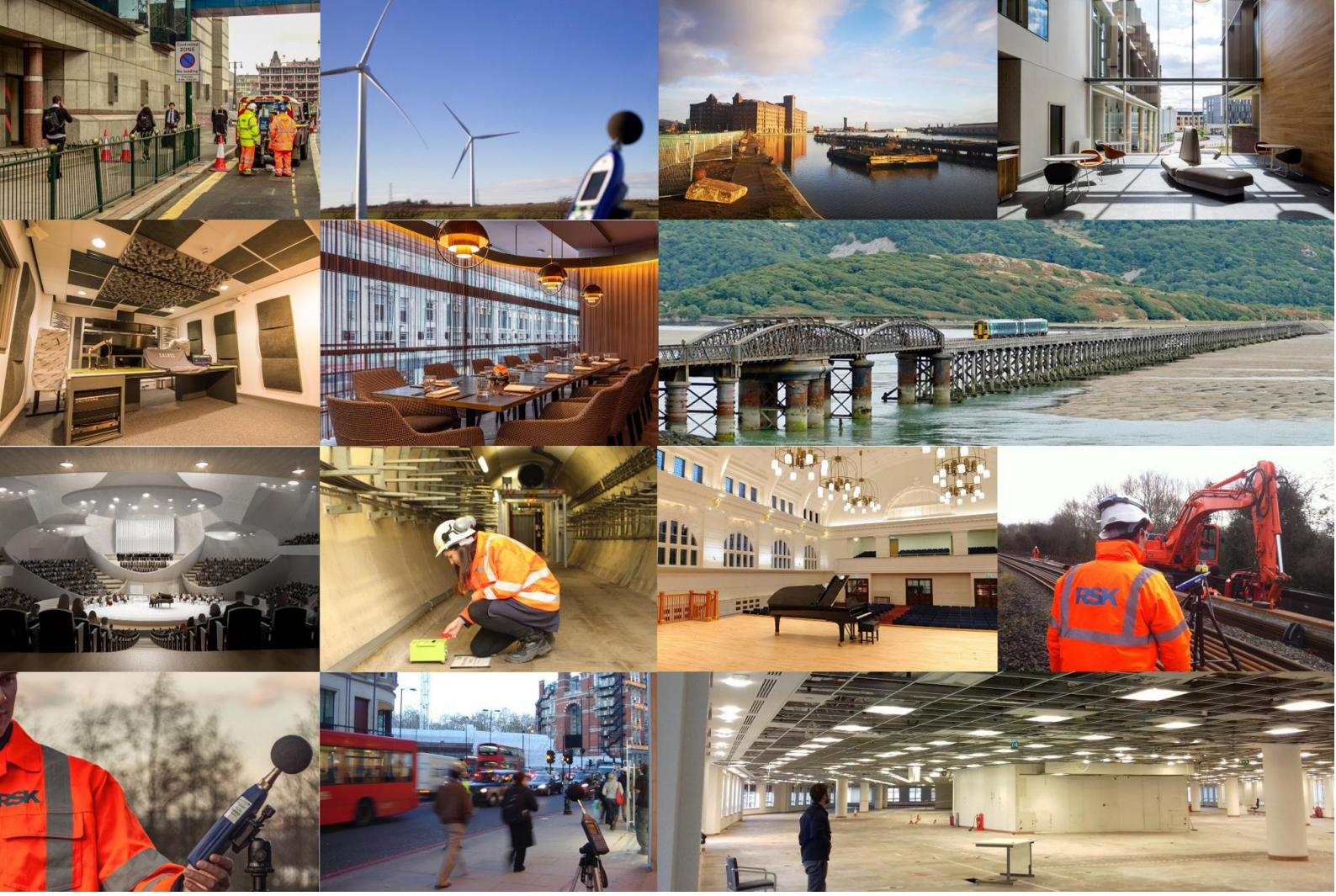
# Appendix F – Noise Impact Assessment



# ENVIRONMENTAL PERMITTING - NOISE IMPACT ASSESSMENT

## BARROW MILL BOILER HOUSE

Kimberly-Clark Limited

2062351-RSKA-RP-002-(02)

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# General notes

| | |
|---|---|
| **Project Name:** | Barrow Mill Boiler House |
| **Title:** | Environmental Permitting - Noise Impact Assessment |
| **Client:** | Kimberly-Clark Limited |
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| Author(s): | Kate Mann, MIOA<br>Senior Acoustic Consultant | Technical reviewer: | Daniel Clare, MIOA<br>Managing Director – RSK Acoustics |
| Signature: |  | Signature: |  |
| Date: | 10 April 2026 | Date: | 10 April 2026 |

# Contents

# 1 Introduction

## 1.1 Instruction

RSK Acoustics (RSKA) has been instructed by Kimberly-Clark Limited (KC) to undertake a noise impact assessment to inform a permit variation application for a new duel fuel (hydrogen and natural gas) boiler plant room at the existing Kimberly Clark Barrow Mill in in Barrow-in-Furness, Cumbria (LA14 4QS).

The staff preparing this document are members of the Institute of Acoustics (IOA) who have undertaken Diploma in Acoustics and Noise Control, and therefore are competent to undertake this study.

A glossary of acoustic terminology relevant to the acoustic investigation is appended to this document.

## 1.2 Overview of Site Operations

KC use the site to manufacture tissue products for consumer and professional businesses. The plant manufactures tissue on two tissue paper machines (TM5 and TM3), and the products can be produced from imported virgin fibre or recycled fibre which is processed in the site de-inking facility. The tissue is currently dried using heat from natural gas and steam from the existing boiler plant, housed in the HPBH. Reels of tissue are converted into rolled or folded products in the converting department and packaged before being palletised for storage and subsequent distribution.

