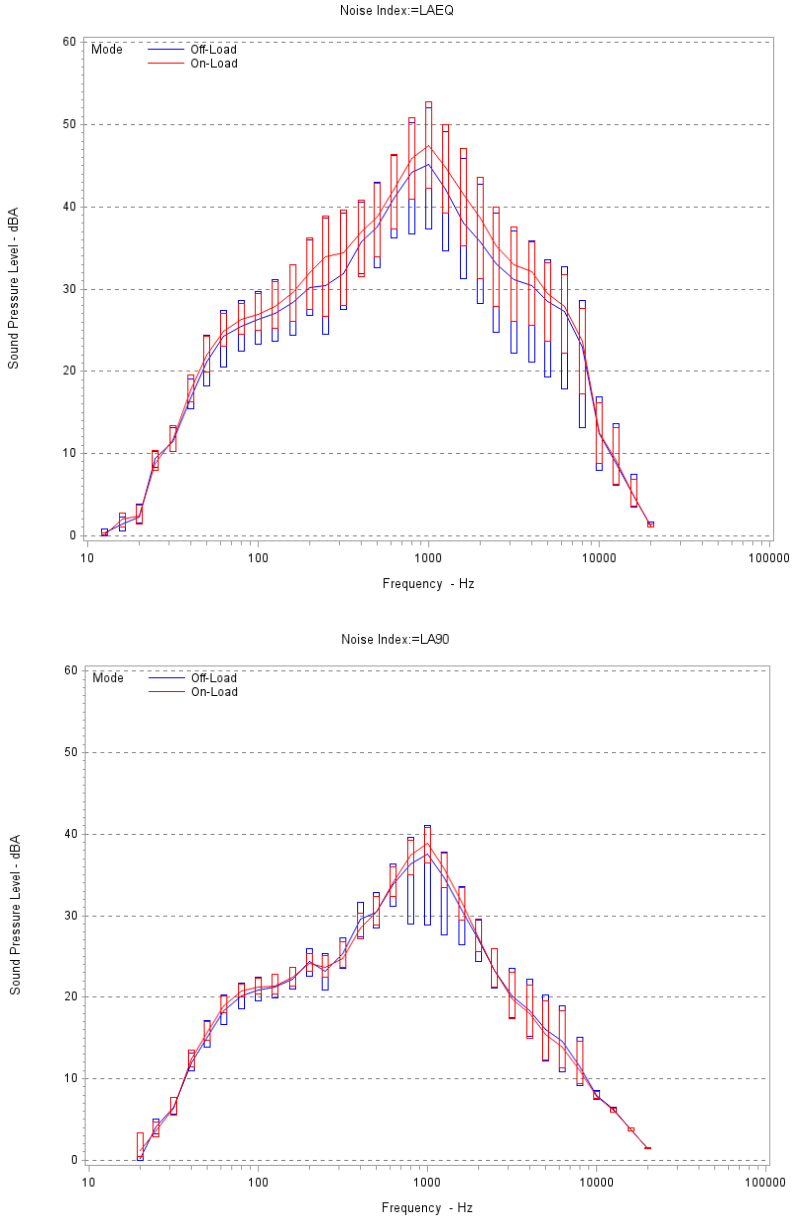


Figure 4-4 One-third octave band spectra (L_{Aeq} and L_{A90}) measured during 00:00-04:00 period at the Access Road position.

The key feature of these graphs is the absence of any prominent spectral peaks in the various on-load/off-load & L_{Aeq}/L_{A90} the 1/3rd octave band levels. This is a positive indication that the spectra at nearby residential properties (Rockcliffe Cottages & The Sheiling/Wenlo) would have a site contribution that was absent of prominent tonal features. The audibility of the site's specific noise level in the context of the diurnal ambient sound level at residential receptors is considered during the attended monitoring, see Section 4.2.

4.2 Attended Survey – 21-22 November 2023

The overall L_{A01}, L_{A10}, L_{A50}, L_{A90}, L_{A99} and L_{Aeq} levels measured during the survey on 21-22 November 2023 are shown in Table 4-2. Further comments on the general character and evolution of the noise climate at each NSR are given in

Table 4-3.

Table 4-2 Summary of attended survey results 21-22/11/2023.

		Sound Pressure Level dB					
Position	Time	L_{Aeq}	L_{A01}	L_{A10}	L_{A50}	L_{A90}	L_{A99}
102 Kelsterton Road	18:28	60.8	67.5	63.3	59.6	56.2	53.5
	21:20	55.1	63.5	59.2	51.4	46.9	43.8
	00:20	47.4	61.0	49.2	36.4	33.6	32.8
	01:16	43.1	55.3	44	34.6	**33.1**	32.4
Kelsterton Farm	16:13	58.8	63.5	60.8	58.1	55.7	53.9
	18:56	55.6	61.7	58.7	54.8	48.7	44.9
	19:48	54.6	61.0	58.1	53.1	48.6	46.0
	21:32	52.6	60.3	55.8	50.4	45.5	44.2
	22:33	50.7	58.2	54.6	48.2	40.4	38.8
	00:08	46.4	55.8	50.5	40.8	38.5	37.7
	01:04	43.1	55.2	44.4	38.3	**37.0**	36.4
Rockcliffe Cottages	16:38	60.6	70.9	62.3	57.9	54.3	49.9
	19:11	56.1	61.0	58.2	55.6	52.6	50.8
	20:59	53.0	59.4	56.1	51.8	46.7	43.6
	21:58	53.1	58.5	55.8	52.0	45.8	42.3
	23:38	47.3	57.9	52.8	38.5	35.4	34.3
	00:33	45.1	53.8	50.1	39.0	**35.4**	34.5
The Sheiling/ Wenlo	17:02	57.5	68.2	57.8	55.0	53.3	51.8
	19:19	51.2	55.9	53.9	50.9	46.7	43.5
	22:07	55.6	64.8	54.6	51.4	46.3	43.5
	23:45	46.8	52.7	49.9	45.5	40.4	39.1
	00:42	39.7	47.0	41.4	38.4	**37.5**	36.9
Cae Coch/ Woodfield Railway Cottages	18:08	60.2	66.3	63.1	58.9	54.5	51.8
	19:29	58.1	64.4	61.8	56.4	50.5	48.4
	21:10	55.0	64.0	58.9	52.2	46.6	45.4
	22:19	57.3	65.8	61.0	55.0	47.7	45.9
	23:57	49.0	60.2	50.5	44.2	42.9	42.1
	00:53	48.6	59.2	50.8	44.0	**42.8**	41.9
Meteorological Conditions	Cool and damp. Very light winds throughout, Variable direction locally – but plumes suggest wind from SW quadrant.						
Plant Conditions	U1, U2 and U4 were at various loads until around 22:00, then started to shutdown. U1 the last unit to come off-load around 23:30.						

