Annex F

Noise Baseline Survey Report
**BACKGROUND**

This noise baseline has been prepared by Environmental Resources Management Ltd (ERM) on behalf of Keadby Developments Limited (the Company). It presents the survey methodology and baseline conditions to support an application for a Section 36 consent variation by the Company. In 1993, consent was granted for the construction and operation of a combined cycle gas turbine (CCGT) generating station at Keadby in North Lincolnshire and is known as Keadby II, henceforth the Proposed Development. The consent was implemented through construction of a new access road; however, the power station was not built.

Although there have been no substantial changes to legislation regarding noise since the 1992 EIA, the treatment of noise and vibration in EIA reflects developments over the intervening years. In addition a key standard for operational noise, British Standard BS 4142: 2014 - *Methods for rating and assessing industrial and commercial sound* has been recently updated and this has been taken account of in the baseline noise survey as well as the assessment.

Presented within this document are the baseline methodology and a summary of relevant baseline conditions, including the background noise levels adopted at each receptor.

**F1.1 RELEVANT DOCUMENTS, STANDARDS AND GUIDELINES**

The Noise Impact Assessment (NIA) has been undertaken with due regard to and in accordance with the following acoustics standards and guidelines:

- British Standard BS 7445-1:2003 - *Description and measurement of environmental noise*; and

**F1.2 ACOUSTIC GLOSSARY**

All sound pressure levels presented in this report (e.g. noise levels predicted at a receptor) are in decibels A-weighted, referenced to $2 \times 10^{-5}$ Pa.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHS</td>
<td>Environmental, Health, and Safety</td>
</tr>
<tr>
<td>NSR</td>
<td>Noise Sensitive Receiver</td>
</tr>
<tr>
<td>NML</td>
<td>Noise Monitoring Location</td>
</tr>
<tr>
<td>OANM</td>
<td>Operator Attended Noise Measurements</td>
</tr>
<tr>
<td>SLM</td>
<td>Sound Level Meter</td>
</tr>
<tr>
<td>UANM</td>
<td>Unattended Noise Monitoring</td>
</tr>
</tbody>
</table>

A glossary of other relevant acoustics terminology and concepts is provided in Appendix A to this annex.
**F2 BASELINE METHODOLOGY**

**F2.1 INTRODUCTION**

Two baseline noise surveys have been performed, both of these consisted of a series of continuous unattended noise measurements (UANM) and operator attended noise measurements (OANM) within the vicinity of the Proposed Development site near to Keadby I Power Station. The first survey took place during the months June, July and August 2015. During the 2015 survey Keadby I was not in operation. The second survey took place during January 2016 when Keadby I was in normal operation, and running continuously throughout this second survey.

The two surveys were conducted to measure ambient noise levels and determine background noise levels within the study area.

The baseline noise monitoring surveys consisted of:

- continuous UANM for a prolonged period; measuring $L_{Aeq}$, $L_{AMax}$, $L_A$, $L_A5$, $L_A10$, $L_A50$, $L_A90$, $L_A95$, $L_A99$ and $L_{Amin}$, statistical noise parameters;
- OANM (during the daytime and night time) at nearest potential noise sensitive receptor locations to quantify and characterise noise emissions from all noise sources in the area such as road traffic, industrial noise, rail, and shipping; and
- deployment of a meteorological station to measure wind speed data for the purpose of excluding noise measurements affected by periods of high winds and/or rain.

The baseline noise assessment provides quantification and an understanding of the acoustic environment with specific focus on existing industrial noise, particularly during the night time period.

Sampling locations were selected using aerial photography, maps and experience from previous site visits and studies undertaken in the area; these were used to determine the location of operations and nearby sensitive receptors. The final decision was then made while in the field to determine the most suitable and representative locations for monitoring equipment to be deployed (see Figure F2.1).

The purpose of these measurements is to analyse their corresponding results and to determine the ‘Representative Background Level’ (RBL) for each receptor catchment area, as summarised in Table F2.
Figure 2.1
Noise Monitoring Locations
Catchments and Measurement locations

SCALE: See Scale Bar
SIZE: A4
PROJECT: 0280278
DATE: 28/01/2016
VERSION: A01
DRAWN: GB
CHECKED: SM
APPROVED: KM

Site Boundary
- Attended Noise Sensitive Location
- Unattended Noise Sensitive Receptor

Source: © Getmapping plc © 2016 GeoEye © 2016 Intermap Earthstar Geographics © 2016 Microsoft Corporation

Path: P:\Projects\0280278_KeadbyGB_KM\MAPS\EIA\08_Noise\0280278_Noise_A02.mxd
Instrumentation and Calibration
A Brüel and Kjaer 2238 Type 1 precision grade Sound Level Meter (SLM) and two Ngara Real Time Acquisition Systems were used for long term UANM. A Brüel and Kjaer 2250L Type 1 precision grade SLM was used for short term OANM. The instruments were calibrated before and after measurements and no significant calibration drift (<0.5 dB) was detected.

F2.2 ATTENDED AND UNATTENDED MONITORING LOCATIONS

F2.2.1 Noise Monitoring Locations

From the perspective of potential sensitive human receptors, sampling locations were located at specially selected locations within the vicinity of the Proposed Development site (see Figure F2.1).

F2.2.2 Long Term Continuous Unattended Noise Monitoring

Representative measurement locations within the vicinity of the Proposed Development site were used to measure the baseline noise levels. Long term continuous UANM stations were used to measure the ambient noise on a continuous basis over a 5 to 10 day period for the 2015 survey, and a 2 day period for the 2016 survey; ensuring the existing day and night time noise baseline was captured.

The 2015 and 2016 survey measurement locations are shown in Table F2.1 and Table F2.2 respectively. The monitors automatically logged the L_{Aeq}, L_{A90}, L_{A10}, L_{AMax} and L_{AMin} parameters every 15 minutes during each deployment.

Table F2.1 Long Term Unattended Noise Monitoring Locations (2015 Survey)

<table>
<thead>
<tr>
<th>ID</th>
<th>Catchment</th>
<th>Name</th>
<th>Type</th>
<th>Coordinates (UTM 30U)</th>
<th>X (m East)</th>
<th>Y (m North)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NML1</td>
<td>South West</td>
<td>Vazon Bridge</td>
<td>Residential</td>
<td></td>
<td>648605</td>
<td>5940651</td>
</tr>
<tr>
<td>NML3</td>
<td>North</td>
<td>Hawthorne House</td>
<td>Residential</td>
<td></td>
<td>649134</td>
<td>5941025</td>
</tr>
<tr>
<td>NML4</td>
<td>Keadby</td>
<td>Keadby Village</td>
<td>Residential</td>
<td></td>
<td>649386</td>
<td>5941000</td>
</tr>
<tr>
<td>NML5</td>
<td>East</td>
<td>Mariners Arms Flats</td>
<td>Residential</td>
<td></td>
<td>649462</td>
<td>5940768</td>
</tr>
</tbody>
</table>

Table F2.2 Long Term Unattended Noise Monitoring Locations (2016 Survey)

<table>
<thead>
<tr>
<th>ID</th>
<th>Catchment</th>
<th>Name</th>
<th>Type</th>
<th>Coordinates (UTM 30U)</th>
<th>X (m East)</th>
<th>Y (m North)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NML1</td>
<td>South West</td>
<td>Vazon Bridge</td>
<td>Residential</td>
<td></td>
<td>648605</td>
<td>5940651</td>
</tr>
<tr>
<td>NML2</td>
<td>North</td>
<td>Red House</td>
<td>Residential</td>
<td></td>
<td>648775</td>
<td>5941090</td>
</tr>
<tr>
<td>NML4</td>
<td>Keadby</td>
<td>Keadby Village</td>
<td>Residential</td>
<td></td>
<td>649386</td>
<td>5941000</td>
</tr>
<tr>
<td>NML5</td>
<td>East</td>
<td>Mariners Arms Flats</td>
<td>Residential</td>
<td></td>
<td>649462</td>
<td>5940768</td>
</tr>
</tbody>
</table>
F2.2.3 Short Term Operator Attended Measurements

A series of short term OANM were conducted during both the daytime and night time at representative measurement locations (shown in Table F2.3). These allowed the nature, character and dominant noise sources surrounding and within the Study Area to be identified. Short-term measurements were also undertaken near long-term locations to verify the long-term measurements. Measurements were 10 to 15 minutes in duration and recorded the following parameters - $L_{Aeq}$, $L_{A90}$, $L_{A10}$, $L_{AMax}$ and $L_{AMin}$.