## 1.3 Site Location and Context

### 1.3.1 Site location

The Barrow Mill site is centred on approximate National Grid reference 319574E, 472750N. An aerial image of the site is shown below:


*Figure 1 Aerial view of the site*

The area immediately bounding the site presently comprising the following uses and noise sensitive receptors:

- **Northern boundary** – agricultural land with industrial and commercial businesses beyond;
- **Eastern boundary** – the A590 immediately adjacent with industrial and commercial businesses, agricultural land and residential properties beyond;
- **Southern boundary** – industrial and commercial units including a building merchant and agricultural land; and,
- **Western boundary** – agricultural land and a railway line with the Walney Channel and Walney Aerodrome beyond.

Figure 2 shows the location of the site in relation to the nearest noise sensitive receptors to the site.

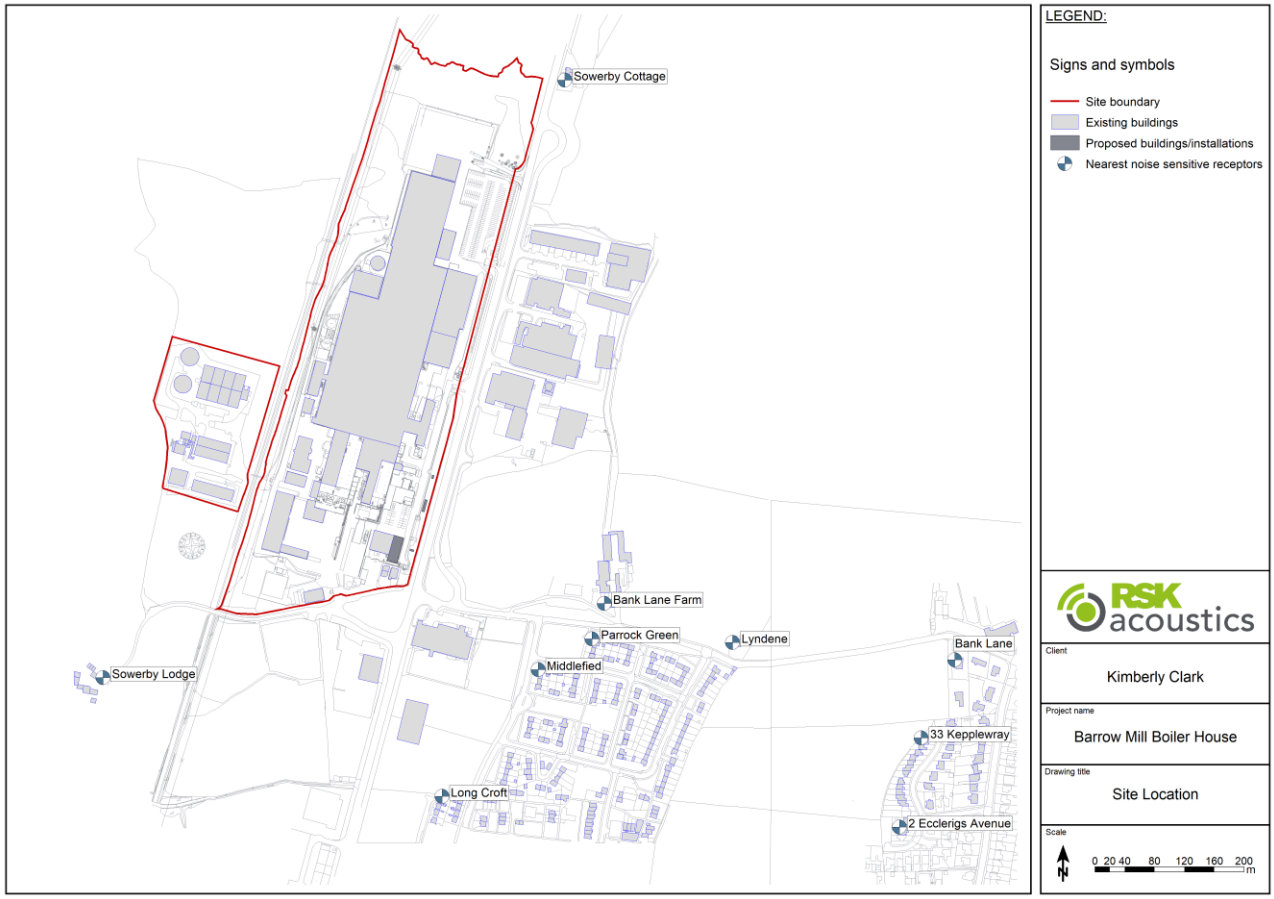


*Figure 2 Site location*

The nearest noise sensitive receptors to the site are residential properties to the east/south-east of the site, including properties located along Bank Lane, Parrock Green, Middlefield/Whinsfield Avenue, Long Croft and Kepplewray Drive. The intervening ground largely comprises soft ground (fields/ agricultural land) as well as the A590.

### 1.3.2 Proposed development

The proposed development consists of the installation of replacement boilers, chimney stacks and associated pipework / infrastructure at the existing Barrow Mill site.

The existing boilers are located in the High Pressure Boiler House (HPBH). There are currently three boilers in the HPBH; two boilers are required for routine operation with the third used as a standby. The existing Low Pressure Boiler House (LPBH) lies adjacent (east) of the HPBH. The LPBH houses three boilers that have all been decommissioned.

As part of Kimberly Clark's sustainability strategy, the proposed development includes the provision of three new boilers with full 100% hydrogen firing capability. The boilers will have dual fuel capability to allow use of either hydrogen or natural gas as a fuel. The new boilers will be located within the existing LPBH. As with the existing boilers, two are required for routine operation with the third used as a standby. As part of the proposals, the existing chimney stacks will be replaced with new 20m high stacks (above ground level), and alterations to the building façade will be undertaken to facilitate the construction and ongoing maintenance of the new boiler plant. A new transformer will be housed in an electrical room in the proposed LPBH.

