

# STRATFORD MINING COMPLEX

**Monthly Compliance Noise Monitoring  
March 2020**

**Prepared for:**

Stratford Coal Pty Ltd  
PO Box 168  
Gloucester NSW 2442

SLR Ref: 630.11771-R28  
Version No: -v1.0  
May 2020



## PREPARED BY

SLR Consulting Australia Pty Ltd  
ABN 29 001 584 612  
10 Kings Road  
New Lambton NSW 2305 Australia  
(PO Box 447 New Lambton NSW 2305)  
T: +61 2 4037 3200  
E: newcastleau@slrconsulting.com www.slrconsulting.com

## 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.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

## DOCUMENT CONTROL

| Reference          | Date       | Prepared       | Checked          | Authorised       |
|--------------------|------------|----------------|------------------|------------------|
| 630.11771-R28-v1.0 | 1 May 2020 | Shannon Harvey | Martin Davenport | Martin Davenport |
|                    |            |                |                  |                  |
|                    |            |                |                  |                  |
|                    |            |                |                  |                  |
|                    |            |                |                  |                  |
|                    |            |                |                  |                  |



## CONTENTS

|          |  |           |
|----------|--|-----------|
| <b>1</b> | <b>INTRODUCTION .....</b>  | <b>6</b>  |
| <b>2</b> | <b>SMC NOISE CRITERIA .....</b>  | <b>7</b>  |
| 2.1      | Project Approval Schedule 3 Environmental Performance Conditions ..... | 7         |
| 2.2      | EPL Noise Limits – SMC Operations .....                                | 9         |
| 2.3      | Noise Limits at the Nominated Attended Noise Monitoring Locations..... | 9         |
| 2.4      | Assessment of Low-frequency Emissions .....                            | 9         |
| <b>3</b> | <b>OPERATIONAL NOISE MONITORING METHODOLOGY .....</b>                  | <b>10</b> |
| 3.1      | General Requirements.....  | 10        |
| 3.2      | Operator-attended Noise Monitoring Locations .....                     | 11        |
| <b>4</b> | <b>RESULTS .....</b>   | <b>13</b> |
| 4.1      | Operator-attended Noise Monitoring – SMC Operational Activity .....    | 13        |
| 4.1.1    | Operator-attended Noise Survey Results – ‘Atkins’ .....                | 14        |
| 4.1.2    | Operator-attended Noise Survey Results - ‘Clarke’ .....                | 15        |
| 4.1.3    | Operator-attended Noise Survey Results - ‘Hall’ .....                  | 16        |
| 4.1.4    | Operator-attended Noise Survey Results - ‘Lowrey’ .....                | 17        |
| 4.1.5    | Operator-attended Noise Survey Results - ‘Pryce-Jones’ .....           | 18        |
| 4.1.6    | Operator-attended Noise Survey Results – ‘Van der Drift’ .....         | 19        |
| 4.1.7    | Operator-attended Noise Survey Results – ‘Greenwood’ .....             | 20        |
| 4.2      | Rail Noise Monitoring .....  | 21        |
| <b>5</b> | <b>PERFORMANCE ASSESSMENT .....</b>                                    | <b>21</b> |
| <b>6</b> | <b>SLEEP DISTURBANCE.....</b>  | <b>22</b> |
| <b>7</b> | <b>CONCLUSION.....</b>   | <b>23</b> |

## DOCUMENT REFERENCES

### TABLES

|          |  |    |
|----------|--|----|
| Table 1  | Noise Limits for the Nominated Noise Monitoring Locations..... | 9  |
| Table 2  | SMC Operational Noise Monitoring Locations.....                | 11 |
| Table 3  | Operator-attended Noise Survey Results - ‘Atkins’ .....        | 14 |
| Table 4  | Operator-attended Noise Survey Results - ‘Clarke’ .....        | 15 |
| Table 5  | Operator-attended Noise Survey Results - ‘Hall’ .....          | 16 |
| Table 6  | Attended Noise Survey Results - ‘Lowrey’ .....                 | 17 |
| Table 7  | Attended Noise Survey Results – ‘Pryce Jones’ .....            | 18 |
| Table 8  | Attended Noise Survey Results – ‘Van der Drift’ .....          | 19 |
| Table 9  | Attended Noise Survey Results – ‘Greenwood’ .....              | 20 |
| Table 10 | Operator-attended Rail Noise Monitoring Results .....          | 21 |

## CONTENTS

|          |   |    |
|----------|---|----|
| Table 11 | Performance Assessment - Operations.....        | 21 |
| Table 12 | Performance Assessment – Sleep Disturbance..... | 22 |

## FIGURES

|          |  |    |
|----------|--|----|
| Figure 1 | Stratford Mining Complex Attended Noise Monitoring Locations ..... | 12 |
|----------|--|----|

## APPENDICES

|            |                                       |
|------------|---------------------------------------|
| Appendix A | Acoustics 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 on Tuesday 24 March 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*

| <b>Property ID</b>    |                |
|-----------------------|----------------|
| 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*

| <b>Property ID</b> | <b>Property ID</b>     |
|--------------------|------------------------|
| 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"> <li>Open cut mining operations in the Bowens Road North and Roseville West Extension pits</li> <li>Recovery and transport of CHPP rejects for re-processing</li> <li>Construction of the noise mitigation bunds on the western side of the Avon North, Roseville West Extension and Stratford East pits</li> </ul> | 7 am to 6 pm, 7 days per week   |
| <ul style="list-style-type: none"> <li>Open cut mining operations in the Avon North and Stratford East pits</li> <li>Coal processing, loading and dispatch of product coal trains</li> </ul>  | 24 hours a day, 7 days per week |
| <ul style="list-style-type: none"> <li>Maintenance activities</li> </ul>  | 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<br><i>L<sub>Aeq(15 min)</sub></i> | Evening<br><i>L<sub>Aeq(15 min)</sub></i> | Night<br><i>L<sub>Aeq(15 min)</sub></i> | Night<br><i>L<sub>A1(1 min)</sub></i> |
|--------------------------------------|---------------------------------------|---|---|---------------------------------------|
| 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 <sup>1</sup>      | 35                                    | 35      | 35    | 45                           |
| Clarke <sup>1,2</sup>    | 37                                    | 37      | 37    | 45                           |
| Hall                     | 35                                    | 35      | 35    | 45                           |
| Lowrey                   | 35                                    | 35      | 35    | 45                           |
| Pryce Jones <sup>3</sup> | 43                                    | 43      | 43    | 49                           |
| Van der Drift            | 37                                    | 36      | 35    | 45                           |
| Greenwood                | 35                                    | 35      | 35    | 45                           |

Note 1: Owned by Stratford Coal Pty Ltd

Note 2: 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 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 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  $\pm 0.5$  dBA.

All operator-attended noise measurements were conducted using a one-third octave integrating Brüel & Kjær Type 2250L (s/n 3003389) and Brüel & Kjær Type 2270 (s/n 2697354) together with a Svantek SV30A acoustical calibrator (s/n 39462).

## 3.2 Operator-attended Noise Monitoring Locations

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

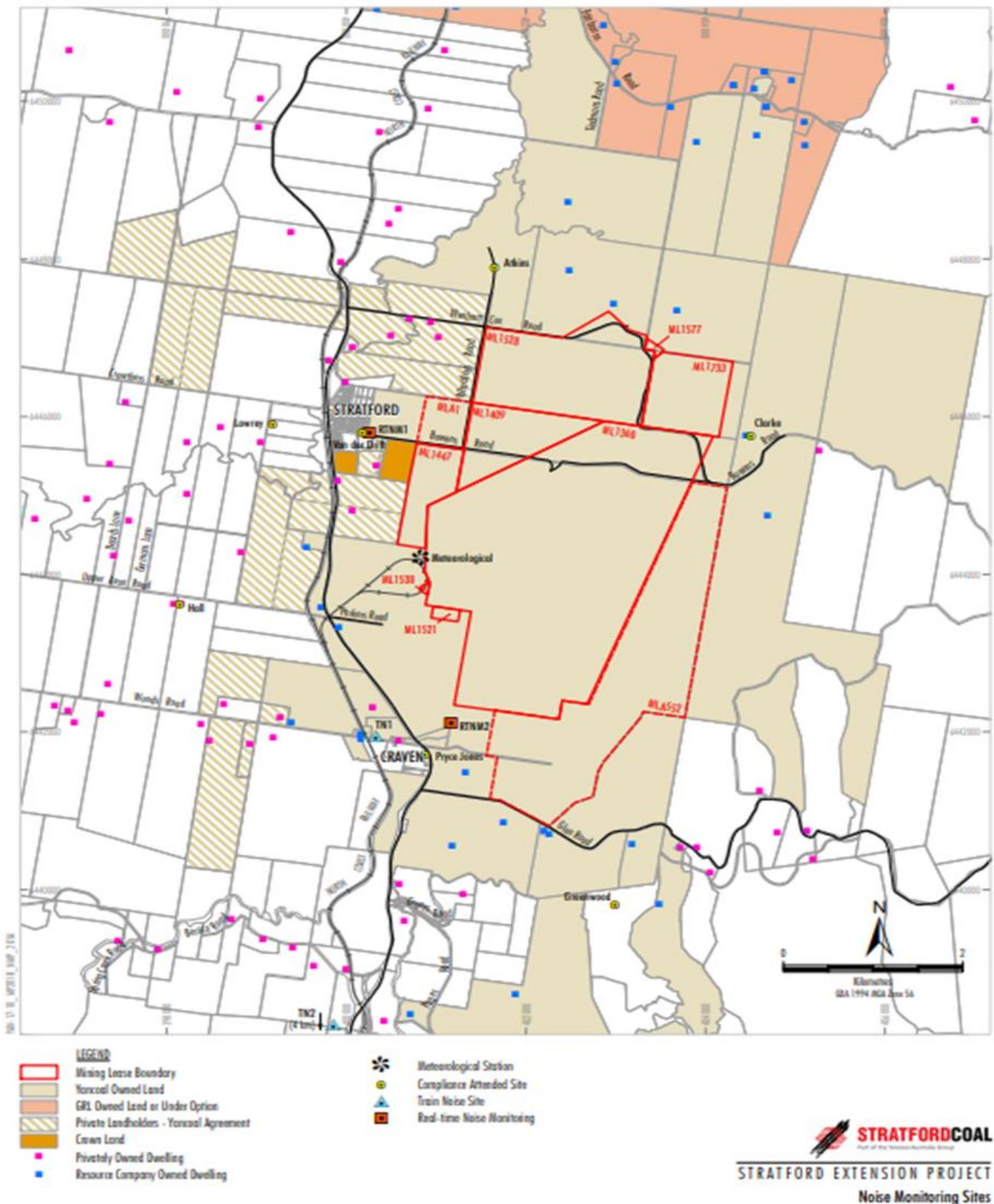
Operator-attended noise measurements were conducted during the day, evening and night-time period for a minimum of 15 minutes per period at each of the seven nominated residential noise monitoring locations. The details of the operator-attended SMC operational noise monitoring locations are contained 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 on Tuesday 24 March 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 to the north of the site.

**Table 3 Operator-attended Noise Survey Results - ‘Atkins’**

| Period  | Date/Start Time/<br>Weather                           | Primary Noise Descriptor dBA (15 minute) |                 |                  |                  |                  |                             | Description of Noise Emissions and Typical Maximum Noise Levels (dBA)   |
|---------|---|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
|         |   | L <sub>Amax</sub>                        | L <sub>A1</sub> | L <sub>A10</sub> | L <sub>A90</sub> | L <sub>Aeq</sub> | L <sub>Aeq</sub> (≤1.25kHz) |   |
| Day     | 24/03/2020<br>15:10<br>23°C<br>4 m/s NE               | 53                                       | 42              | 38               | 33               | 36               | 34                          | <i>Site related noise events:</i><br><b>SMC: Audible</b><br>Avon North pit operations 28-35<br><b>L<sub>Aeq</sub>(15minute) contribution 31 dBA</b><br><i>Other noise events:</i><br>Wind 27-53<br>Livestock 30-33<br>Insects 20-25<br>Birdsong 28-35                               |
| Evening | 24/03/2020<br>20:17<br><br>Weather data not available | 41                                       | 36              | 33               | 31               | 32               | 22                          | <i>Site related noise events:</i><br><b>SMC: Barely Audible</b><br>Pit operations and haul trucks <25<br><b>L<sub>Aeq</sub>(15minute) contribution &lt;25 dBA</b><br><i>Other noise events:</i><br>Livestock 33-41<br>Insects 32-36   |
| Night   | 24/03/2020<br>22:00<br>18°C<br>2.1 m/s N              | 53                                       | 35              | 33               | 31               | 33               | 23                          | <i>Site related noise events:</i><br><b>SMC: Barely Audible</b><br>Pit operations and haul trucks <25<br><b>L<sub>Aeq</sub>(15minute) contribution &lt;25 dBA</b><br><b>L<sub>Amax</sub> contribution &lt;25 dBA</b><br><i>Other noise events:</i><br>Livestock 53<br>Insects 32-36 |

SMC operations were audible during the day and barely audible during the evening and night-time operator attended noise surveys at this location. SMC operations generated L<sub>Aeq</sub>(15minute) contributions of 31 dBA during the day, <25 dBA during the evening and <25 dBA during the night-time. SMC operations generated an L<sub>Amax</sub> level of <25 dBA during the night-time attended noise survey.

