

STRATFORD MINING COMPLEX

**Monthly Compliance Noise Monitoring
February 2020**

Prepared for:

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Stratford Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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CONTENTS

| | | |
|----------|--|-------------------------------------|
| 1 | INTRODUCTION | 5 |
| 2 | SMC NOISE CRITERIA | 6 |
| 2.1 | Project Approval Schedule 3 Environmental Performance Conditions | 6 |
| 2.2 | EPL Noise Limits – SMC Operations | Error! Bookmark not defined. |
| 2.3 | Noise Limits at the Nominated Attended Noise Monitoring Locations..... | 8 |
| 2.4 | Assessment of Low Frequency Emissions | 8 |
| 3 | OPERATIONAL NOISE MONITORING METHODOLOGY | 9 |
| 3.1 | General Requirements..... | 9 |
| 3.2 | Operator-attended Noise Monitoring Locations | 10 |
| 4 | RESULTS | 12 |
| 4.1 | Operator-attended Noise Monitoring – SMC Operational Activity..... | 12 |
| 4.1.1 | Operator-attended Noise Survey Results – ‘Atkins’ | 13 |
| Table 4 | Predicted Noise Levels at the Receivers to the North of ‘Atkins’ | 15 |
| 4.1.2 | Operator-attended Noise Survey Results – ‘Clarke’ | 16 |
| 4.1.3 | Operator-attended Noise Survey Results ‘Hall’ | 17 |
| 4.1.4 | Operator-attended Noise Survey Results – ‘Lowrey’ | 18 |
| 4.1.5 | Operator-attended Noise Survey Results – ‘Pryce-Jones’ | 19 |
| 4.1.6 | Operator-attended Noise Survey Results – ‘Van der Drift’ | 20 |
| 4.1.7 | Operator-attended Noise Monitoring Results – ‘Greenwood’ | 21 |
| 5 | PERFORMANCE ASSESSMENT | 22 |
| 5.1 | Operations | 22 |
| 5.2 | Sleep Disturbance | 23 |
| 6 | CONCLUSION..... | 23 |

DOCUMENT REFERENCES

TABLES

| | | |
|---------|--|----|
| Table 1 | Noise Limits for the Nominated Noise Monitoring Locations..... | 8 |
| Table 2 | SMC Operational Noise Monitoring Locations..... | 10 |
| Table 3 | Operator-attended Noise Survey Results - ‘Atkins’ | 14 |
| Table 4 | Predicted Noise Levels at the Receivers to the North of ‘Atkins’ | 15 |
| Table 5 | Operator-attended Noise Survey Results - ‘Clarke’ | 16 |
| Table 6 | Operator-attended Noise Survey Results - ‘Hall’ | 17 |
| Table 7 | Attended Noise Survey Results - ‘Lowrey’ | 18 |

CONTENTS

| | | |
|----------|--|----|
| Table 8 | Attended Noise Survey Results – ‘Pryce Jones’ | 19 |
| Table 9 | Attended Noise Survey Results – ‘Van der Drift’ | 20 |
| Table 10 | Attended Noise Survey Results – ‘Greenwood’ | 21 |
| Table 11 | Performance Assessment – Operations | 22 |
| Table 12 | Performance Assessment – Sleep Disturbance | 23 |
| | | |
| Table 1 | Noise Limits for the Nominated Noise Monitoring Locations | 8 |
| Table 2 | SMC Operational Noise Monitoring Locations | 10 |
| Table 3 | Operator-attended Noise Survey Results - ‘Atkins’ | 14 |
| Table 4 | Predicted Noise Levels at the Receivers to the North of ‘Atkins’ | 15 |
| Table 5 | Operator-attended Noise Survey Results - ‘Clarke’ | 16 |
| Table 6 | Operator-attended Noise Survey Results - ‘Hall’ | 17 |
| Table 7 | Attended Noise Survey Results - ‘Lowrey’ | 18 |
| Table 8 | Attended Noise Survey Results – ‘Pryce Jones’ | 19 |
| Table 9 | Attended Noise Survey Results – ‘Van der Drift’ | 20 |
| Table 10 | Attended Noise Survey Results – ‘Greenwood’ | 21 |
| Table 11 | Performance Assessment – Operations | 22 |
| Table 12 | Performance Assessment – Sleep Disturbance | 23 |

FIGURES

| | | |
|----------|--|----|
| Figure 1 | Stratford Mining Complex Attended Noise Monitoring Locations | 11 |
|----------|--|----|

APPENDICES

| | |
|------------|---------------------------------------|
| Appendix A | Acoustic Terminology |
| Appendix B | Operator Attended Noise Survey Charts |

1 Introduction

Stratford Coal Pty Limited (SCPL), a wholly owned subsidiary of Yancoal Australia Limited (Yancoal), has commissioned SLR Consulting Australia Pty Ltd (SLR) to conduct monthly noise monitoring for the Stratford Mining Complex (SMC) operations guided by the requirements of the *Stratford Mining Complex (Stratford Extension Project) Noise Management Plan* (NMP), Document No. NMP-R03-A, dated 17 June 2019. This report presents the results and findings from the operator-attended noise surveys conducted between Wednesday 19 February 2020 and Friday 21 February 2020.

It is understood that the SMC collectively comprises the Bowens Road North Open Cut (BRNOC), Avon North Open Cut, Stratford East Open Cut, Roseville West Open Cut and the associated coal processing and handling facilities. Run-of-mine (ROM) coal from the SCM is processed then loaded and railed on the North Coast Railway to the port of Newcastle.

The objectives of the noise monitoring programme for this operating period were as follows:

- Conduct three rounds of external operator-attended noise measurements at the seven nominated locations, representative of receivers in the area surrounding the SMC. The seven nominated external operator-attended noise measurement locations are:
 - Atkins – Off Wenhams Cox Road, Stratford
 - Clarke – Off Wenhams Cox Road, Stratford
 - Hall – Upper Avon Road
 - Lowrey – Off Crowthers Road, Stratford
 - Pryce Jones – The Bucketts Way, Craven
 - Van der Drift – Wood Street, Stratford
 - Greenwood – Off Glen Road, Craven

Noise monitoring will occur for a day, evening and night period. The day, evening and night periods being those defined in the NSW *Industrial Noise Policy* (EPA 2000).

- The operator will quantify and characterise the maximum (L_{Amax}) and the intrusive (L_{Aeq} and L_{Ceq}) noise level contributions from SMC operations over a 15 minute measurement period. In addition, the operator will quantify and characterise the overall levels of ambient noise (i.e. L_{Amax} , LA_1 , LA_{10} , LA_{50} , LA_{90} , and L_{Aeq}) over the 15 minute measurement interval.
- Assess the noise emissions of SMC and determine compliance with respect to the limits contained in the NMP.

In addition to monthly noise monitoring at the nominated residential receivers, the NMP requires quarterly noise monitoring of rail activity and verification monitoring of the Real Time Noise Monitor (RTNM) network.

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

2 SMC Noise Criteria

The figures presented in this Section are extracts from the *Stratford Extension Project (SSD-4966)* Development Consent dated 29 May 2015.

2.1 Project Approval Schedule 3 Environmental Performance Conditions

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from an owner of the land listed in Table 1, the Applicant shall acquire the land in accordance with the procedures in conditions 5-6 of Schedule 4.

Table 1: Land subject to acquisition upon request

| Property ID | |
|-----------------------|----------------|
| 40/51/Cr1 – L. Blanch | 42 – D. Blanch |
| Cr7 – Pryce-Jones | Cr 2 – Boorer |

Note: To interpret the location referred to in Table 1 see the applicable figure in Appendix 5.

However, the obligation to acquire a property does not apply if the Applicant has a negotiated agreement with the owner/s of the relevant land that sets aside acquisition under the terms of this consent, and the Applicant has advised the Department in writing of the terms of this agreement.

ADDITIONAL MITIGATION UPON REQUEST

2. Upon receiving a written request from the owner of any residence on the land listed in Tables 1 and 2, the Applicant shall implement additional noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at the residence in consultation with the owner. These measures must be reasonable and feasible and directed towards reducing the noise impacts of the development on the residence.

If within 3 months of receiving this request from the owner, the Applicant and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.

Table 2: Land subject to additional noise mitigation upon request

| Property ID | Property ID |
|-------------------|------------------------|
| 31(1) – Isaac | 60 – Healy / Greenwood |
| 44 – Cross / Jane | 36 – Wallace |
| 37 – Worth | 29 – Ward |
| 15(3) – Falla | |

Note: To interpret the locations referred to in Table 2 see the applicable figure in Appendix 5.

However, the obligation to implement noise mitigation measures does not apply if the Applicant has a negotiated agreement with the owner/s of the relevant residence or land that sets aside noise mitigation measures under the terms of this consent, and the Applicant has advised the Department in writing of the terms of this agreement.

NOISE

Hours of Operation

3. The Applicant shall comply with the operating hours in Table 3.

Table 3: Operating hours

| Activity | Operating Hours |
|---|---------------------------------|
| <ul style="list-style-type: none"> Open cut mining operations in the Bowens Road North and Roseville West Extension pits Recovery and transport of CHPP rejects for re-processing Construction of the noise mitigation bunds on the western side of the Avon North, Roseville West Extension and Stratford East pits | 7 am to 6 pm, 7 days per week |
| <ul style="list-style-type: none"> Open cut mining operations in the Avon North and Stratford East pits Coal processing, loading and dispatch of product coal trains | 24 hours a day, 7 days per week |
| <ul style="list-style-type: none"> Maintenance activities | week |

Noise Criteria

4. The Applicant shall ensure that the noise generated by the development does not exceed the criteria in Table 4 at any residence on privately-owned land.

Table 4: Noise criteria dB(A)

| Land | Day | Evening | Night | Night |
|--------------------------------------|---------------------------|---------------------------|---------------------------|-------------------------|
| | $L_{Aeq}(15 \text{ min})$ | $L_{Aeq}(15 \text{ min})$ | $L_{Aeq}(15 \text{ min})$ | $L_{A1}(1 \text{ min})$ |
| 40/51/Cr1 – L. Blanch | 43 | 43 | 43 | 50 |
| Cr7 – Pryce-Jones | 43 | 43 | 43 | 49 |
| 42 – D. Blanch | 42 | 42 | 42 | 50 |
| Cr 2 – Boorer | 41 | 41 | 41 | 49 |
| 31(1) – Isaac | 40 | 40 | 40 | 48 |
| 36 – Wallace | 39 | 39 | 39 | 47 |
| 44 – Cross / Jane | | | | |
| 60 – Healy / Greenwood | 39 | 39 | 39 | 45 |
| 37 – Worth | 38 | 38 | 38 | 46 |
| 29 – Ward | 38 | 38 | 37 | 45 |
| 23 – Bagnall | 37 | 37 | 37 | 45 |
| 31(2) – Isaac | | | | |
| 296 – Watson | | | | |
| 297 – Bosma | | | | |
| 298 – Yates | 36 | 36 | 36 | 45 |
| 15(3) – Falla | 39 | 35 | 35 | 45 |
| 15(2) – Falla | 36 | 35 | 35 | 45 |
| Stratford Village | 37 | 36 | 35 | 45 |
| All other privately-owned residences | 35 | 35 | 35 | 45 |

- To interpret the locations referred to in Table 4 see the applicable figure(s) in Appendix 5.
- Stratford village is shown on the figure(s) in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 6 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has a negotiated agreement with the owner/s of the relevant residence or land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

1. The noise criteria in Table 4 in Schedule 3 are to apply to a receiver under all meteorological conditions except under:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) temperature inversion conditions between 1.5°C and 3°C/100 m and wind speed greater than 2 m/s at 10 m above ground level; or
 - (c) temperature inversion conditions greater than 3°C/100 m.

2.2 EPL Noise Limits – SMC Operations

The noise limits specified in EPL 5161 are consistent with the noise criteria specified in SSD-4966.

2.3 Noise Limits at the Nominated Attended Noise Monitoring Locations

The site specific noise limits for the seven nominated attended noise monitoring locations are summarised in **Table 1**.

Table 1 Noise Limits for the Nominated Noise Monitoring Locations

| Locality | Intrusiveness Criteria LAeq(15minute) | | | Night LA1(1minute) Criterion |
|--------------------------|---------------------------------------|---------|-------|------------------------------|
| | Day | Evening | Night | Night |
| Atkins ¹ | 35 | 35 | 35 | 45 |
| Clarke ² | 37 | 37 | 37 | 45 |
| Hall | 35 | 35 | 35 | 45 |
| Lowrey | 35 | 35 | 35 | 45 |
| Pryce Jones ³ | 43 | 43 | 43 | 49 |
| Van der Drift | 37 | 36 | 35 | 45 |
| Greenwood | 35 | 35 | 35 | 45 |

Note 1: Owned by Stratford Coal Pty Ltd. Criteria adopted from 5(1),5(2), 9(2) and 10 located further to the north as a guide only and are not definitive at this location.

Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall as a guide only and are not definitive at this location.

Note 3: Land subject to acquisition upon request.

2.4 Assessment of Low Frequency Emissions

To address the low-frequency noise assessment issues raised in the 2014 Independent Environmental Audit, as outlined in the VIPAC letter (29N-15-0009-TNT-472681-0, dated 26 February 2015), the following analysis of the operator-attended monitoring data was proposed:

...a full L_{Ceq} minus L_{Aeq} spectrum low frequency analysis will be conducted on all noise compliance measurements where the mine noise contribution is deemed to be the dominant noise source. This will be conducted in accordance with the guidance set out in the INP in accordance with the requirements of Development Consent 23-98/99 Schedule 3 Condition 7(a) and Development Consent 39-02-01 Schedule 2 Condition 6.4C(a)(i).

The low-frequency analysis proposed above shall also serve to meet the *Compliance Monitoring* requirement of Section 5(d) of Appendix 6 *Noise Compliance Assessment* of the Stratford Extension Project Development Consent (SSD-4966, dated 29 May 2015), that states:

...the use of an appropriate modifying factor for low frequency noise to be applied during compliance testing at any individual residence if low frequency noise is present (in accordance with the INP) and before comparison with the specified noise levels in the consent.

At all locations weather conditions were either outside of the consented conditions, SMC was not the dominant noise source, not audible and/or significantly below the relevant noise criteria and was therefore low frequency noise has not been addressed further in this report. The results of the operator attended noise measurements are presented in **Section 4**.

3 Operational Noise Monitoring Methodology

3.1 General Requirements

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672.1 – 2004 *Electroacoustics—Sound level meters – Specifications*, AS IEC 61672.2-2004, AS IEC 61672.3-2004 and carried current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ± 0.5 dBA.

All operator-attended noise measurements were conducted using a one-third octave integrating Brüel & Kjær Type 2250L (s/n 3003389) together with a Svantek SV30A acoustical calibrator (s/n 39482).

3.2 Operator-attended Noise Monitoring Locations

Noise monitoring was conducted in accordance with the requirements of the NMP.