Notes:	Values identified in bold/underline are deemed to be the best indicator of the steady continuous noise contribution from the site (albeit only becoming distinguishable when traffic has subsided, and the units are off-load)

The values highlighted in bold are considered to represent the best estimate of the specific noise level from the plant at various receptors. Where no value is highlighted, it is considered that none of the level metrics were representative of the specific noise level component from the plant.

Table 4-3 Subjective Descriptions of Ambient Sound at NSRs

Survey Observations Positions
All Positions Noise from vehicles on the local and regional roads affected the noise climate at all off-site monitoring locations. Intermittent train movements also occasionally contributed to the climate at Rockcliffe/The Sheiling/ Wenlo and Cae Coch/Woodfield 'Railway' Cottage locations. Although measurements were typically paused to exclude noise from Power Station site traffic using Kelsterton Road, it was not possible to pause the measurement to exclude the noise contribution from all traffic movements on the nearby A and B roads, therefore the L_{Aeq} level is not considered to be reliable measure of the power station's specific noise contribution. Instead, the L_{A90} and L_{A99} levels during longer lulls in traffic could represent a more reliable basis for estimating the steady continuous power stations contribution. (See later $L_{Aeq,1sec}$ timeseries in Figure 4-6 and Figure 4-7) Wind was light and from a SW quadrant throughout the survey – which quite a common wind direction for the area.
Rockcliffe **Evening:** Mainly traffic noise, plant discernible during lulls in traffic but only very minor contribution **Night:** Traffic affecting $L_{Aeq.}$ Steady contribution from Power Station (PS) and Oakenholt industry discernible during lulls in traffic. G*eneral broadband industrial noise including a minor drone from Cooling Tower (CT) area.*
Sheiling/Wenlo **Evening:** Mainly traffic noise, but minor steady broadband contribution from PS plant discernible during lulls in traffic. **Night:** Traffic remains the main L_{Aeq} source throughout. Steady contribution from PS discernible - general broadband industrial noise including a minor drone from general CT area. Oakenholt industry mill also discernible at time – but more minor then PS. Subjectively, later L_{A90} levels are considered to be a good indicator of PS steady contribution.
Woodfield Railway Cottage **Evening:** Mainly traffic noise from A road, during infrequent lulls in traffic steady contribution from PS (CT, PPCT and Above Ground Installation (AGI)) **Night:** PPCT and CT and are main steady noise source but traffic still main L_{Aeq} contributor. *[Power station signature –high frequency from AGI and general broadband/ slight drone industrial signature from PPCT/CT]*
Kelsterton Farm **Evening:** Traffic noise is very dominant L_{Aeq} and L_{A90} source. PS discernible only during lulls in traffic – general broadband character. **Night:** Traffic noise still dominant L_{Aeq} source. General plant noise discernible in between traffic. *[Power*

station noise character is predominantly broadband with some minor drone from CT and low frequency roar. Potential minor contribution from Auxiliary boilers and minor steam venting]

102 Kelsterton Road

Evening: Traffic noise dominates L_{Aeq} and L_{A90}, PS noise indiscernible due to no lulls in residual sound.

Night: Traffic noise still dominates L_{Aeq}. Only during last sample is a general industrial noise apparent from PS direction – broadband and indistinct in character

Plant Commentary

It is appropriate to analyse the results from monitoring based on the following operational states – one or more units on load, all units shutdown but cooling tower plant remaining in service

The time series of L_{A90} residential location spot measurements and Near Railway continuous monitoring L_{Aeq} and L_{A90} levels are shown in Figure 4-5. The sound level trend seen across all the positions suggests that the last set of attended off-site surveys are likely to have coincided with the period of lowest ambient level.