Table F2.3 Short Term Operator Attended Noise Monitoring Locations (2015 and 2016 Survey)

<table>
<thead>
<tr>
<th>ID</th>
<th>Catchment</th>
<th>Name</th>
<th>Type</th>
<th>Coordinates (UTM 30U)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X (m East)</td>
</tr>
<tr>
<td>NML1</td>
<td>South West</td>
<td>Vazon Bridge</td>
<td>Residential</td>
<td>648605</td>
</tr>
<tr>
<td>NML2</td>
<td>North</td>
<td>Red House</td>
<td>Residential</td>
<td>648765</td>
</tr>
<tr>
<td>NML3</td>
<td>North</td>
<td>Hawthorne House</td>
<td>Residential</td>
<td>649134</td>
</tr>
<tr>
<td>NML4</td>
<td>Keadby</td>
<td>Keadby Village</td>
<td>Residential</td>
<td>649386</td>
</tr>
<tr>
<td>NML5</td>
<td>East</td>
<td>Mariners Arms Flats</td>
<td>Residential</td>
<td>649462</td>
</tr>
<tr>
<td>NML6*</td>
<td>Three Rivers</td>
<td>Trent Side</td>
<td>Residential</td>
<td>649462</td>
</tr>
<tr>
<td>NML7</td>
<td>Three Rivers</td>
<td>South Bank</td>
<td>Residential</td>
<td>649566</td>
</tr>
</tbody>
</table>

(1) – 2015 survey only, results demonstrated this was very similar to NML7.

F2.3 LIMITATIONS

It is not practical to measure existing noise levels at every location within a project assessment area or even at every receptor selected for the assessment. It is generally considered standard acoustics practice to measure existing ambient and background noise levels at a limited number of locations (the measurement locations are selected to capture data that is representative of the receptors considered in the assessment) and then adopt the measured values at each applicable receptor location or catchment area/region.
F3 BASELINE DESCRIPTION

F3.1 INTRODUCTION

This baseline study assists in the quantification and understanding of the existing acoustic environment including the identification of baseline noise levels at potentially affected Noise Sensitive Receivers (NSRs). These NSRs are located at the same NMLs and use the same reference numbers (i.e. NML1 = NSR1). The baseline environment can be defined as the conditions that would prevail in the absence of the Proposed Development. This information sets the scene for the assessment of the potential noise impacts at the NSRs created by the proposed Project.

F3.2 NOISE MONITORING RESULTS 2015 SURVEY

F3.2.1 Attended Noise Monitoring

The OANM results, which include the existing measured ambient (LAeq) and background (LA90) noise levels for each receptor catchment area, are summarised for the day and night periods in Table F3.1 and Table F3.2.

The complete set of OANM results are presented graphically in Appendix B.1.
<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Date, Time</th>
<th>Duration, t</th>
<th>$L_{\text{Aeq}}$</th>
<th>$L_{\text{Amax}}$</th>
<th>$L_{10}$</th>
<th>$L_{90}$</th>
<th>Wind Speed, m/s</th>
<th>Temperature, Celsius</th>
<th>Noise Environment Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSR1</td>
<td>Vazon Bridge</td>
<td>09/06/2015 17:18:07</td>
<td>00:11:30</td>
<td>54</td>
<td>80</td>
<td>46</td>
<td>37</td>
<td>&lt;5</td>
<td>15.9</td>
<td>Primary sources are passing trains and bird song, other sources are rustling leaves and engine noise from boats</td>
</tr>
<tr>
<td>NSR2</td>
<td>Red House</td>
<td>18/06/2015 18:50:02</td>
<td>00:15:14</td>
<td>41</td>
<td>42</td>
<td>42</td>
<td>40</td>
<td>&lt;5</td>
<td>14.0</td>
<td>Primary sources are bird song. Noise from wind turbine generators and the electrical substation station (100 m west) is also audible.</td>
</tr>
<tr>
<td>NSR3</td>
<td>Hawthorne House</td>
<td>18/06/2015 17:30:14</td>
<td>00:14:23</td>
<td>49</td>
<td>67</td>
<td>51</td>
<td>38</td>
<td>&lt;5</td>
<td>14.5</td>
<td>Primary sources are barking dogs. Other sources are wind turbine generators and rustling trees. Train noise is barely audible.</td>
</tr>
<tr>
<td>NSR4</td>
<td>Keadby Village</td>
<td>09/06/2015 18:09:06</td>
<td>00:15:29</td>
<td>49</td>
<td>78</td>
<td>47</td>
<td>36</td>
<td>&lt;5</td>
<td>15.4</td>
<td>Primary sources are rustling leaves and village noise (public, music, traffic).</td>
</tr>
<tr>
<td>NSR5</td>
<td>Mariners Arms Flats</td>
<td>10/06/2015 11:59:56</td>
<td>00:14:23</td>
<td>44</td>
<td>61</td>
<td>47</td>
<td>34</td>
<td>&lt;5</td>
<td>16.1</td>
<td>Primary sources are traffic noise and bird song.</td>
</tr>
<tr>
<td>NSR6</td>
<td>Trent Side</td>
<td>18/06/2015 15:40:01</td>
<td>00:14:50</td>
<td>48</td>
<td>70</td>
<td>50</td>
<td>41</td>
<td>&lt;5</td>
<td>15.0</td>
<td>Primary sources are bird song, traffic noise (Station Road), and train noise (Trent Side, 500 m southwest)</td>
</tr>
<tr>
<td>NSR7</td>
<td>South Bank</td>
<td>10/06/2015 10:31:29</td>
<td>00:11:05</td>
<td>46</td>
<td>58</td>
<td>49</td>
<td>41</td>
<td>&lt;5</td>
<td>13.4</td>
<td>Primary sources are bird song, traffic noise, train noise and flowing water.</td>
</tr>
</tbody>
</table>

Daytime Period: 0700 – 2300
### Table F3.2  2015 Short Term Night-time Operator Attended Noise Monitoring Results