Three new pressure regulating and metering stations (PRMS) will also be installed (one for hydrogen and two for natural gas) along the grass bank on east of the site. The existing PRMS (located in the vicinity of the existing boiler house) at the site will be decommissioned as part of the works.

Hydrogen for the new boilers will be supplied by the local PEM electrolyser sited on land approximately 400 metres south of the site (approved previously under B09/2022/0869). The proposed development therefore marks the next important step for Kimberly Clark in reducing the amount of natural gas used in its production process.

# 2 Policy, Standards and Guidance

| Document | Summary |
|---|---|
| ***Planning policy*** | |
| National Planning Policy Framework (NPPF) 2025 | The NPPF sets out the Government's planning policies for England and how these are expected to be applied. The NPPF includes statements relating to noise and the requirement to take it into account during the planning process. |
| Noise Policy Statement for England (NPSE) 2010 | The NPSE sets out the long-term vision of Government noise policy: to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. |
| ***Standards and guidance*** | |
| Commission Implementing Decision - establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the production of pulp, paper and board (2014/687/EU), September 2014 | BAT 17 provides guidance on BAT for reducing the emissions of noise from pulp and paper manufacturing. |
| BS 4142:2014+A1:2019 *'Methods for rating and assessing industrial and commercial sound'* | BS 4142 provides a method for rating industrial and commercial sound and a method for assessing resulting impacts upon people. The method is applicable to fixed plant installations, sound from industrial and manufacturing process and other associated activities.<br><br>The rating method takes into account specific source characteristics, such as tonality, impulsivity and intermittency. The impact assessment procedure described in BS 4142 is based on the comparison of the rating sound level with the background sound level prevailing at the assessment locations.<br><br>The methodology set out within the standard is not intended to be used to assess the extent of an impact at indoor locations. However, internal sound levels may be taken into account by considering any acoustic attenuation measures such as façade treatment or screening when discussing the context of the assessment result. The determination of noise amounting to a nuisance is beyond the scope of the standard. |
| BS 7445-1:2003 *'Description and measurement of environmental noise'* | BS 7445 defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities. |
| BS EN IEC 60942:2018 *'Electroacoustics – Sound calibrators'* | BS EN IEC 60942 specifies the performance requirements for sound calibrators. |
| BS EN 61672-1:2013 *'Electroacoustics – Sound level meters'* | BS EN 61672-1 provides electroacoustic performance specifications for sound measuring instruments. |
| BS ISO 9613-2:2024 *'Acoustics – Attenuation of sound during propagation outdoors'* | Part two of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors to enable the prediction of environmental noise at a distance from a variety of sources. |
| Environment Agency (EA), | This guidance replaces the withdrawn Environment Agency Horizontal Guidance for Noise (H3) parts 1 and 2, and |

| Document | Summary |
|---|---|
| Noise and Vibration Management: Environmental Permits, 2022 | SEPA's Guidance on the control of noise at PPC installations.<br><br>The purpose of the Noise and Vibration Management Guidance is to provide supplementary information including guidance on regulation and permitting, a description of the principles of noise measurement and prediction; and the control of noise by design, by operational and management techniques and abatement technologies.<br><br>The Noise and Vibration Management Guidance specifies to follow the methodology in accordance with BS 4142 with consideration to the off-site noise monitoring survey and source assessment. |
| Environment Agency (EA), Method implementation document (MID) for BS 4142, 2023 | This MID supplements BS 4142:2014+A1:2019 Method for rating and assessing industrial and commercial sound (BS 4142), and should be followed when applying to the EA for new environmental permits or permit variation. |
| World Health Organisation (WHO) Guidelines for Community Noise, 1999 | The Guidelines for Community noise was published as a response to a need for action together with a generic need for improvements in legislation at a national level. Although not legislation, this document provides general guidance and guidelines which have been set for different health effects, using the lowest noise level that produces an adverse health effect in specific human environments. |
| WHO *'Night Noise Guidelines for Europe'* (NNG), 2009 | The NNG aims to present the conclusions of the WHO working group responsible for preparing guidelines for exposure to noise during the night. This document forms an extension to the WHO Guidelines for Community Noise. |

*Table 1 Planning policies, standards and guidance*

# 3 Noise Survey

## 3.1 Survey Methodology

Noise surveys have been undertaken to define the sound levels at the nearest noise sensitive receptors to the Barrow Mill site to both quantify the existing noise emissions generated from the site.

Noise measurements were undertaken between Sunday 25 and Wednesday 28 December 2022 during the Christmas shutdown period as the Barrow Mill site is typically operational 24 hours a day. This allowed for background sound levels in absence of the site to be measured.

Attended noise monitoring was also undertaken on Wednesday 10 and Thursday 11 May 2023 while the site was operational to provide further context of the existing noise levels at the receptors. Measurements were undertaken during the night-time as the 24 hour operation of the site and proposed boiler house, and night-time levels representing the greatest potential for impacts due to the other noise sources in the areas being reduced.

The measurement locations are summarised in Table 2 and presented graphically in Figure 3. Photographs of the monitoring locations are presented in Appendix B.