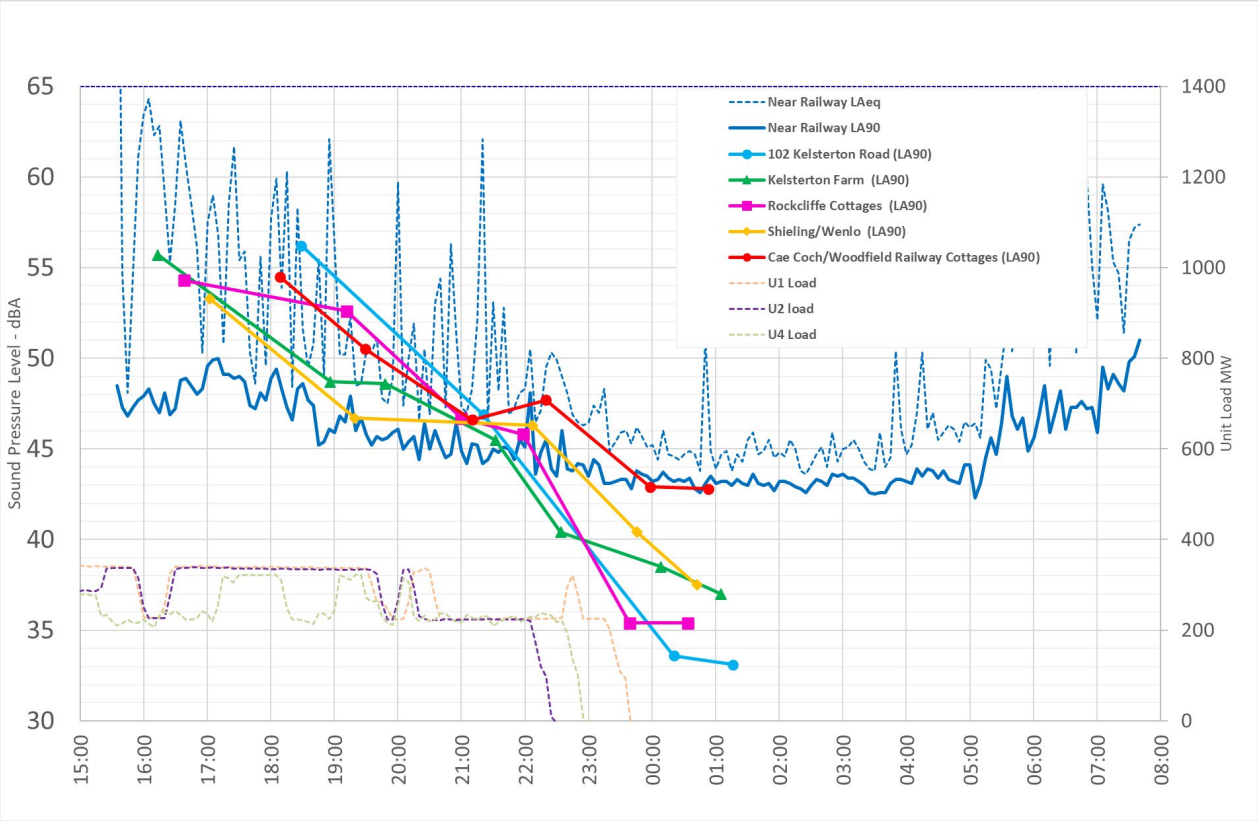
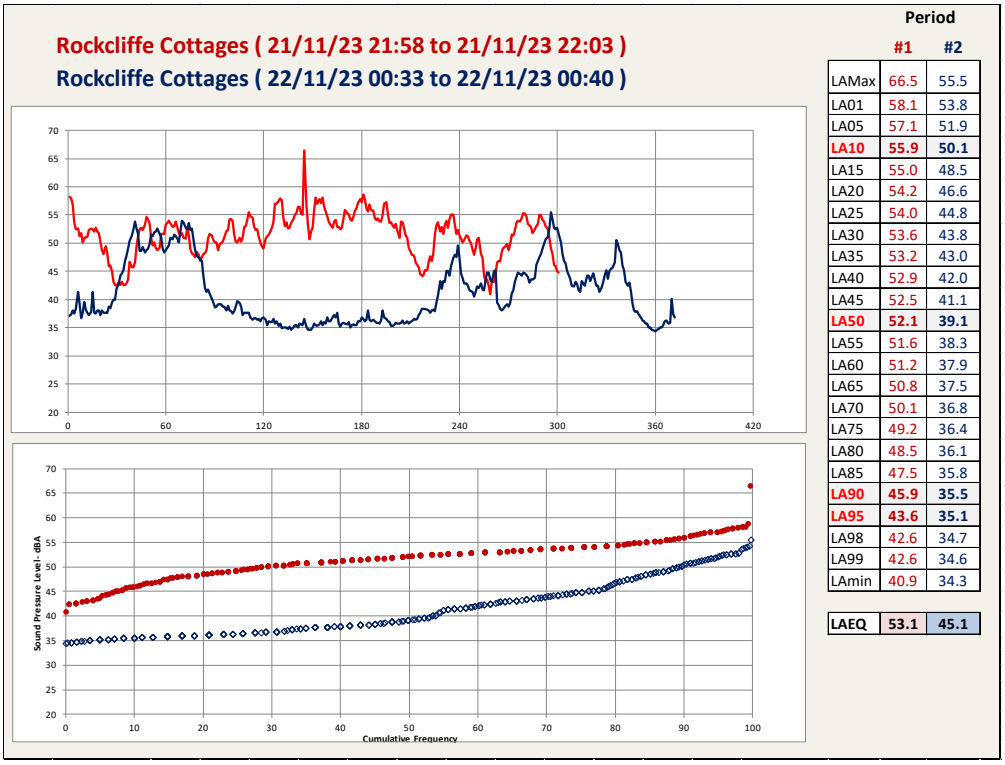
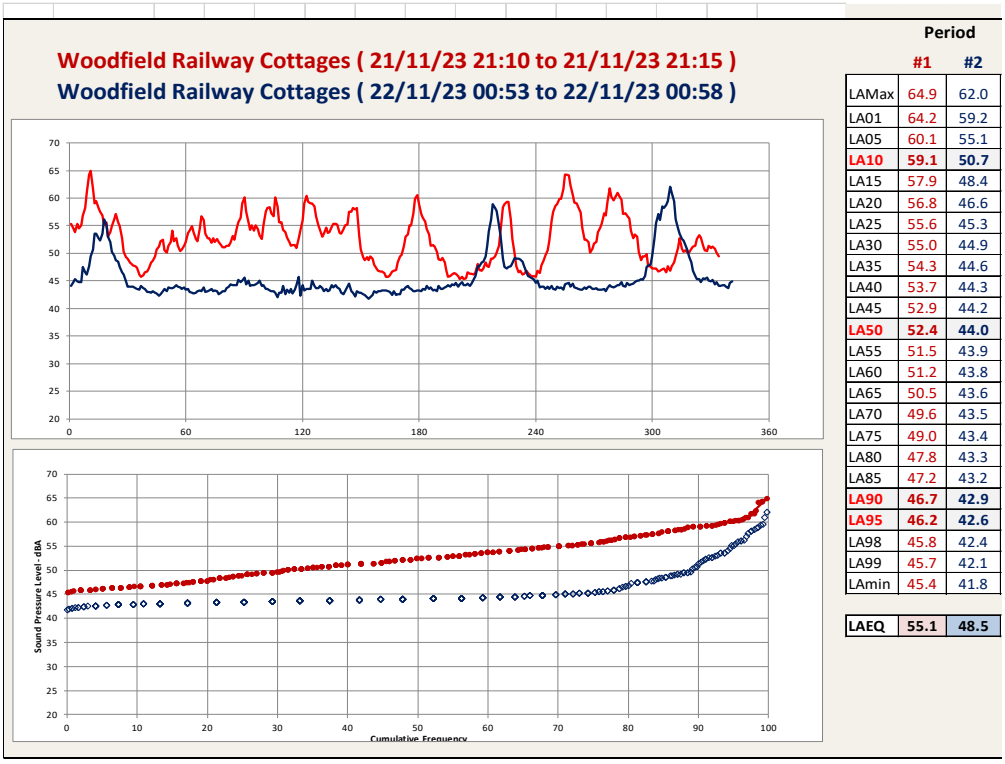