<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Date, Time</th>
<th>Duration, t</th>
<th>L&lt;sub&gt;Aeq&lt;/sub&gt;</th>
<th>L&lt;sub&gt;Am&lt;/sub&gt;</th>
<th>L&lt;sub&gt;10&lt;/sub&gt;</th>
<th>L&lt;sub&gt;90&lt;/sub&gt;</th>
<th>Wind Speed, m/s</th>
<th>Temperature, Celsius</th>
<th>Noise Environment Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSR1</td>
<td>Vazon Bridge</td>
<td>09/06/2015 23:13:07</td>
<td>00:13:07</td>
<td>36</td>
<td>55</td>
<td>37</td>
<td>33</td>
<td>&lt;5</td>
<td>7.5</td>
<td>Primary sources are passing trains, when absent the rustling leaves are audible.</td>
</tr>
<tr>
<td>NSR 2</td>
<td>Red House</td>
<td>09/06/2015 23:30:21</td>
<td>00:12:15</td>
<td>36</td>
<td>58</td>
<td>40</td>
<td>31</td>
<td>&lt;5</td>
<td>7.4</td>
<td>Primary sources are passing trains, when absent the noise environment is comprised of rustling leaves and grass and 'buzzing' from overhead pylons.</td>
</tr>
<tr>
<td>NSR 3</td>
<td>Hawthorne House</td>
<td>09/06/2015 23:47:11</td>
<td>00:12:39</td>
<td>36</td>
<td>63</td>
<td>36</td>
<td>31</td>
<td>&lt;5</td>
<td>7.2</td>
<td>Primary sources are barking dogs and when absent 'buzzing' from nearby pylons. Passing trains are audible but less dominant at this location.</td>
</tr>
<tr>
<td>NSR 4</td>
<td>Keadby Village</td>
<td>10/06/2015 00:03:06</td>
<td>00:10:20</td>
<td>35</td>
<td>56</td>
<td>38</td>
<td>28</td>
<td>&lt;5</td>
<td>6.7</td>
<td>Primary sources are rustling leaves and village noise (occasional cars, distant tv/talking).</td>
</tr>
<tr>
<td>NSR 5</td>
<td>Manners Arms Flats</td>
<td>09/06/2015 22:51:24</td>
<td>00:12:02</td>
<td>36</td>
<td>56</td>
<td>39</td>
<td>32</td>
<td>&lt;5</td>
<td>7.5</td>
<td>Primary sources are occasional traffic and rustling leaves.</td>
</tr>
<tr>
<td>NSR 6</td>
<td>Trent Side</td>
<td>10/06/2015 00:27:03</td>
<td>00:11:20</td>
<td>36</td>
<td>54</td>
<td>38</td>
<td>31</td>
<td>&lt;5</td>
<td>5.3</td>
<td>Primary sources are traffic, flowing water from nearby canal and rustling leaves. Occasional bird song.</td>
</tr>
<tr>
<td>NSR 7</td>
<td>South Bank</td>
<td>10/06/2015 00:48:06</td>
<td>00:10:52</td>
<td>37</td>
<td>52</td>
<td>41</td>
<td>32</td>
<td>&lt;5</td>
<td>4.7</td>
<td>Primary sources are traffic, flowing water from nearby canal and rustling leaves. Occasional bird song.</td>
</tr>
</tbody>
</table>

Night-time Period: 2300-0700
F3.2.2  Unattended Noise Monitoring

The full UANM results for every 24 hours of monitoring at each location are presented graphically within Appendix C.1. Hourly wind speeds measured at Vazon House are also plotted.

Following the guidance in BS4142 the Representative Sound Levels are taken as the levels that are typical and most commonly occurring in each time period; day and night. To establish a Representative Background Sound Level for each NSR, the method from Section 8 of BS4142 has been used. The unattended noise monitoring results (ambient LAeq and background LA90) for each receptor have been divided into day (0700-2300 hours) and night (2300-0700 hours) periods, measurements during bad weather and wind speed above 5m/s has been excluded. This gave between 850 and 950 15 minute noise levels for each NML. The results are shown graphically using distribution graphs (including cumulative distribution) in Figure F3.1 to Figure F3.12. In marginal cases the cumulative distribution is also considered in arriving at the representative background sound levels.
Figure F3.1  Distribution Graph of Vazon Bridge NSR1 Daytime Data
Figure F3.2  Distribution Graph of Vazon Bridge NSR1 Night Data
Figure F3.3  Distribution Graph of NSR3 Daytime Data

Hawthorne House - NSR3 - Day

- L90 Day
- Laeq Day
- L90 Cumulative %
- LAeq Cumulative %

Number of Samples

Sound Pressure Level, dB(A)

Percentage

0 10 20 30 40 50 60 70 80 90 100
0 20 40 60 80 100

20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90
Figure F3.4  Distribution Graph of NSR3 Night Data
Figure F3.5  Distribution Graph of NSR4 Daytime Data

Keadby Village - NSR4 - Day

- L90 Day
- Laeq Day
- L90 Cumulative %
- LAeq Cumulative %

Number of Samples

Sound Pressure Level, dB(A)

Percentage

0 10 20 30 40 50 60 70 80 90 100

20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90

0 10 20 30 40 50 60 70 80 90 100
Figure F3.6  Distribution Graph of NSR4 Night Data

Keadby Village - NSR4 - Night

- **L90 Night**
- **Laeq Night**
- **L90 Cumulative %**
- **Laeq Cumulative %**

**Sound Pressure Level, dBA**
- 0
- 10
- 20
- 30
- 40
- 50
- 60
- 70
- 80
- 90

**Number of Samples**
- 0
- 10
- 20
- 30
- 40
- 50
- 60
- 70
- 80
- 90
- 100
F3.3 **Noise Monitoring Results 2016 Survey**

Keadby 1 was in normal operation, and running throughout the 2016 survey.

**F3.3.1 Attended Noise Monitoring**

The OANM results, which include the existing measured ambient (L\text{Aeq}) and background (L\text{A90}) noise levels for each receptor catchment area, are summarised for the day and night periods in *Table F3.3* and *Table F3.4*.

The complete set of OANM results are presented graphically in *Appendix B.2*. 
<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Date, Time</th>
<th>Duration, t</th>
<th>L_{Aeq}</th>
<th>L_{Amax}</th>
<th>L_{10}</th>
<th>L_{90}</th>
<th>Wind Speed, m/s</th>
<th>Temperature, Celsius</th>
<th>Noise Environment Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSR1</td>
<td>Vazon Bridge</td>
<td>12/01/2016 11:46</td>
<td>00:11:19</td>
<td>43</td>
<td>60</td>
<td>47</td>
<td>39</td>
<td>&lt;5</td>
<td>5.3</td>
<td>Primary sources are passing trains. Other sources are wind turbines, birdsong, planes overhead, and broadband industrial noise.</td>
</tr>
<tr>
<td>NSR2</td>
<td>Red House</td>
<td>11/01/2016 14:19</td>
<td>00:11:31</td>
<td>38</td>
<td>49</td>
<td>41</td>
<td>35</td>
<td>&lt;5</td>
<td>3.9</td>
<td>Primary sources are bird song and traffic. Other sources include faint construction noise from Red house, passing trains and a fire burning.</td>
</tr>
<tr>
<td>NSR3</td>
<td>Hawthorne House</td>
<td>11/01/2016 14:35</td>
<td>00:13:12</td>
<td>38</td>
<td>58</td>
<td>41</td>
<td>32</td>
<td>&lt;5</td>
<td>3.1</td>
<td>Primary sources are bird song and dogs barking. Other sources include distant trains passing, traffic noise and planes overhead.</td>
</tr>
<tr>
<td>NSR4</td>
<td>Keadby Village</td>
<td>11/01/2016 18:55</td>
<td>00:12:19</td>
<td>40</td>
<td>52</td>
<td>41</td>
<td>39</td>
<td>&lt;5</td>
<td>1.2</td>
<td>Primary sources are noise from Keadby I and traffic noise. Other sources include noise from local residents and planes overhead.</td>
</tr>
<tr>
<td>NSR5</td>
<td>Mariners ArmsFlats</td>
<td>12/01/2016 12:56</td>
<td>00:11:48</td>
<td>44</td>
<td>64</td>
<td>44</td>
<td>37</td>
<td>&lt;5</td>
<td>6.3</td>
<td>Primary sources are traffic and close industrial noise from the south. Other sources include distant trains passing, rustling leaves and residential noise.</td>
</tr>
<tr>
<td>NSR7</td>
<td>South Bank</td>
<td>12/01/2016 13:11</td>
<td>00:11:20</td>
<td>45</td>
<td>60</td>
<td>48</td>
<td>39</td>
<td>&lt;5</td>
<td>6.5</td>
<td>Primary sources are traffic and local construction noise. Other sources include bird song, and noise from the nearby weir.</td>
</tr>
</tbody>
</table>