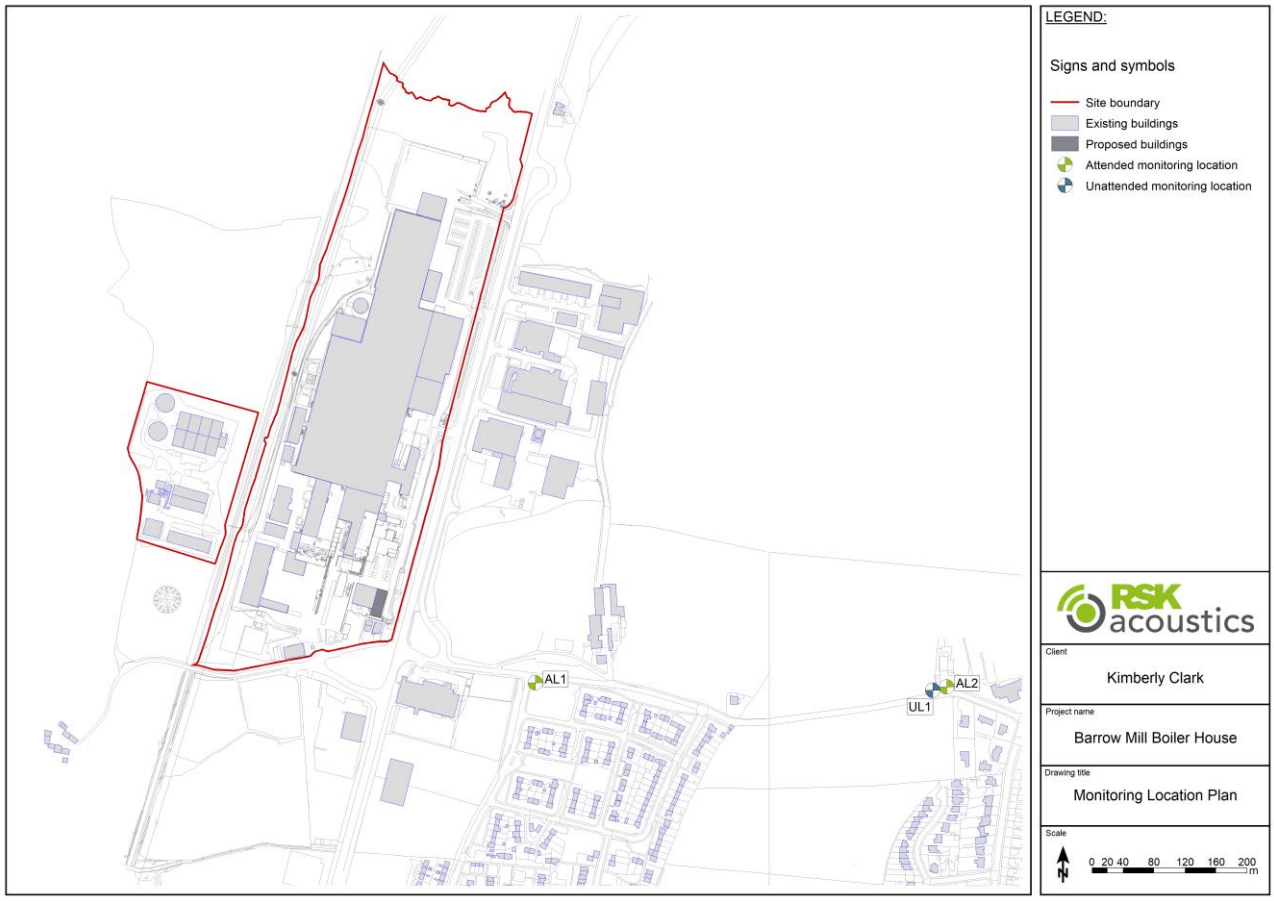


*Figure 3 Monitoring locations*

| Ref. | Survey Date | Measurement Type | Approx. coordinates | Description |
|---|---|---|---|---|
| UL1 | December 2022 | Unattended | 562647N, 174029E | Unattended noise logger installed in free-field conditions approximately 1.5m above ground level. Installed to monitor background sound levels during the Christmas site shutdown. |
| AL1 | May 2023 | Attended | 319783N, 472398E | Attended noise measurement undertaken in representative free-field conditions approximately 1.5m above ground level. Installed to monitor site levels at a location representative of the nearest noise sensitive receptors located in the vicinity of Middlefield road. |
| AL2 | | | 320317N, 472394E | Attended noise measurement undertaken in representative free-field conditions approximately 1.5m above ground level. Installed to monitor site levels at a location representative of noise sensitive receptors located at the eastern end of Bank Lane. |

*Table 2 Monitoring locations*

## 3.2 Survey Equipment

The noise measurements were undertaken using the following equipment:

| Survey Equipment | Type | Serial number | Calibration date expiry |
|---|---|---|---|
| Sound level meter | 01dB FUSION | 14598 | 30/05/2022 |
| Acoustic calibrator | Rion NC-74 | 34857331 | 31/03/2022 |
| Sound level meter | SVAN 971 | 72618 | 08/08/2022 |
| Acoustic calibrator | Rion NC-74 | 34167506 | 27/06/2022 |

*Table 3 Monitoring equipment*

The sound level meters conformed to the Class 1 requirements of BS EN 61672-1:2013. The calibrators used conformed to the Class 1 requirements of BS EN IEC 60942:2018. The equipment used had a calibration history that is traceable to a certified calibration institution. Calibration certificates are available on request. The calibration of the sound level meters were field checked prior to commencing measurements and prior to removing the equipment from site upon completion; no significant calibration drift was observed i.e., within a +/- 0.5 dB tolerance.

## 3.3 Weather Conditions

Weather information for the background noise measurements was obtained through a nearby third-party weather station (Wunderground ref. IBARRO18) to determine conditions throughout the unattended survey duration. The weather information has been summarised in Figure 4 below. Detailed hourly weather information can be provided upon request. Noise levels measured during adverse weather conditions on Sunday 25 December until 2am on Monday 26 December 2022 have been excluded from the assessment.

For the remainder of the measurement period, wind speeds were noted to be less than 5 m/s in a predominantly northerly wind direction with no significant precipitation during the night-time periods. Therefore, weather conditions were generally considered conducive to noise monitoring.