Figure 4-5 Time series L_{Aeq} and L_{A90} on-site monitoring Near Railway and L_{A90} level from off-site attended spot measurements

The on- and off-site L_{A90} levels do reduce following the units coming off-load, however this decrease is not directly attributable to the change in plant status. Instead, the reductions are primarily attributable to traffic noise contribution decreasing considerably around the same time, which can be seen in the level timeseries from the attended measurements. $L_{Aeq,1s}$ levels for selected periods at each residential receptor location are plotted in Figure 4-6 and Figure 4-7. These graphs also show the cumulative frequency distribution and percentile values of the noise levels that occurred within selected measurement period (typically 5min (300s) in duration). The difference apparent between the evening and late night-time results clearly show the dominance of traffic noise in the community.

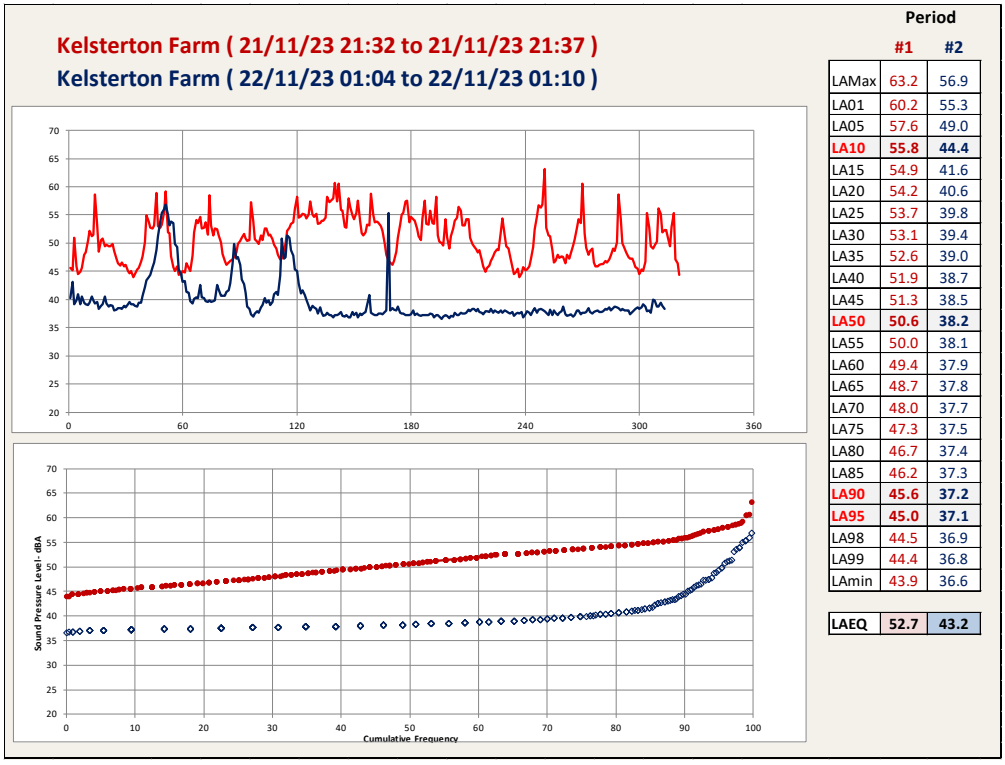


	Period #1	#2
LAMax	66.5	55.5
LA01	58.1	53.8
LA05	57.1	51.9
LA10	**55.9**	**50.1**
LA15	55.0	48.5
LA20	54.2	46.6
LA25	54.0	44.8
LA30	53.6	43.8
LA35	53.2	43.0
LA40	52.9	42.0
LA45	52.5	41.1
LA50	**52.1**	**39.1**
LA55	51.6	38.3
LA60	51.2	37.9
LA65	50.8	37.5
LA70	50.1	36.8
LA75	49.2	36.4
LA80	48.5	36.1
LA85	47.5	35.8
LA90	**45.9**	**35.5**
LA95	**43.6**	**35.1**
LA98	42.6	34.7
LA99	42.6	34.6
LAmin	40.9	34.3
LAEQ	**53.1**	**45.1**