Daytime Period: 0700 – 2300
Table F3.4  2016 Short Term Night-time Operator Attended Noise Monitoring Results

<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Date, Time</th>
<th>Duration, t</th>
<th>L\text{eq}</th>
<th>L\text{max}</th>
<th>L\text{10}</th>
<th>L\text{90}</th>
<th>Wind Speed, m/s</th>
<th>Temperature, Celsius</th>
<th>Noise Environment Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSR1</td>
<td>Vazon Bridge</td>
<td>11/01/2016 23:17</td>
<td>00:11:09</td>
<td>40</td>
<td>44</td>
<td>41</td>
<td>39</td>
<td>&lt;5</td>
<td>1.4</td>
<td>Primary sources are passing trains and wind turbine noise. Other sources are rustling leaves, wind chimes, and broadband industrial noise.</td>
</tr>
<tr>
<td>NSR2</td>
<td>Red House</td>
<td>11/01/2016 23:34</td>
<td>00:11:29</td>
<td>49</td>
<td>68</td>
<td>51</td>
<td>38</td>
<td>&lt;5</td>
<td>1.6</td>
<td>Primary sources are wind farm noise and noise from Keadby I. Other sources include pilon buzzing and rustling bushes.</td>
</tr>
<tr>
<td>NSR3</td>
<td>Hawthorne House</td>
<td>11/01/2016 23:59</td>
<td>00:12:16</td>
<td>38</td>
<td>41</td>
<td>39</td>
<td>37</td>
<td>&lt;5</td>
<td>1.9</td>
<td>Primary sources are noise from Keadby I and wind farm noise. Other sources include barking dogs and rustling bushes.</td>
</tr>
<tr>
<td>NSR4</td>
<td>Keadby Village</td>
<td>12/01/2016 00:15</td>
<td>00:10:07</td>
<td>43</td>
<td>58</td>
<td>46</td>
<td>39</td>
<td>&lt;5</td>
<td>2.3</td>
<td>Primary source is noise from Keadby I. Other sources include distant passing trains, occasional traffic and rustling long grass.</td>
</tr>
</tbody>
</table>

Night-time Period: 2300-0700
**F3.3.2 Unattended Noise Monitoring**

The full UANM results for every 24 hours of monitoring at each location are presented graphically within *Appendix C.2*. Hourly wind speeds measured at Varzen House are also plotted.

To facilitate the derivation of Representative Sound Levels following the guidance in BS4142 the unattended noise monitoring results (ambient $L_{Aeq}$ and background $L_{A90}$) for each receptor have been divided into day (0700-2300 hours) and night (2300-0700 hours) periods, measurements during bad weather and wind speed above 5m/s has been excluded. This gave between 170 and 180 15 minute noise levels for each NML. The results are shown graphically using distribution graphs in *Figure F3.7* to *Figure F3.12*. As mentioned in Section F3.2.2 the cumulative distribution has also been considered when selecting the representative value.
Figure F3.7  Distribution Graph of NSR1 Daytime Data

Vazon Bridge - NSR1 - Day
Figure F3.8  Distribution Graph of NSR1 Night Data

Vazon Bridge - NSR1 - Night

- L90 Night
- Leq Night
- L90 Night Cumulative Percentage
- Leq Cumulative Percentage

Number of Occurrences

Sound Pressure Level, dB(A)
Figure F3.9  Distribution Graph of NSR2 Daytime Data
Figure F3.10 Distribution Graph of NSR2 Night Data
Figure F3.11  Distribution Graph of NSR4 Daytime Data
Figure F3.12 Distribution Graph of NSR4 Night Data

Keadby Village - NSR4 - Night

- Blue line: L90 Night
- Red line: Leq Night
- Blue dashed line: L90 Night Cumulative Percentage
- Red dashed line: Leq Cumulative Percentage

The graph shows the distribution of sound pressure levels (in dB(A)) for night data. The y-axis represents the number of occurrences, and the x-axis shows the sound pressure level range. The distribution is visualized with different lines for various metrics, indicating the percentage of occurrences at different levels.
F3.3.3 Discussion

The attended measurements correspond well with the unattended measurements. This provides confidence that the unattended surveys captured samples of noise conditions that were typical and representative of the noise climate at each NML.

F3.4 Summary of 2015 and 2016 Survey Results

The noise climate at each NML, for both surveys, is summarised in the tables below.

Table F3.5 Noise Climate at Vazon Bridge (NML1)

<table>
<thead>
<tr>
<th>2015 Survey</th>
<th>2016 Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>• OANM and UANM performed;</td>
<td>• OANM and UANM performed;</td>
</tr>
<tr>
<td>• primary sources are passing trains, giving high increases in noise levels for short periods of time (see appendix B.1);</td>
<td>• primary sources are passing trains giving high increases in noise levels for short periods of time (see appendix B.2);</td>
</tr>
<tr>
<td>• LAmx levels in the range 75 – 85 dB during passbys (little impact on L90 levels).</td>
<td>• LAmx levels in the range 75 – 85 dB during passbys (little impact on L90 levels).</td>
</tr>
<tr>
<td>• Passing trains result in a dynamic noise climate, with LAeq and L90 levels of approximately 54 dB and 37 dB respectively.</td>
<td>• Passing trains result in a dynamic noise climate, with LAeq and L90 levels of approximately 58 dB and 39 dB respectively.</td>
</tr>
<tr>
<td>• in absence of trains, primary sources are bird song and rustling leaves.</td>
<td>• in absence of trains, primary sources are bird song and wind turbines.</td>
</tr>
<tr>
<td></td>
<td>• Noise associated with Keadby I was not noticeably perceivable.</td>
</tr>
</tbody>
</table>
This dynamic noise environment is important to the noise assessment because it influences the way in which new noise from the power station will be perceived. This is discussed in the ES chapter. Importantly the railway lies between the house and the power plant site, so the façade that will experience new noise from the power station is the same façade that currently experiences train noise levels of $L_{A\text{max}}$ 75-85dB at least four times an hour, 21 hours a day.

**Table F3.6  **Noise Climate at Red House (NML2)

<table>
<thead>
<tr>
<th>2015 Survey</th>
<th>2016 Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>• UANM performed;</td>
<td>• OANM and UANM performed;</td>
</tr>
<tr>
<td>• Primary sources are bird song and passing trains. Noise from the wind turbine noise, and broadband noise from the substation to the north is audible.</td>
<td>• Primary sources are noise from Keadby I, passing trains peaks and wind turbine noise. Broadband noise from the substation to the north and electrical buzzing from overhead pilons is audible.</td>
</tr>
<tr>
<td>• More stable noise climate with respect to NSR1, with $L_{t0}$ approximately 7 dB above the $L_{t0}$ during the day period, and 3 dB during the night period.</td>
<td>• More stable noise climate with respect to NSR1, with $L_{t0}$ approximately 6 dB above the $L_{t0}$ during the day period, and 2 dB during the night period.</td>
</tr>
<tr>
<td>• The OANM levels similar to UANM levels measured at NML3</td>
<td>• The OANM levels similar to UANM levels measured at NML1</td>
</tr>
</tbody>
</table>

**Table F3.7  **Noise Climate at Hawthorne House (NML 3)

<table>
<thead>
<tr>
<th>2015 Survey</th>
<th>2016 Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>• OANM and UANM performed;</td>
<td>• UANM performed;</td>
</tr>
<tr>
<td>• Primary sources are barking dogs and rustling leaves, train noise and wind turbine noise is just audible.</td>
<td>• Primary sources are barking dogs and bird song, train noise, Keadby I, and wind turbine noise is just audible.</td>
</tr>
<tr>
<td>• Noise climate is similar to NML2, with the OANM levels being within 1-2dB.</td>
<td>• Noise climate is similar to NML2; OANM measured the same $L_{A\text{eq}}$, and an $L_{90}$ within 3 dB.</td>
</tr>
<tr>
<td>• Reasonable to adopt UANM results for NML2 for this site.</td>
<td>• Reasonable to adopt UANM results for NML2 for this site.</td>
</tr>
</tbody>
</table>