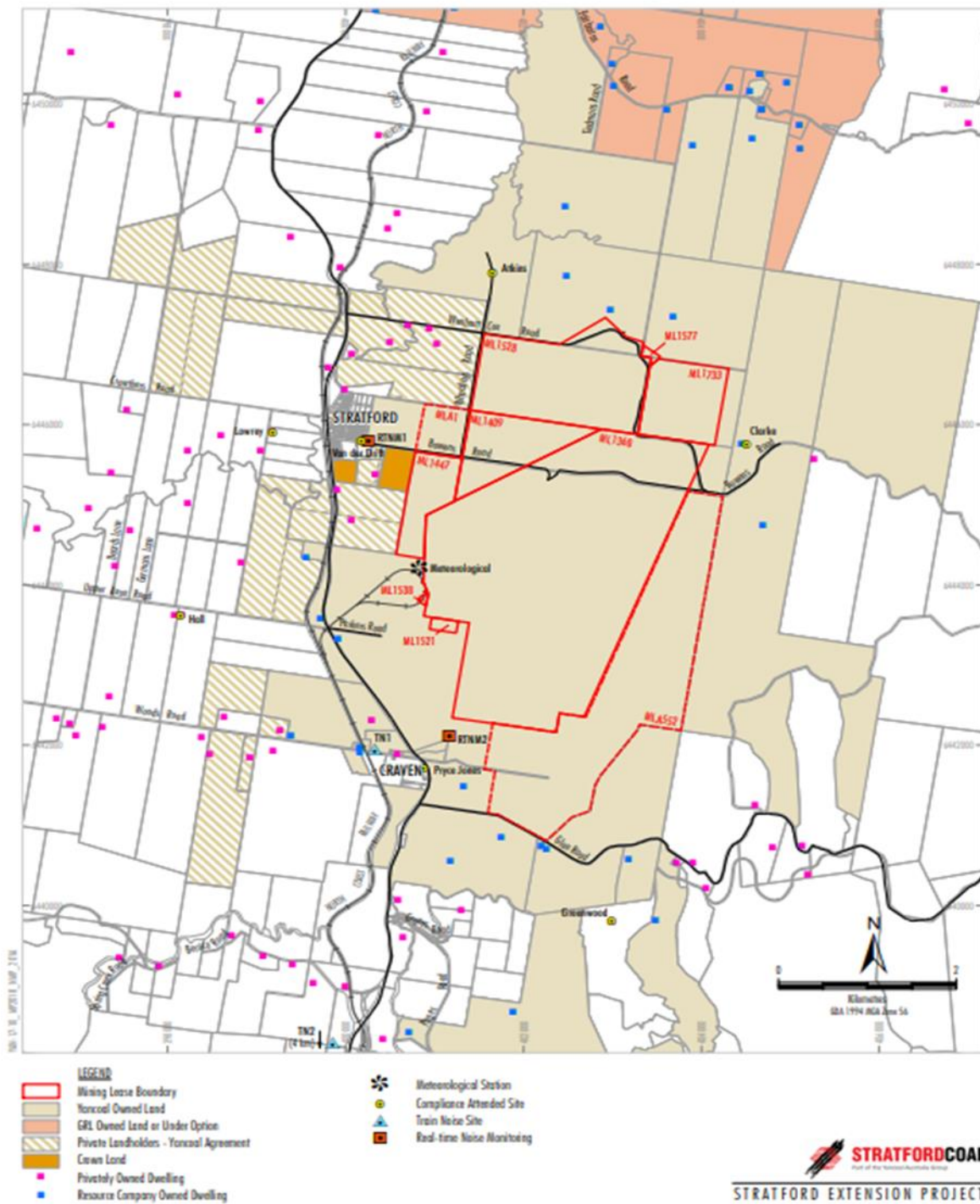
Operator-attended noise measurements were conducted during the day, evening and night-time period for a minimum of 15 minutes per period at each of the seven nominated residential noise monitoring locations. The details of the operator-attended SMC operational noise monitoring locations are contained within **Table 2** and shown generally in **Figure 1**. During the operator-attended noise measurements, the character and relative contribution of ambient noise sources and SMC contributions were determined by observations on site.

Table 2 SMC Operational Noise Monitoring Locations

| Monitoring Location | Receiver Type | Resident / Owner | Monitoring Location - MGA Zone 56 | |
|---------------------|---------------|------------------|-----------------------------------|--------------|
| | | | Easting (m) | Northing (m) |
| Atkins | Residence | Atkins | 401544 | 6447134 |
| Clarke | Residence | Clarke | 404406 | 6445783 |
| Hall | Residence | Hall | 398269 | 6443709 |
| Lowrey | Residence | Lowrey | 399193 | 6445879 |
| Pryce Jones | Residence | Pryce Jones | 400807 | 6441846 |
| Van der Drift | Residence | Van der Drift | 400171 | 6445775 |
| Greenwood | Residence | Greenwood | 402617 | 6440457 |

The objective of the SMC operational operator-attended noise monitoring was to measure the maximum (L_{Amax}) and the $L_{Aeq(15minute)}$ noise level contributions at the nearest potentially affected receptors to determine the noise contribution of mining activities associated with SMC operations over a 15 minute measurement period. During the measurement, the operator also quantifies and characterises the overall levels of ambient noise in the area (i.e. L_{Amax} , LA_1 , LA_{10} , LA_{90} , and L_{Aeq}) over the 15 minute measurement interval.

Figure 1 Stratford Mining Complex Attended Noise Monitoring Locations



Source: NMP

4 Results

4.1 Operator-attended Noise Monitoring – SMC Operational Activity

Operator-attended noise measurements were conducted during a day, evening and night period between Wednesday 19 February 2020 and Friday 21 February 2020. Results of the operator-attended noise surveys at residential locations are provided in **Sections 4.1.1 to 4.1.7**.

A summary of the results for the attended noise monitoring are displayed graphically in **Appendix B** showing L_{Amax} , L_{Aeq} , and $L_{Aeq(<1.25kHz)}$ in 1-second intervals throughout the monitoring survey.

Ambient noise levels presented include all noise sources such as transport (roads, rail and aircraft), fauna (insects, frogs, birds, and bats), farm animals (cows, bulls), the natural environment (wind, wind in trees), domestic noises, other industrial operations as well as SMC noise emissions.

Weather data during the monitoring period has been obtained from the weather station located on the SMC site.

The tables provide the following information:

- Date and start time, operator and equipment details.
- Monitoring location.
- Wind velocity (m/s) and temperature (°C) at the measurement location.
- Typical maximum (L_{Amax}) and contributed $L_{Aeq(15minute)}$ noise levels.

4.1.1 Operator-attended Noise Survey Results – ‘Atkins’

Results of the operator-attended noise surveys at ‘Atkins’ are provided in **Table 3**. Monitoring location ‘Atkins’ represents residential receptors located further to the north of the site.

Table 3 Operator-attended Noise Survey Results - 'Atkins'

| Period | Date/Start Time/ Weather | Primary Noise Descriptor dBA (15 minute) | | | | | | Description of Noise Emissions and Typical Maximum Noise Levels (dBA) |
|---------------------------|---|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
| | | L _{Amax} | L _{A1} | L _{A10} | L _{A90} | L _{Aeq} | L _{Aeq} (≤1.25kHz) | |
| Day | 20/2/2020 07:50 17°C 0.2 m/s N | 57 | 46 | 44 | 39 | 41 | 41 | <i>Site related noise events:</i> SMC: Audible All mine operations 38-43 L_{Aeq}(15minute) contribution 41 dBA <i>Other noise events:</i> Insects 38-42 Birds 40-47 |
| Day – Remeasure (1) | 20/02/20 09:01 20°C 1.1 m/s NE | 67 | 53 | 44 | 37 | 44 | 43 | <i>Site related noise events:</i> SMC: Audible All mine operations 36-41 L_{Aeq}(15minute) contribution 39 dBA <i>Other noise events:</i> Insects 38-42 Birds 40-47 Passby 50-67 |
| Day – Follow Up Measure 1 | 21/02/2020 08:33 21°C 0.7 m/s W | 55 | 49 | 40 | 33 | 38 | 36 | <i>Site related noise events:</i> SMC: Audible All mine operations 34-39 L_{Aeq}(15minute) contribution 36 dBA <i>Other noise events:</i> Insects/frogs 37 Birds 36-50 Passby 48-55 |
| Day – Follow Up Measure 2 | 21/02/2020 09:57 22°C 2.4 m/s NE | 52 | 48 | 42 | 37 | 40 | 37 | <i>Site related noise events:</i> SMC: Audible All mine operations 36-40 Single loud noise 43-46 L_{Aeq}(15minute) contribution 38 dBA <i>Other noise events:</i> Insects 37 Birds 40-45 Passby 42-52 |
| Evening | 19/2/2020 21:26 25°C 3.2 m/s W | 58 | 43 | 41 | 37 | 39 | 36 | <i>Site related noise events:</i> SMC: Audible Dozer 31-36 L_{Aeq}(15minute) contribution 30 dBA <i>Other noise events:</i> Insects/frogs 38-42 |

| Period | Date/Start Time/ Weather | Primary Noise Descriptor dBA (15 minute) | | | | | | Description of Noise Emissions and Typical Maximum Noise Levels (dBA) |
|--------|---|--|-----------------|------------------|------------------|------------------|-----------------------------|--|
| | | L _{Amax} | L _{A1} | L _{A10} | L _{A90} | L _{Aeq} | L _{Aeq} (≤1.25kHz) | |
| Night | 20/2/2020 00:42 19°C 1 m/s WSW | 51 | 44 | 43 | 41 | 42 | 33 | <i>Site related noise events:</i> SMC: Audible Engine noise 26-33 L_{Aeq}(15minute) contribution 29 dBA L_{Amax} contribution 33 dBA <i>Other noise events:</i> Road traffic 30-32 Insects/frogs 39-45 |

SMC operations were audible during all operator attended surveys. SMC operations generated an L_{Aeq}(15minute) noise contribution of up to 41 dBA during the day, 30 dBA during the evening and 29 dBA during the night-time respectively. During the night-time period the operation of the pit generated L_{Amax} noise levels of up to 33 dBA at the monitoring location.

Daytime noise levels were predicted to the residences to the north of the 'Atkins' noise monitoring location using an ENM model. The noise model was calibrated using the operator attended noise monitoring results and weather conditions at the Atkins noise monitoring location. Daytime predicted noise levels are provided in **Table 4**.

Table 4 Predicted Noise Levels at the Receivers to the North of 'Atkins'

| Receiver Location | Day Measurement 1 | Day Measurement 2 (Re-measure) |
|---------------------------------------|-------------------|--------------------------------|
| Measured Noise Level | | |
| Atkins Measurement Location | 41 dBA | 39 dBA |
| Predicted Noise Levels | | |
| 5 (1) – Bagnall ¹ | 32 dBA | 30 dBA |
| 5 (2) – Bagnall ¹ | 29 dBA | 27 dBA |
| 9 (2) – Williams ¹ | 35 dBA | 32 dBA |
| 10 - Whatmore & Whatmore ¹ | 35 dBA | 32 dBA |

Note 1: Refer Stratford Extension Project EIS

L_{Aeq}(15minute) daytime noise levels at the nearest privately-owned residences are predicted to be 35 dBA or less.

4.1.2 Operator-attended Noise Survey Results – ‘Clarke’

Results of the operator-attended noise surveys at ‘Clarke’ are provided in **Table 5**. Monitoring location ‘Clarke’ represents residential receptors located to the east of the site, and is a SMC owned property. The monitoring results at Clarke are used to determine SMC contributions at the ‘Bagnall’ residence located further to the east.

Table 5 Operator-attended Noise Survey Results - ‘Clarke’

| Clarke | Date/Start Time/ Weather | Primary Noise Descriptor dBA (15 minute) | | | | | | Description of Noise Emissions and Typical Maximum Noise Levels (dBA) |
|---------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
| | | L _{Amax} | L _{A1} | L _{A10} | L _{A90} | L _{Aeq} | L _{Aeq} (≤1.25kHz) | |
| Day | 19/02/2020 17:15 31°C 4 m/s W | 61 | 53 | 50 | 45 | 48 | 48 | <i>Site related noise events:</i> SMC: Audible Avon north pit operations 45-50 L_{Aeq}(15minute) contribution 48 dBA <i>Other noise events:</i> Wind Gusts 50-53 |
| Evening | 19/02/2020 21:44 23°C 1.6 m/s SW | 72 | 53 | 51 | 47 | 50 | 49 | <i>Site related noise events:</i> SMC: Audible Engine noise 45-49 Dozers 53 L_{Aeq}(15minute) contribution 46 dBA <i>Other noise events:</i> Passby: 55-72 Insects/frogs 44-49 |
| Night | 20/02/2020 00:18 20°C 1.3 m/s SSW | 57 | 47 | 45 | 40 | 42 | 41 | <i>Site related noise events:</i> SMC: Audible Avon north pit operations 36-51 L_{Aeq}(15minute) contribution 41 dBA L_{Amax} contribution 51 dBA <i>Other noise events:</i> Insects/frogs 38-42 |

SMC operations were audible during the day, evening and night-time operator attended surveys. SMC operations generated an L_{Aeq}(15minute) noise contribution of 48 dBA during the day, 46 dBA during the evening and 41 dBA during the night-time respectively. During the night-time period the operation of the pit generated L_{Amax} noise levels of up to 51 dBA at the monitoring location.

Meteorological data from the onsite SMC automatic weather stations showed a temperature inversion in excess of 3°C/100 m during the day-time period of the operator attended measurements. As such, the day-time criteria is not applicable during the attended noise survey.

Noise levels were predicted to the Bagnall residence using an ENM model. The noise model was calibrated using the operator attended noise monitoring results and weather conditions at the Clarke noise monitoring location. L_{Aeq}(15minute) noise levels are predicted to be 37 dBA and 30 dBA during the evening and night-time, respectively. The night-time L_{Amax} noise level is predicted to be 40 dBA.

4.1.3 Operator-attended Noise Survey Results 'Hall'

Results of the operator-attended noise surveys at 'Hall' are provided in **Table 6**. Monitoring location 'Hall' represents residential receptors located to the southwest of the site.

Table 6 Operator-attended Noise Survey Results - 'Hall'

| Hall | Date/Start Time/ Weather | Primary Noise Descriptor dBA (15 minute) | | | | | | Description of Noise Emissions and Typical Maximum Noise Levels (dBA) |
|---------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
| | | L _{Amax} | L _{A1} | L _{A10} | L _{A90} | L _{Aeq} | L _{Aeq} (≤1.25kHz) | |
| Day | 19/02/2020 16:47 32°C 4.8 m/s WSW | 77 | 60 | 42 | 30 | 49 | 48 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Wind in trees 34-39 Birdsong 33-48 Passby 50-77 Insects 36-45 |
| Evening | 19/02/2020 20:19 24°C 1.3 m/s W | 65 | 53 | 52 | 50 | 51 | 30 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Birdsong 56-60 Insects/frogs 54-55 Dog barking 55 |
| Night | 19/02/2020 23:08 22°C 2.4 m/s SSW | 70 | 42 | 40 | 38 | 40 | 31 | <i>Site related noise events:</i> SMC: Faintly Audible General mining operations 25-28 L_{Aeq}(15minute) contribution 25 dBA L_{Amax} contribution 28 dBA <i>Other noise events:</i> Insects/frogs 38-39 |

SMC operations were inaudible during the day time and evening and faintly audible during the evening operator attended noise surveys at this location. The SMC generated L_{Aeq}(15minute) noise contributions of 25 dBA and a L_{Amax} noise level of 28 dBA during the night.