#### 4.1.2 Operator-attended Noise Survey Results - 'Clarke'

Results of the operator-attended noise surveys at 'Clarke' are provided in **Table 4**. 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 4 Operator-attended Noise Survey Results - 'Clarke'**

| Clarke  | Date/Start Time/<br>Weather                | Primary Noise Descriptor dBA (15 minute) |                 |                  |                  |                  |                             | Description of Noise Emissions and Typical Maximum Noise Levels (dBA)  |
|---------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|--|
|         |  | L <sub>Amax</sub>                        | L <sub>A1</sub> | L <sub>A10</sub> | L <sub>A90</sub> | L <sub>Aeq</sub> | L <sub>Aeq</sub> (≤1.25kHz) |  |
| Day     | 24/03/2020<br>15:38<br>22°C<br>3.4 m/s ENE | 64                                       | 44              | 38               | 32               | 36               | 35                          | <i>Site related noise events:</i><br><b>SMC: Faintly Audible</b><br>Avon north pit operations 20-31<br><b>L<sub>Aeq</sub>(15minute) contribution 27 dBA</b><br><i>Other noise events:</i><br>Birdsong 21-29<br>Wind Gusts 30-45<br>Insects 16-20                                       |
| Evening | 24/03/2020<br>18:59<br>20°C<br>2.3 m/s NNE | 48                                       | 37              | 35               | 32               | 34               | 31                          | <i>Site related noise events:</i><br><b>SMC: Audible</b><br>Pit operations 28-33<br><b>L<sub>Aeq</sub>(15minute) contribution 30 dBA</b><br><i>Other noise events:</i><br>Wind 32-39<br>Insects 32-38<br>Birdsong 48   |
| Night   | 24/03/2020<br>22:25<br>17°C<br>2.5 m/s N   | 54                                       | 47              | 45               | 38               | 43               | 42                          | <i>Site related noise events:</i><br><b>SMC: Audible</b><br>Pit operations 38-54<br><b>L<sub>Aeq</sub>(15minute) contribution 42 dBA</b><br><b>L<sub>Amax</sub> contribution 54 dBA</b><br><b>L<sub>A1min</sub> contribution 50 dBA</b><br><i>Other noise events:</i><br>Insects 25-30 |

SMC operations were faintly audible during the day and audible during the evening and night-time operator-attended surveys at this location. SMC operations generated an L<sub>Aeq</sub>(15minute) noise contribution of 27 dBA during the day, 30 dBA during the evening and 42 dBA during the night-time. During the night-time period, the operation of the pit generated L<sub>Amax</sub> noise levels of up to 54 dBA and L<sub>A1</sub>(1minute) 50 dBA at the monitoring location.

Taking into account the distance between the observed SMC operations and the nearest privately-owned residence Bagnall, LAeq(15minute) noise levels of 20 dBA during the daytime, 23 dBA during the evening and 35 dBA during the night-time survey are predicted at the Bagnall location. SMC operations are also predicted to generate a LA1(1minute) level of 43 dBA during the night-time period at this location. This figure is considered conservative as it takes into account corrections for propagation distance only (i.e. no shielding due to topography or atmospheric absorption). As such SMC operations are considered to be compliant at the Bagnall location.

#### 4.1.3 Operator-attended Noise Survey Results - 'Hall'

Results of the operator-attended noise surveys at 'Hall' are provided in **Table 5**. Monitoring location 'Hall' represents residential receptors located to the southwest of the site.

**Table 5 Operator-attended Noise Survey Results - 'Hall'**

| Hall    | Date/Start Time/<br>Weather                | Primary Noise Descriptor dBA (15 minute) |                 |                  |                  |                  |                             | Description of Noise Emissions and Typical Maximum Noise Levels (dBA)   |
|---------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
|         |  | L <sub>Amax</sub>                        | L <sub>A1</sub> | L <sub>A10</sub> | L <sub>A90</sub> | L <sub>Aeq</sub> | L <sub>Aeq</sub> (≤1.25kHz) |   |
| Day     | 24/03/2020<br>15:11<br>27°C<br>4.0 m/s NE  | 77                                       | 55              | 41               | 33               | 48               | 46                          | <i>Site related noise events:</i><br><b>SMC: Inaudible</b><br><i>Other noise events:</i><br>Passby 77<br>Road traffic 32-39<br>Wind in trees 38-43<br>Birdsong 43   |
| Evening | 24/03/2020<br>19:00<br>20°C<br>2.3 m/s NNE | 76                                       | 52              | 48               | 33               | 49               | 47                          | <i>Site related noise events:</i><br><b>SMC: Faintly Audible</b><br>General mining operations 18-28<br><b>LAeq(15minute) contribution 25 dBA</b><br><i>Other noise events:</i><br>Traffic passby 40-76<br>Insects 23-35<br>Birds 22-56<br>Train 25-45                               |
| Night   | 24/03/2020<br>23:01<br>17°C<br>2.5 m/s NNE | 53                                       | 38              | 36               | 33               | 35               | 28                          | <i>Site related noise events:</i><br><b>SMC: Faintly Audible</b><br>General mining operations 24-33<br><b>LAeq(15minute) contribution 27 dBA</b><br><b>L<sub>Amax</sub> contribution 33 dBA</b><br><i>Other noise events:</i><br>Insects 29-33<br>Road traffic 26-30<br>Horse 36-44 |

SMC operations were inaudible during the day and faintly audible during the evening and night-time operator-attended noise surveys at this location. SMC operations generated LAeq(15minute) contributions of 25 dBA during the evening and 27 dBA during the night-time. SMC operations generated an L<sub>Amax</sub> level of 33 dBA during the night-time attended noise survey.



#### 4.1.4 Operator-attended Noise Survey Results - 'Lowrey'

Results of the operator-attended noise surveys at 'Lowrey' are provided in **Table 6**. Monitoring location 'Lowrey' represents residential receptors located to the west of the site and west of Bucketts Way.

**Table 6** Attended Noise Survey Results - 'Lowrey'

| Period  | Date/Start Time/<br>Weather                | Primary Noise Descriptor dBA (15 minute) |                 |                  |                  |                  |                             | Description of Noise Emissions and Typical Maximum Noise Levels (dBA)   |
|---------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|---|
|         |  | L <sub>Amax</sub>                        | L <sub>A1</sub> | L <sub>A10</sub> | L <sub>A90</sub> | L <sub>Aeq</sub> | L <sub>Aeq</sub> (≤1.25kHz) |   |
| Day     | 24/03/2020<br>14:43<br>23°C<br>4 m/s NE    | 64                                       | 61              | 45               | 38               | 47               | 46                          | <i>Site related noise events:</i><br><b>SMC: Inaudible</b><br><i>Other noise events:</i><br>Road traffic 30-45<br>Birdsong 28-43<br>Insects 18-30<br>Train 50-64  |
| Evening | 24/03/2020<br>19:27<br>20°C<br>2.3 m/s NNE | 49                                       | 43              | 39               | 33               | 37               | 34                          | <i>Site related noise events:</i><br><b>SMC: Faintly Audible</b><br>Dozer 29<br>Haul trucks 25-32<br><b>L<sub>Aeq</sub>(15minute) contribution 28 dBA</b><br><i>Other noise events:</i><br>Road traffic 33-42<br>Dog barking 35-39<br>Aeroplane 49<br>Insects 36-38                                 |
| Night   | 24/03/2020<br>22:32<br>17°C<br>2.5 m/s NNE | 57                                       | 42              | 37               | 34               | 36               | 32                          | <i>Site related noise events:</i><br><b>SMC: Faintly Audible</b><br>General mining operations 25-31<br><b>L<sub>Aeq</sub>(15minute) contribution 29 dBA</b><br><b>L<sub>Amax</sub> contribution 31 dBA</b><br><i>Other noise events:</i><br>Road traffic 35-52<br>Bats 33-57<br>Insects/frogs 27-32 |

SMC operations were inaudible during the day and faintly audible during the evening night-time operator-attended noise surveys at this location. SMC operations generated L<sub>Aeq</sub>(15minute) contributions of 28 dBA during the evening and 29 dBA during the night-time. SMC operations generated an L<sub>Amax</sub> level of 31 dBA during the night-time attended noise survey.

#### 4.1.5 Operator-attended Noise Survey Results - 'Pryce-Jones'

Results of the operator-attended noise surveys at 'Pryce Jones' are provided in **Table 7**. Monitoring location 'Pryce Jones' represents residential receptors located in Craven to the south of the site.

**Table 7** Attended Noise Survey Results – 'Pryce Jones'

| Pryce-Jones | Date/Start Time/<br>Weather                | Primary Noise Descriptor dBA (15 minute) |                 |                  |                  |                  |                             | Description of Noise Emissions and Typical Maximum Noise Levels (dBA)  |
|-------------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|--|
|             |  | L <sub>Amax</sub>                        | L <sub>A1</sub> | L <sub>A10</sub> | L <sub>A90</sub> | L <sub>Aeq</sub> | L <sub>Aeq</sub> (≤1.25kHz) |  |
| Day         | 24/03/2020<br>13:42<br>21°C<br>3.6 m/s NNE | 78                                       | 65              | 58               | 37               | 55               | 54                          | <i>Site related noise events:</i><br><b>SMC: Not Measurable</b><br><i>Other noise events:</i><br>Insects 14-21<br>Birds 30-39<br>Road traffic 56-78<br>Lawn mower 25-34  |
| Evening     | 24/03/2020<br>19:55<br>19°C<br>2.4 m/s N   | 68                                       | 60              | 46               | 37               | 47               | 45                          | <i>Site related noise events:</i><br><b>SMC: Audible</b><br>Mine hum 28-34<br>Haul trucks 35-39<br><b>L<sub>Aeq</sub>(15minute) contribution 34 dBA</b><br><i>Other noise events:</i><br>Road traffic 38-68<br>Insects/frogs 30-40   |
| Night       | 24/03/2020<br>22:00<br>18°C<br>2.1 m/s N   | 70                                       | 61              | 47               | 37               | 49               | 47                          | <i>Site related noise events:</i><br><b>SMC: Audible</b><br>General mining operations 33-35<br><b>L<sub>Aeq</sub>(15minute) contribution 33 dBA</b><br><b>L<sub>Amax</sub> contribution 35 dBA</b><br><i>Other noise events:</i><br>Frogs / insects 39-53<br>Road traffic 61 |

SMC operations were not measurable during the day and audible during the evening and night-time operator attended noise surveys at this location. SMC operations generated L<sub>Aeq</sub>(15minute) contributions of 34 dBA during the evening and 33 dBA during the night time. SMC operations generated an L<sub>Amax</sub> level of 35 dBA during the night-time attended noise survey.

#### 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 8**.

**Table 8 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 <sub>Amax</sub>                        | L <sub>A1</sub> | L <sub>A10</sub> | L <sub>A90</sub> | L <sub>Aeq</sub> | L <sub>Aeq</sub> (≤1.25kHz) |  |
| Day           | 24/3/20<br>15:35<br>22°C<br>3.4 m/s ENE   | 71                                       | 69              | 60               | 36               | 56               | 50                          | <i>Site related noise events:</i><br><b>SMC: Audible</b><br>Haul trucks 31-38<br>Dozer 32-46<br><b>L<sub>Aeq</sub>(15minute) contribution 36 dBA</b><br><i>Other noise events:</i><br>Road traffic 51-71<br>Aeroplane 42<br>Wind in trees 32-39<br>Birdsong 42-70              |
| Evening       | 24/3/2020<br>19:52<br>20°C<br>2.3 m/s NNE | 49                                       | 47              | 41               | 29               | 37               | 36                          | <i>Site related noise events:</i><br><b>SMC: Audible</b><br>Haul trucks 25-37<br><b>L<sub>Aeq</sub>(15minute) contribution 28 dBA</b><br><i>Other noise events:</i><br>Train 49<br>Insects 30-38<br>Road traffic 32-35   |
| Night         | 24/3/2020<br>22:51<br>17°C<br>2.5 m/s NNE | 41                                       | 37              | 33               | 28               | 31               | 29                          | <i>Site related noise events:</i><br><b>SMC: Audible</b><br>Haul trucks 25-41<br>Pit operations 27-31<br><b>L<sub>Aeq</sub>(15minute) contribution 29 dBA</b><br><b>L<sub>Amax</sub> contribution 41 dBA</b><br><i>Other noise events:</i><br>Road traffic 36<br>Insects 27-29 |

SMC operations were audible during all periods of the operator-attended noise surveys at this location. SMC operations generated L<sub>Aeq</sub>(15minute) contributions of 36 dBA during the day, 28 dBA during the evening and 29 dBA during the night-time. SMC operations generated an L<sub>Amax</sub> level of 41 dBA during the night-time attended noise survey.

#### 4.1.7 Operator-attended Noise Survey Results – ‘Greenwood’

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

**Table 9 Attended Noise Survey Results – ‘Greenwood’**

| Greenwood | Date/Start Time/<br>Weather                | Primary Noise Descriptor dBA (15 minute) |                 |                  |                  |                  |                             | Description of Noise Emissions and Typical Maximum Noise Levels (dBA)  |
|-----------|--|--|-----------------|------------------|------------------|------------------|-----------------------------|--|
|           |  | L <sub>Amax</sub>                        | L <sub>A1</sub> | L <sub>A10</sub> | L <sub>A90</sub> | L <sub>Aeq</sub> | L <sub>Aeq</sub> (≤1.25kHz) |  |
| Day       | 24/03/2020<br>14:07<br>21°C<br>3.6 m/s NNE | 62                                       | 49              | 44               | 34               | 41               | 33                          | <i>Site related noise events:</i><br><b>SMC: Inaudible</b><br><i>Other noise events:</i><br>Wind in trees 30-39<br>Birdsong 25-62<br>Aeroplane 23-30   |
| Evening   | 24/03/2020<br>19:29<br>20°C<br>2.3 m/s NNE | 55                                       | 51              | 49               | 37               | 44               | 33                          | <i>Site related noise events:</i><br><b>SMC: Inaudible</b><br><i>Other noise events:</i><br>Insects 30-55<br>Wind in trees 27-44<br>Aeroplane 27-46  |
| Night     | 24/03/2020<br>23:34<br>17°C<br>2.4 m/s N   | 50                                       | 46              | 37               | 33               | 37               | 27                          | <i>Site related noise events:</i><br><b>SMC: Barely Audible</b><br>Haul trucks audible in lulls <25<br><b>L<sub>Aeq</sub>(15minute) contribution &lt;25 dBA</b><br><b>L<sub>Amax</sub> contribution &lt;25 dBA</b><br><i>Other noise events:</i><br>Insects/frogs 38-50<br>Wind in trees 27-32 |

SMC operations were inaudible during the day and evening and barely audible during the night-time operator-attended noise surveys at this location. SMC operations generated L<sub>Aeq</sub>(15minute) noise levels of <25 dBA and L<sub>Amax</sub> noise levels of <25 dBA were recorded during the night-time noise survey.