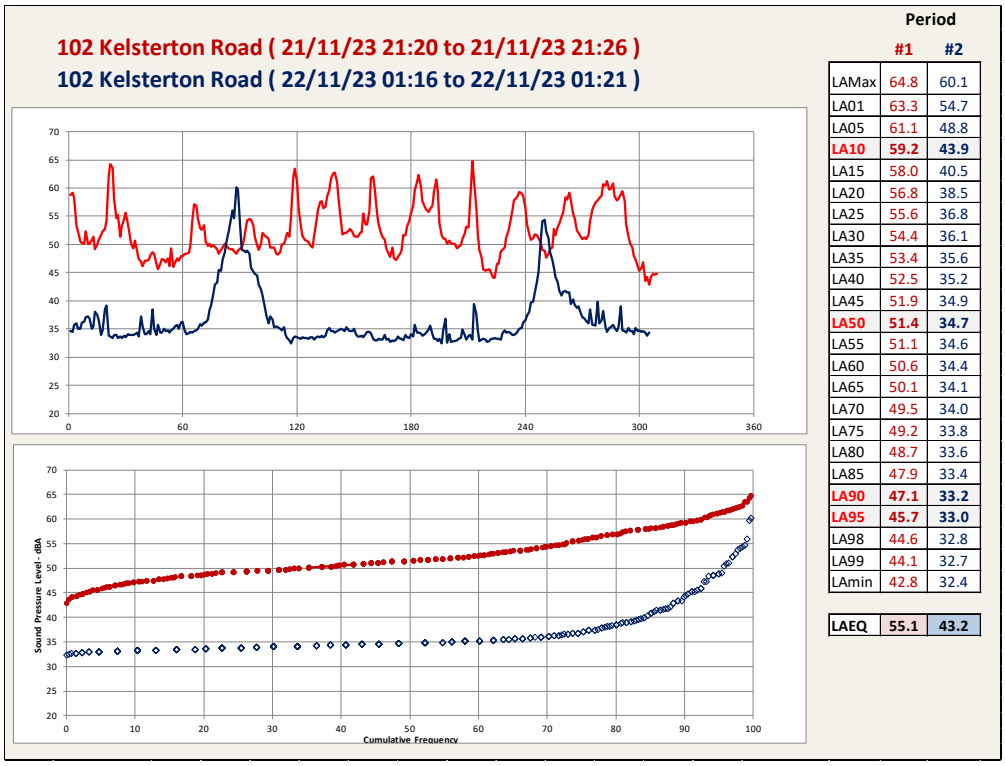


	Period #1	#2
LAMax	64.9	62.0
LA01	64.2	59.2
LA05	60.1	55.1
LA10	**59.1**	**50.7**
LA15	57.9	48.4
LA20	56.8	46.6
LA25	55.6	45.3
LA30	55.0	44.9
LA35	54.3	44.6
LA40	53.7	44.3
LA45	52.9	44.2
LA50	**52.4**	**44.0**
LA55	51.5	43.9
LA60	51.2	43.8
LA65	50.5	43.6
LA70	49.6	43.5
LA75	49.0	43.4
LA80	47.8	43.3
LA85	47.2	43.2
LA90	**46.7**	**42.9**
LA95	**46.2**	**42.6**
LA98	45.8	42.4
LA99	45.7	42.1
LAmin	45.4	41.8
LAEQ	**55.1**	**48.5**

Figure 4-6 Comparison of timeseries and cumulative frequency plot of $L_{Aeq,1s}$ monitoring at Rockcliffe Cottage and Woodfield Railway Cottages.



	Period #1	#2
LAMax	63.2	56.9
LA01	60.2	55.3
LA05	57.6	49.0
LA10	**55.8**	**44.4**
LA15	54.9	41.6
LA20	54.2	40.6
LA25	53.7	39.8
LA30	53.1	39.4
LA35	52.6	39.0
LA40	51.9	38.7
LA45	51.3	38.5
LA50	**50.6**	**38.2**
LA55	50.0	38.1
LA60	49.4	37.9
LA65	48.7	37.8
LA70	48.0	37.7
LA75	47.3	37.5
LA80	46.7	37.4
LA85	46.2	37.3
LA90	**45.6**	**37.2**
LA95	**45.0**	**37.1**
LA98	44.5	36.9
LA99	44.4	36.8
LAmin	43.9	36.6
LAEQ	**52.7**	**43.2**



	Period #1	#2
LAMax	64.8	60.1
LA01	63.3	54.7
LA05	61.1	48.8
LA10	**59.2**	**43.9**
LA15	58.0	40.5
LA20	56.8	38.5
LA25	55.6	36.8
LA30	54.4	36.1
LA35	53.4	35.6
LA40	52.5	35.2
LA45	51.9	34.9
LA50	**51.4**	**34.7**
LA55	51.1	34.6
LA60	50.6	34.4
LA65	50.1	34.1
LA70	49.5	34.0
LA75	49.2	33.8
LA80	48.7	33.6
LA85	47.9	33.4
LA90	**47.1**	**33.2**
LA95	**45.7**	**33.0**
LA98	44.6	32.8
LA99	44.1	32.7
LAmin	42.8	32.4
LAEQ	**55.1**	**43.2**

Figure 4-7 Comparison of timeseries and cumulative frequency plot of $L_{Aeq,1s}$ monitoring at Kelsterton Farm and Kelsterton Road.