4.1.4 Operator-attended Noise Survey Results – ‘Lowrey’

Results of the operator-attended noise surveys at ‘Lowrey’ are provided in **Table 7**. Monitoring location ‘Lowrey’ represents residential receptors located to the west of the site and west of Bucketts Way.

Table 7 Attended Noise Survey Results - ‘Lowrey’

| Period | Date/Start Time/ Weather | Primary Noise Descriptor dBA (15 minute) | | | | | | Description of Noise Emissions and Typical Maximum Noise Levels (dBA) |
|---------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
| | | L _{Amax} | L _{A1} | L _{A10} | L _{A90} | L _{Aeq} | L _{Aeq} (≤1.25kHz) | |
| Day | 20/02/2020 08:16 19°C 0.9 m/s NE | 60 | 51 | 43 | 36 | 41 | 39 | <i>Site related noise events:</i> SMC: Audible Engine noise 33-35 Dozers 39 L_{Aeq}(15minute) contribution 34 dBA <i>Other noise events:</i> Road traffic 35-48 Birdsong 38-51 Insects 37-40 Livestock 39-40 |
| Evening | 19/02/2020 21:03 23°C 0.9 m/s WSW | 73 | 49 | 48 | 46 | 48 | 36 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Insects/frogs 49-51 |
| Night | 19/02/2020 23:52 21°C 2.3 m/s SSW | 64 | 60 | 49 | 40 | 49 | 46 | <i>Site related noise events:</i> SMC: Audible Engine noise 35-43 L_{Aeq}(15minute) contribution 35 dBA L_{Amax} contribution 43 dBA <i>Other noise events:</i> Insects/frogs 43-51 Train 50-64 |

SMC operations were audible during the day and night-time, and inaudible during the evening operator attended noise surveys at this location. SMC operations generated L_{Aeq}(15minute) contributions of 34 during the daytime and 33 dBA during the night-time.

4.1.5 Operator-attended Noise Survey Results – ‘Pryce-Jones’

Results of the operator-attended noise surveys at ‘Pryce Jones’ are provided in **Table 8**. Monitoring location ‘Pryce Jones’ represents residential receptors located in Craven to the south of the site.

Table 8 Attended Noise Survey Results – ‘Pryce Jones’

| Pryce-Jones | Date/Start Time/ Weather | Primary Noise Descriptor dBA (15 minute) | | | | | | Description of Noise Emissions and Typical Maximum Noise Levels (dBA) |
|-------------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
| | | L _{Amax} | L _{A1} | L _{A10} | L _{A90} | L _{Aeq} | L _{Aeq} (≤1.25kHz) | |
| Day | 19/02/2020 16:26 32°C 4.3 m/s WSW | 75 | 69 | 62 | 42 | 58 | 57 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Insects 43-44 Birds 45 Road traffic 59-75 Wind 40-44 |
| Evening | 19/02/2020 19:56 25°C 3 m/s W | 71 | 67 | 55 | 47 | 54 | 57 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Road traffic 62-71 Insects/frogs 47-50 Birds 48-50 |
| Night | 19/02/2020 22:44 22°C 2.2 m/s SSE | 70 | 58 | 52 | 49 | 52 | 45 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Insects/frogs 45-54 Road traffic 58-70 |

SMC operations were inaudible during the day, evening and night-time operator attended noise surveys at this location.

4.1.6 Operator-attended Noise Survey Results – ‘Van der Drift’

Results of the operator-attended noise surveys at ‘Van der Drift’ are provided in **Table 9**.

Table 9 Attended Noise Survey Results – ‘Van der Drift’

| Van der Drift | Date/Start Time/ Weather | Primary Noise Descriptor dBA (15 minute) | | | | | | Description of Noise Emissions and Typical Maximum Noise Levels (dBA) |
|---------------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
| | | L _{Amax} | L _{A1} | L _{A10} | L _{A90} | L _{Aeq} | L _{Aeq} (≤1.25kHz) | |
| Day | 20/02/2020 08:37 19°C 1 m/s NE | 71 | 60 | 48 | 36 | 48 | 47 | <i>Site related noise events:</i> SMC: Audible General mining operations 30-35 Single loud noise 37-38 L_{Aeq}(15minute) contribution 33 dBA <i>Other noise events:</i> Insects 36 Birds 45-57 Dog barking 44-51 Road traffic 34 Passby 46-71 |
| Evening | 19/02/2020 20:42 24°C 2.7 m/s SW | 56 | 48 | 43 | 37 | 40 | 37 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Road traffic 39-42 Insects/frogs 37-40 Dogs barking 50-56 Aeroplane 42-47 |
| Night | 19/02/2020 23:32 22°C 2.7 m/s SSW | 53 | 43 | 38 | 35 | 37 | 31 | <i>Site related noise events:</i> SMC: Faintly Audible General mining operations 25-27 L_{Aeq}(15minute) contribution 26 dBA L_{Amax} contribution 27 dBA <i>Other noise events:</i> Insects/frogs 35-36 Train 38 Passby 38-53 |

SMC operations were audible during the day and faintly audible during the night-time operator attended noise surveys at this location. SMC operations generated L_{Aeq}(15minute) noise levels of 33 dBA during the day and 26 dBA during the night-time period. During the night-time, SMC operations generated L_{Amax} noise levels of up to 27 dBA.

4.1.7 Operator-attended Noise Monitoring Results – ‘Greenwood’

Results of the operator-attended noise surveys at ‘Greenwood’ are provided in **Table 10**.

Table 10 Attended Noise Survey Results – ‘Greenwood’

| Greenwood | Date/Start Time/ Weather | Primary Noise Descriptor dBA (15 minute) | | | | | | Description of Noise Emissions and Typical Maximum Noise Levels (dBA) |
|-----------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
| | | L _{Amax} | L _{A1} | L _{A10} | L _{A90} | L _{Aeq} | L _{Aeq} (≤1.25kHz) | |
| Day | 19/02/2020 16:04 31°C 2.5 m/s SSE | 65 | 56 | 50 | 39 | 46 | 43 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Wind related noise 43-60 Birds 44-39 |
| Evening | 19/02/2020 19:33 27°C 3.1 m/s SE | 54 | 47 | 45 | 41 | 43 | 28 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Insects 40-43 Birds 41-48 |
| Night | 19/02/2020 22:23 22°C 2 m/s S | 60 | 51 | 48 | 45 | 47 | 35 | <i>Site related noise events:</i> SMC: Inaudible <i>Other noise events:</i> Insects/frogs 46-52 |

SMC operations were inaudible during all operator-attended noise surveys at this location.

5 Performance Assessment

5.1 Operations

Results of the operator-attended noise measurements compared with the relevant noise criteria contained in the SMC Development Consent are given in **Table 11**.

Table 11 Performance Assessment – Operations

| | Estimated SMC L _{Aeq} (15minute) Noise Level dBA ¹ | | | Noise Criteria L _{Aeq} (15minute) dBA | | | Compliance | | |
|---------------------------------------|--|----------------|----------------|---|-----|-------|------------------|------------------|------------------|
| | Day | Eve | Night | Day | Eve | Night | Day | Eve | Night |
| Atkins | 41 | 30 | 25 | 35 | 35 | 35 | N/A ⁵ | N/A ⁵ | N/A ⁵ |
| 5 (1) Bagnall ¹ | 32 | - ⁶ | - ⁶ | 35 | 35 | 35 | Yes | Yes | Yes |
| 5 (2) – Bagnall ¹ | 29 | - ⁶ | - ⁶ | 35 | 35 | 35 | Yes | Yes | Yes |
| 9 (2) – Williams ¹ | 35 | - ⁶ | - ⁶ | 35 | 35 | 35 | Yes | Yes | Yes |
| 10 - Whatmore & Whatmore ¹ | 35 | - ⁶ | - ⁶ | 35 | 35 | 35 | Yes | Yes | Yes |
| Clarke ² | 48 | 46 | 41 | 37 | 37 | 37 | N/A ⁵ | N/A ⁵ | N/A ⁵ |
| Bagnall ³ | N/M | 37 | 30 | 37 | 37 | 37 | N/A | N/A | N/A |
| Hall | I/A | I/A | 25 | 35 | 35 | 35 | Yes | Yes | Yes |
| Lowrey | 34 | I/A | 35 | 35 | 35 | 35 | Yes | Yes | Yes |
| Pryce Jones | I/A | I/A | I/A | 43 | 43 | 43 | Yes | Yes | Yes |
| Van der Drift | 33 | I/A | 26 | 37 | 36 | 35 | Yes | Yes | Yes |
| Greenwood | I/A | I/A | I/A | 35 | 35 | 35 | Yes | Yes | Yes |

Note 1: I/A = Inaudible.

Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.

Note 3: Modelled result.

Note 4: Not assessed due to non-compliant weather conditions during the Clarke operator attended measurement.

Note 5: Criteria adopted as a guide only.

Note 6: Not modelled. Compliance achieved at Atkins therefore noise levels would comply at this receiver.

Results presented in **Table 11** indicate that SMC operations during the operator attended noise monitoring at all privately owned locations under applicable weather conditions were compliant with the relevant Development Consent conditions.

5.2 Sleep Disturbance

Results of the night period sleep disturbance measurements compared with the relevant noise criteria contained in the Development Consent are given in

Table 12 Performance Assessment – Sleep Disturbance

| Location | SMC LA1(1minute) Contribution | Noise Criteria LA1(1minute) | Compliance |
|---------------------|-------------------------------|-----------------------------|------------------|
| Atkins | 33 | 45 | N/A ³ |
| Clarke ² | 43 | 45 | N/A ³ |
| Bagnall | 40 | 45 | N/A |
| Hall | 28 | 45 | Yes |
| Lowrey | 43 | 45 | Yes |
| Pryce Jones | I/A | 49 | Yes |
| Van der Drift | 27 | 45 | Yes |
| Greenwood | I/A | 45 | Yes |

Note 1: I/A = Inaudible.

Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.

Note 3: Criteria adopted as a guide only.

Table 12 indicate that SMC operations during the night-time operator-attended noise monitoring at all privately owned locations under applicable weather conditions were compliant with the relevant Development Consent conditions.

6 Conclusion

SLR was engaged by Stratford Coal Pty Limited to conduct monthly noise monitoring for the Stratford Mining Complex (SMC) operations guided by the requirements of the *Stratford Mining Complex Noise Management Plan (NMP)*, Document No. NMP-R03-A, dated 17 June 2019.

Operator-attended noise monitoring was conducted at seven residential receiver locations commencing Wednesday 19 February 2020, Thursday 20 February 2020 and Friday 21 February 2020 in order to determine the noise performance of the SMC operations against the Development Consent conditions.

Based on the measured SMC noise contribution, compliance with the relevant operational noise criteria was achieved at all privately owned receivers during the day, evening and night monitoring periods

Based on the measured SMC noise contribution, compliance with the relevant sleep disturbance noise criteria was achieved at all privately owned receivers during the night-time noise monitoring period under applicable weather conditions.

APPENDIX A

Acoustic Terminology

1. Sound Level or Noise Level

The terms ‘sound’ and ‘noise’ are almost interchangeable, except that ‘noise’ often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. ‘A’ Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an ‘A-weighting’ filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

| Sound Pressure Level (dBA) | Typical Source | Subjective Evaluation |
|----------------------------|--|-----------------------|
| 130 | Threshold of pain | Intolerable |
| 120 | Heavy rock concert | Extremely noisy |
| 110 | Grinding on steel | |
| 100 | Loud car horn at 3 m | Very noisy |
| 90 | Construction site with pneumatic hammering | |
| 80 | Kerbside of busy street | Loud |
| 70 | Loud radio or television | |
| 60 | Department store | Moderate to quiet |
| 50 | General Office | |
| 40 | Inside private office | Quiet to very quiet |
| 30 | Inside bedroom | |
| 20 | Recording studio | Almost silent |

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as ‘linear’, and the units are expressed as dB(lin) or dB.

3. Sound Power Level

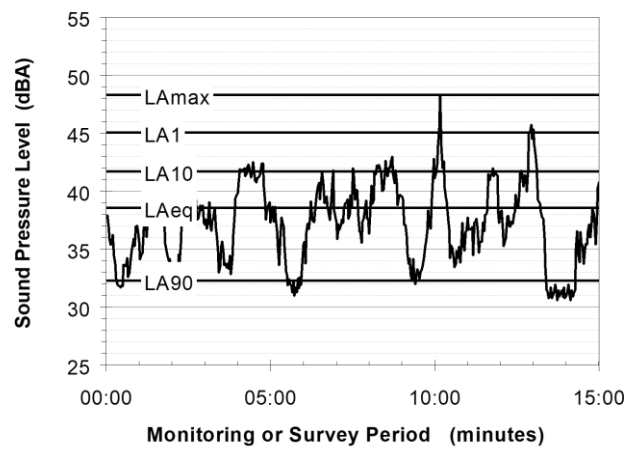
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

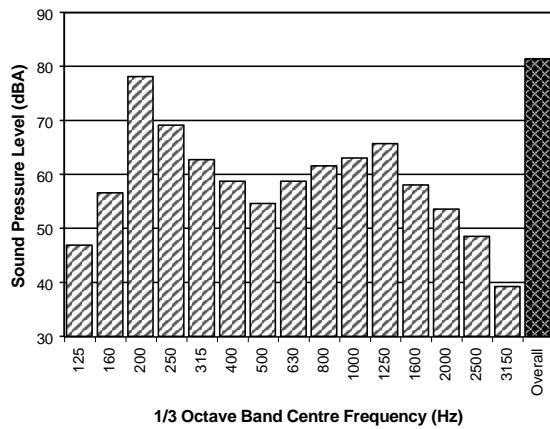
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