## 4.2 Rail Noise Monitoring

SMC rail pass-by noise levels are presented in **Table 10**.

**Table 10 Operator-attended Rail Noise Monitoring Results**

| Monitoring Location | Date and Time      | L <sub>Amax</sub> (dBA) |               |
|---------------------|--------------------|-------------------------|---------------|
|                     |                    | Horn Included           | Horn Excluded |
| TN1                 | 24/03/2020 1:28 PM | 79 <sup>1</sup>         | 79            |
| TN2                 | 24/03/2020 1:39PM  | 67                      | 67            |

Note 1: Horn was not sounded.

Maximum SMC rail pass-were compliant with the 85 dBA L<sub>Amax</sub> limit at both locations, including the sounding of the horn (where sounded) on the approach to the level crossing at both locations.

## 5 Performance Assessment

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<br>L <sub>Aeq</sub> (15minute) Noise Level<br>dBA <sup>1</sup> |     |       | Noise Criteria L <sub>Aeq</sub> (15minute)<br>dBA |     |       | Compliance       |                  |                  |
|----------------------|--|-----|-------|---|-----|-------|------------------|------------------|------------------|
|                      | Day  | Eve | Night | Day   | Eve | Night | Day              | Eve              | Night            |
| Atkins               | 31   | <25 | <25   | 35  | 35  | 35    | Yes              | Yes              | Yes              |
| Clarke <sup>2</sup>  | 27   | 30  | 42    | 37  | 37  | 37    | N/A <sup>5</sup> | N/A <sup>5</sup> | N/A <sup>5</sup> |
| Bagnall <sup>3</sup> | 20   | 23  | 35    | 37  | 37  | 37    | Yes              | Yes              | Yes              |
| Hall                 | I/A  | 25  | 27    | 35  | 35  | 35    | Yes              | Yes              | Yes              |
| Lowrey               | I/A  | 28  | 29    | 35  | 35  | 35    | Yes              | Yes              | Yes              |
| Pryce Jones          | N/M  | 34  | 33    | 43  | 43  | 43    | Yes              | Yes              | Yes              |
| Van der Drift        | 36   | 28  | 29    | 37  | 36  | 35    | Yes              | Yes              | Yes              |
| Greenwood            | I/A  | I/A | <25   | 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.

## 6 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**.

**Table 12 Performance Assessment – Sleep Disturbance**

| Location             | SMC LA1(1minute) Contribution | Noise Criteria LA1(1minute) | Compliance         |
|----------------------|-------------------------------|-----------------------------|--------------------|
| Atkins               | <25                           | 45                          | Yes                |
| Clarke <sup>2</sup>  | 54                            | 45                          | N/A <sup>4,5</sup> |
| Bagnall <sup>3</sup> | 43                            | 45                          | N/A <sup>5</sup>   |
| Hall                 | 33                            | 45                          | Yes                |
| Lowrey               | 31                            | 45                          | Yes                |
| Pryce Jones          | 41                            | 49                          | Yes                |
| Van der Drift        | <25                           | 45                          | Yes                |

Note 1: I/A = Inaudible.

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

Note 3: Modelled result.

Note 4: Criteria adopted as a guide only.

Note 5: Criteria not applicable due to weather conditions outside meteorological conditions detailed in SSD-4966.

## 7 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 Tuesday 24 March 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 noise monitoring locations 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 noise monitoring locations 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  $2 \times 10^{-5}$  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 | Loud                  |
| 80                         | Kerbside of busy street                    |                       |
| 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

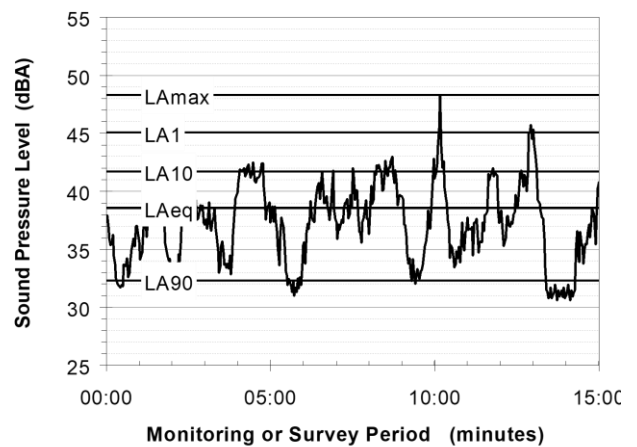
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit  $10^{-12}$  W.

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

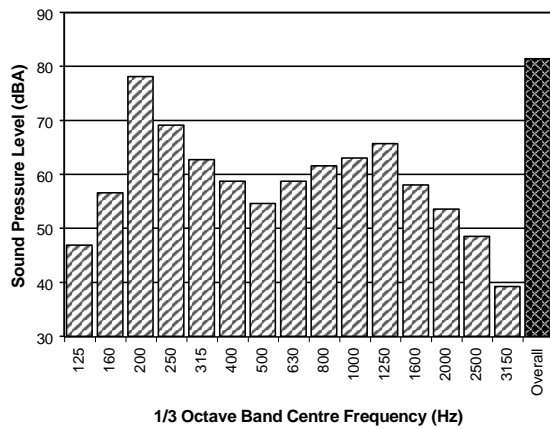
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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)

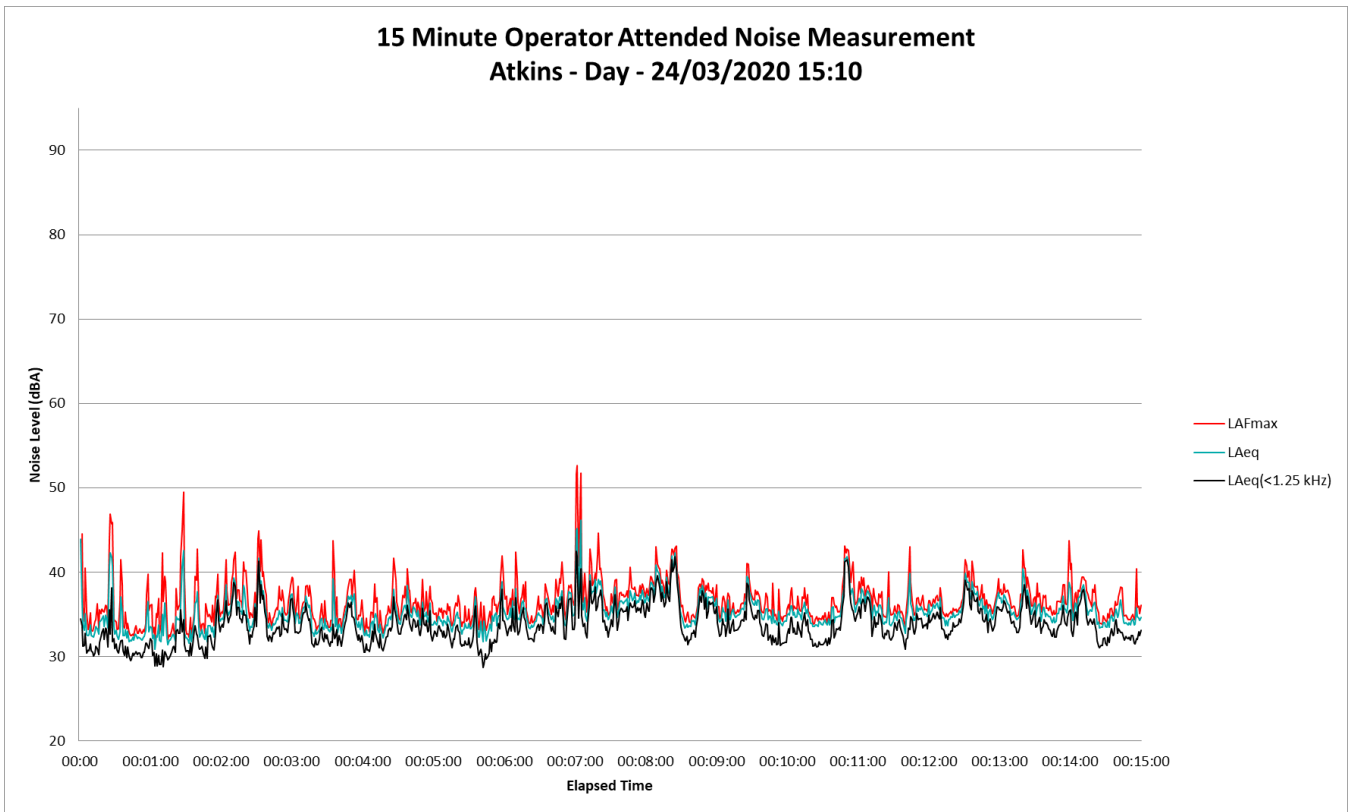
A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **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.