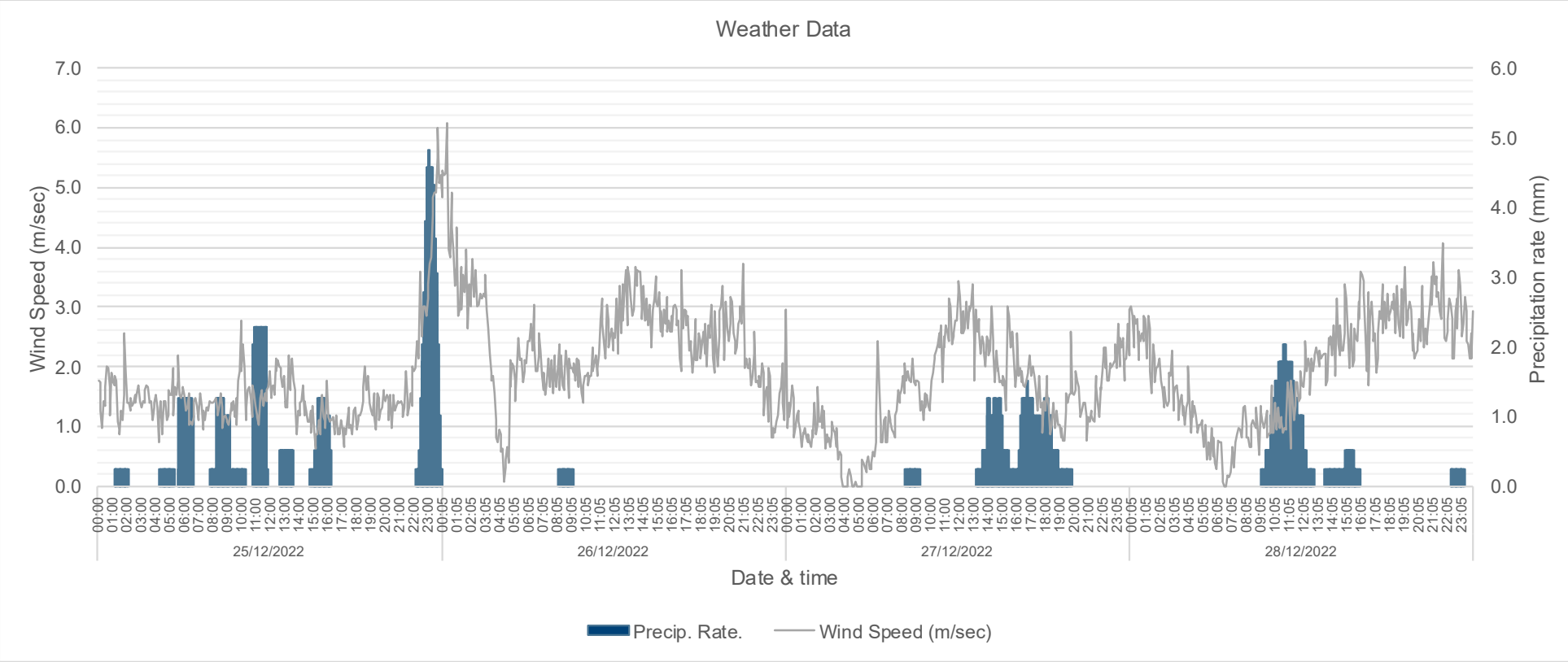


*Figure 4* *Weather conditions*

Weather conditions were noted during the attended noise survey in May 2023 and were clear and dry with wind speeds of less than 5 m/s, therefore weather conditions were considered conducive to noise monitoring.

## 3.4 Survey Observations

During the noise survey, prominent noise sources were noted to be steady state noise from the existing Barrow Mill site, road traffic noise from the A590 and regular vehicle movements on Bank Lane. In absence of the KC Barrow Mill site operations, the noise environment comprised road traffic noise and noise from a builders merchants and other industrial/commercial units located along Bank Lane and the A590.

## 3.5 Results

### 3.5.1 Unattended noise measurements – UL1 (December 2022)

The noise monitoring data measured at UL1 is presented below. A tabulated summary is presented in Appendix C.