**Table F3.8  **Noise Climate at Keadby Village (NML4)

<table>
<thead>
<tr>
<th>2015 Survey</th>
<th>2016 Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>• OANM and UANM performed;</td>
<td>• OANM and UANM performed;</td>
</tr>
<tr>
<td>• Primary sources are rustling leaves and village noise (traffic, music)</td>
<td>• Primary sources are Keadby I and traffic noise.</td>
</tr>
<tr>
<td>• Daytime levels, $L_{A\text{eq}}$ are elevated due to village noise. Night time levels become more stable.</td>
<td>• Daytime levels, $L_{A\text{eq}}$ are elevated due to village noise. Night time levels become more stable.</td>
</tr>
</tbody>
</table>
### Table F3.9 Noise Climate at Mariners Arms Flats (NML5)

<table>
<thead>
<tr>
<th>2015 Survey</th>
<th>2016 Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>• OANM and UANM performed;</td>
<td>• UANM performed;</td>
</tr>
<tr>
<td>• Primary sources are traffic and bird song, industrial noise is also audible.</td>
<td>• Primary sources are traffic noise and industrial noise. Train noise, rustling leaves and village noise is audible.</td>
</tr>
<tr>
<td>• UANM measurements exhibit continuous low level noise during the night period; indicating either a noise source close to the SLM, or a fault with the measuring equipment. Results are unreliable and so discarded (and not reported herein)</td>
<td>• OANM ( L_{Aeq}, L_{Amax} ) and ( L_{10} ) levels are higher than those measured at NML4, and the ( L_{90} ) is within 2 dB. Survey observations are comparable.</td>
</tr>
<tr>
<td>• OANM levels within 2 dB of those measured at NML4. Survey observations are comparable.</td>
<td>• Reasonable to adopt UANM results from NML4 for this site.</td>
</tr>
<tr>
<td>• Reasonable to adopt UANM results from NML4 for this site.</td>
<td></td>
</tr>
</tbody>
</table>

(1) A low level noise would be undetectable during the daytime period due to the background level being higher.

### Table F3.10 Noise Climate at Trent Side (NML6) and South Bank (NML7)

<table>
<thead>
<tr>
<th>2015 Survey</th>
<th>2016 Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>• UANM performed;</td>
<td>• UANM performed (NML 7 only);</td>
</tr>
<tr>
<td>• Primary sources are bird song, traffic noise and flowing water. Train noise is audible.</td>
<td>• Primary sources are traffic and industrial noise. Bird song and noise from flowing water is present.</td>
</tr>
<tr>
<td>• Observed levels and noise environment very similar for NML6 and NML7.</td>
<td>• Local industrial noise causes the ( L_{Aeq} ) to increase slightly during day periods (with respect to NML4).</td>
</tr>
<tr>
<td>• Levels are very similar to those measured at NML4 and NML5.</td>
<td>• OANM measured ( L_{90} ) the same as that measured at NML4.</td>
</tr>
<tr>
<td>• Local industrial noise causes the ( L_{Aeq} ) to increase slightly during day periods (with respect to NML4).</td>
<td>• Reasonable to adopt UANM levels from NML4 for these two locations.</td>
</tr>
<tr>
<td>• OANM measured ( L_{90} ) the same as that measured at NML4.</td>
<td></td>
</tr>
<tr>
<td>• Reasonable to adopt UANM levels from NML4 for these two locations.</td>
<td></td>
</tr>
</tbody>
</table>

### Table F3.11 Summary of Representative Sound Levels at NSRs

<table>
<thead>
<tr>
<th>NSR</th>
<th>( L_{90}, \text{dB} )</th>
<th>( L_{eq}, \text{dB} )</th>
<th>( L_{90}, \text{dB} )</th>
<th>( L_{eq}, \text{dB} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Vazon Bridge</td>
<td>37/ 38</td>
<td>59/ 58</td>
<td>36/ 38</td>
<td>39/ 39 periods without trains</td>
</tr>
<tr>
<td>2 Red House RBL</td>
<td>37/ 39</td>
<td>45/ 45</td>
<td>33/ 40</td>
<td>36/ 41</td>
</tr>
<tr>
<td>3 Hawthorne House</td>
<td>37/ 39</td>
<td>45/ 45</td>
<td>33/ 40</td>
<td>36/ 41</td>
</tr>
<tr>
<td>4 Keadby Village</td>
<td>35/ 39</td>
<td>45/ 44</td>
<td>30/ 38</td>
<td>36/ 41</td>
</tr>
<tr>
<td>5 Mariners Arms RBL</td>
<td>35/ 39</td>
<td>45/ 44</td>
<td>30/ 38</td>
<td>36/ 41</td>
</tr>
<tr>
<td>6 Trent Side RBL</td>
<td>35/ 39</td>
<td>45/ 44</td>
<td>30/ 38</td>
<td>36/ 41</td>
</tr>
<tr>
<td>7 South Bank RBL</td>
<td>35/ 39</td>
<td>45/ 44</td>
<td>30/ 38</td>
<td>36/ 41</td>
</tr>
</tbody>
</table>

1 – Summer 2015 Survey without Keadby I operating/ January 2016 survey with Keadby I operating.  
2 – NSR2 and NSR3 interchangeable, see text.  
3 – as NSR4, see text.
The table shows that the measured $L_{90}$ and $L_{eq}$ were higher in the 2016 survey except at Vazon Bridge. Observations in 2016 indicated that Keadby I was audible and contributing to noise levels to the north of the site (NML 2, 3 and 4 in particular) but other industrial noise sources including the nearby wind turbines and electrical sub-station were also present, so the increase in levels may not be due solely to Keadby I.

The representative $L_{90}$ at all locations increased in the 2016 survey.
Appendix A

Acoustic Terminology
Glossary, Definitions and Abbreviations
1 ACOUSTICS - GLOSSARY OF TERMS AND DEFINITIONS

1.1 WHAT IS NOISE?

Noise is often defined as unwanted sound but technically, noise is the perception of a series of compressions and rarefactions above and below normal atmospheric pressure.

1.2 HOW TO MEASURE AND DESCRIBE NOISE?

Noise is measured using a specially designed 'sound level' meter which must meet internationally recognised performance standards. Audible sound pressure levels vary across a range of $10^7$ Pascals (Pa), from the threshold of hearing at $20\mu$Pa to the threshold of pain at 200 Pa. Scientists have defined a statistically described logarithmic scale called Decibels (dB) to more manageably describe noise.

To demonstrate how this scale works, the following points give an indication of how the noise levels and differences are perceived by an average person:

- 0 dB - represents the threshold of human hearing (for a young person with ears in good condition);
- 50 dB – represents average conversation;
- 70 dB – represents average street noise, local traffic etc;
- 90 dB – represents the noise inside an industrial premises or factory;
- 140 dB - represents the threshold of pain – the point at which permanent hearing damage may occur.

1.3 ACOUSTIC TERMINOLOGY & STATISTICAL NOISE DESCRIPTORS

Environmental noise levels such as noise generated by industry, construction and road traffic are commonly expressed in dB(A). The A-weighting scale follows the average human hearing response and enables comparison of the intensity of noise with different frequency characteristics. Time varying noise sources are often described in terms of statistical noise descriptors. The following descriptors are commonly used when assessing noise.

1/3 Octave Single octave bands divided into three parts
Octave A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
Ambient Noise The noise associated with a given environment. Typically a composite of sounds from many sources
located both near and far where no particular sound is dominant.