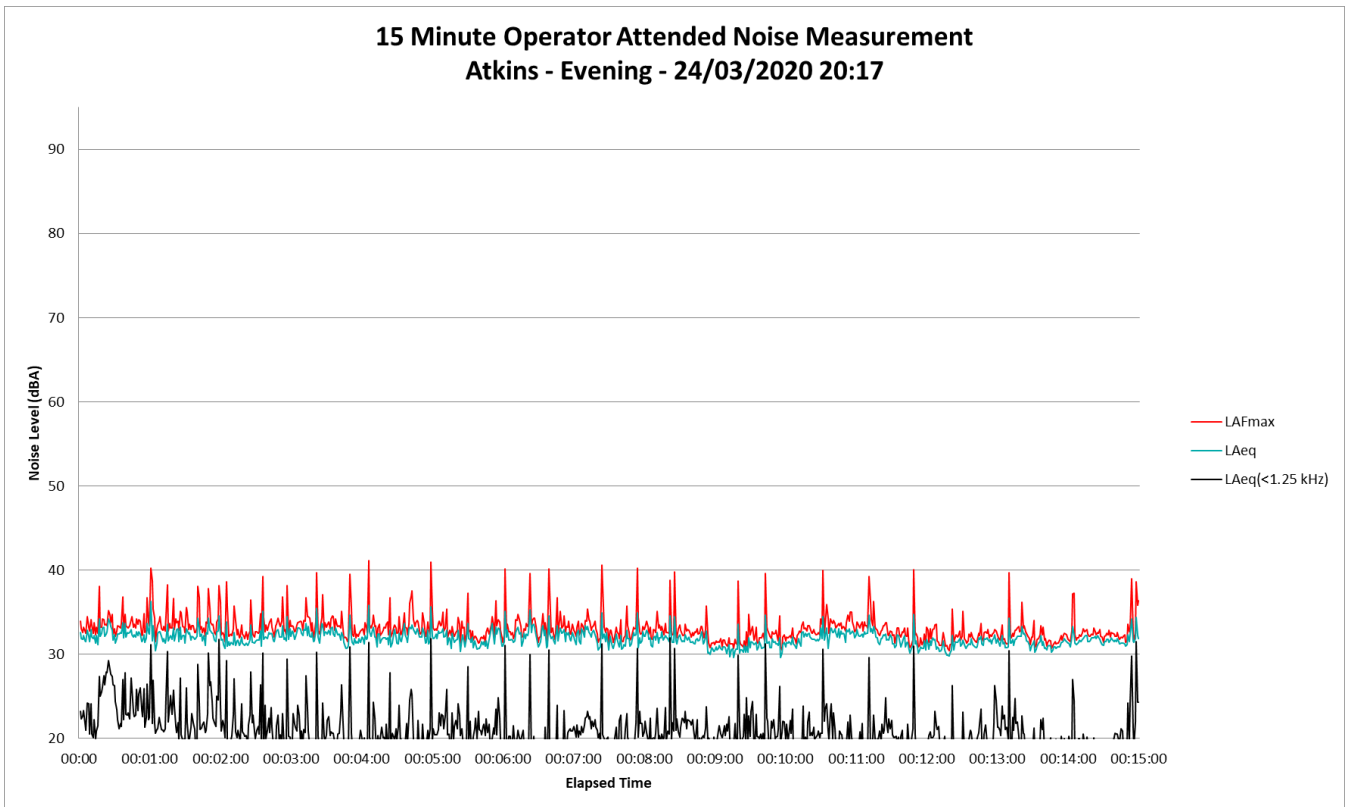
# APPENDIX B

## Operator Attended Noise Survey Charts

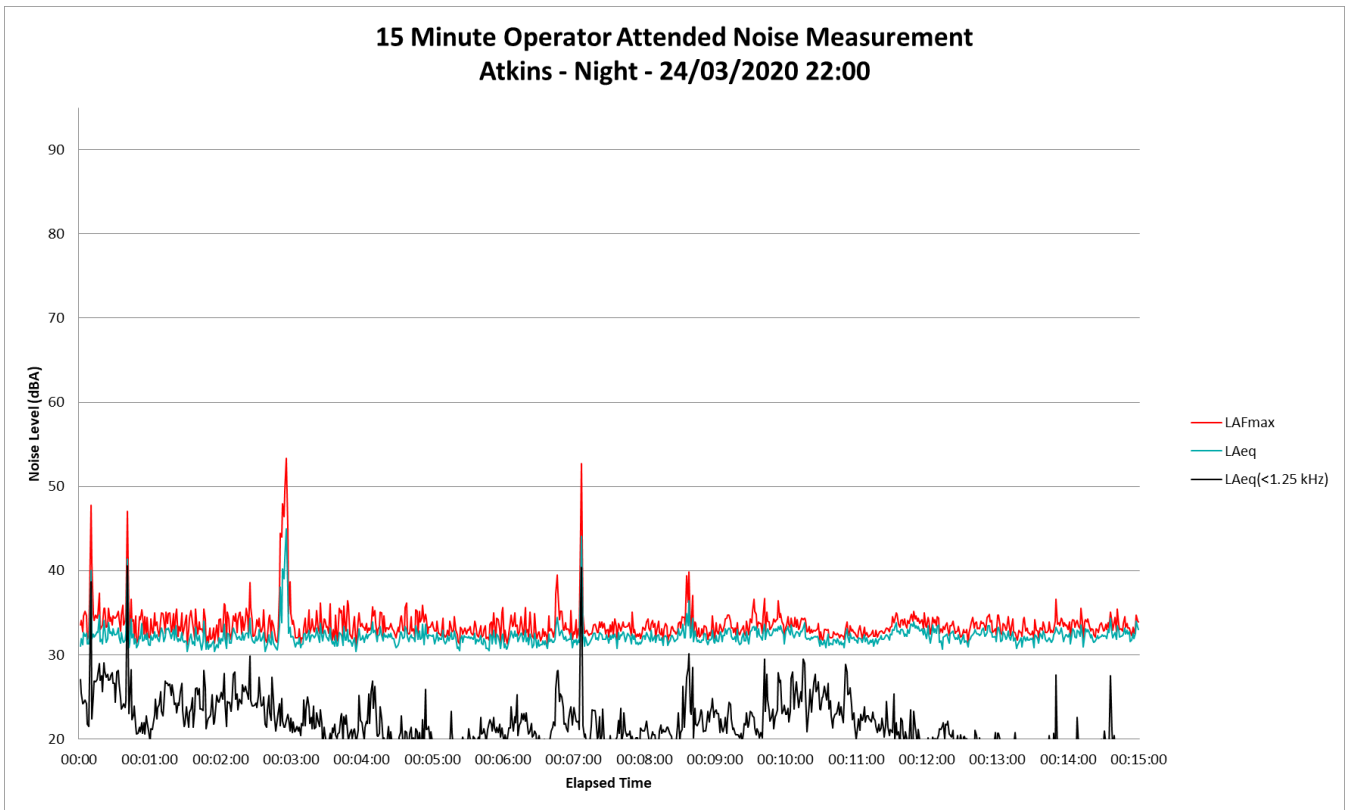
**Figure B1 – Day Period – ‘Atkins’ Operator Attended Noise Survey Results**



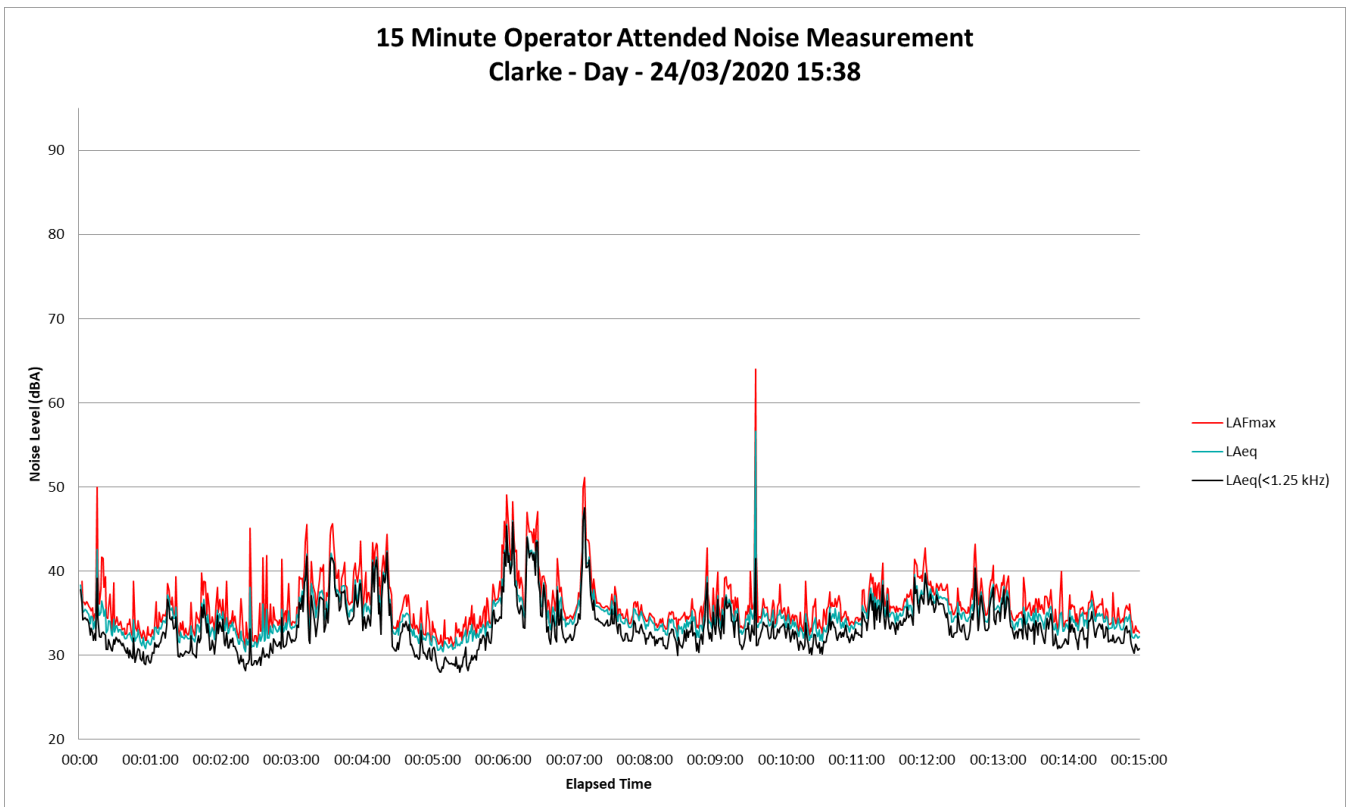
**Figure B2 – Evening Period – ‘Atkins’ Operator Attended Noise Survey Results**



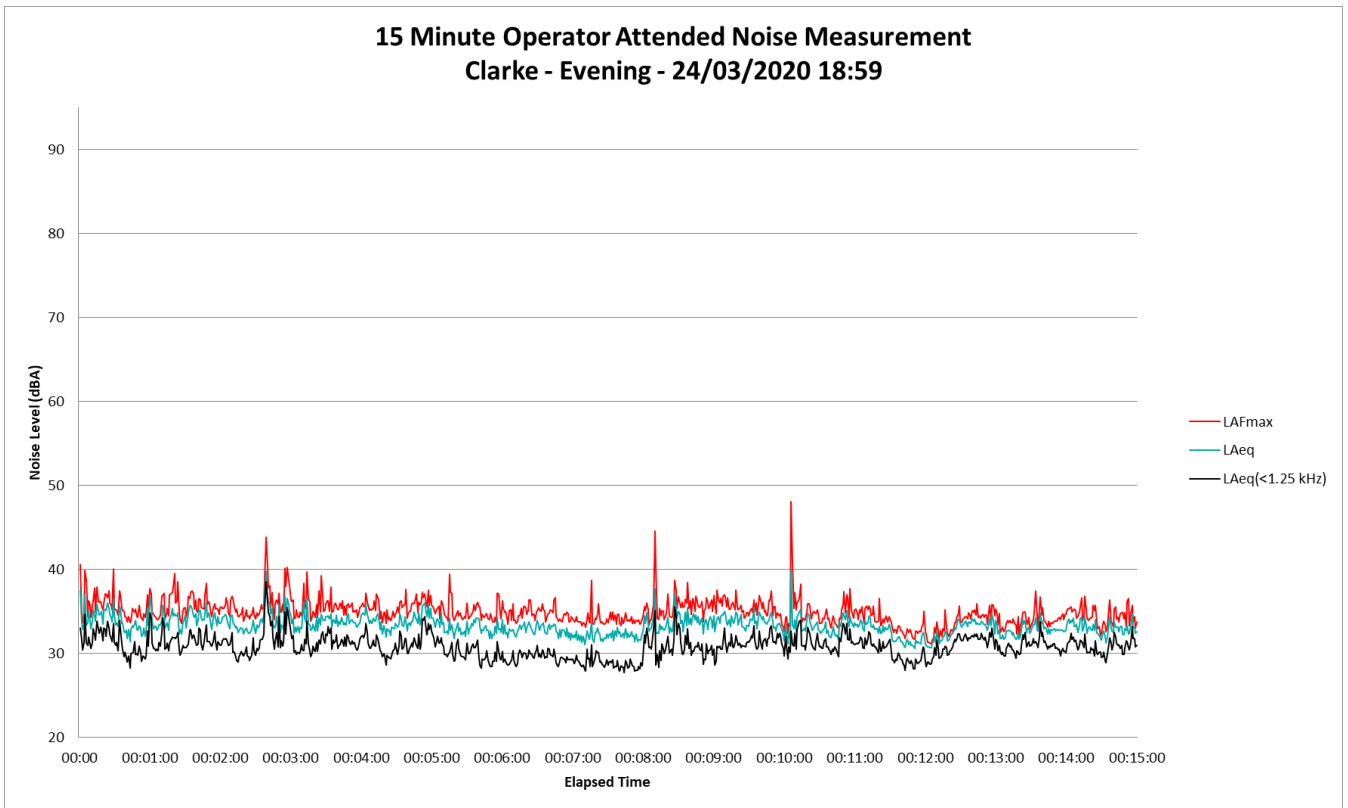
**Figure B3 – Night Period – ‘Atkins’ Operator Attended Noise Survey Results**



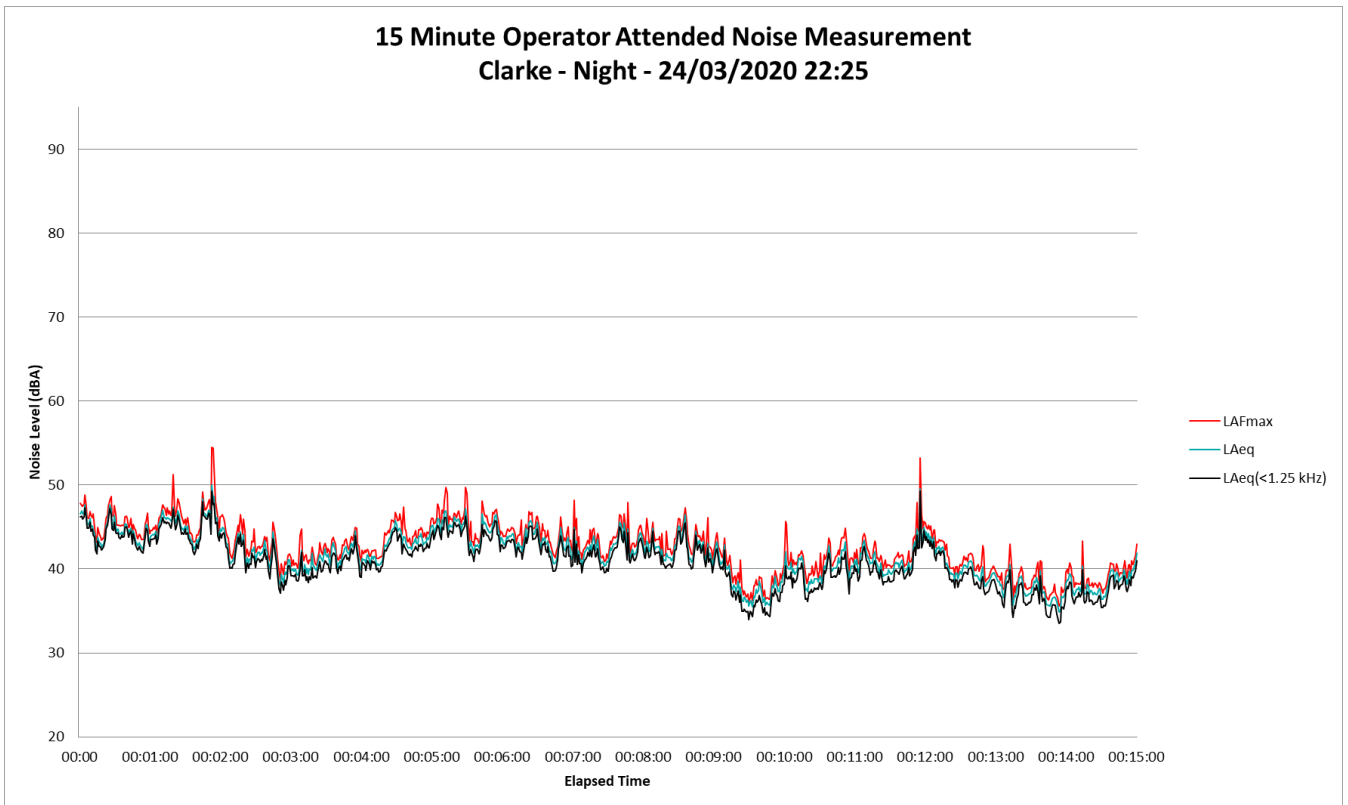
**Figure B4 – Day Period – ‘Clarke’ Operator Attended Noise Survey Results**