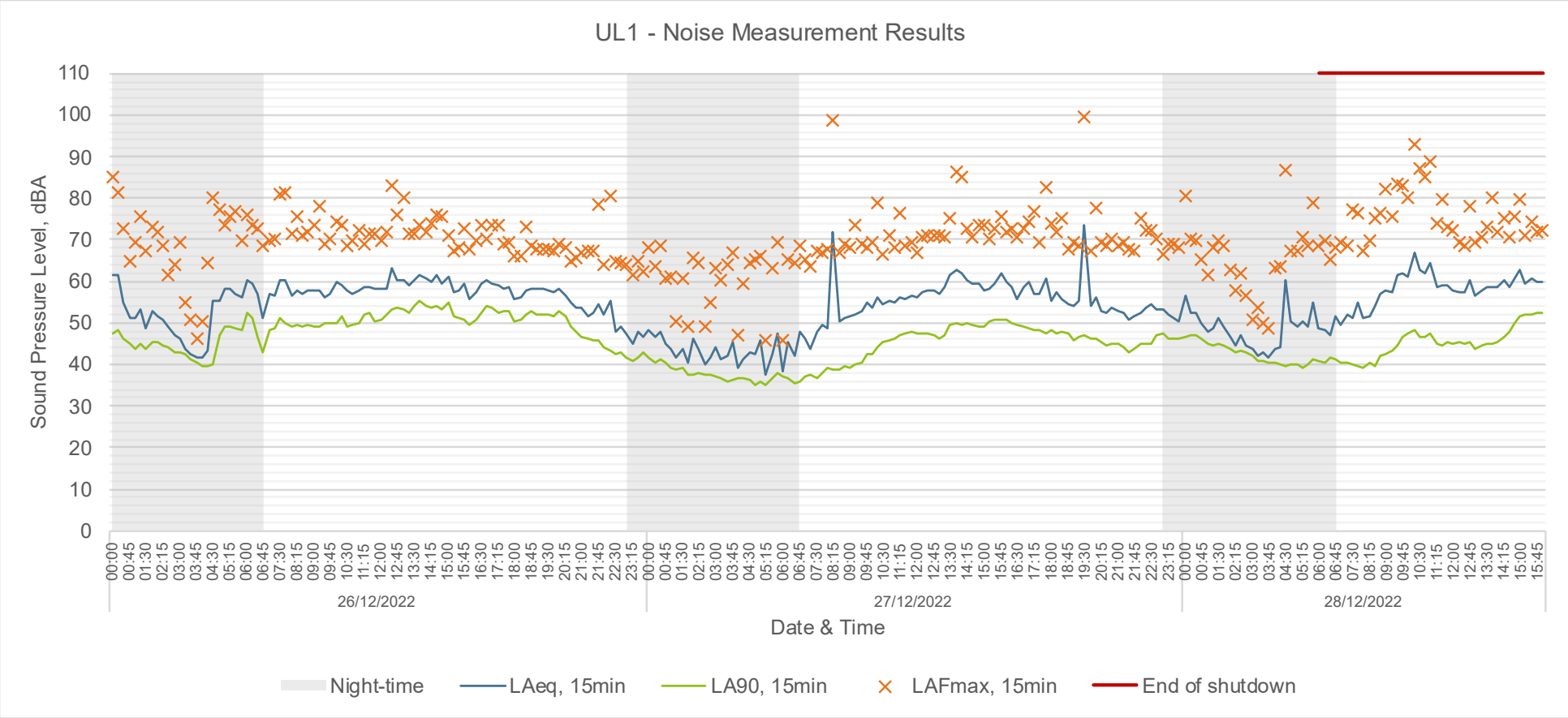


*Figure 5 UL1 noise survey results*

The methodology detailed in BS 4142: 2014+A1: 2019 provides an example of statistical analysis to determine the typical background sound level ($L_{A90,15min}$). The following analysis adopts the methodologies applied within the aforementioned standard for UL1.

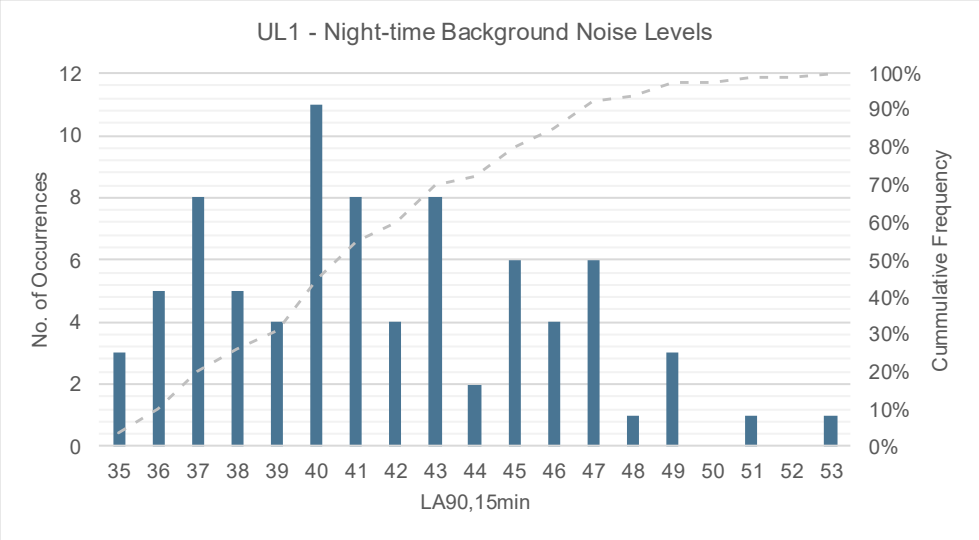


*Figure 6 Statistical analysis of background sound levels – UL1*

Based on Figure 6, 'BS 4142:2014+A1:2019 Technical Note (March 2020 Version 1.0) and professional judgment, an existing background sound level of **37 dB $L_{A90,15min}$** during the night-time has been derived.

### 3.5.2 Attended noise measurements (May 2023)

Night-time measurements were undertaken in May 2023 at AL1 and AL2 while the Barrow Mill site was operational. A summary of the attended noise monitoring levels is presented below:

| Date | Time | $L_{Aeq,15min}$ (dB) | $L_{AFmax,15min}$ (dB) | $L_{A90,15min}$ (dB) |
|---|---|---|---|---|
| Thursday 11/05/2023 | 00:40 | 52 | 67 | 50 |
| | 00:55 | 52 | 68 | 50 |
| | 01:10 | 52 | 55 | 50 |
| | 01:25 | 53 | 68 | 51 |

*Table 4 AL1 noise monitoring data*

| Date | Time | $L_{Aeq,15min}$ (dB) | $L_{AFmax,15min}$ (dB) | $L_{A90,15min}$ (dB) |
|---|---|---|---|---|
| Wednesday 10/05/2023 | 23:30 | 43 | 61 | 41 |
| | 23:45 | 47 | 68 | 41 |
| Thursday 11/05/2023 | 00:00 | 46 | 66 | 42 |
| | 00:15 | 44 | 61 | 42 |

*Table 5 AL2 noise monitoring data*

As per Section 3.4, the noise environment was dominated by steady-state noise, particularly during the night-time when road traffic noise was reduced and the existing Barrow Mill site became more prominent. Additionally, due to the 24-hour operations of the site, and night-time levels representing the greatest potential for impacts, attended night-time only measurements were considered to be appropriate. On this basis, the data presented above is judged to be representative of the noise levels experienced at these locations while the existing site is operational.