APPENDIX B

Operator Attended Noise Survey Charts

Figure B1 – Day Period – ‘Atkins’ Operator Attended Noise Survey Results

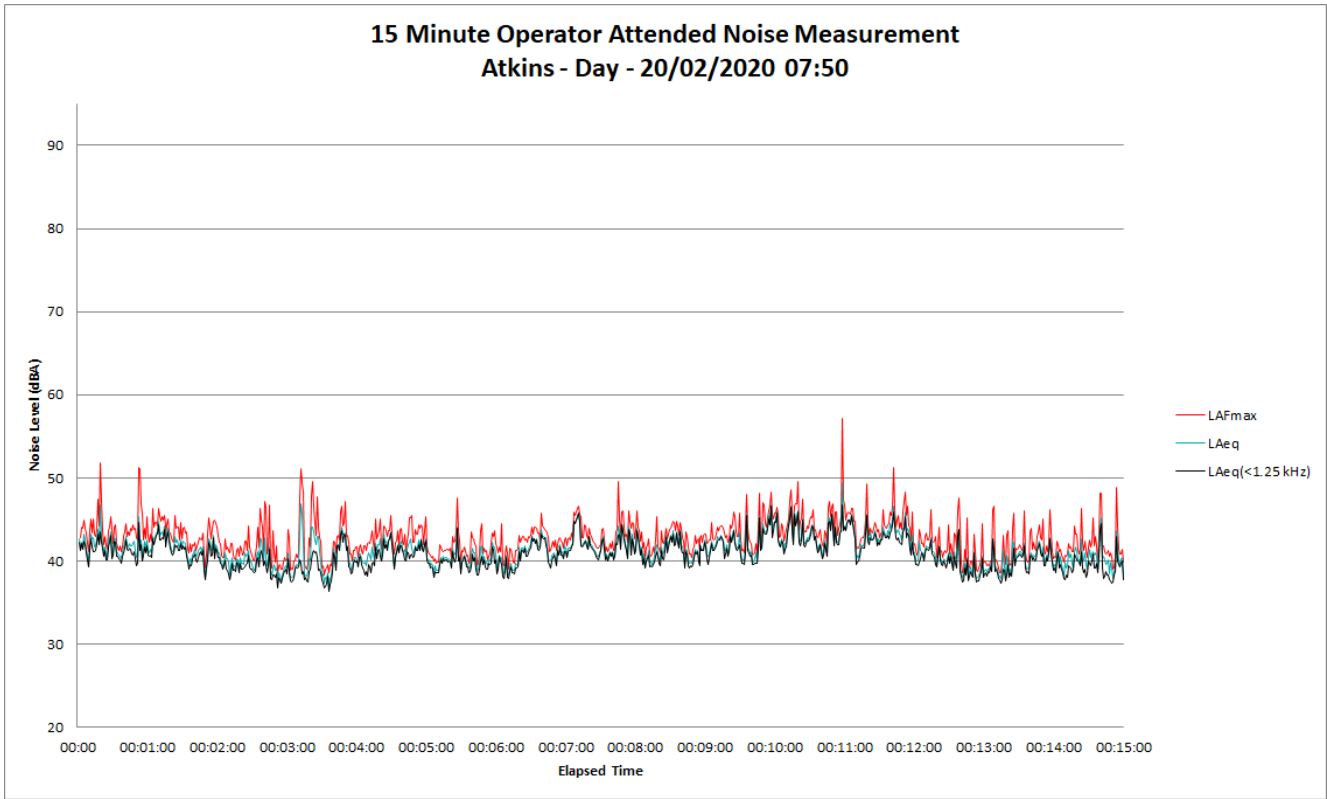


Figure B2 – Day Period – ‘Atkins’ Operator Attended Remeasure Noise Survey Results