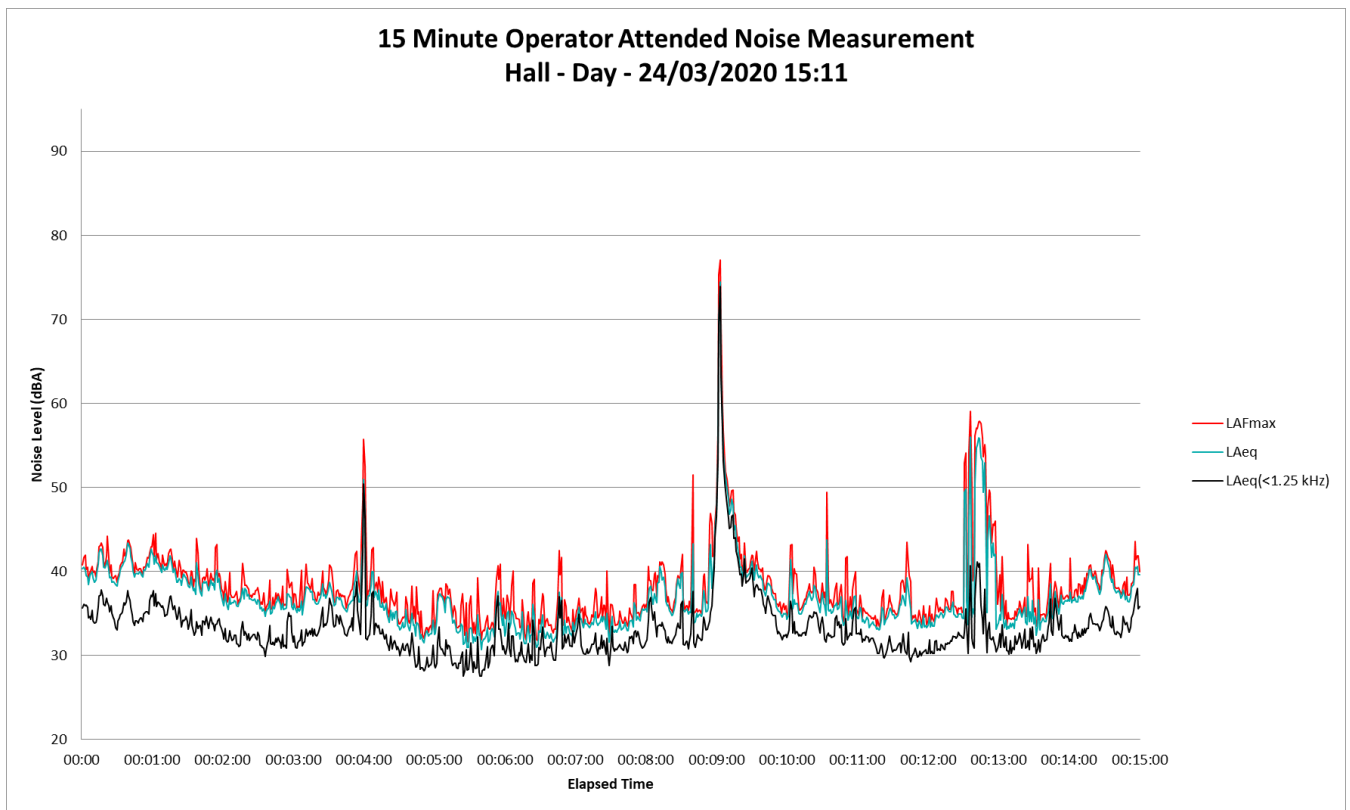
**Figure B5 – Evening Period – ‘Clarke’ Operator Attended Noise Survey Results**



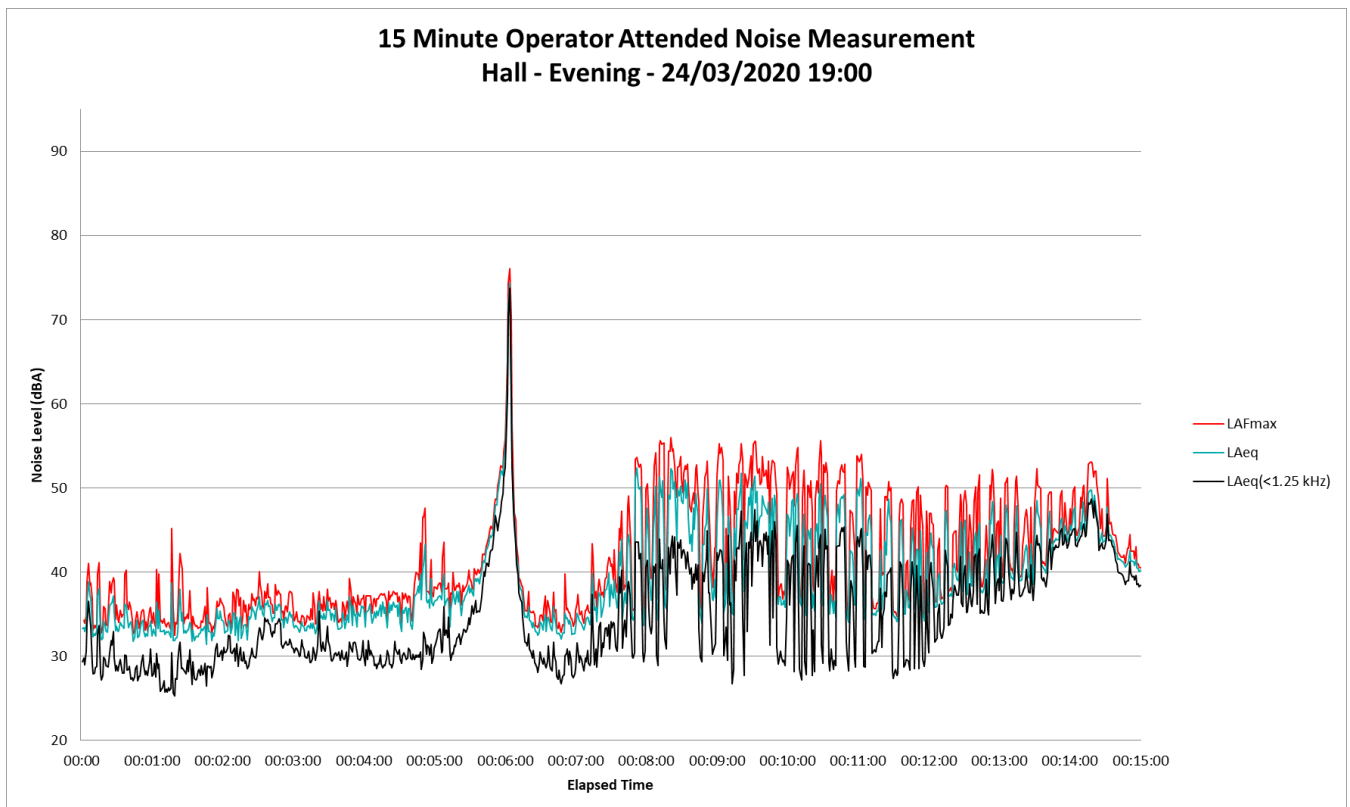
**Figure B6 – Night Period – ‘Clarke’ Operator Attended Noise Survey Results**



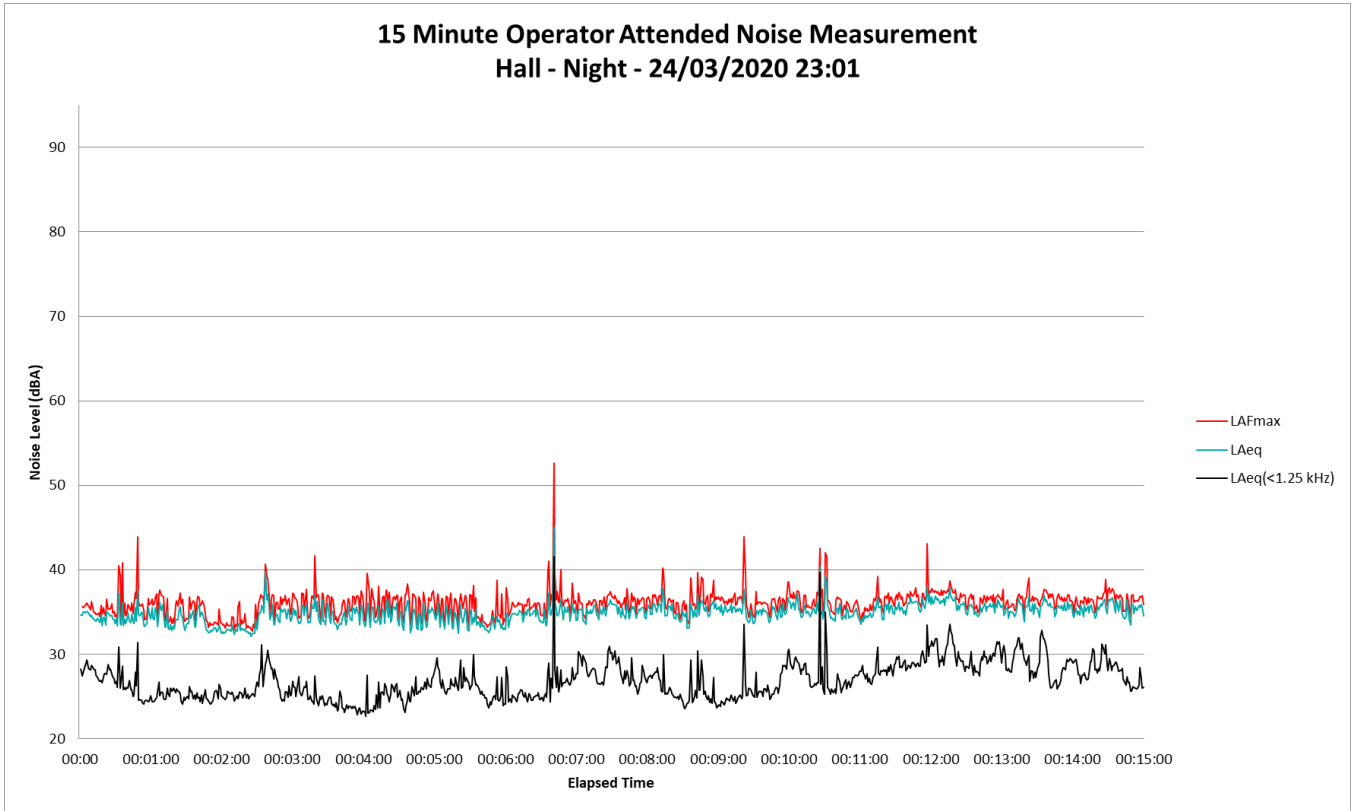
**Figure B7 – Day Period – ‘Hall’ Operator Attended Noise Survey Results**



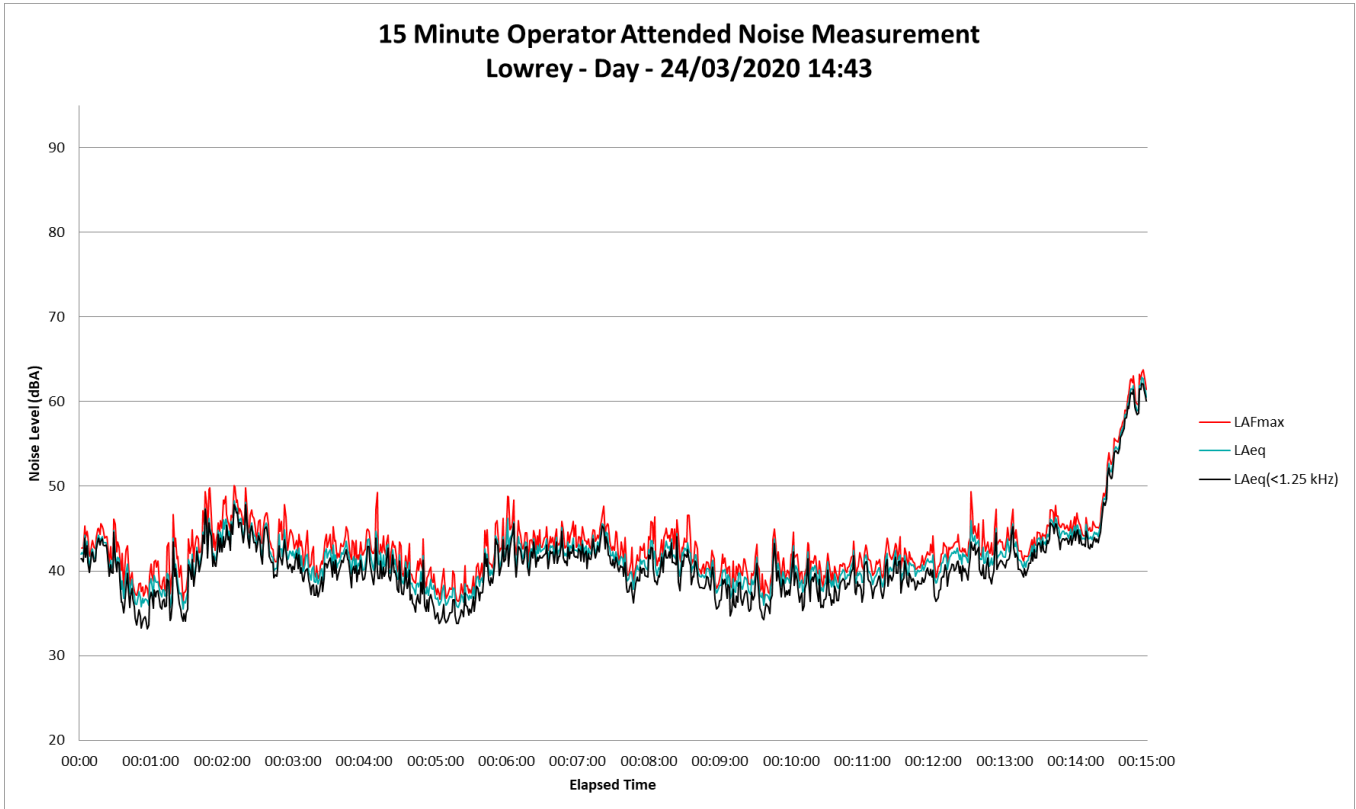
**Figure B8 – Evening Period – ‘Hall’ Operator Attended Noise Survey Results**