**A Weighting**  
A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

**Decibel (dB)**  
The units of sound level and noise exposure measurement where a step of 10 dB is a ten-fold increase in intensity or sound energy and actually sounds a little more than twice as loud.

| dB(A), dBA | Decibels A-weighted. |
| dB(C, dBC | Decibels C-weighted. |
| dB(Z), dB(L) | Decibels Linear or decibels Z-weighted. |

**Hertz (Hz)**  
The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.

**LA10**  
The percentile sound pressure level exceeded for 10% of the measurement period with 'A' frequency weighting calculated by statistical analysis. Typically used to assess the impact of an existing operation on a receiver area and is referred to as the cumulative noise levels at the receiver attributable to the noise source.

**LA90**  
The percentile sound pressure level exceeded for 90% of the measurement period with 'A' frequency weighting calculated by statistical analysis.

**LMax**  
The maximum of the sound pressure levels recorded of a measurement period.

**Laeq, T**  
Equivalent continuous sound pressure level with 'A' frequency weighting - The value of the sound pressure level of a continuous steady noise that, a measurement interval of time (t), has the same mean square sound pressure as the sound under consideration whose level varies with time.

**LAN**  
Percentile level - a measure of the fluctuation of the sound pressure level with 'A' frequency weighting which is exceeded 'N' per cent of the measurement time.
SPL, Lp  

**Sound pressure level** - The level of sound pressure; expressed in decibels, as measured by a standard sound level meter with a microphone. This differs from Lw in that this is the received sound as opposed to the sound ‘intensity’:

where \( p \) is the rms sound pressure in pascals and \( p_o \) is the sound reference pressure at 20 \( \mu \text{Pa} \) (2 x 10\(^{-5}\)).

SWL, Lw  

**Sound power level** - This is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment:

where \( W \) is the sound power in watts and \( W_o \) is the sound reference power at 10\(^{-12}\) watts.
1.4 **British Standard BS4142: Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas - Specific Terms**

**Ambient noise**
Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

**Background noise level** $L_{A90,T}$
The ‘A’-weighted sound pressure of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, $T$, measured using the time weighting, $F$, and quoted to the nearest whole number of decibels.

**Measurement time interval** $T_m$
The total time over which measurements are taken.

**Rating level**, $L_{Ar,Tr}$
The specific noise level plus any adjustment for characteristic features of the noise.

**Reference time interval**, $T_r$
The specified interval over which an equivalent continuous ‘A’-weighted sound pressure level is determined.

**Residual noise**
The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

**Residual noise level**, $L_{Aeq,T}$
The equivalent continuous ‘A’-weighted sound pressure level of the residual noise.

**Specific noise level**, $L_{Aeq,Tr}$
The equivalent continuous ‘A’-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

**Specific noise source**
The noise source under investigation for assessing the likelihood of complaints.
Appendix B1

Short Term Operator
Attended Noise Monitoring Results
NML2 Red House - Day - Thursday 18 June 2015

Intermittent Bird Song to 56 dBA

Measured SPL, dB(A)

Time

NSR2 20150618 2.xlsm : Results Graph
NML3 Hawthorne House - Day - Thursday 18 June 2015

Dogs barking throughout recording, peaks at 17:21:51 and 17:27:00 due to louder barking.
NSR4 Keadby Village - Tuesday 09 June 2015

Measured SPL, dB(A)

---

Recorded LA1,t
Recorded LA10,t
Recorded LAeq,t
Recorded LA90,t
Observations

Banging noise to 66 dBA
Banging noise to 65 dBA
Operator to 75 dBA
Banging noise to 68 dBA

Measured SPL dB(A) vs Time


Measured SPL dB(A)

30 35 40 45 50 55 60 65 70 75 80 85

Time

---

Recorded LA1,t
Recorded LA10,t
Recorded LAeq,t
Recorded LA90,t
Observations

Banging noise to 66 dBA
Banging noise to 65 dBA
Operator to 75 dBA
Banging noise to 68 dBA

NSR4 20150609 4.xlsx : Results Graph
NML5 Mariners Arms Flats - Day - Tuesday 09 June 2015

Distant Lawn Mower measured from 12:04:56
NML7 South Bank - Day - Wednesday 10 June 2015

Recorded Data

Measured SPL, dB(A)
Time

- Operator (data omitted)
- Recorded LA_{1,t}
- Recorded LA_{10,t}
- Recorded LA_{eq,t}
- Recorded LA_{90,t}
- Observations

Intermittent bird calls throughout

NSR7 20150609 7.xlsm : Results Graph
# NML8 South Pilfrey Farm (Unoccupied Outbuildings) - Day - Thursday 18 June 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Measured SPL, dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>47.9</td>
</tr>
<tr>
<td></td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>51.8</td>
</tr>
<tr>
<td></td>
<td>53.1</td>
</tr>
</tbody>
</table>

- **Measured SPL**
- **Recorded LA1,t**
- **Recorded LA10,t**
- **Recorded LAeq,t**
- **Recorded LA90,t**
- **Observations**

Wind Speed Increase
<table>
<thead>
<tr>
<th>Time</th>
<th>Measured SPL, dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23:34:32</td>
<td>44.9</td>
</tr>
<tr>
<td>23:35:32</td>
<td>35.8</td>
</tr>
<tr>
<td>23:36:32</td>
<td>31.0</td>
</tr>
</tbody>
</table>

**NML3 Hawthorne House - Night - Tuesday 09 June 2015**

**Measured SPL**
- Operator to 48 dBA
- Operator to 49 dBA
- Operator to 51 dBA
- Operator to 55 dBA
- Operator to 59 dBA

**Recorded SPL**
- Recorded LA1,t
- Recorded LA10,t
- Recorded LAeq,t
- Recorded LA90,t

**Observations**
- Operator (data omitted)
NML4 Keadby Village - Night - Wednesday 10 June 2015

Measured SPL, dB(A)

- Operator to 48 dBA
- Car to 45 dBA


28.2 35.0 37.9 44.7

Recorded LA1,t Recorded LA10,t Recorded LAeq,t Recorded LA90,t Observations

Measured SPL, dB(A)

- Operator to 48 dBA
- Car to 45 dBA


28.2 35.0 37.9 44.7

Recorded LA1,t Recorded LA10,t Recorded LAeq,t Recorded LA90,t Observations

Measured SPL, dB(A)

- Operator to 48 dBA
- Car to 45 dBA


28.2 35.0 37.9 44.7

Recorded LA1,t Recorded LA10,t Recorded LAeq,t Recorded LA90,t Observations

Measured SPL, dB(A)

- Operator to 48 dBA
- Car to 45 dBA


28.2 35.0 37.9 44.7

Recorded LA1,t Recorded LA10,t Recorded LAeq,t Recorded LA90,t Observations
NML5 Mariners Arms Flats - Night - Tuesday 09 June 2015

- Measured SPL
- Recorded LA1,t
- Recorded LA10,t
- Recorded LAeq,t
- Recorded LA90,t
- Observations

Measured SPL, dB(A)

Operator (data omitted)

Plane overhead to 42 dBA

Car to 42 dBA

Time

22:39:11
22:40:11
22:41:11
22:42:11
22:43:22
22:44:22
22:45:22
22:46:22
22:47:22
22:48:22
22:49:22
22:50:22
22:51:22
22:52:22

NML6 Trent Side - Night - Wednesday 10 June 2015

- Measured SPL
- Recorded LA1,t
- Recorded LA10,t
- Recorded L(eq,t)
- Recorded LA90,t
- Observations

Measured SPL, dB(A)

Time

Operator to 47 dBA
Birds to 44 dBA
Operator to 44 dBA
Car door to 45 dBA
Car to 45 dBA
Birds to 44 dBA
Car to 45 dBA