In common with previous noise monitoring exercises, the on-site L_{Aeq} and L_{A90} levels during overnight periods are typically within 1dB, showing that the site noise emissions are predominantly steady. Therefore, where the ambient noise level at residential locations is affected by transient traffic events that couldn't reasonably be excluded by pausing the sampling, an estimate of the specific L_{Aeq} from the plant experienced off-site might be derived from the measured off-site L_{A90} level (i.e., $L_{Aeq} = L_{A90} + 1dB$). This approach is further justified by the small level difference (i.e. 1 – 1.5dB) between L_{A50} and L_{A90} seen in the percentile tables from the last round of attended measurements at 102 Kelsterton Road, Kelsterton Farm and Cae Coch/Woodfield Railway cottages (Right hand #2 columns in Figure 4-6 and Figure 4-7).

To quantify the impact of the plant noise (i.e., the BS 4142 assessment) it is necessary to consider not only its level but also its character. The narrow band Fast Fourier Transform (FFT) spectra measured at selected receptors during the final nighttime measurement at each location are shown in Figure 4-8. These FFT analyses were taken during the lulls in the traffic noise (see Figure 4-6 and Figure 4-7) therefore represent a robust characterisation of the site signature.

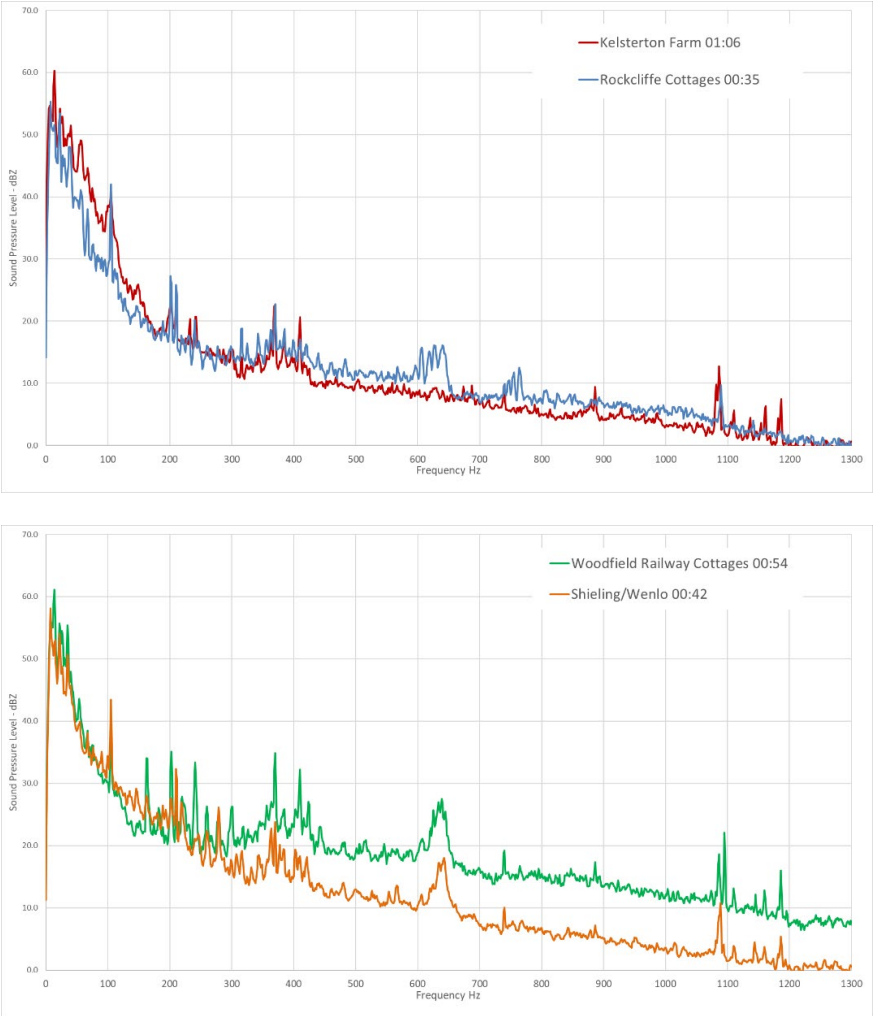


Figure 4-8 FFT narrow band spectra whilst all units off-load 22/11/2023.

A detailed tonal prominent assessment has not been undertaken, as the site noise has a distinctive character in various spectral ranges, however, is not particularly prominent in relation to the residual sound, even in the middle of the night.

At Cae Coch Cottages/Woodfield Railway Cottages the cooling towers component is clearly perceptible (attracting a 4 dB penalty), however a +2dB rating penalty is considered appropriate at other locations in recognition of the tonal plant sound being just perceptible relative to the level of nighttime residual sound.

5 BS 4142 Assessment

The average "Deep-night" L_{A90} and L_{Aeq} levels and corresponding attended survey measurements are compared in Table 5-1 below.