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

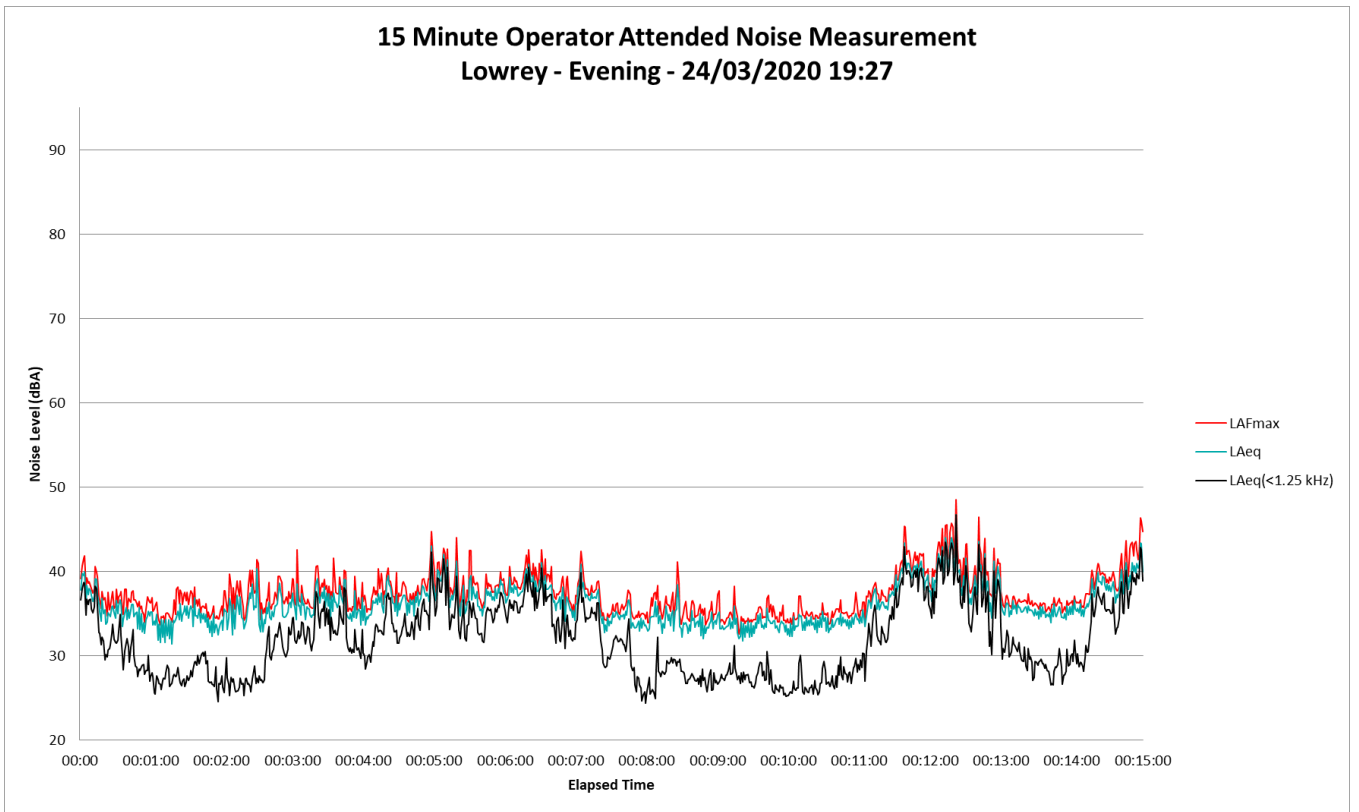


**Figure B10 – Day Period – ‘Lowrey’ Operator Attended Noise Survey Results**

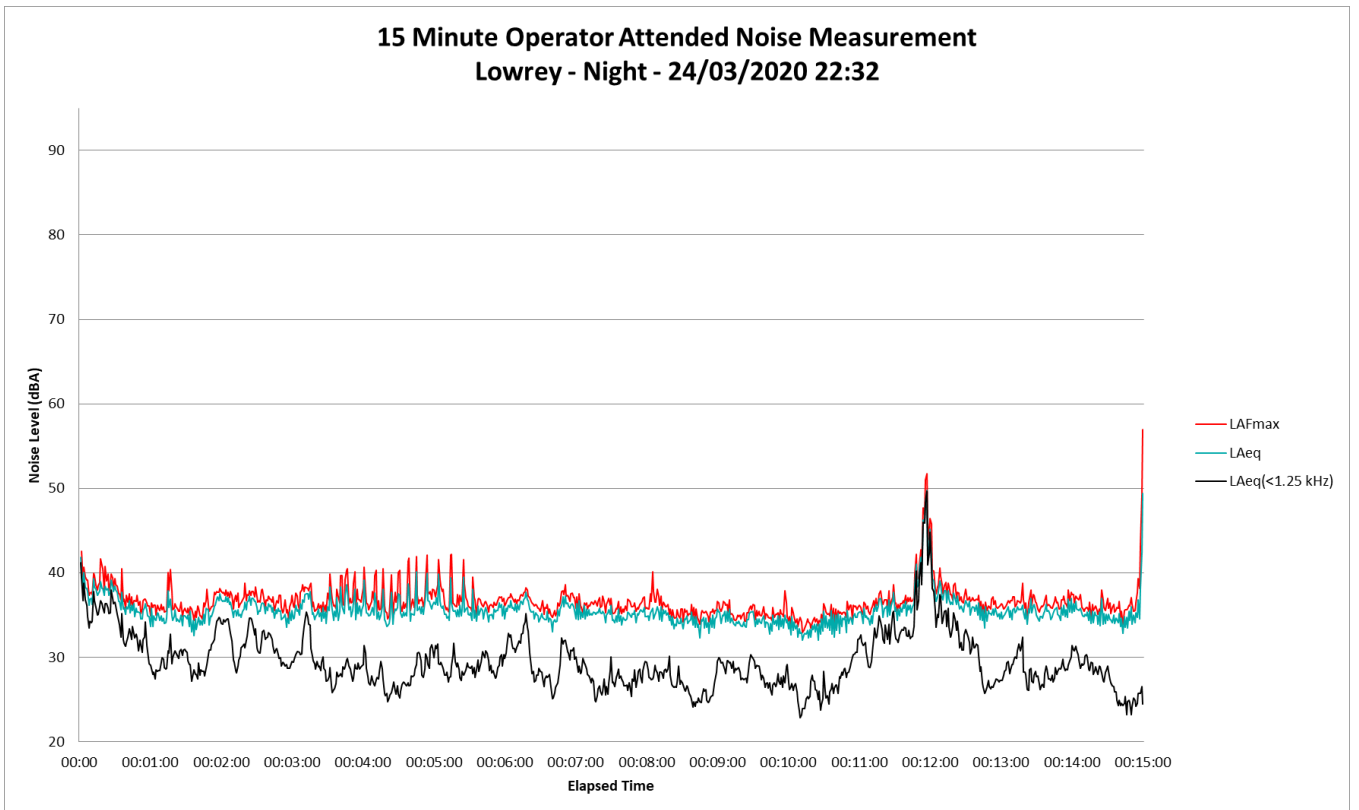




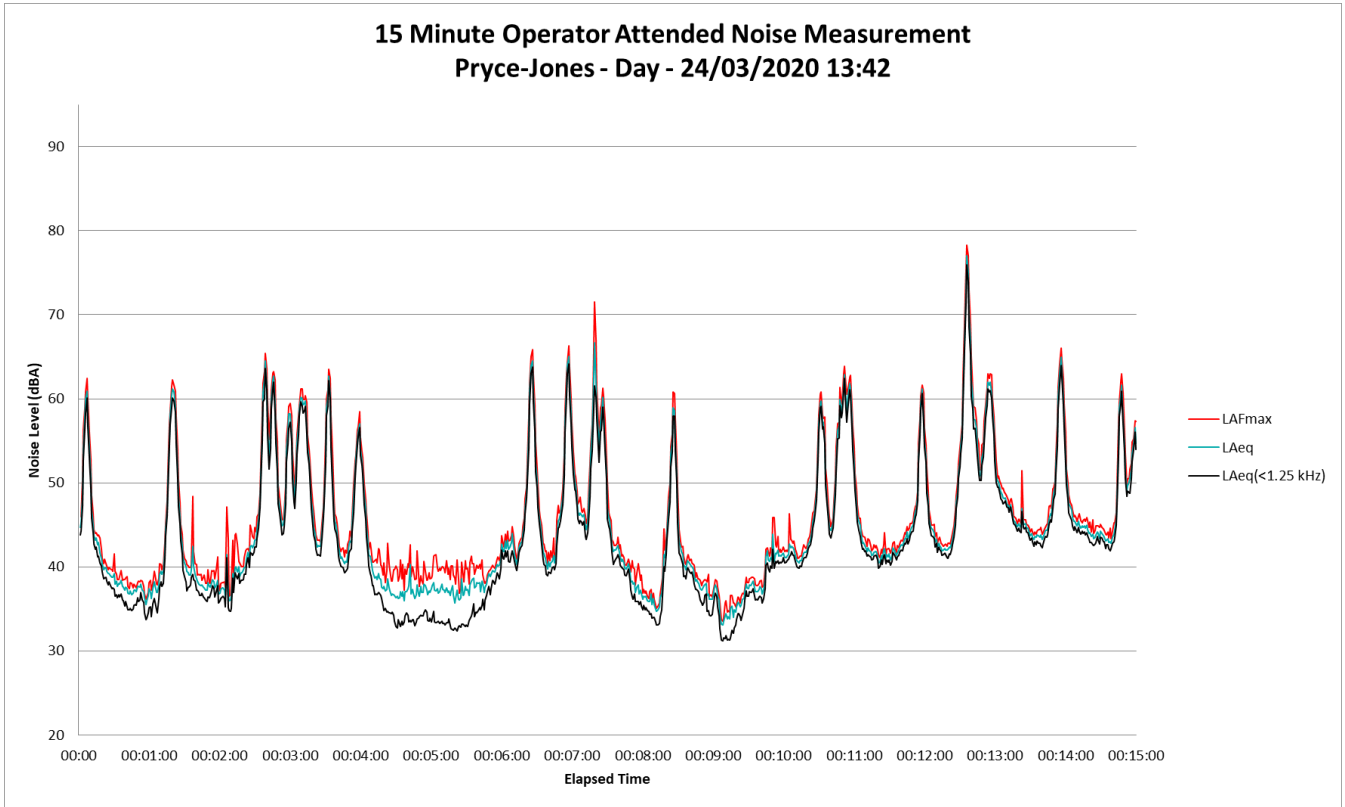
**Figure B11 – Evening Period – ‘Lowrey’ Operator Attended Noise Survey Results**



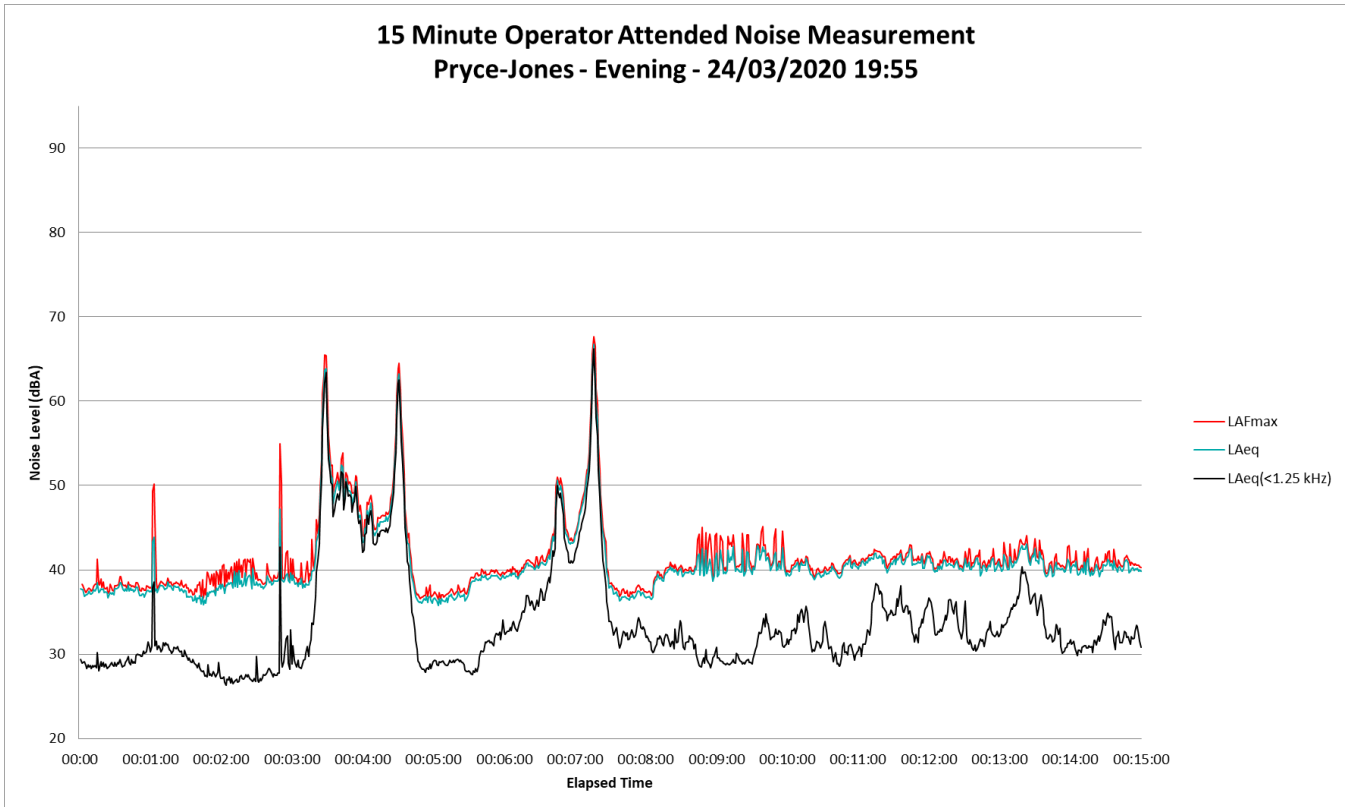
**Figure B12 – Night Period – ‘Lowrey’ Operator Attended Noise Survey Results**