# 4 Noise Impact Assessment Methodology

## 4.1 Source Data

The noise emission data for the new boiler plant is presented below. The assessment has been undertaken on the basis that two of the boilers (and associated stacks) will be in use under normal operating conditions, with the third used as a standby. It is assumed all other plant items associated with the proposed boiler house have the potential operate simultaneously under normal conditions.

| Quantity | Octave band centre frequency (Hz) - $L_p$ dB | | | | | | | | $L_{wA}$ dB |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| 2 | 86 | 89 | 88 | 78 | 66 | 61 | 63 | 58 | **82** |

*Table 6 Noise emission data – boilers*

| Quantity | Octave band centre frequency (Hz) - $L_p$ dB | | | | | | | | $L_{wA}$ dB |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| 2 | 72 | 108 | 107 | 105 | 103 | 100 | 100 | 96 | **93** |

*Table 7 Noise emission data – stacks*

| Quantity | Octave band centre frequency (Hz) - $L_p$ dB | | | | | | | | $L_{wA}$ dB |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| 1 | 72 | 77 | 72 | 72 | 63 | 55 | 50 | 43 | **71** |

*Table 8 Noise emission data - transformer*

| Quantity | Octave band centre frequency (Hz) - $L_p$ dB | | | | | | | | $L_{wA}$ dB |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| 1 | - | - | - | 56 | 65 | 76 | 79 | 77 | **82** |

*Table 9 Noise emission data – hydrogen PRMS*

| Quantity | Octave band centre frequency (Hz) - $L_p$ dB | | | | | | | | $L_{wA}$ dB |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| 2 | - | - | - | 53 | 63 | 73 | 82 | 74 | **84** |

*Table 10 Noise emission data – natural gas PRMS*

For the existing site, source levels were determined through an attended noise survey across the site in May 2023[1] undertaken to inform a report prepared by RSK Acoustics for submission to the EA. Details of the measurements are presented in Appendix D.

## 4.2 Modelling Methodology

A number of proprietary and well proven software packages are available that can be programmed to conform to recognised source noise calculations and propagation calculations. Unless otherwise indicated all noise predictions presented in this report have been carried out using SoundPLAN v9.1.

[1] RSK Acoustics - 2060428-RSKA-RP-001(01) – June 2023

International Standard: ISO 9613-2: 2024: 'Acoustics - Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors' enables the prediction of noise levels in the community from sources of known sound emission.

The noise prediction method described in this part of the standard is general and is suitable for a wide range of engineering applications where the noise level outdoors is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect;
- Reflection from surfaces; and
- Screening by obstructions, barriers and buildings.

The method predicts noise levels under metrological conditions favourable to noise propagation from the sound source to the receiver, such as downwind propagation, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night.

An overview of the modelling parameters is given in Table 11.

| Item | Setting |
|---|---|
| Algorithm | BS ISO 9613-2: 2024 |
| Ground absorption | Ground absorption has been set based on local conditions as derived from aerial imagery and the noise surveys.<br>Acoustically hard (assumed 0 coefficient) – roads, water, pavements and hard standing areas;<br>Acoustically soft (assumed 1 coefficient) – grassed areas, vegetation |
| Meteorological conditions | 10 degrees Celsius;<br>70% humidity; and<br>Wind from source to receiver. |
| Receptor height | Ground Floor level set at 1.5m above external ground level.<br>First Floor level set at 4m above external ground level. |
| Site layout | Site layout as per drawings:<br>3001954-AME-BM-ZZ-DR-PL-6052 P1 – Barrow Mill Steam Generation Boilers Replacement Site Location Plan as Proposed<br>3001954-AME-BM-ZZ-DR-PL-6054 P1 LPBH Elevations as Proposed<br>3001954-AME-BM-ZZ-DR-CV-6022 P2 Retaining Wall GA & Sections |
| Source modelling | See Section 4.1 and Appendix D.<br><br>The stacks were modelled as an omni-directional point source at 20m above ground level.<br><br>The boiler house was modelled as a 3D object with an internal reverberant sound pressure level calculated based on the noise data provided by Cannon Bono and Ameresco, the number of each of the sources, the geometry and finishes of each room. For the main boiler house area this was calculated to be 70 dBA, and for the transformer room this was calculated to be 62 dBA. The internal finishes are acoustically reflective: concrete floor with an average absorption coefficient of 0.02, and steel cladding with an average absorption |

| Item | Setting |
|---|---|
| | coefficient of 0.10. Spectral data for the building envelope is presented in Appendix E.<br><br>Areas of the existing brick building are being retained, modelled as single leaf brick meeting 45 $R_w$ dB. The remainder of the boiler house as per site layout plans comprises a cladding and roof system meeting 26 $R_w$ dB and 25 $R_w$ dB respectively with louvred openings (modelled as fully transmissive areas), and roller shutter doors and double doors meeting 18 $R_w$ dB.<br><br>The hydrogen PMRS is modelled as a 3D object (3.3m L x 16.5m W x 2.4m H) - 72 dBA at 1m (accounting for a 10 dB reduction due to a GRP enclosure).<br><br>The natural gas PMRS are modelled a 3D object (4.9m L x 2.5m W x 2.5m H) - 74 dBA at 1m (accounting for a 10 dB reduction due to a GRP enclosure). |
| Terrain | LiDAR DTM from Defra with a 1-metre resolution has been imported into the model. |

*Table 11 Modelling parameters*

## 4.3 Acoustic Corrections

According to BS 4142:2014+A1:2019: 'Methods for rating and assessing industrial and commercial sound', where certain features of the specific sound level can increase the significance of impact of a sound level, a character correction through objective and/or subjective methods is applied to provide a rating level. The characteristics of a sound that are likely to cause an increase in the significance of impact are tonality, impulsivity, intermittency or where the specific sound is readily distinctive (such as a whine, hiss, screech, non-tonal hum, rattle or rasp) against the residual acoustic environment.