Key points:
- Operator data omitted
- Recorded SPL values
- Observations

Time stamps:
00:15:43
00:16:43
00:17:43
00:18:43
00:19:43
00:20:43
00:21:43
00:22:43
00:23:43
00:24:43
00:25:43
00:26:43
Appendix C.1

Long Term Unattended Noise Monitoring Results
Statistical Noise Levels
NML1 Vazon Bridge - Friday 31 July 2015

- $L_{max}$
- $L_1$
- $L_{10}$
- $L_{90}$
- $Leq$
- Rain $\geq 0.5mm$
- Mean Wind Speed m/s

<table>
<thead>
<tr>
<th>Time (End of 15 Minute Sample Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00</td>
</tr>
<tr>
<td>Wind Speed (m/s)</td>
</tr>
</tbody>
</table>

Appendix C1 - NML1
Report 0280278
Statistical Noise Levels
NML1 Vazon Bridge - Saturday 1 August 2015

Lmax, L1, L10, L90, Leq, Rain >= 0.5mm, Mean Wind Speed m/s

Sound Pressure Level, dB(A)
Wind Speed (m/s)

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML1 Vazon Bridge - Sunday 2 August 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Sound Pressure Level, dB(A) vs. Time (End of 15 Minute Sample Interval)

- Wind Speed (m/s)
- Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML1 Vazon Bridge - Monday 3 August 2015

Lmax
L1
L10
L90
Leq
Rain >= 0.5mm
Mean Wind Speed m/s
Statistical Noise Levels
NML1 Vazon Bridge - Tuesday 4 August 2015

Lmax  L1  L10  L90  Leq  Rain >= 0.5mm  Mean Wind Speed m/s

Sound Pressure Level, dB(A)

Wind Speed (m/s)

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML1 Vazon Bridge - Wednesday 5 August 2015

Sound Pressure Level, dB(A)

Time (End of 15 Minute Sample Interval)

Lmax  L1  L10  L90  Leq  Rain >= 0.5mm  Mean Wind Speed m/s

Appendix C1 - NML1
Report 0280278
Statistical Noise Levels
NML1 Vazon Bridge - Thursday 6 August 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Lmax, L1, L10, L90, and Leq are sound pressure levels used to measure noise.
Rain >= 0.5mm indicates the presence of rain.
Mean Wind Speed m/s shows the average wind speed over time.

Time (End of 15 Minute Sample Interval)

Sound Pressure Level, dB(A)

Wind Speed (m/s)
### Statistical Noise Levels

**NML1 Vazon Bridge - Friday 7 August 2015**

<table>
<thead>
<tr>
<th>Statistical Noise Levels</th>
<th>Lmax</th>
<th>L1</th>
<th>L10</th>
<th>L90</th>
<th>Leq</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rain &gt;= 0.5mm</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mean Wind Speed m/s</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Wind Speed (m/s) vs. Sound Pressure Level (dB(A))

- **Graph X-Axis:** Time (End of 15 Minute Sample Interval)
- **Graph Y-Axis:** Sound Pressure Level, dB(A) vs. Wind Speed (m/s)

---

**Appendix C1 - NML1**

**Report 0280278**
Statistical Noise Levels
NML1 Vazon Bridge - Saturday 8 August 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Wind Speed (m/s)
Sound Pressure Level, dB(A)
Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML1 Vazon Bridge - Sunday 9 August 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s
Statistical Noise Levels
NML1 Vazon Bridge - Monday 10 August 2015

- $L_{max}$
- $L_1$
- $L_{10}$
- $L_{90}$
- $L_{eq}$
- Rain $\geq 0.5\text{mm}$
- Mean Wind Speed m/s

Sound Pressure Level, dB(A) vs. Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML3 Hawthorne House - Friday 31 July 2015

Sound Pressure Level, dB(A) vs. Time (End of 15 Minute Sample Interval)

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s
Statistical Noise Levels
NML3 Hawthorne House - Saturday 1 August 2015

- Time (End of 15 Minute Sample Interval)
- Sound Pressure Level, dB(A)
- Wind Speed (m/s)
- Statistical Noise Levels
  - NML3 Hawthorne House
  - Saturday 1 August 2015
  - Lmax
  - L1
  - L10
  - L90
  - Leq
  - Rain >= 0.5mm
  - Mean Wind Speed m/s
Statistical Noise Levels
NML3 Hawthorne House - Sunday 2 August 2015

Lmax, L1, L10, L90, Leq, Rain >= 0.5mm, Mean Wind Speed m/s

Sound Pressure Level, dB(A) vs. Time (End of 15 Minute Sample Interval)

Wind Speed (m/s)
Statistical Noise Levels
NML3 Hawthorne House - Monday 3 August 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Sound Pressure Level, dB(A) vs Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML3 Hawthorne House - Tuesday 4 August 2015

Lmax  L1  L10  L90  Leq  Rain >= 0.5mm  Mean Wind Speed m/s

Sound Pressure Level, dB(A)

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML3 Hawthorne House - Wednesday 5 August 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Sound Pressure Level, dB(A)
Wind Speed (m/s)

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML3 Hawthorne House - Thursday 6 August 2015

- \( L_{\text{max}} \)
- \( L_{1} \)
- \( L_{10} \)
- \( L_{90} \)
- \( L_{\text{eq}} \)
- Rain \( \geq 0.5 \text{mm} \)
- Mean Wind Speed m/s

Time (End of 15 Minute Sample Interval)

Sound Pressure Level, dB(A)

Wind Speed (m/s)
Statistical Noise Levels
NML3 Hawthorne House - Friday 7 August 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

- Time (End of 15 Minute Sample Interval)
- Wind Speed (m/s)
- Sound Pressure Level, dB(A)
Statistical Noise Levels
NML3 Hawthorne House - Saturday 8 August 2015

Lmax  L1  L10  L90  Leq  Rain >= 0.5mm  Mean Wind Speed m/s

Sound Pressure Level, dB(A)
Wind Speed (m/s)

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML3 Hawthorne House - Sunday 9 August 2015

Lmax
L1
L10
L90
Leq
Rain >= 0.5mm
Mean Wind Speed m/s

Sound Pressure Level, dB(A)
Wind Speed (m/s)

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML3 Hawthorne House - Monday 10 August 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Sound Pressure Level, dB(A) vs. Time (End of 15 Minute Sample Interval)

Wind Speed (m/s)

Appendix C1 - NML3
Report 0280278
Statistical Noise Levels
NML4 Keadby Village - Tuesday 9 June 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Time (End of 15 Minute Sample Interval)

Sound Pressure Level, dB(A)

Wind Speed (m/s)
Statistical Noise Levels
NML4 Keadby Village - Thursday 11 June 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML4 Keadby Village - Friday 12 June 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Sound Pressure Level, dB(A) vs. Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML4 Keadby Village - Saturday 13 June 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Sound Pressure Level, dB(A) vs. Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML4 Keadby Village - Sunday 14 June 2015

- $L_{\text{max}}$
- $L_1$
- $L_{10}$
- $L_{90}$
- $L_{\text{eq}}$
- Rain $\geq 0.5$mm
- Mean Wind Speed m/s

<table>
<thead>
<tr>
<th>Time (End of 15 Minute Sample Interval)</th>
<th>Wind Speed (m/s)</th>
<th>Sound Pressure Level, dB(A)</th>
</tr>
</thead>
</table>

- $L_{\text{max}}$
- $L_1$
- $L_{10}$
- $L_{90}$
- $L_{\text{eq}}$
- Rain $\geq 0.5$mm
- Mean Wind Speed m/s

Appendix C1 - NML4
Report 0280278
Statistical Noise Levels
NML4 Keadby Village - Monday 15 June 2015

Lmax, L1, L10, L90, Leq, Mean Wind Speed m/s

Time (End of 15 Minute Sample Interval)