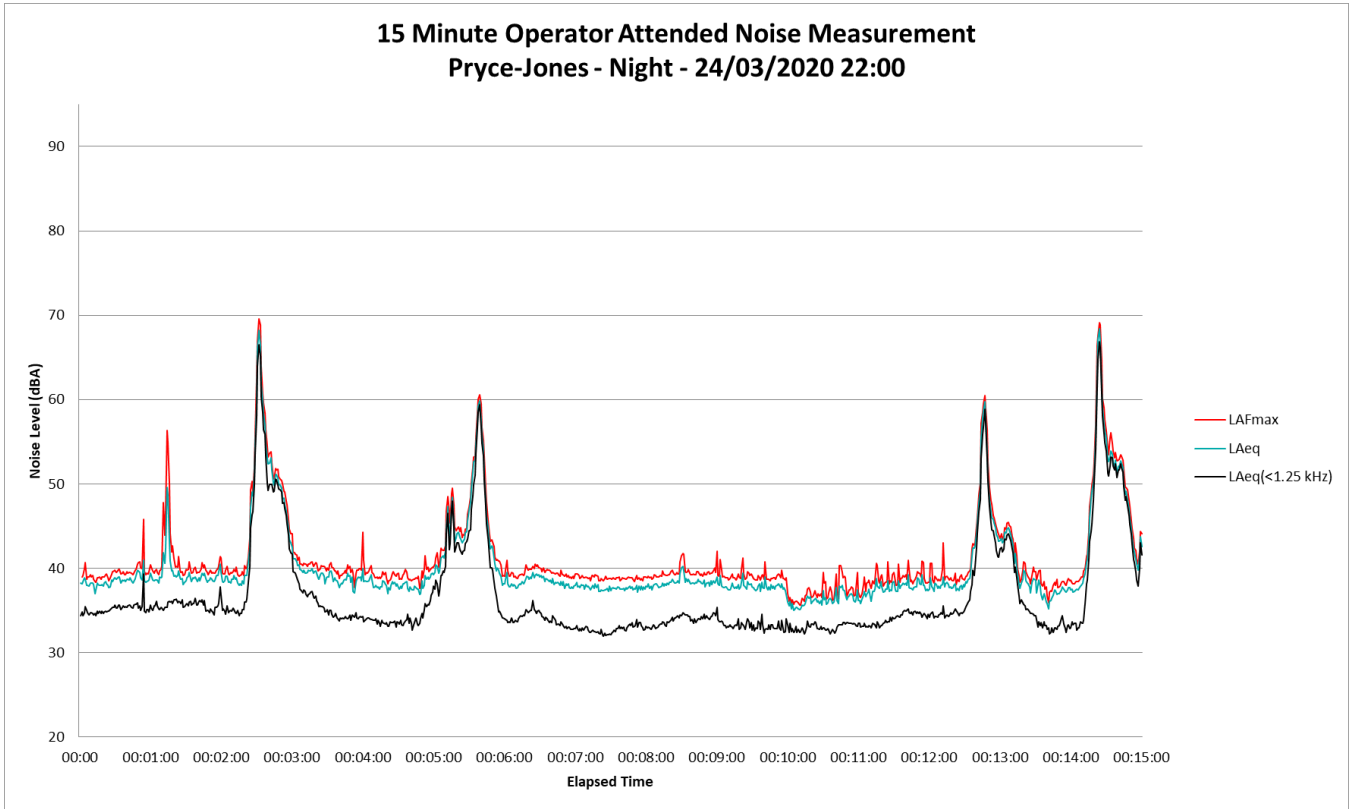
**Figure B13 – Day Period – ‘Pryce Jones’ Operator Attended Noise Survey Results**



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



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



**Figure B16 – Day Period – ‘Van der Drift’ Operator Attended Noise Survey Results**

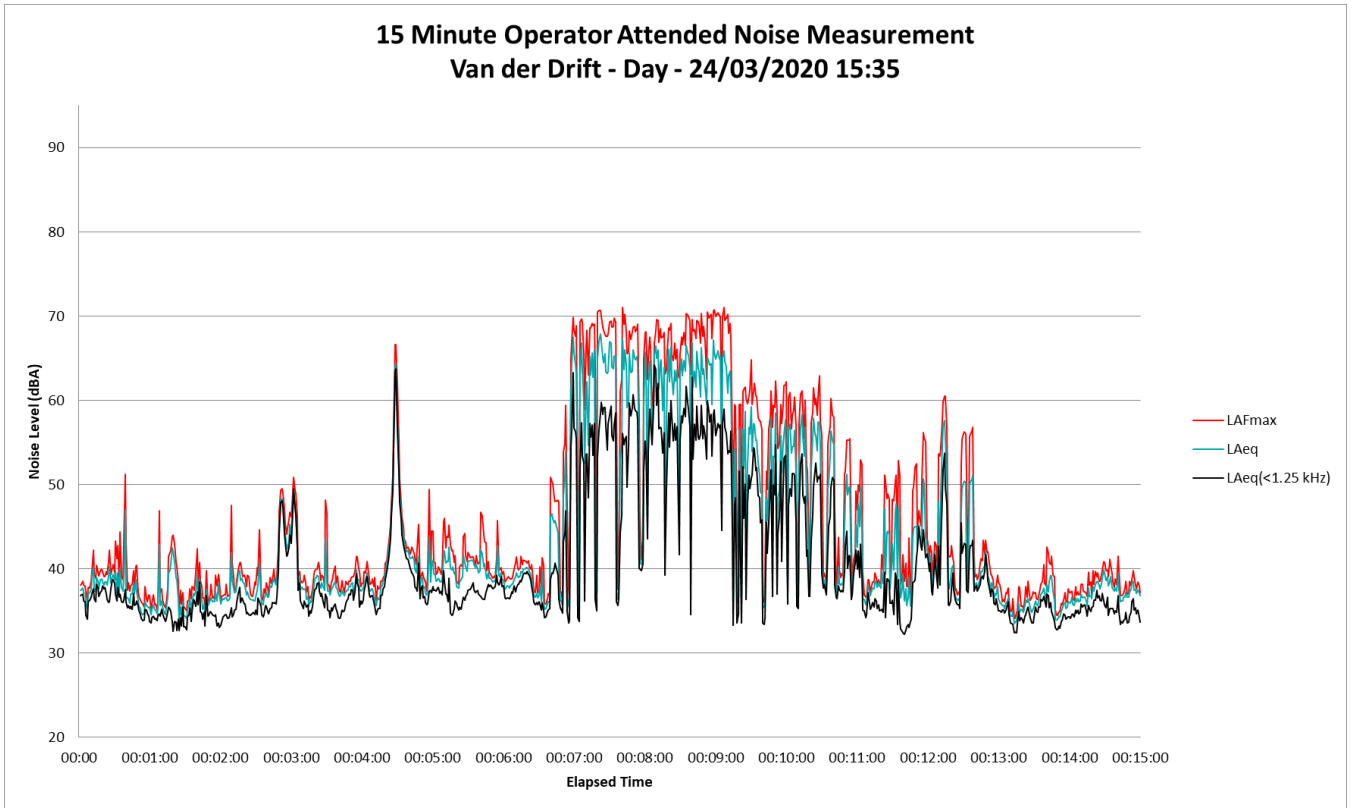


Figure B17 – Evening Period – ‘Van der Drift’ Operator Attended Noise Survey Results

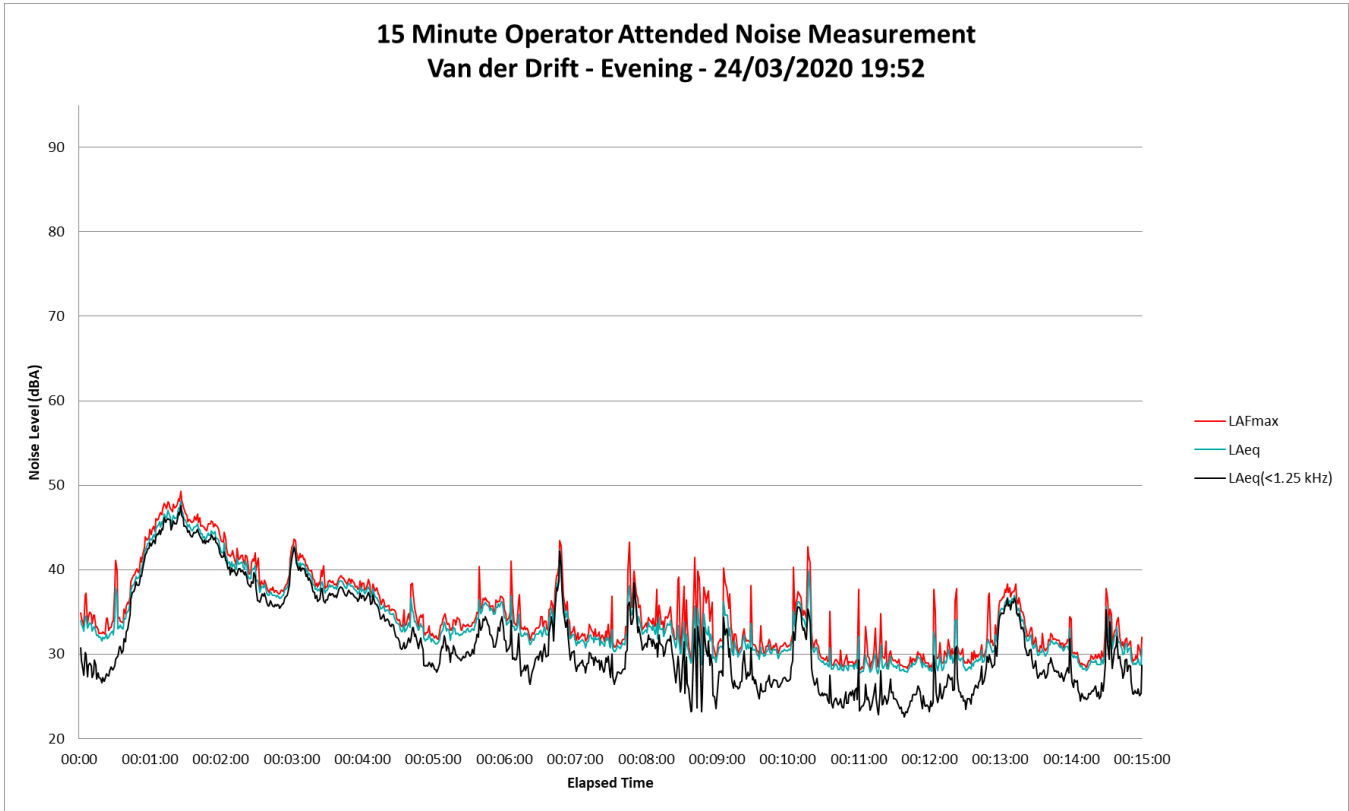


Figure B18 – Night Period – ‘Van der Drift’ Operator Attended Noise Survey Results