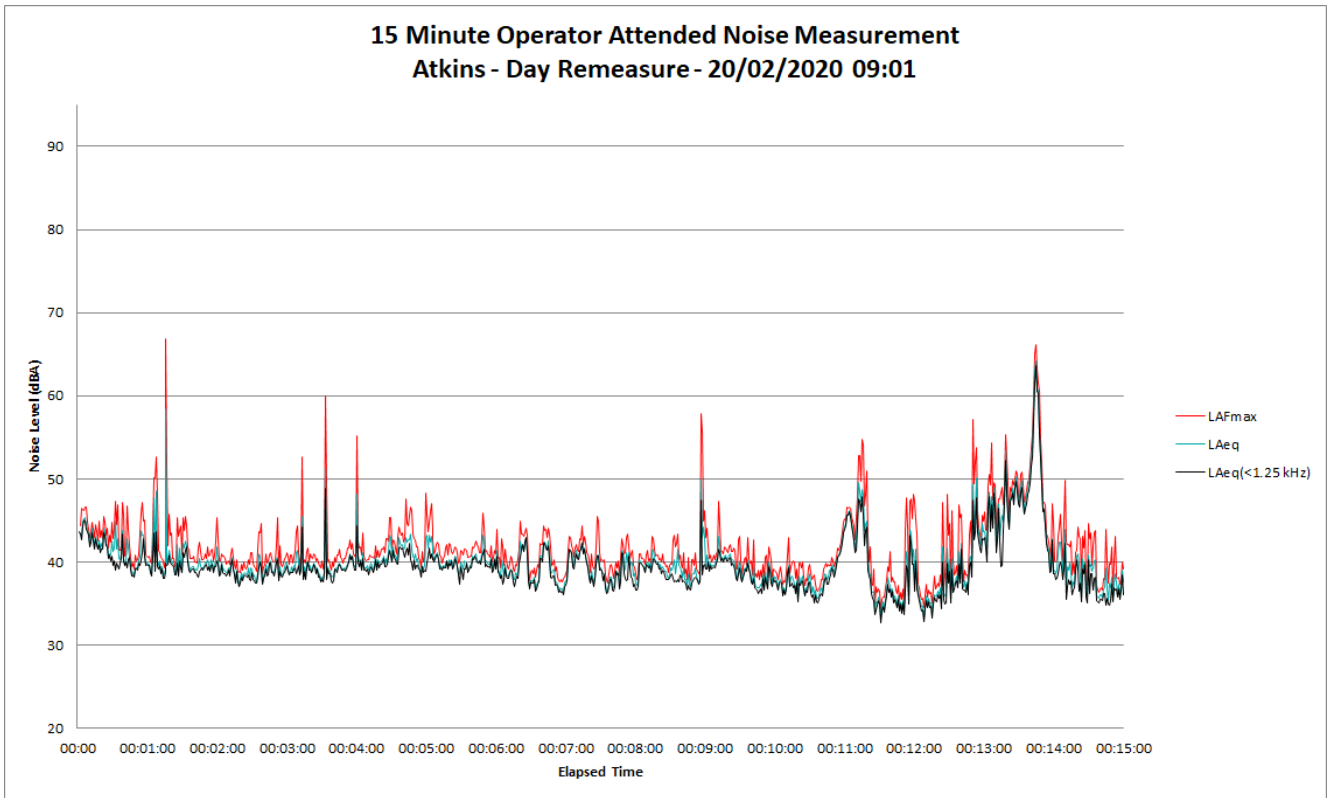


Figure B3 – Evening Period – ‘Atkins’ Operator Attended Noise Survey Results

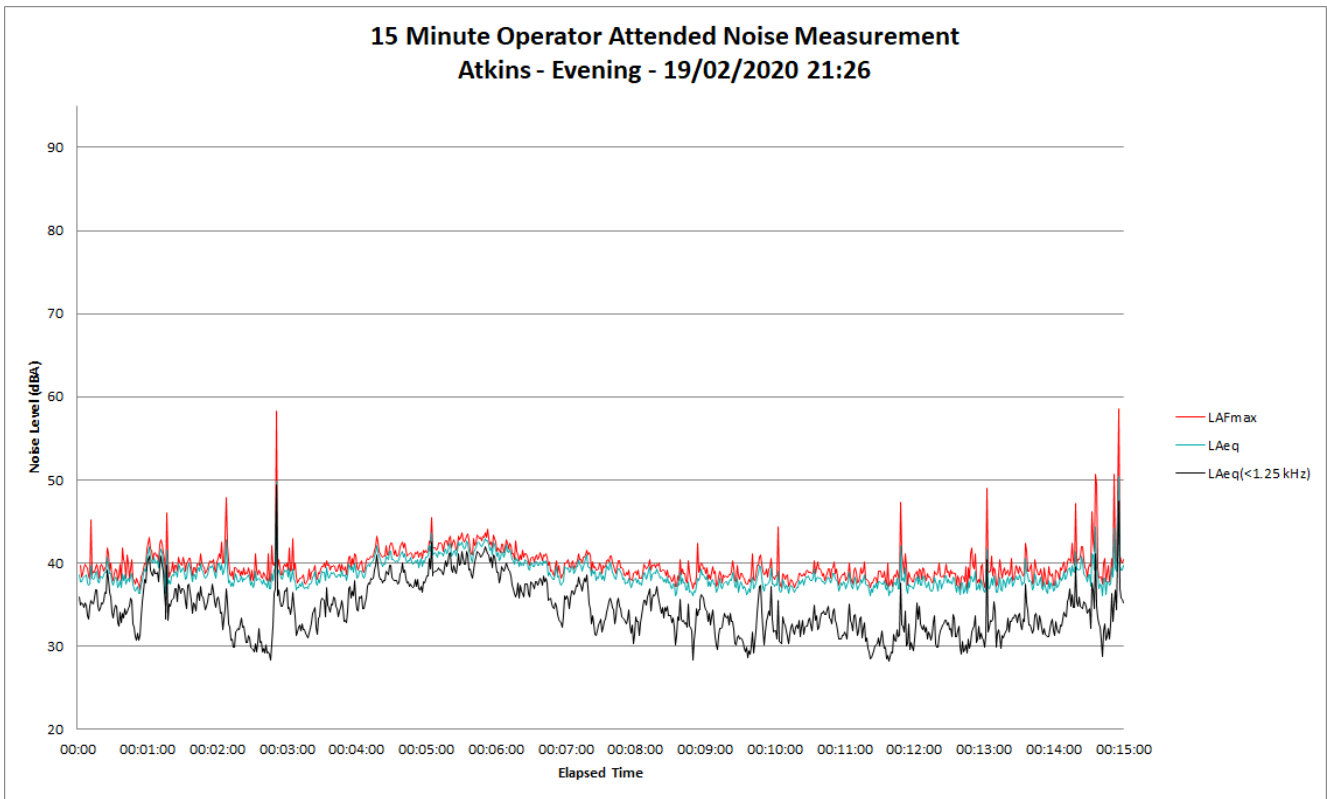


Figure B4 – Night Period – ‘Atkins’ Operator Attended Noise Survey Results

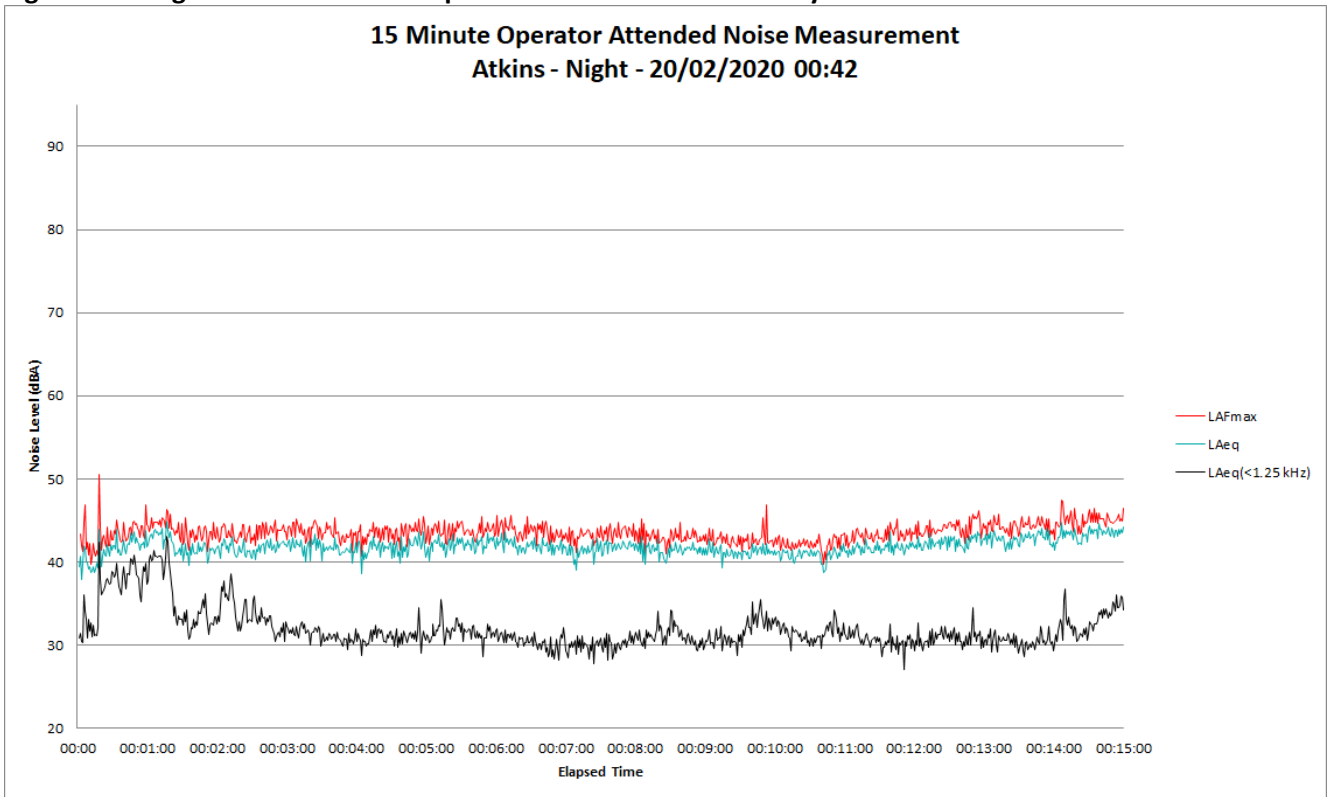


Figure B5 – Day Period – ‘Clarke’ Operator Attended Noise Survey Results

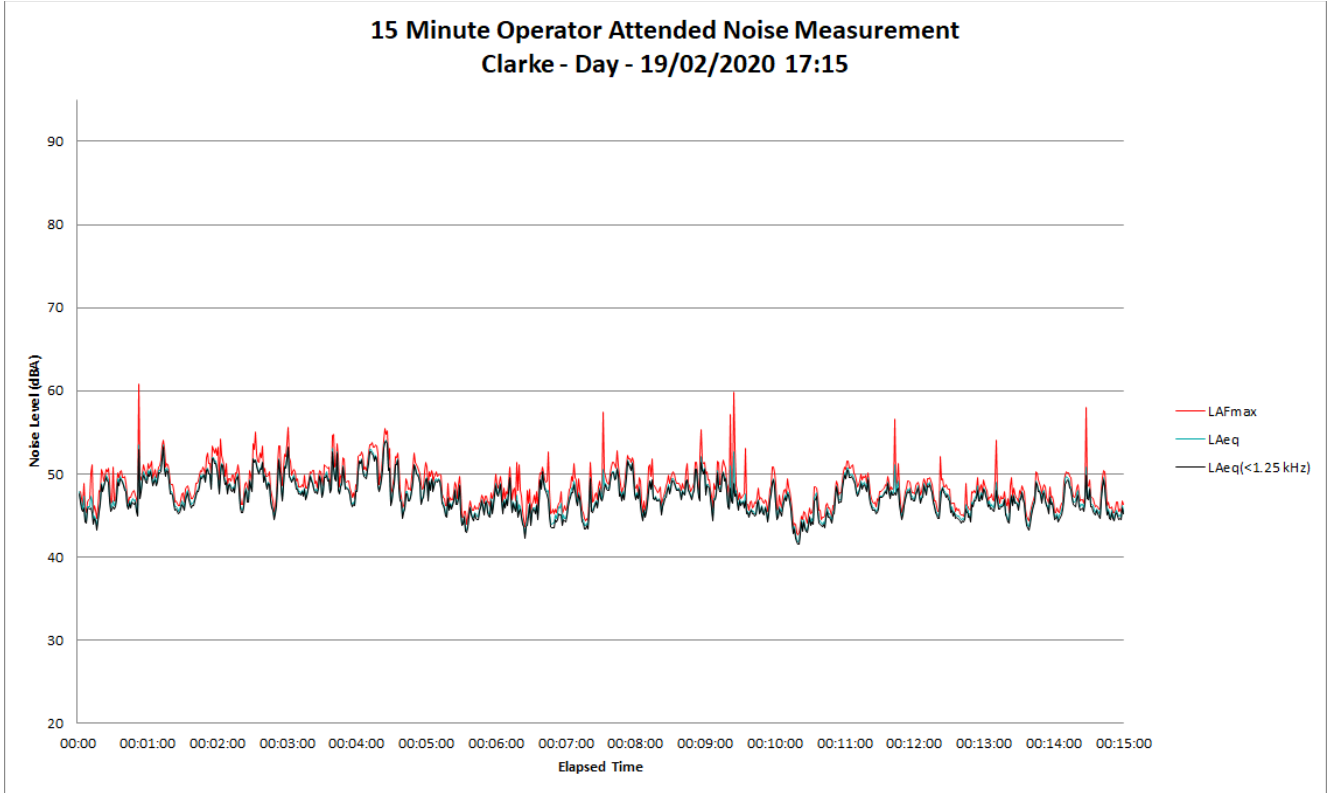


Figure B6 – Evening Period – ‘Clarke’ Operator Attended Noise Survey Results

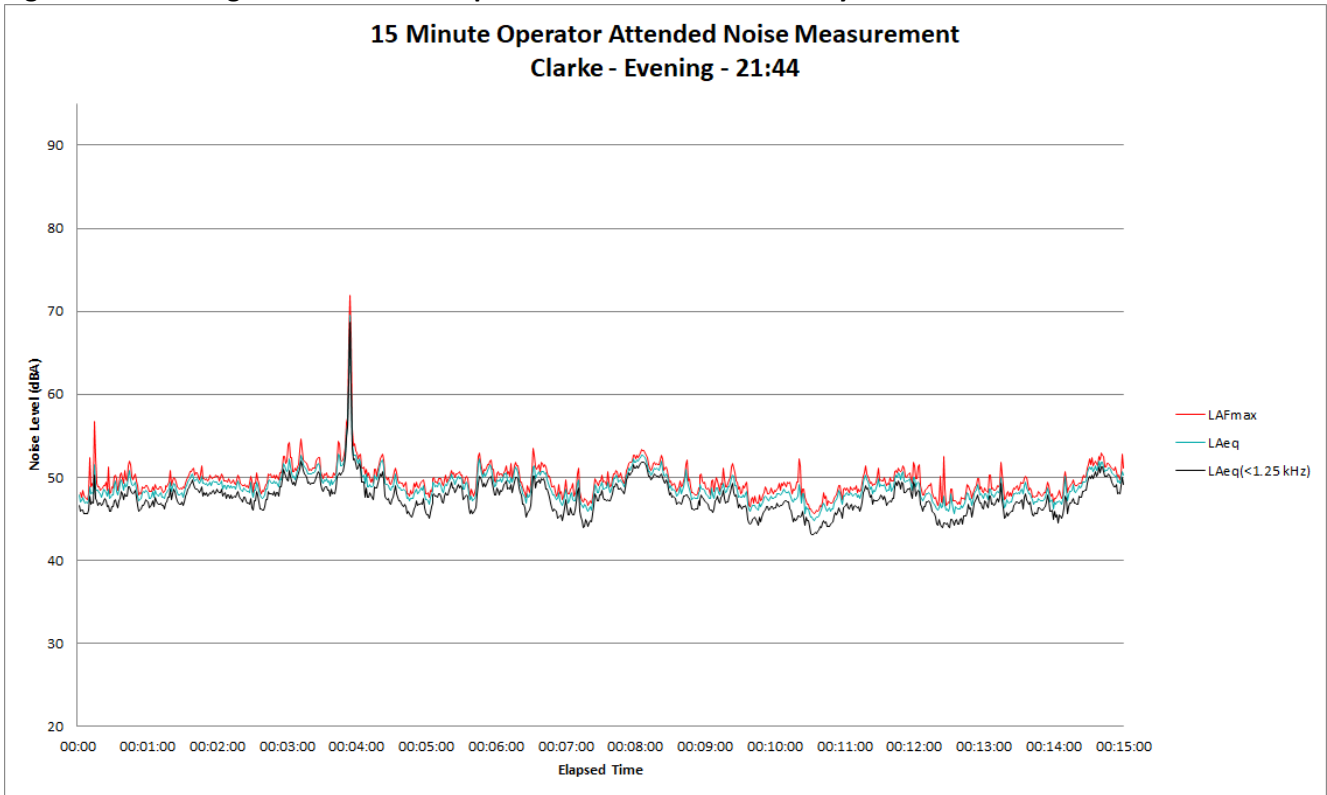


Figure B7 – Night Period – ‘Clarke’ Operator Attended Noise Survey Results

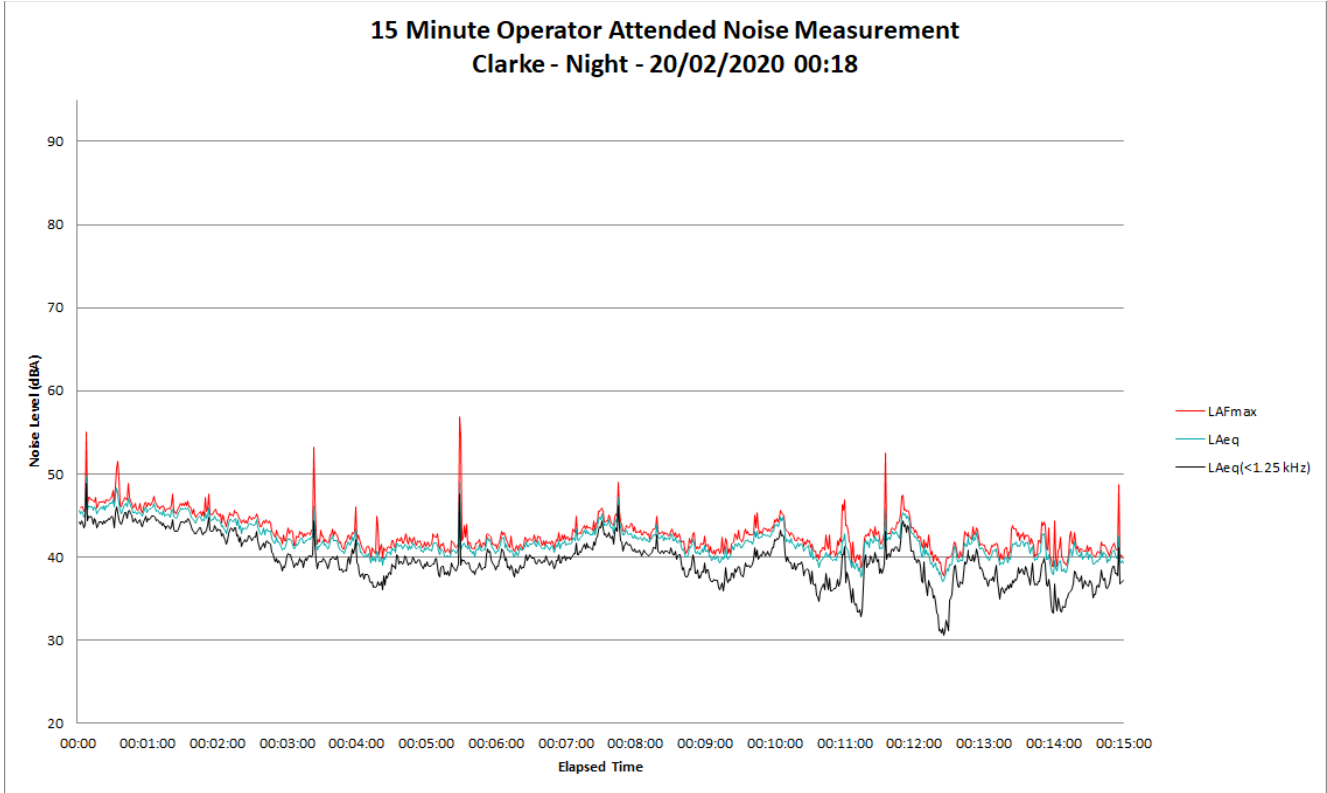


Figure B8 – Day Period – ‘Hall’ Operator Attended Noise Survey Results