Sound Pressure Level, dB(A)

Wind Speed (m/s)
Statistical Noise Levels
NML4 Keadby Village - Tuesday 16 June 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Sound Pressure Level, dB(A)
Wind Speed (m/s)

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML4 Keadby Village - Wednesday 17 June 2015

Lmax  L1  L10  L90  Leq  Rain >= 0.5mm  Mean Wind Speed m/s

Wind Speed (m/s)

Sound Pressure Level, dB(A)

Time (End of 15 Minute Sample Interval)

Appendix C1 - NML4

Report 0280278
Statistical Noise Levels
NML4 Keadby Village - Thursday 18 June 2015

- Lmax
- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Sound Pressure Level, dB(A)
Wind Speed (m/s)

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML5 Mariners Arms Flats - Saturday 1 August 2015

- $L_{max}$
- $L_1$
- $L_{10}$
- $L_{90}$
- $L_{eq}$
- Rain $\geq 0.5$mm
- Mean Wind Speed m/s

Sound Pressure Level, dB(A) vs. Time (End of 15 Minute Sample Interval)

Appendix C1 - NML5
Report 0280278
Statistical Noise Levels
NML5 Mariners Arms Flats - Sunday 2 August 2015

Lmax  L10  L1  L90  Leq

Rain >= 0.5mm
Mean Wind Speed m/s
Statistical Noise Levels
NML5 Mariners Arms Flats - Monday 3 August 2015

Lmax  L1  L10  L90  Leq

Rain >= 0.5mm  Mean Wind Speed m/s

Time (End of 15 Minute Sample Interval)

Sound Pressure Level, dB(A)

Wind Speed (m/s)
Statistical Noise Levels
NML5 Mariners Arms Flats - Tuesday 4 August 2015

Sound Pressure Level, dB(A)

Wind Speed (m/s)

Time (End of 15 Minute Sample Interval)
Statistical Noise Levels
NML5 Mariners Arms Flats - Wednesday 5 August 2015

Lmax L1 L10 L90 Leq Rain >= 0.5mm Mean Wind Speed m/s

Sound Pressure Level, dB(A) vs. Time (End of 15 Minute Sample Interval)

Mean Wind Speed (m/s)
Appendix B2

Short Term Attended Noise Monitoring Results
NSR2 Red House - Day - Monday 11 January 2016

Measured SPL, dB(A)

Time

Measured SPL

Recorded LA1,t

Recorded LA10,t

Recorded LAeq,t

Recorded LA90,t

Local Residents

Train Noise

Appendix B2 – Page 2

Report 0280278
NSR3 Hawthorne House - Day - Monday 11 January 2016

Measured SPL, dB(A)

Recorded LA1,t
Recorded LA10,t
Recorded LAeq,t
Recorded LA90,t

|--- Car passing --|
|--- Car passing --|
|--- Dogs Barking--|
- Plane Overhead -|
NSR5 Mariners Arms Flats - Day - Tuesday 12 January 2016

<table>
<thead>
<tr>
<th>Measured SPL</th>
<th>Recorded LA1,t</th>
<th>Recorded LA10,t</th>
<th>Recorded LAeq,t</th>
<th>Recorded LA90,t</th>
</tr>
</thead>
</table>

--- Train Noise ---

--- Car Noise ---

--- Industrial Noise ---

--- Residential Noise ---
NSR1 Vazon Bridge - Night - Monday 11 January 2016

Measured SPL dBA

<table>
<thead>
<tr>
<th>Time</th>
<th>Recorded LA1,t</th>
<th>Recorded LA10,t</th>
<th>Recorded LAeq,t</th>
<th>Recorded LA90,t</th>
</tr>
</thead>
<tbody>
<tr>
<td>23:17:46</td>
<td>41.5</td>
<td>40.8</td>
<td>40.1</td>
<td>39.3</td>
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<tr>
<td>23:18:46</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23:19:46</td>
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<tr>
<td>23:20:46</td>
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<td>23:21:46</td>
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<td>23:22:46</td>
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<td>23:23:46</td>
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<td>23:24:46</td>
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<td>23:25:46</td>
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<td>23:26:46</td>
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<td>23:27:46</td>
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</table>
NSR2 Red House - Night - Monday 11 January 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Measured SPL</th>
<th>Recorded LA1,t</th>
<th>Recorded LA10,t</th>
<th>Recorded LAeq,t</th>
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<td>23:39:45</td>
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<td>23:41:45</td>
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<tr>
<td>23:42:45</td>
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<td>23:43:45</td>
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<tr>
<td>23:44:45</td>
<td>67</td>
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</tbody>
</table>
NSR3 Hawthorne House - Night - Monday 11 January 2016

Measured SPL, dB(A)

Recorded LA1,t
Recorded LA10,t
Recorded LAeq,t
Recorded LA90,t

Measured SPL, dB(A)

23:59:11 00:00:11 00:01:11 00:02:11 00:03:11 00:04:11 00:05:11 00:06:11 00:07:11 00:08:11 00:09:11

Recorded LA1,t
Recorded LA10,t
Recorded LAeq,t
Recorded LA90,t

40.0
39.2
38.3
37.3

34 36 38 40 42 44 46

23:59:11 00:00:11 00:01:11 00:02:11 00:03:11 00:04:11 00:05:11 00:06:11 00:07:11 00:08:11 00:09:11

Time
NSR4 Keadby Village - Night - Tuesday 12 January 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Measured SPL</th>
<th>Recorded LA1,t</th>
<th>Recorded LA10,t</th>
<th>Recorded LAeq,t</th>
<th>Recorded LA90,t</th>
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<tbody>
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</tr>
<tr>
<td>00:17:12</td>
<td>42.8</td>
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</tr>
<tr>
<td>00:18:12</td>
<td>45.9</td>
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<tr>
<td>00:19:12</td>
<td>51.2</td>
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<td>00:09:11</td>
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</tr>
</tbody>
</table>

Recorded LA1,t, LA10,t, LAeq,t, LA90,t
Appendix C2

Long Term Unattended Noise Monitoring Results
Statistical Noise Levels
NSR1 - Vazon Bridge - Monday 11 January 2016

L1  L10  L90  Leq  Rain >= 0.5mm  Mean Wind Speed m/s
Statistical Noise Levels
NSR1 - Vazon Bridge - Tuesday 12 January 2016

Sound Pressure Level, dB(A)

Time (End of 15 Minute Sample Interval)

Statistical Noise Levels
NSR1 - Vazon Bridge - Tuesday 12 January 2016

L1
L10
L90
Leq
Rain >= 0.5mm
Mean Wind Speed m/s
Statistical Noise Levels
NSR1 - Vazon Bridge - Wednesday 13 January 2016

- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Time (End of 15 Minute Sample Interval)

00:00 02:00 04:00 06:00 08:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 00:00

Wind Speed (m/s)

Sound Pressure Level, dB(A)
Statistical Noise Levels
NSR2 - Red House - Monday 11 January 2016

- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s
Statistical Noise Levels
NSR2 - Red House - Tuesday 12 January 2016

- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Time (End of 15 Minute Sample Interval)

Sound Pressure Level, dB(A)

Wind Speed (m/s)
Statistical Noise Levels
NSR4 - Keadby Village - Monday 11 January 2016

- L1
- L10
- L90
- Leq
- Rain >= 0.5mm
- Mean Wind Speed m/s

Time (End of 15 Minute Sample Interval)

Sound Pressure Level, dB(A)

Wind Speed (m/s)
Statistical Noise Levels
NSR4 - Keadby Village - Tuesday 12 January 2016

Sound Pressure Level, dB(A)

Time (End of 15 Minute Sample Interval)

- Mean Wind Speed m/s
- Rain >= 0.5mm
- Leq
- L90
- L10
- L1