Environmental Noise Survey and Noise Impact Assessment
At Johnson Matthey, Clitheroe
June 2015

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1. Introduction

1.1 Background

Environmental Evaluation Ltd was commissioned by Johnson Matthey Catalysts to carry out an environmental noise survey and noise impact assessment to support planning for the installation of a new substation containing two transformers and associated fans at its site in Clitheroe, Lancashire.

This report therefore presents the results of a series of noise measurements made around the site and in the surrounding community in order to establish the typical environmental noise levels arising at present, and to predict the potential noise impact of the substation at these properties.

A noise survey was undertaken by Mrs Susan Witterick, of dBX Acoustics, on behalf of Environmental Evaluation around the Johnson Matthey site and in the local area between 09:00hours on 3rd June 2015 and 08:00 hours on 4th June 2015.

1.2 Warranties

Environmental Evaluation Ltd has made every effort to assess all information provided during the course of this investigation; however, no guarantees or warranties can be made as to the accuracy or validity of information provided by third parties.

Environmental Evaluation Ltd accepts no responsibility or liability for the consequences of this document in part or in whole being used for any other purpose than that for which it was commissioned. Any persons so using or relying upon this document for such a purpose do so at their own risk.

This report has been prepared for the sole use of Johnson Matthey Catalysts and shall not be relied upon or transferred to any other party without the express written authorisation of Environmental Evaluation Ltd. Where opinions expressed are based on current guidelines and legislation, no liability can be accepted by Environmental Evaluation Ltd for the effects of any future changes to such guidelines and legislation.
2. Measurement Methodology

Measurements were made in third octave bands which are presented in full in a spreadsheet accompanying this report. The noise monitoring equipment used during the survey was a pair of CEL-633 Type 1 sound level meters, serial numbers 1539298 and 3921025.

On site calibration checks were performed on the meter before and after the measurements using a CEL 120/1 calibrator serial number 2045151 and were found to be within the permitted tolerance of BS EN 61672-1:2013.

All equipment had a valid calibration certificate at the time of the survey and all microphones were fitted with a windshield.

For all measurements the microphone was located approximately 1.5m above ground level and 3.5m away from any other reflective surface, i.e. in free field conditions.

Daytime noise measurements were each of 15 minutes duration, with a 5 minute measurement period used overnight.
3. Site Observations

3.1 Measurement Locations

The measurement locations at the site and in the community are indicated in the figure in Appendix 1.

The measurement locations were selected to match those studied in 2013 by Environmental Evaluation and reported in report number 65315. An additional location (Location 5) was added at the location of the proposed substation.

The dominant noise sources at all locations were plant and activity both at the Johnson Matthey site and at the nearby Hanson plant. Local road traffic was also noted; in particular regular HGV movements associated with the Hanson plant were noted along West Bradford Road throughout the night time period.

3.2 Weather Conditions

The weather during the survey was good with a temperature of 14°C during the daytime and 6°C at night. The wind speed varied between 1 and 3 m/s and there was no precipitation.
4. Survey Results

4.1 Noise Levels at Continuous Monitor

Continuous noise measurements were made at the boundary with Moorland School (Location 3) throughout the survey period. The time history (in 15 minute periods) at this location is shown in Figure 1 below. The noise levels were consistent throughout the survey period with the lowest night time noise level being $L_{A90,15min}$ 52 dB.

![Figure 1: Time profile at Location 3 (Moorland School)](image-url)
4.2 Noise Levels at Other Locations

Table 1 below shows the A-weighted noise levels measured at the spot measurement locations. The full third octave band data is presented in a spreadsheet provided with this report.

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Time</th>
<th>L_{A_{max}}</th>
<th>L_{A_{eq}}</th>
<th>L_{A_{10}}</th>
<th>L_{A_{90}}</th>
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<td>1</td>
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<td>10:03</td>
<td>77</td>
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<td>52</td>
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<td></td>
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<td>81</td>
<td>64</td>
<td>66</td>
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<td></td>
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<td>62</td>
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<td></td>
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</tr>
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<td></td>
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<td>10:46</td>
<td>85</td>
<td>65</td>
<td>68</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>3 June</td>
<td>11:52</td>
<td>82</td>
<td>64</td>
<td>67</td>
<td>45</td>
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<tr>
<td></td>
<td>4 June</td>
<td>01:29</td>
<td>75</td>
<td>58</td>
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<td>45</td>
</tr>
<tr>
<td></td>
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<td>44</td>
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<td></td>
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<td>81</td>
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<td>09:18</td>
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<td>66</td>
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<td>64</td>
<td>64</td>
<td>63</td>
</tr>
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<td>64</td>
<td>65</td>
<td>64</td>
</tr>
</tbody>
</table>

Table 1: Measured Noise Levels, Spot Measurements

It can be seen that at each location the noise levels are consistent and also that there is little variation between day and night time periods. This is compatible with the observation that the noise climate in the area is dominated by plant and industrial noise. The measured background noise level (L_{A_{90}}) is also comparable to that measured during the 2013 noise survey.
5. **Predicted Noise Levels**

The transformers and fans are to be provided by Electricity North West Ltd. They have provided the following information with regard to noise levels;

‘**As part of the primary transformer testing, EWNL Engineering Specification 323 Issue 4 ‘33/11kV or 33/6.6kV System Transformers’ & in accordance with BS EN 60076-10, the sound power levels for a 23 MVA transformer shall be no greater than 65 dBA without fans and pumps running and no greater than 83 dBA with fans and pumps running’**.