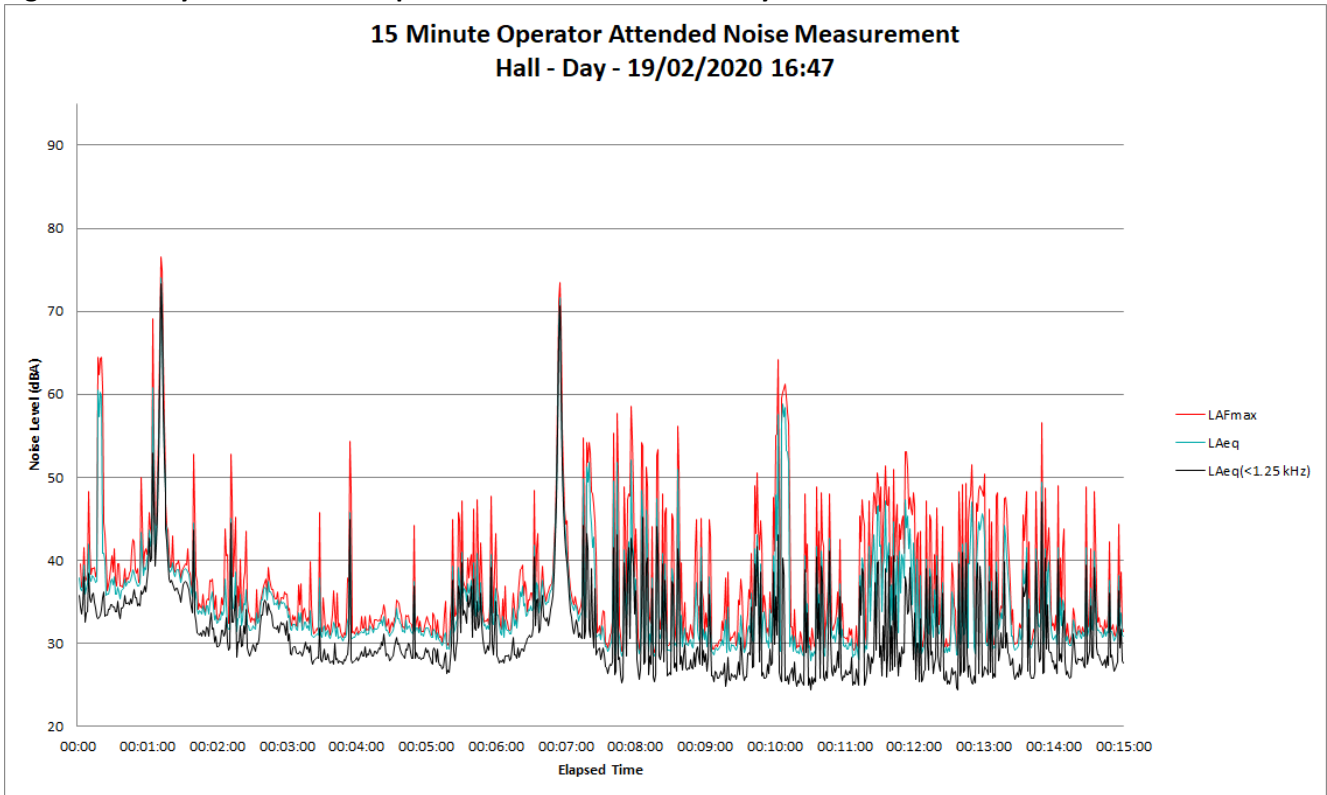


Figure B9 – Evening Period – ‘Hall’ Operator Attended Noise Survey Results

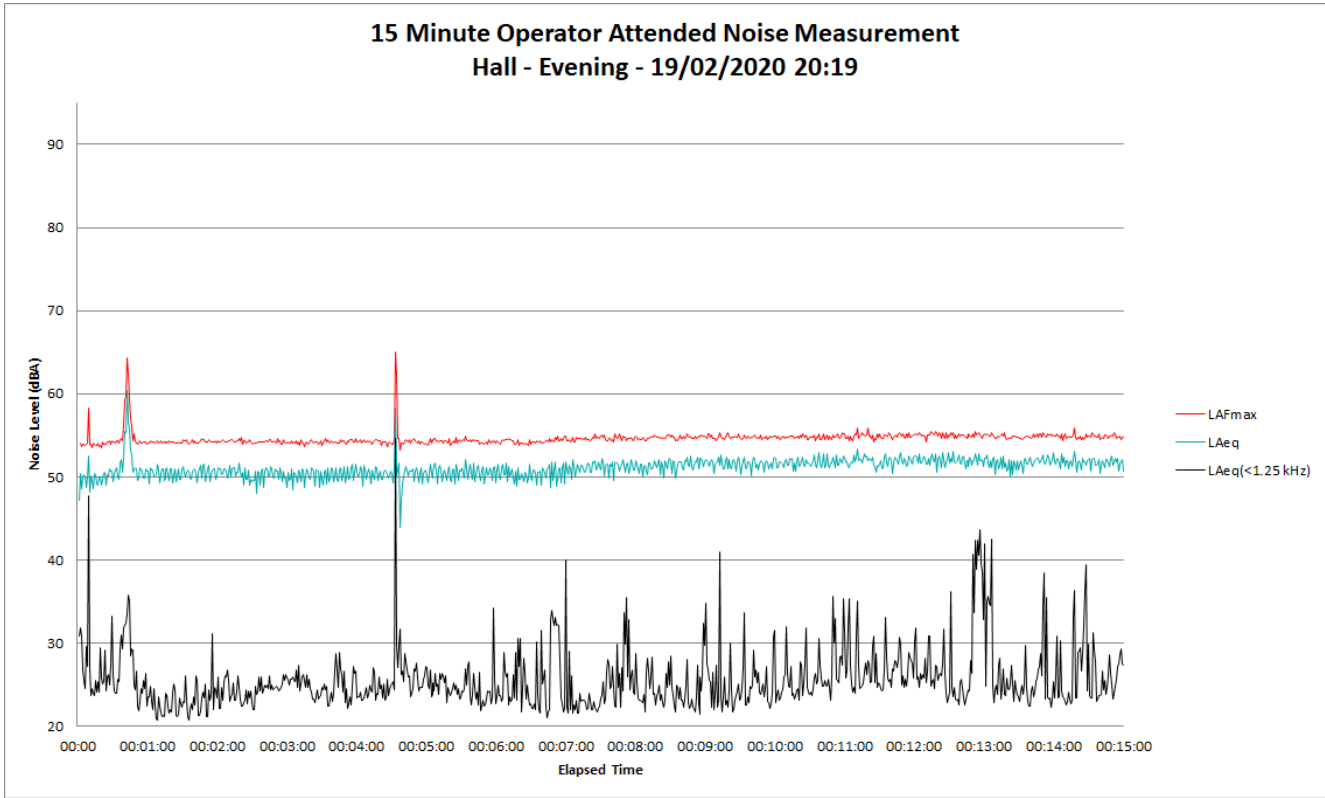


Figure B10 – Night Period – ‘Hall’ Operator Attended Noise Survey Results

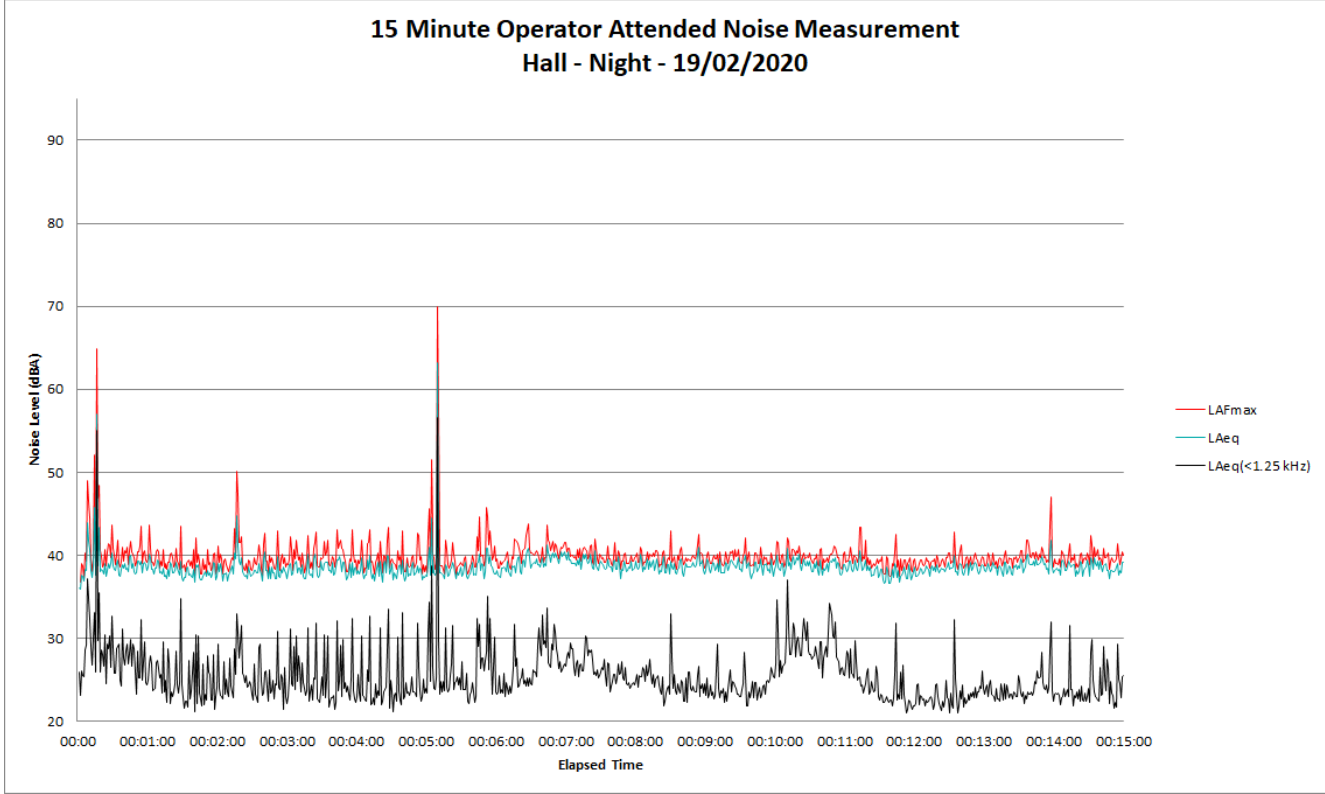


Figure B11 – Day Period – ‘Lowrey’ Operator Attended Noise Survey Results

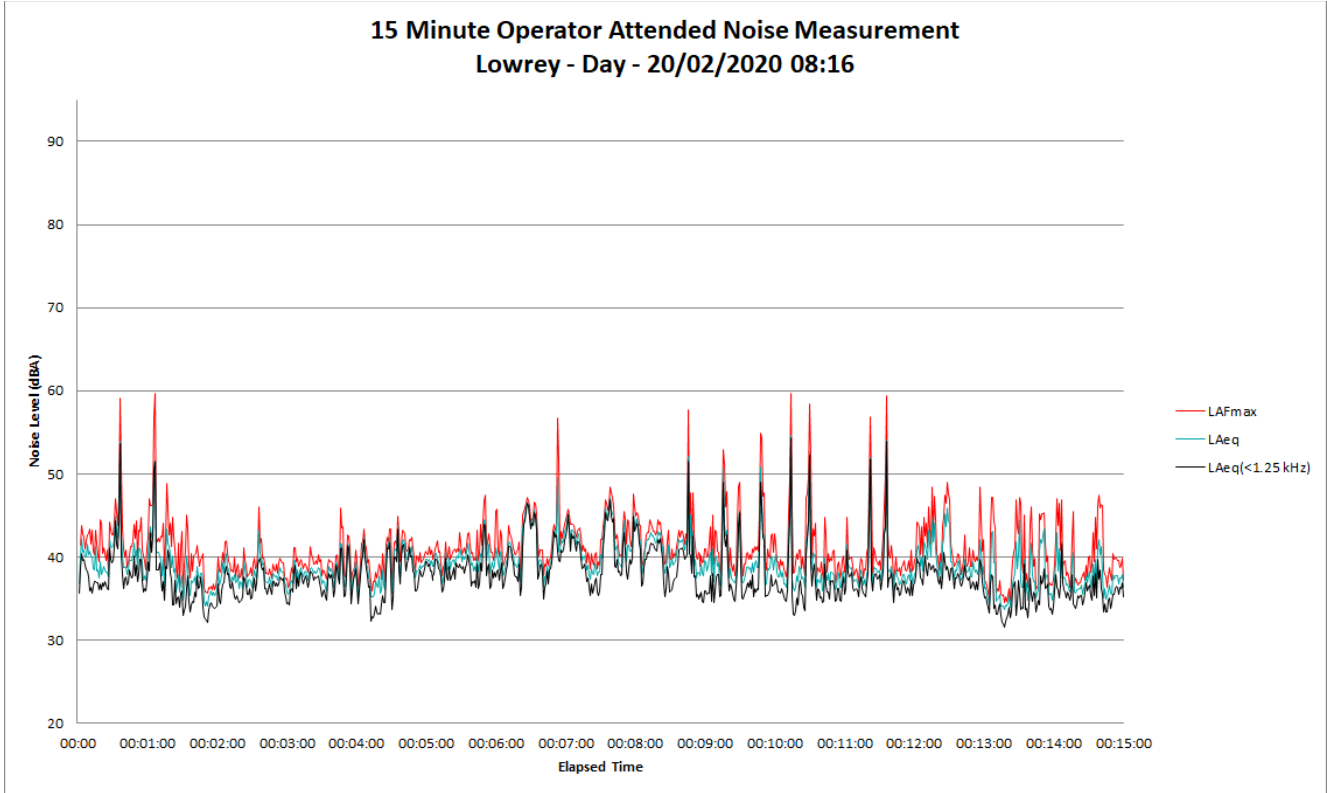


Figure B12 – Evening Period – ‘Lowrey’ Operator Attended Noise Survey Results

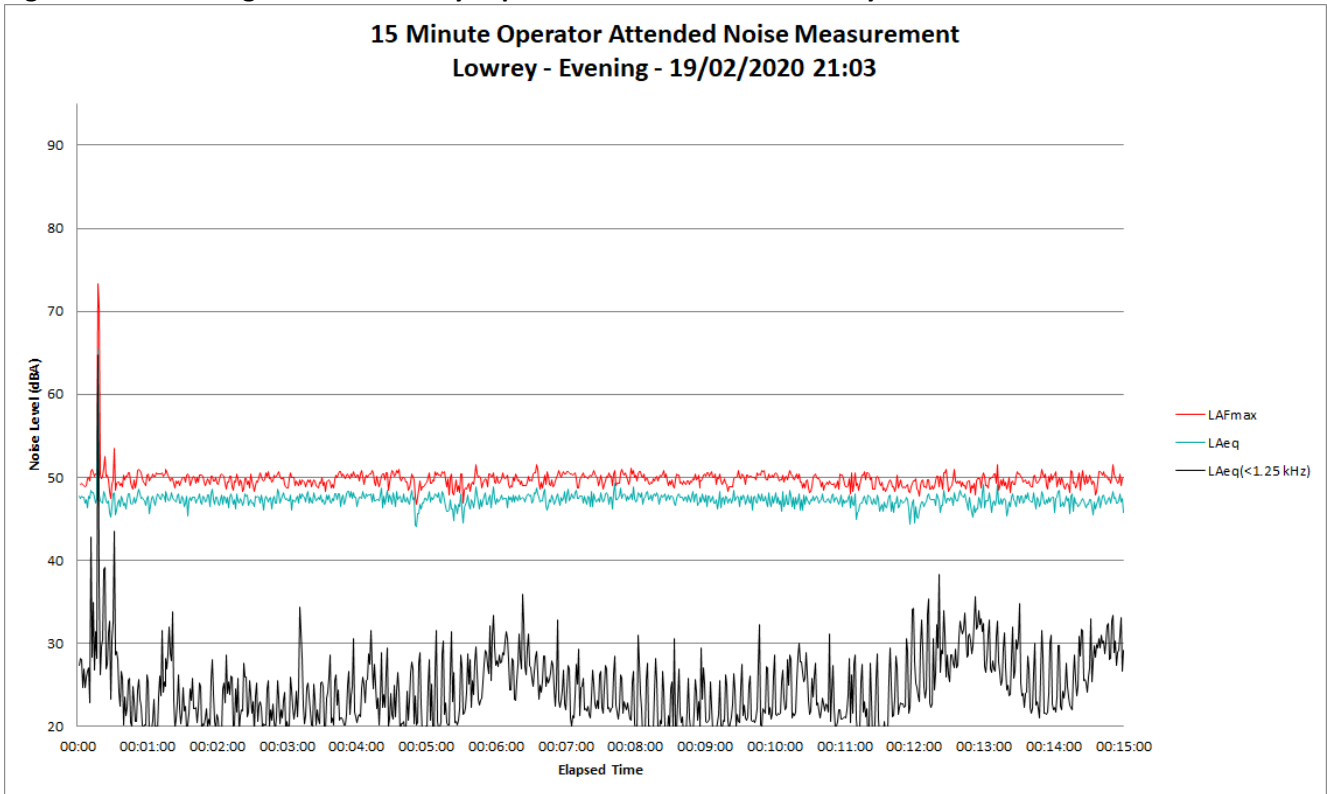


Figure B13 – Night Period – ‘Lowrey’ Operator Attended Noise Survey Results

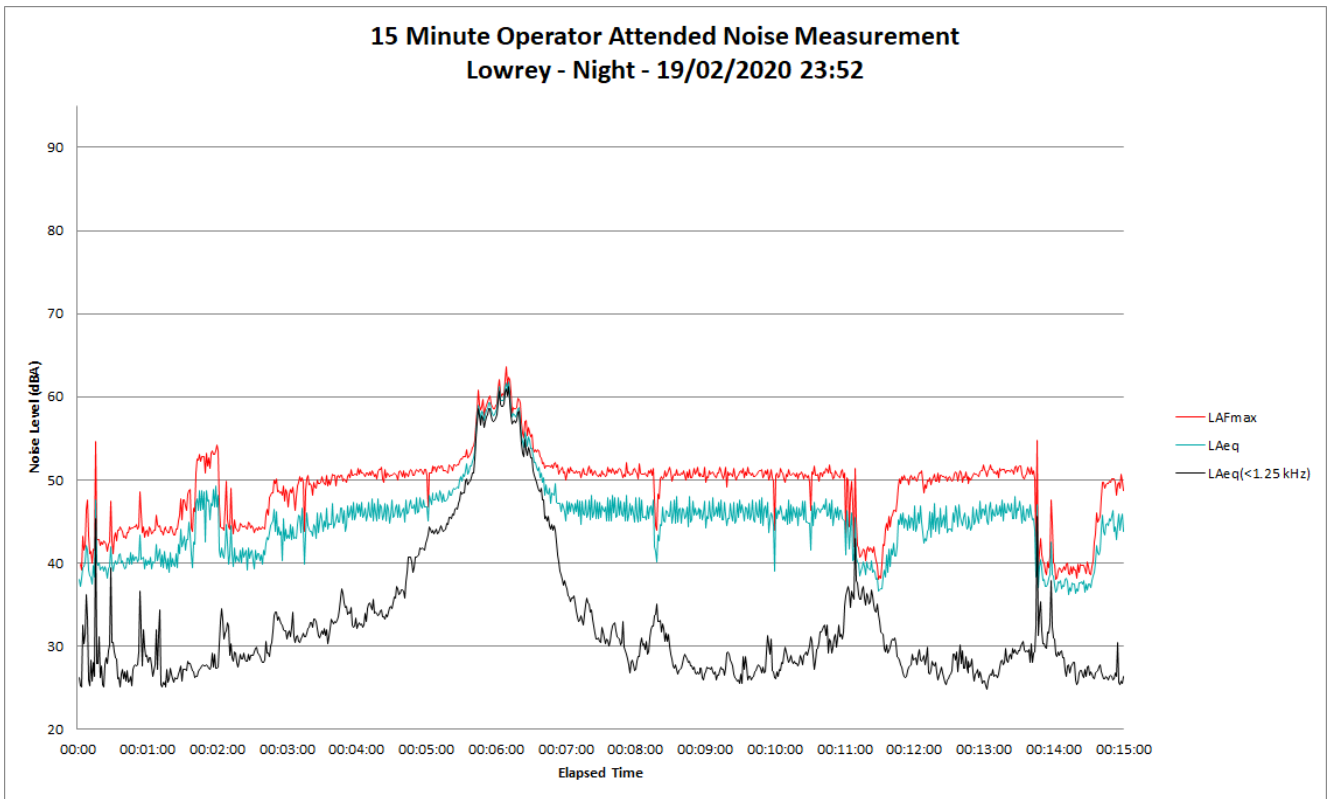