Table 5-1 Summary of Deep-Night measurements and estimated specific noise level at residential and perimeter receptor locations

Position	Type	Period	Mode	L_{Aeq} dB	L_{A90} dB	Estimated Specific $L_{Aeq\ dB}$
Rockcliffe Cottages	Attended	Nov-23	Off-load	45.1	35.4	**37**
Access Road	Continuous	Aug-23	Off-load	42.4	38.5	
			On-load	42.7	37.4	
Shieling/ Wenlo	Attended	Nov-23	Off-load	39.7	37.5	**39**
Cae Coch/ Woodfield Railway Cottages	Attended	Nov-23	Off-load	48.6	42.8	**44**
Near Railway	Continuous	Aug-23	Off-load	45.0	42.7	
			On-load	45.2	42.1	
	Continuous	Nov-23	Off-load	45.0	43.1	
Kelsterton Farm	Continuous	Aug-23	Off-load	46.5	41.3	
			On-load	44.6	39.3	
	Attended	Nov-23	Off-load	43.1	37.0	**38**
102 Kelsterton Road	Attended	Nov-23	Off-load	43.1	33.1	**35**

Note: specific L_{Aeq} is estimated from the overnight L_{A90} + 1dB.

According to BS 4142, the difference between the rating level, $L_{A,r}$, and the background, L_{A90}, provides an indication of the noise impact, see Table 5-2.

As mentioned previously, the continuous operation of the cooling tower plant during the surveys means that none of the recent measurements represent background L_{A90} or Residual L_{Aeq} Levels, so representative deep-nighttime background L_{A90} levels are taken from previous surveys in 2012 and 2017.

Table 5-2 BS 4142 Assessment for Nighttime period

Position	"Deep Night" time Background Mean L_{A90} dB			Estimated Specific L_{Aeq} dB	Rating Level $L_{A,r}$ dB	Rating Level $L_{A,r}$ dB minus Background L_{A90} dB	Night-time (00:00-04:00) BS 4142 Impact
	August 2007	July 2012	July/ Aug 2017	Plant Off-load, but 3 Unit CT and PPCT operational			
Rockcliffe Cottages	36.2	33.8	***33***	37	39	6	Adverse
Cae Coch/Woodfield Railway Cottages	34.5	35.3	**36**	44	48	12	Significant Adverse
Kelsterton Farm	36.2	34.5	**35**	38	40	5	Adverse
102 Kelsterton Road	33.2	**33.3**	*29*	35	35	2	Low/ Adverse

These results show that, purely in terms of numerical differences, the impacts in the middle of the night (the worst case) are ''adverse/significant adverse" at three of the residential receptors. However, BS 4142 advises that the actual impact depends upon the context. The time series in Figure 4-6 and Figure 4-7 show the base steady noise level set by the power station sources, but they also clearly show that, even after midnight, the intermittent but regular road traffic noise has considerable influence on the L_{Aeq} level at residential receptors.

In the context of these intermittent / higher level contributions from traffic which continue throughout the night, the "significant adverse" or "adverse" impact arising from site noise at some of the residential properties is probably an overestimate. In the presence of sustained transient traffic noise, it could be argued that lesser impact descriptors of "adverse" or even "low" might be more appropriate. At other times of day when the plant is more likely to be on-load, the site noise model has previously indicated [3] that the specific noise level for the site is only likely to increase by only around 1dB, compared to that solely from the CTs. This is a very modest increase compared to the contribution from day and evening road traffic noise and the specific plant noise is likely substantially below the background L_{A90} and give rise to a low or negligible impact.

There obviously are some difficulties with looking at trends between surveys and years due to the different circumstances that occurred during each survey. However, for completeness the 2024 survey differences between rating level and night background L_{A90} Levels are summarised in alongside previous survey outcomes.

Accepting the uncertainty associated with inferring the specific noise level from the plant from data affected by traffic noise, the 2023 level differences are within the range of previous levels that typically have not given rise to complaint from local residents. Overall, the impact of typical site operation remains broadly unchanged from the previous assessment in 2019.

Table 5-3 Trend in Nighttime period Rating Assessment

Position	Rating Level $L_{A,r}$ dB minus Background L_{A90} dB											
	Dec 2009	Dec 2010	Dec 2011	Nov 2012	Nov/Dec 2013		Sep 2014		Jan 2016	June 2019	Nov 2023	
					Off-Load	On-Load	Off-Load	On-Load	On-Load	Off-Load CTs On	Off-Load CTs On	Trend 2019-2023
102 Kelsterton Road	6	6	4	N/A	N/A	N/A	1	N/A	1	2	2	►
Kelsterton Farm	7	12	6	5	5	12	4	N/A	5	9	5	▼
Rockcliffe Cottages	7	7	2	5	2	N/A	3	8	3	9	6	▼
Cae Coch/ Woodfield 'Railway' Cottages	10	10	7	15	13	16	8	17	5	9	12	▲

6 Uncertainty

Strictly speaking a formal BS 4142 assessment requires an estimate of the uncertainty in the measurements to understand the reliability of the assessment. Under the circumstances it is not possible to place a numeric value on the uncertainty, however, from a qualitative perspective the following aspects do have an impact on the likely appropriateness of the assessment.

- The maximum impact from plant operation is likely to occur when all four units are on load overnight. however, this is a very rare occurrence and typically the plant is shutdown overnight. e.g., due to market conditions, there were only three night periods when a unit was operational during the continuous monitoring period. The main CTs and PPCTs are the main source of noise from the north-west end of the site, and they typically remained operational throughout all measurement periods. Consequently, the various results do quantify the impact from common type of site activity – which typically arises more regularly than overnight generation.
- Measurement durations during the attended survey were shorter than advised for a formal BS 4142 assessment. This was to allow more positions to be covered repeatedly and appears justifiable based on the agreement in L_{A90} levels between the continuous monitoring near the railway and alongside the access road.
- With regard to the influence of background and residual sound, although traffic noise continues throughout the night, observations suggest that the noise from the site is the main source of steady noise during lulls in traffic. Consequently, basing the specific noise estimate on an adjusted L_{A90} level appears reasonable.
- Weather: The continuous noise monitoring result have been filtered to exclude wet or windy periods, moreover the attended survey was undertaken during dry and very light SW wind conditions. These are common propagation conditions and therefore any subsequent assessment result could be considered to be representative of typical circumstances.