The closest noise sensitive receptor to the site is the boarding school (Moorlands School), the nearest residential buildings on the site are approximately 100m from the proposed substation. The lowest measured night time background noise level at this location (Location 3) was 53 dB LA90,15 min.

At this distance it is reasonable to treat the substation as a point noise source with an overall sound power level of 86 dBA with fans and pumps running (sound power for two units based on data from ENWL quoted above).

The received sound pressure level can be calculated using the equation:

\[
SPL = SWL - 20 \log r - 11 + Directivity
\]

Where SPL is sound pressure level, SWL is sound power level, \( r \) is distance, and the directivity of the source in this situation is considered to be hemispherical i.e. 3 dB.

The sound pressure level arising at the receptor is therefore calculated as 38 dBA.

This prediction does not take into account any screening due either to the landscaping around the site boundary, the intervening bulk of the substation building, or the proposed close boarded fence around the transformers. Allowing a typical 8 dB attenuation for a fence (which is in fact conservative) the level arising at the receptor would be **30 dBA**.
6. BS 4142 Assessment

A BS4142 assessment for noise from the substation (worst case with fans and pumps running at night) affecting the nearest noise sensitive receptor (the school buildings) is presented here.

<table>
<thead>
<tr>
<th>Results</th>
<th>Relevant Clause</th>
<th>Commentary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment made at night so reference time period is 15 minutes</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>Specific sound level calculated above</td>
<td>L_{A_{eq,15min}} 30 dB</td>
<td>7.3.4, 7.3.5</td>
</tr>
<tr>
<td>Acoustic feature correction</td>
<td>+4 dB</td>
<td>9.2</td>
</tr>
<tr>
<td>Rating level</td>
<td>34 dB</td>
<td>9.2</td>
</tr>
<tr>
<td>Background sound level</td>
<td>L_{A_{90,15min}} 53 dB</td>
<td>8</td>
</tr>
<tr>
<td>Excess of rating over background sound level</td>
<td>-19 dB</td>
<td>11</td>
</tr>
<tr>
<td>Assessment indicates that specific the source unlikely to have an impact on the sensitive receptors</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Uncertainty of the assessment</td>
<td>10</td>
<td>The uncertainty of the manufacturer’s noise data for the plant is unlikely to have any impact on the outcome of the assessment</td>
</tr>
</tbody>
</table>

7. Discussion

It is shown that the rating level arising due to the substation in full operation (including fans and pumps) would be significantly below the night time background noise level at the nearest noise sensitive receptor. As such, no adverse noise impact is anticipated.

The assessment allows for a close boarded timber fence around the transformers, breaking the line of sight to the noise sensitive receptors. The assessment indicates that in fact no fence is required acoustically (the rating level would still be 11 dB below background without it).

Given the distance and additional screening provided to the other survey locations, it is concluded that no adverse noise impact would arise at these receptors due to the installation and operation of the substation.
8. Conclusion

Environmental Evaluation attended the Johnson Matthey site in Clitheroe to carry out an environmental noise assessment at locations representative of noise sensitive residences in the vicinity of the site. The noise levels were found to be comparable to those measured at the same locations in 2013.

Based on noise data supplied by ENWL, noise levels at the nearest noise sensitive receptor arising due to operation of the substation have been predicted. These have presented a ‘worst case’ assessment with all pumps and fans also in operation.

A BS 4142:2014 assessment has been carried out to examine the noise impact during the quietest 15 minute period of the night and has demonstrated that no adverse noise impact is expected and no specific noise mitigation is required.

All measurements are supported by third octave band data which is contained in a spreadsheet accompanying this report.
Appendix 1 – Measurement Locations
Appendix 2 - Glossary of Acoustic Terminology

Decibel, dB  
A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level ($L_p$) the reference quantity is $2 \times 10^{-5} \text{ N/m}^2$. The sound pressure level existing when microphone measured pressure is $2 \times 10^{-5} \text{ N/m}^2$ is 0 dB, the threshold of hearing.

$L$  
Instantaneous value of Sound Pressure Level ($L_p$) or Sound Power Level ($L_w$).

Frequency  
Number of cycles per second, measured in hertz (Hz), related to sound pitch.

A weighting  
Arithmetic corrections applied to values of $L_p$ according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.

$L_{eq,T}$  
Equivalent continuous level of sound pressure which, if it actually existed for the integration time period $T$ of the measurement, would possess the same energy as the constantly varying values of $L_p$ actually measured.

$L_{Aeq,T}$  
Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, $T$, of the measurement would possess the same energy as the constantly varying values of $L_p$ actually measured.

$L_{n,T}$  
$L_p$ which was exceeded for n% of time, $T$.

$L_{An,T}$  
Level in dBA which was exceeded for n% of time, $T$.

$L_{max,T}$  
The instantaneous maximum sound pressure level which occurred during time, $T$.

$L_{Amax,T}$  
The instantaneous maximum A weighted sound pressure level which occurred during time, $T$.

Background Noise Level  
The value of $L_{A90,T}$, ref. BS4142:2014.

Assessment Position  
Unless otherwise noted, is a point at 1m from the façade of the nearest affected sensitive property.