Figure B14 – Day Period – ‘Pryce Jones’ Operator Attended Noise Survey Results

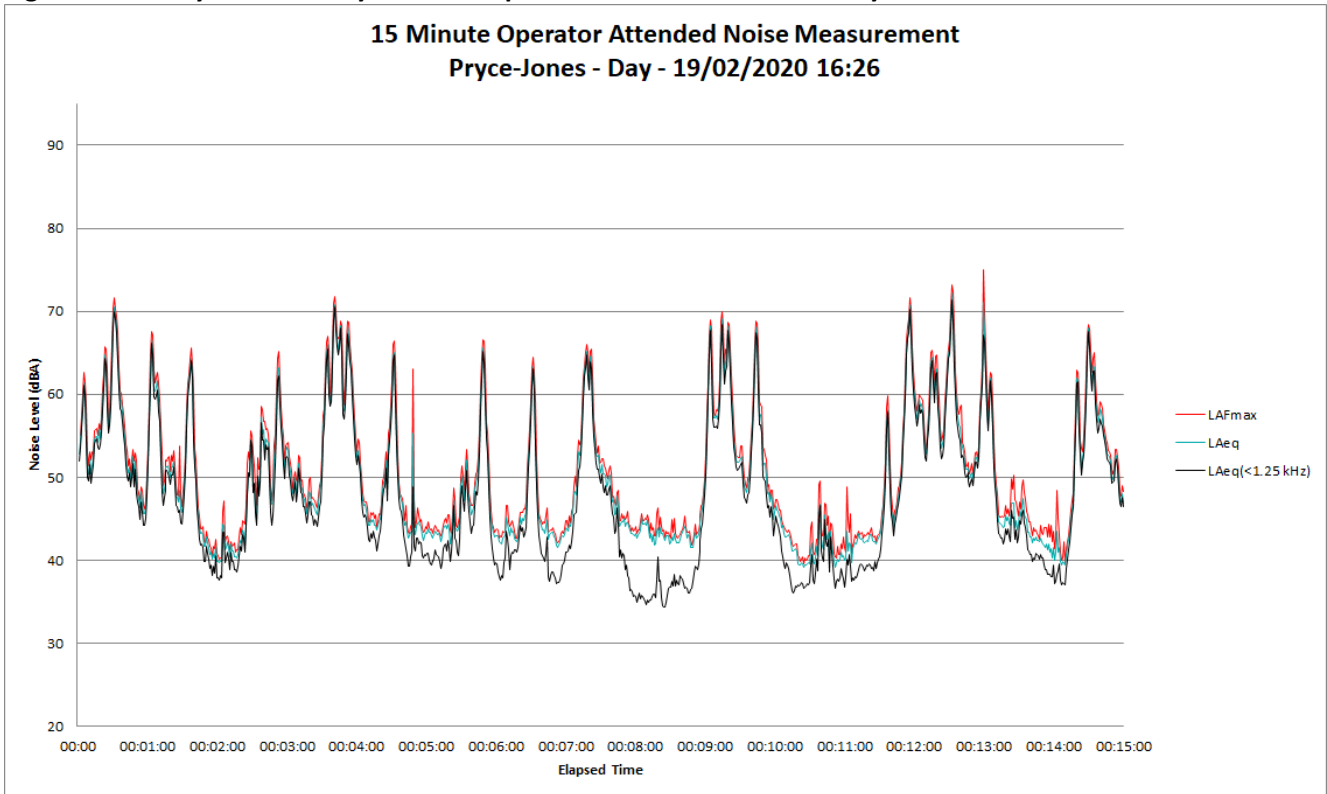


Figure B15 – Evening Period – ‘Pryce Jones’ Operator Attended Noise Survey Results

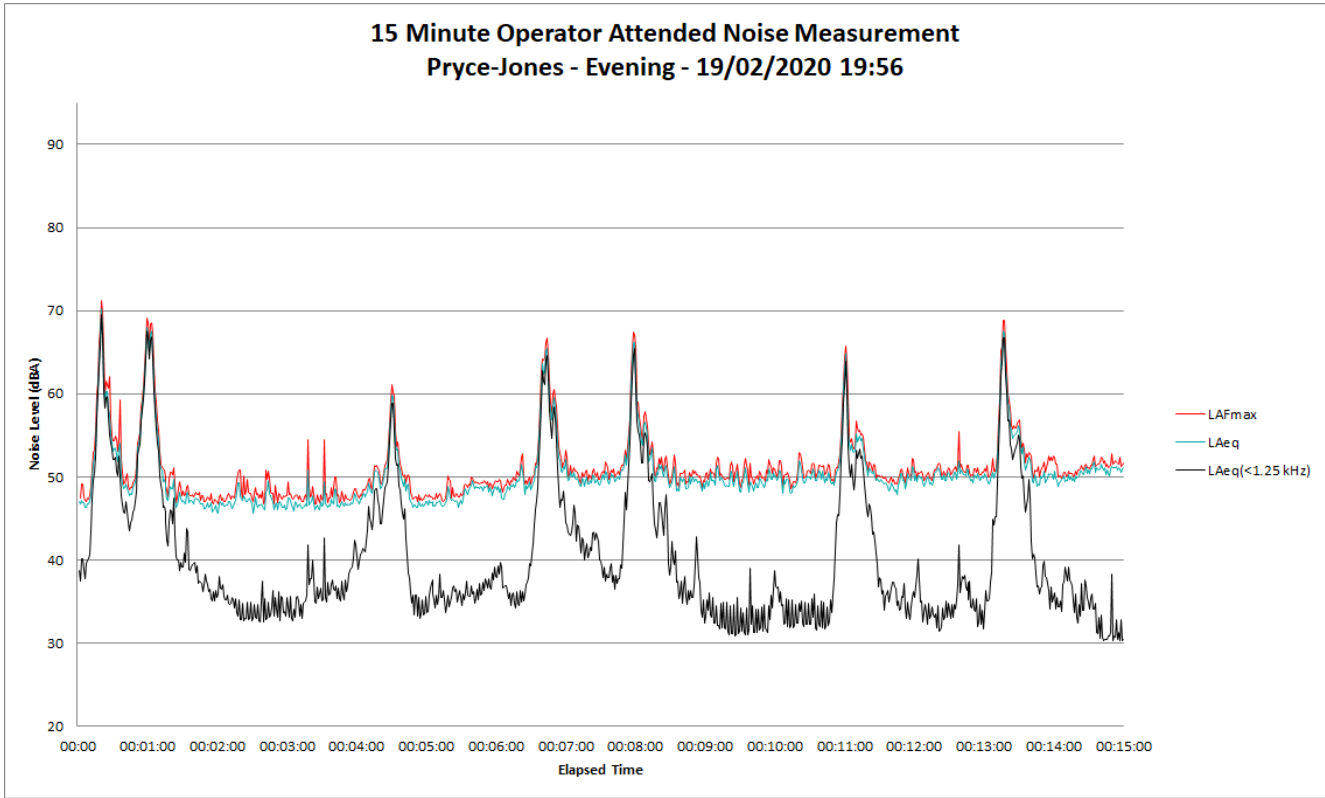


Figure B16 – Night Period – ‘Pryce Jones’ Operator Attended Noise Survey Results

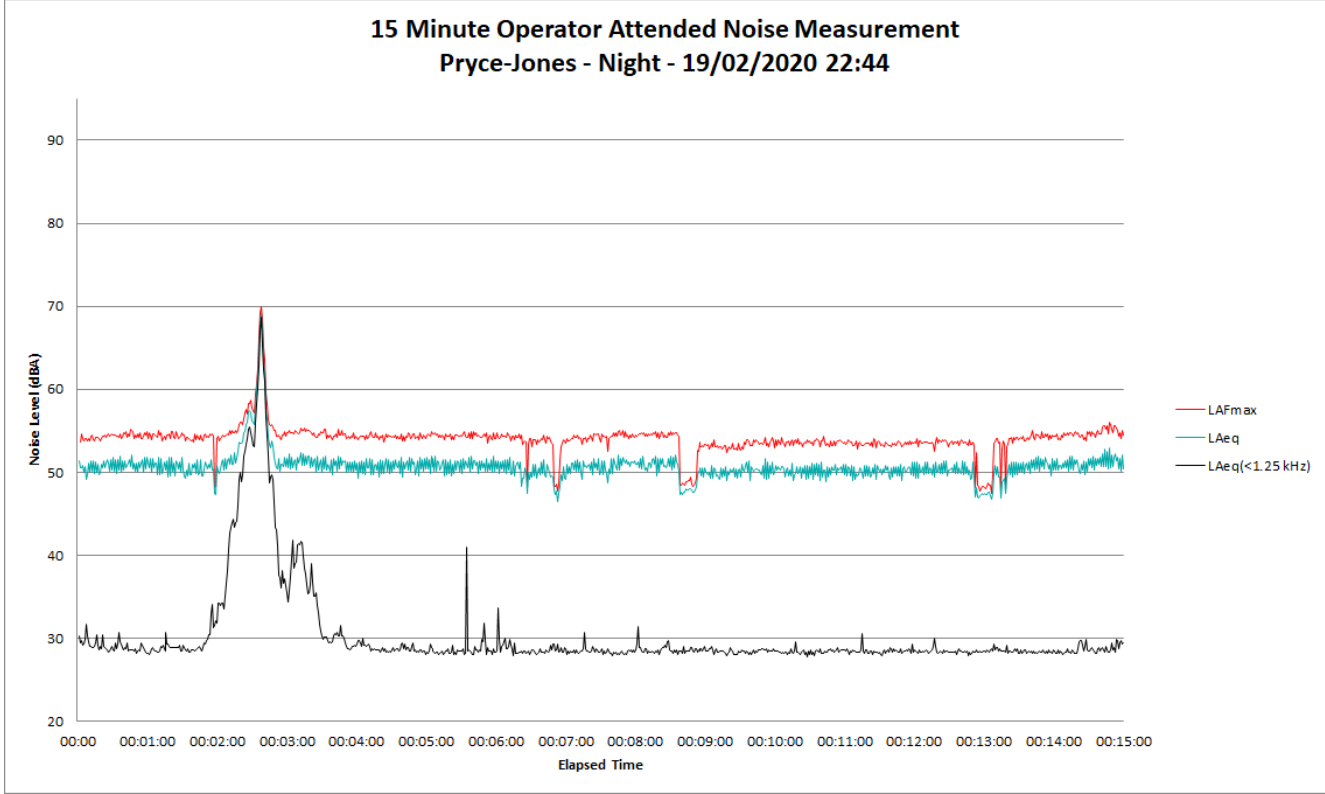


Figure B17 – Day Period – ‘Van der Drift’ Operator Attended Noise Survey Results

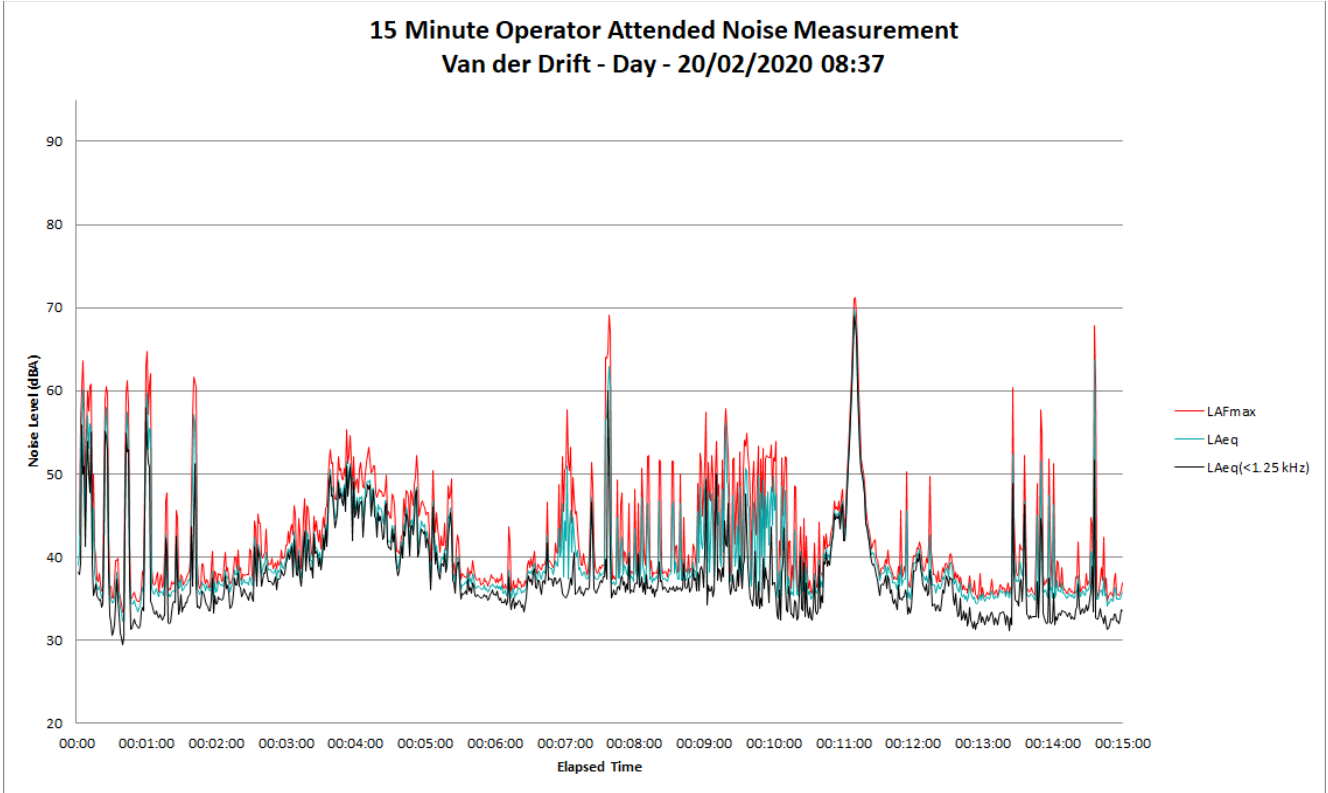


Figure B18 – Evening Period – ‘Van der Drift’ Operator Attended Noise Survey Results

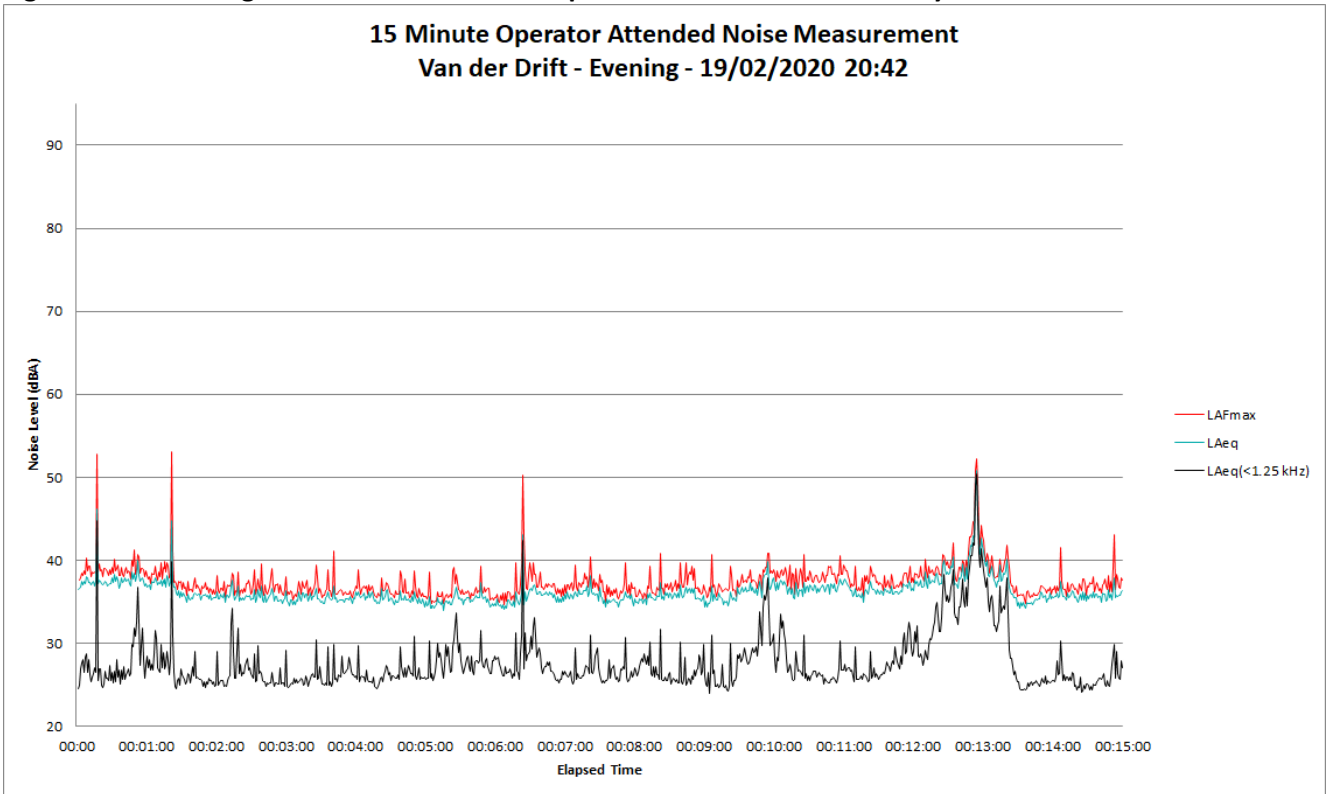


Figure B19 – Night Period – ‘Van der Drift’ Operator Attended Noise Survey Results