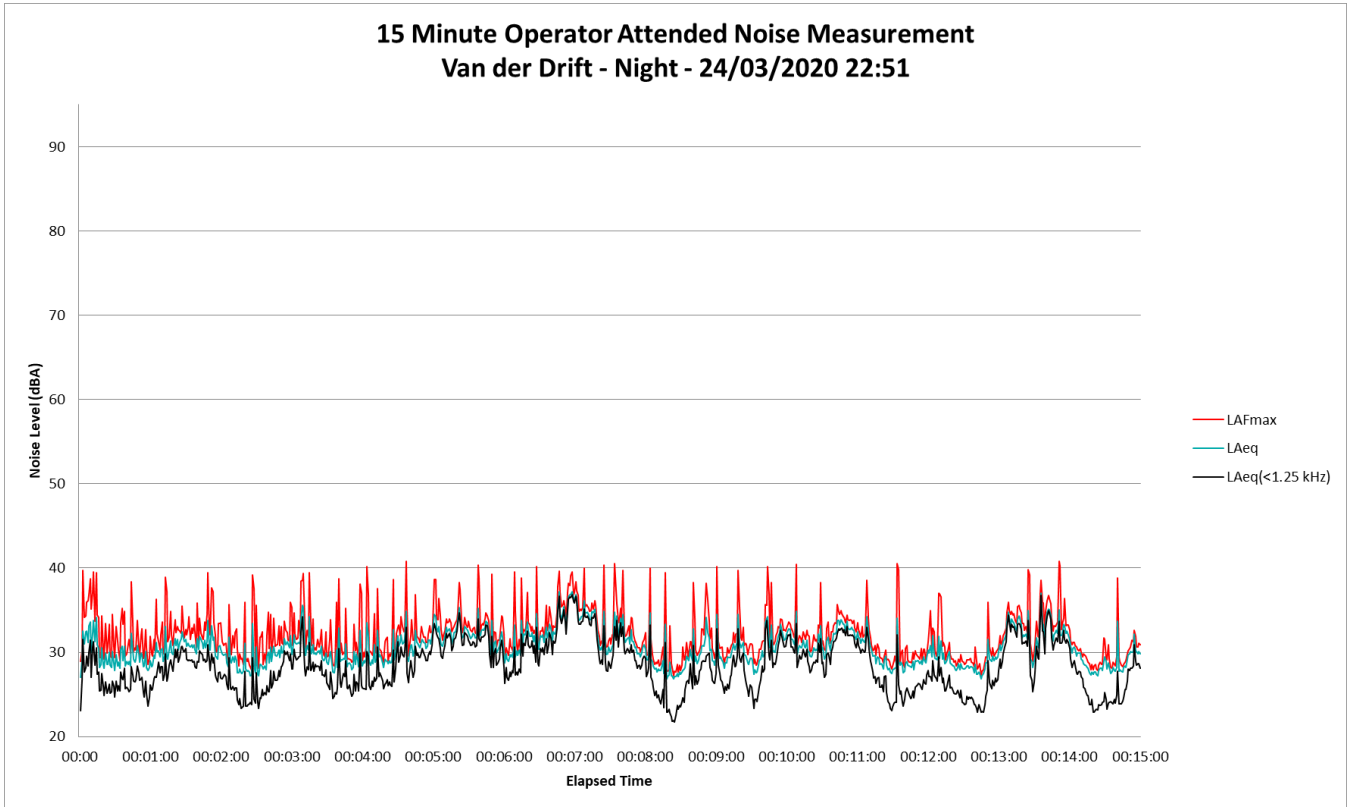


Figure B19 – Day Period – ‘Greenwood’ Operator Attended Noise Survey Results

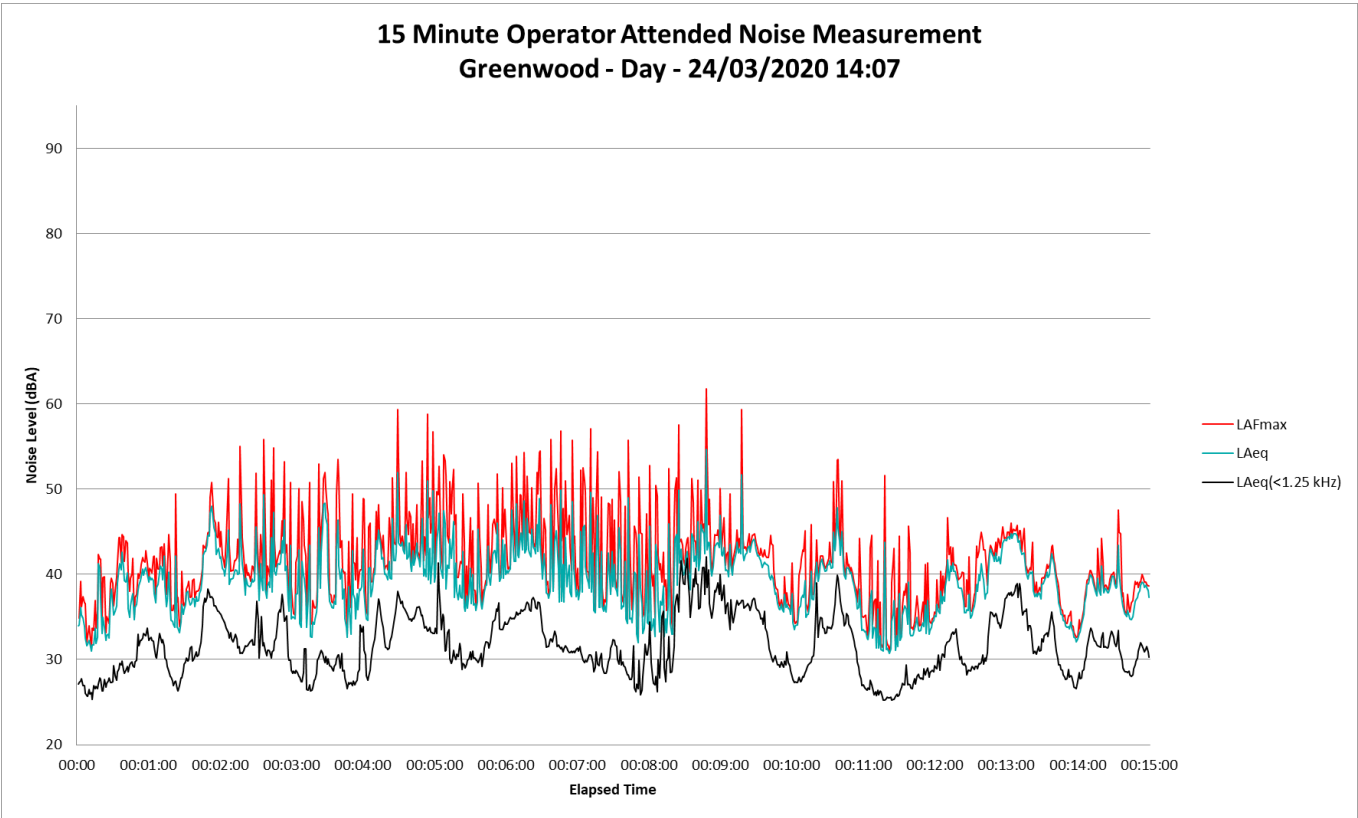


Figure B20 – Evening Period – ‘Greenwood’ Operator Attended Noise Survey Results

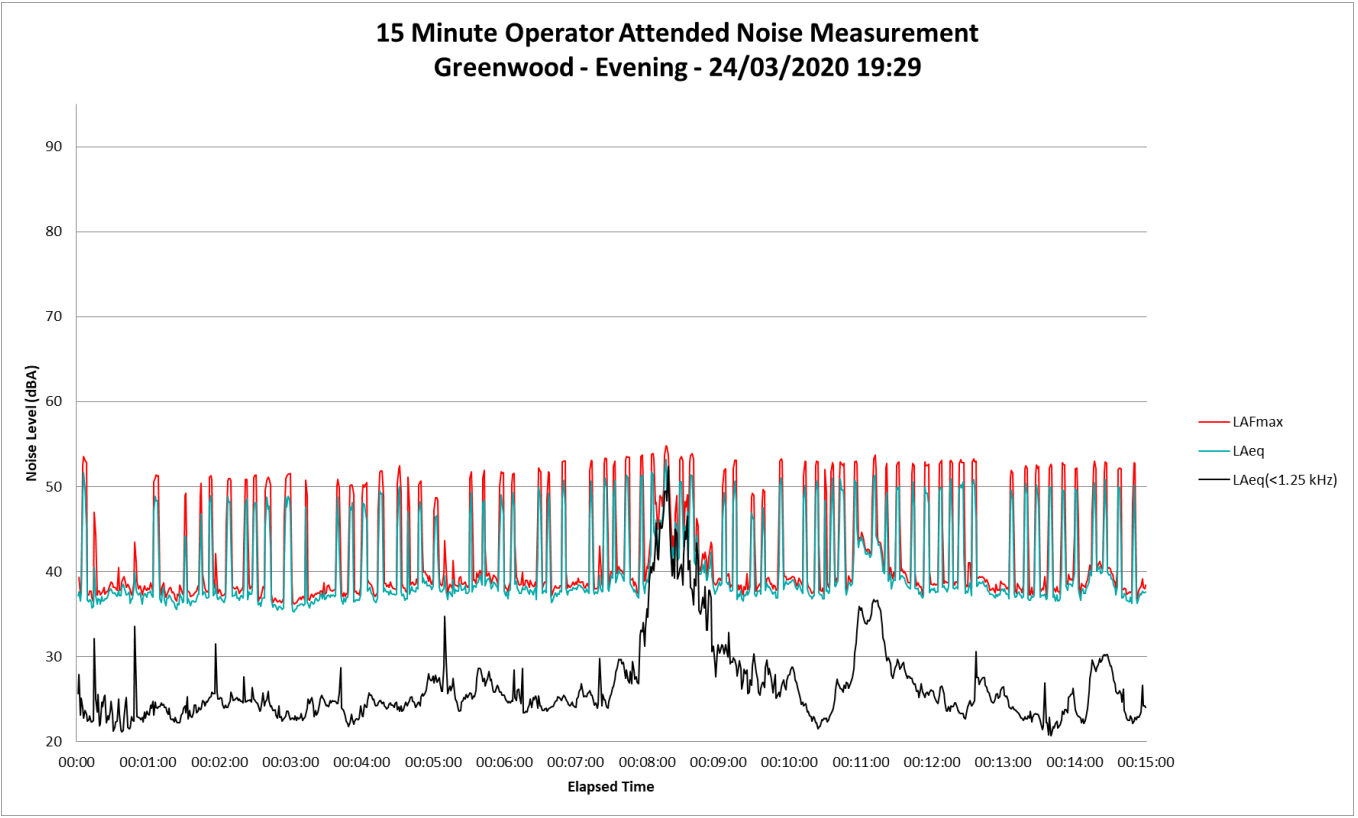
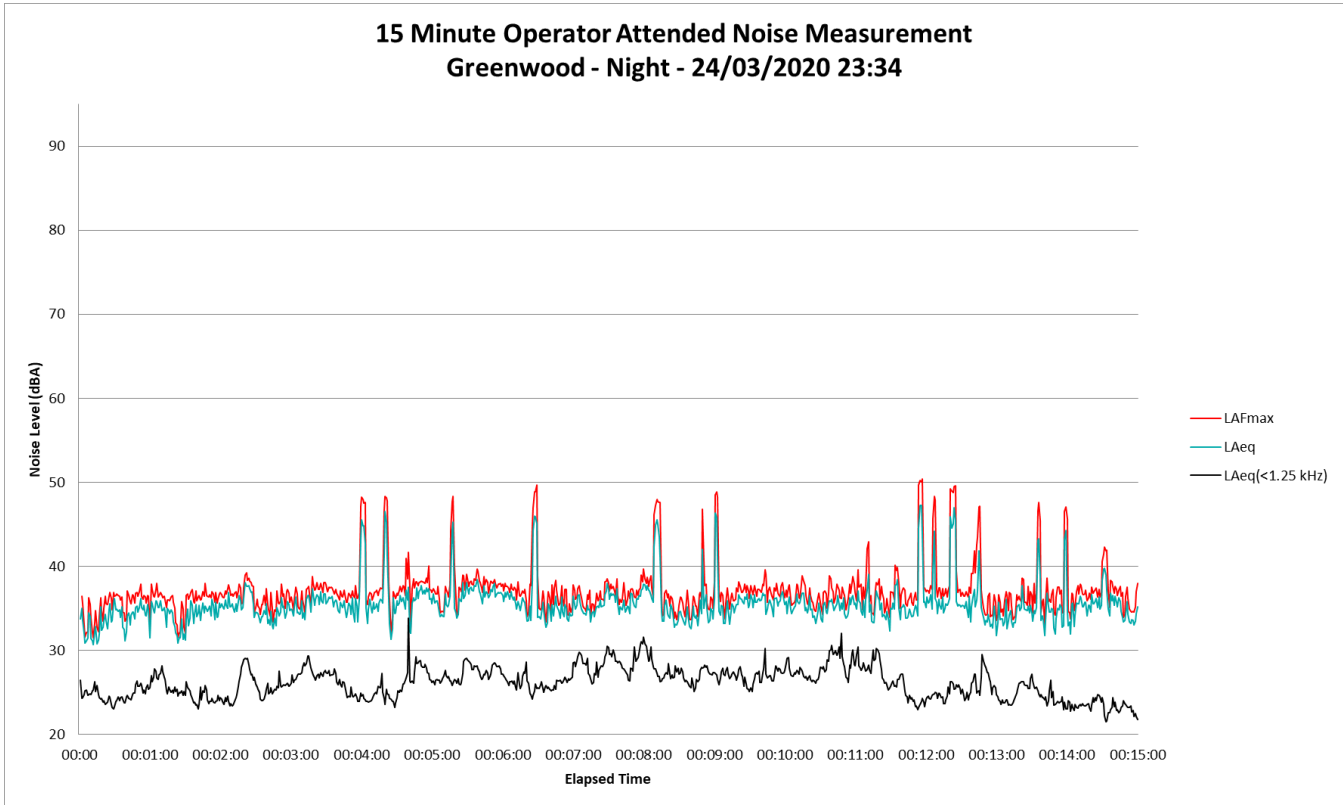


Figure B21 – Night Period – ‘Greenwood’ Operator Attended Noise Survey Results



## ASIA PACIFIC OFFICES

### BRISBANE

Level 2, 15 Astor Terrace  
Spring Hill QLD 4000  
Australia  
T: +61 7 3858 4800  
F: +61 7 3858 4801

### CANBERRA

GPO 410  
Canberra ACT 2600  
Australia  
T: +61 2 6287 0800  
F: +61 2 9427 8200

### DARWIN

Unit 5, 21 Parap Road  
Parap NT 0820  
Australia  
T: +61 8 8998 0100  
F: +61 8 9370 0101

### GOLD COAST

Level 2, 194 Varsity Parade  
Varsity Lakes QLD 4227  
Australia  
M: +61 438 763 516

### MACKAY

21 River Street  
Mackay QLD 4740  
Australia  
T: +61 7 3181 3300

### MELBOURNE

Level 11, 176 Wellington Parade  
East Melbourne VIC 3002  
Australia  
T: +61 3 9249 9400  
F: +61 3 9249 9499

### NEWCASTLE

10 Kings Road  
New Lambton NSW 2305  
Australia  
T: +61 2 4037 3200  
F: +61 2 4037 3201

### PERTH

Ground Floor, 503 Murray Street  
Perth WA 6000  
Australia  
T: +61 8 9422 5900  
F: +61 8 9422 5901

### SYDNEY

Tenancy 202 Submarine School  
Sub Base Platypus  
120 High Street  
North Sydney NSW 2060  
Australia  
T: +61 2 9427 8100  
F: +61 2 9427 8200

### TOWNSVILLE

12 Cannan Street  
South Townsville QLD 4810  
Australia  
T: +61 7 4722 8000  
F: +61 7 4722 8001

### WOLLONGONG

Level 1, The Central Building  
UoW Innovation Campus  
North Wollongong NSW 2500  
Australia  
T: +61 404 939 922

### AUCKLAND

68 Beach Road  
Auckland 1010  
New Zealand  
T: 0800 757 695

### NELSON

6/A Cambridge Street  
Richmond, Nelson 7020  
New Zealand  
T: +64 274 898 628