Overall, it is considered that basing the assessment on the combination of attended and continuous measurements as described should ensure that the assessment outcome is robust.

7 Conclusions

A series of continuous and attended measurement surveys have been completed at residential and site perimeter locations to characterise the environmental noise impact from the Connah's Quay Power Station site. Due to the prevailing electricity market conditions, unit load operation was commonly limited to day and evening time periods and a unit remained on-load overnight on only three occasions. For the attended survey in the wider community all units were off-load by midnight.

For both surveys, the purge pond and main cooling towers continued to operate throughout the period. This was irrespective of whether any units were on-load, and the towers are the main source of sound from the site affecting the northerly and westerly properties. Consequently, the survey results predominantly serve as a quantification of noise impact from this very common type of site operation.

The dominance of the traffic noise in the area meant that the plant noise was only discernible at the more remote locations when there were lulls in vehicle movements. Although road traffic noise is the dominant noise source affecting the ambient L_{Aeq} and L_{A90} level throughout the period, between midnight and 4am there were sufficiently long lulls in the traffic for the ambient / background sound to subside to a level that is representative of the plant's contribution. The specific noise level from the plant has therefore been estimated from the L_{A90} levels that subjectively appeared to be attributable to the site's operation.

Although sound from the cooling tower plant become discernible off-site overnight and was aurally identifiable in the spectrum, the character was not overly distinctive. Visual inspection did not identify any major tones worthy of detailed prominence analysis hence appropriate rating penalties (2-4dB) have been selected based on subjective perceptions of tonal audibility.

A direct numeric comparison between rating levels and historic background levels indicates an 'adverse' or 'significant adverse' impact from the site at three of the residential locations for periods in the middle of the nights. However, this is considered to be an over-simplification of the situation. In the context of intermittent and significant contributions from traffic noise, it is argued that the plant's impact at the time of the survey was considerably lower than suggested by basic decibel subtraction. It is considered that lesser impacts of "adverse" or even "low" would be more appropriate and furthermore the rating differences are within the ranges of previous assessments corresponding to public complaint-free periods. At all other times of the day (including early night or early morning periods), the specific noise from the plant's operation will be significantly lower than the background L_{A90} so a low or negligible impact is likely.

The presence of aurally distinctive features in the site's emission can have a significant effect on the noise impact at night. It is recommended that the power station management continue to monitor and control the noise from those plant components that could degrade and give rise to tonal signature at off-site locations (i.e., by undertaking: plant observations; vibration monitoring; removing faulty units from service; routine maintenance; repair and replacement as necessary).

References & Bibliography

[1] **British Strandards Institute.** *Electroacoustics. Sound level meters. Specifications.* s.l. : BSI, 2013. BS EN 61672-1:2013.

[2] **British Standards Institute.** *Electroacoustics. Sound Calibrators.* s.l. : BSI, 2018. BS EN 60942:2018.

[3] **K, Brown.** *CONNAH'S QUAY POWER STATION: ENVIRONMENTAL NOISE SURVEYS, JUNE 2019.* Uniper. s.l. : Uniper Technologies, 2019. UTG/19/PMP/550/R.

[4] **British Standands Institute.** *BS4142: 2014+A1:2019 Methods for rating and assessing industrial and commercial sound.* 2019.

APPENDIX A
GLOSSARY AND BS4142 ASSESSMENT APPROACH

A1 Glossary

dB	Decibel. Used here to represent the sound pressure level, P, expressed as twenty times the logarithm of the ratio of this pressure to a reference pressure, P_0, 20 x 10^{-6} N/m^2. Thus dB = 20 x $Log_{10}(P/P_0)$.
dBA	As above except that the measured sound is first subject to a frequency weighting, known as the 'A' weighting, which is designed to compensate for the varying sensitivity of the human ear to sounds of different frequency.
$L_{A90,T}$	The A-weighted sound level exceeded for 90% of the measurement period of duration T.
$L_{Aeq,T}$	The equivalent steady dBA sound level containing the same acoustic energy as the actual, measured, fluctuating level.
$L_{A.r}$	The specific equivalent continuous dBA sound pressure level, rated upwards by a dB penalty if tonal, intermittent, impulsive otherwise distinctive in character.
1/3rd octave bands	An octave is a doubling or halving of frequency. One-third octave bands are even finer sub-divisions of the frequency range that are centred at specific frequencies, i.e., 125,160, 200, 250, 315,400, 500Hz etc.
FFT	Fast Fourier Transform – narrow band analysis to reveal tonal components within a measurement spectrum.

A2 BS 4142 Impact Assessment

BS 4142 [4] provides a procedure which can be used to assess the impact of industrial noise on residential properties based on the difference between the rated $L_{A,r}$ noise level from the installation and the background L_{A90} noise level. If there is a tonal, intermittent, or percussive feature in the source noise then additional dB corrections are added to the L_{Aeq} specific noise source level in recognition that it is more likely to attract attention.

Extract from BS4142 regarding Assessment of impact

Typically, the greater the difference between the Rating and Background Level, the greater the magnitude of the impact.

a) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon context
b) A difference of around +5 dB or more is likely to be an indication of an adverse impact, depending upon context
c) The lower the rating level is relative to the measured background sound level the less likely it is that the specific sound source will have an adverse or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific noise source having a low impact, depending on the context.

Note 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

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