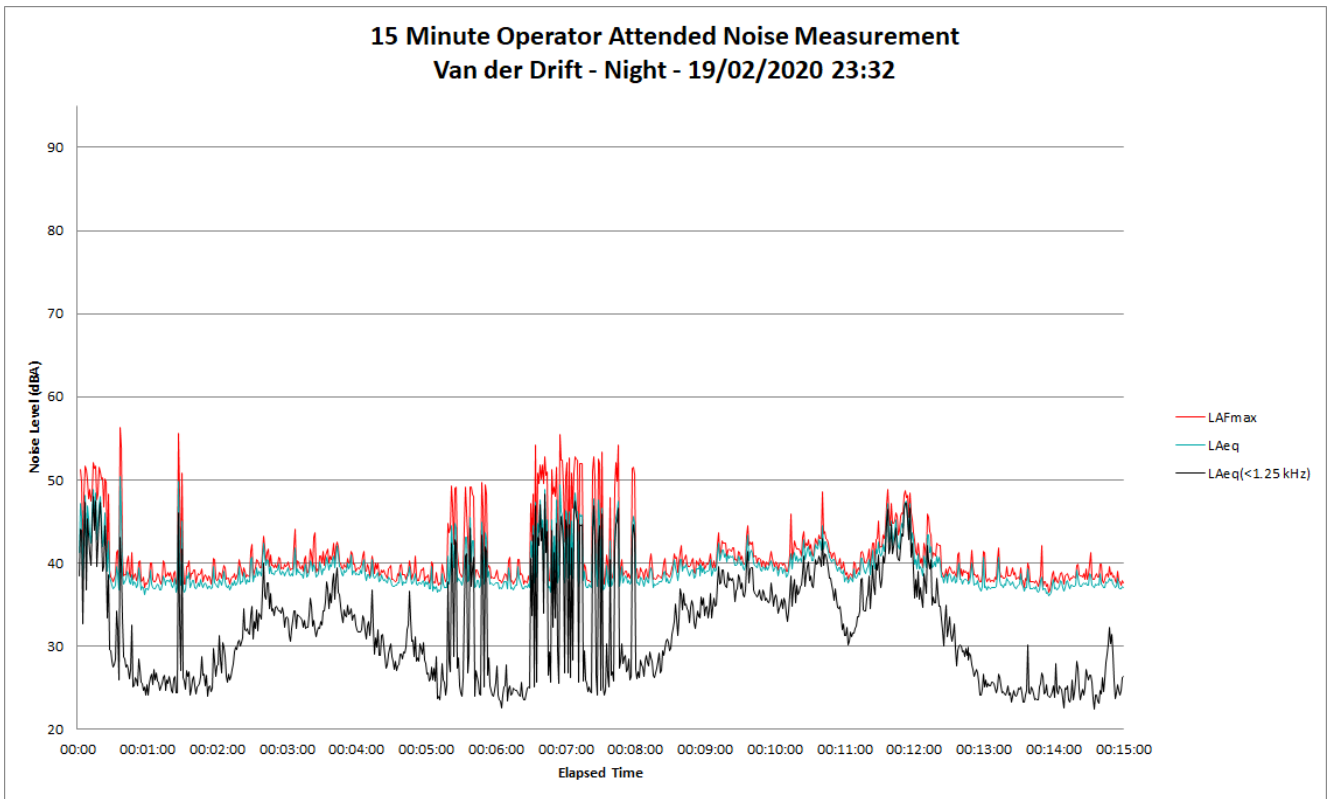


Figure B20 – Day Period – ‘Greenwood’ Operator Attended Noise Survey Results

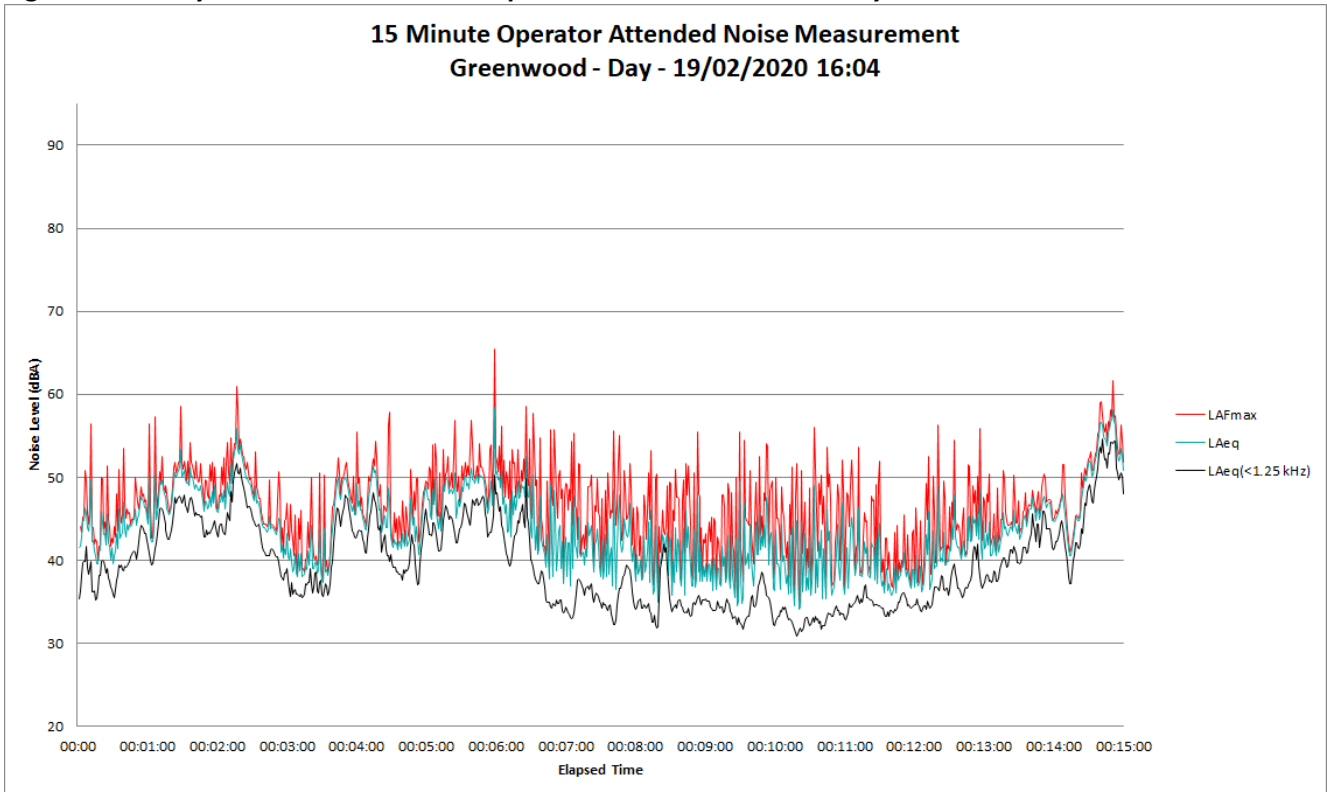


Figure B21 – Evening Period – ‘Greenwood’ Operator Attended Noise Survey Results

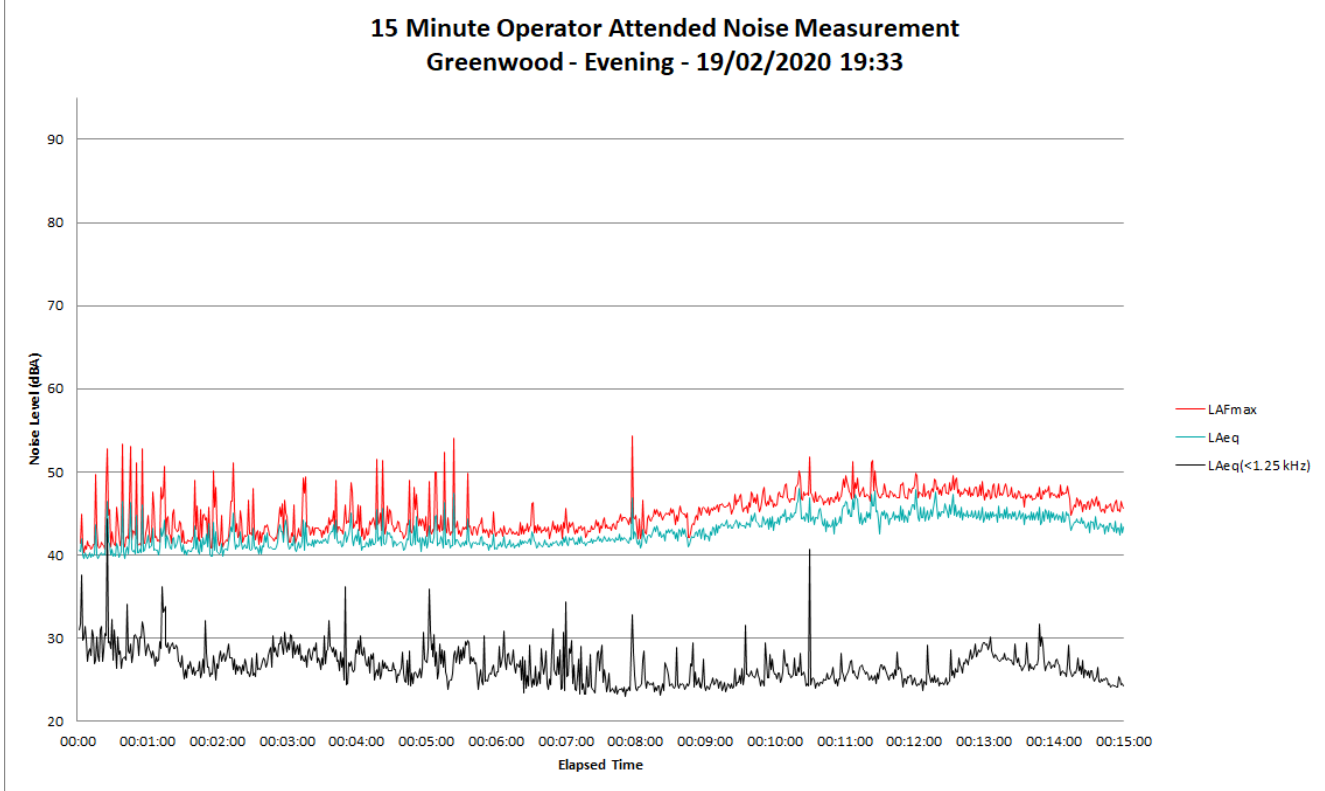
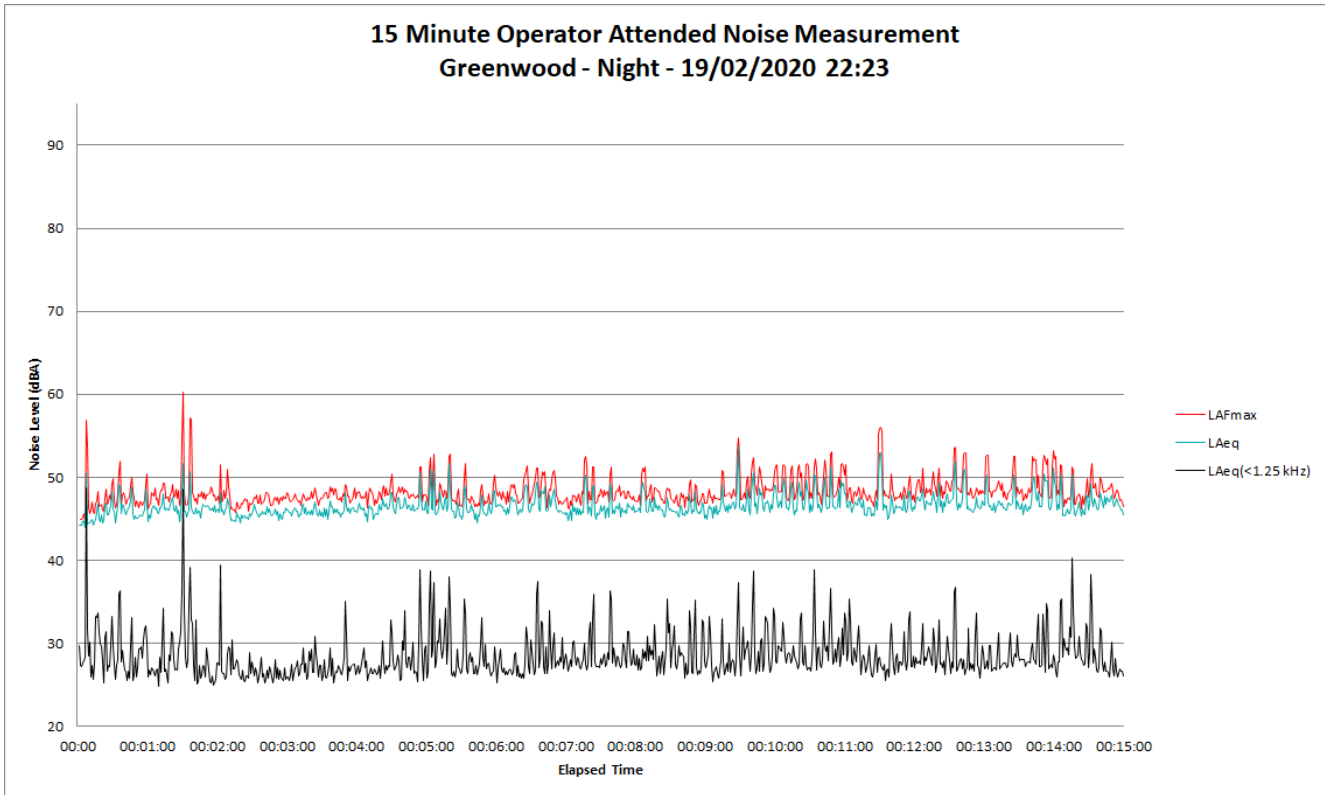


Figure B22 – Night Period – ‘Greenwood’ Operator Attended Noise Survey Results



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