## 4.4 Predicted Noise Levels

### 4.4.1 Specific sound level - boiler house

The specific sound level for the boiler house plant at each of the nearest noise sensitive receptors has been calculated as per Section 4.2, and are presented below in Figure 7 and Table 12.

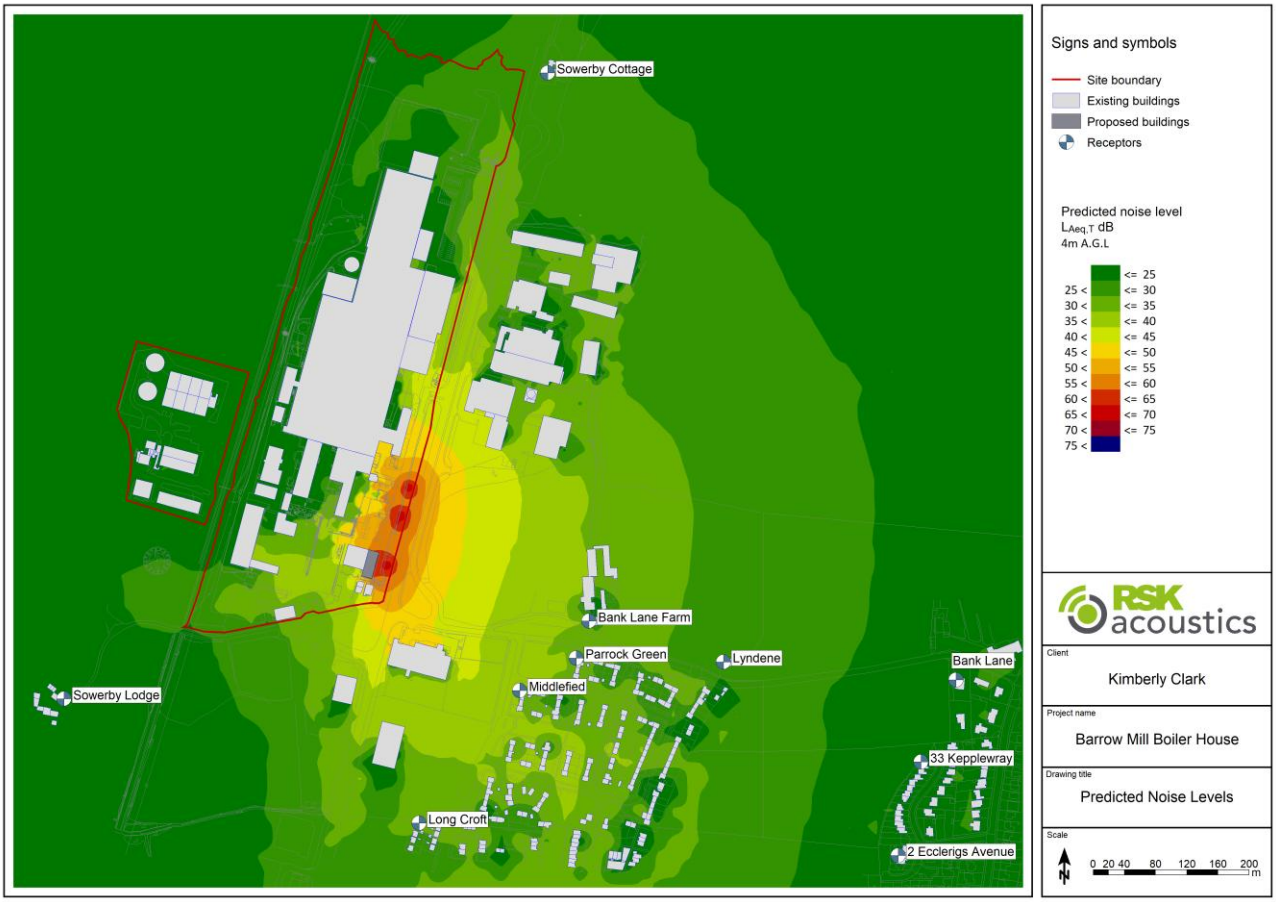


*Figure 7 Predicted specific sound levels (boiler house)*

On this basis, the specific sound levels used for the assessment of the boiler house are presented below in Table 12. These are the nearest noise sensitive receptors to the site and therefore have the potential to be the worst affected by the proposed boiler house plant.

| Noise sensitive receptor | Specific sound level, $L_{Aeq,15min}$ (dB) |
|---|---|
| Bank Lane Farm | 34 |
| Middlefield | 37 |
| Parrock Green | 35 |
| Long Croft | 33 |
| Kepplewray Drive | 24 |

*Table 12 Specific sound levels*

### 4.4.2 Specific sound level - whole site (existing site and boiler house)

The specific noise levels used for the assessment of the whole existing site and the proposed boiler house plant are presented below in Table 13.

| Noise sensitive receptor | Specific sound level, $L_{Aeq,15min}$ (dB) |
|---|---|
| Bank Lane Farm | 47 |
| Middlefield | 49 |
| Parrock Green | 48 |
| Long Croft | 43 |

| Noise sensitive receptor | Specific sound level, $L_{Aeq,15min}$ (dB) |
|---|---|
| Kepplewray Drive | 38 |

*Table 13 Specific sound levels – whole site*



# 5 BS 4142 Assessment

## 5.1 Acoustic Corrections Applied

Taking the acoustic features referenced above in Section 4.3 and predicted levels (Section 4.4) into consideration, the application of rating penalties is as follows:

- **Tonality** – From analysis of the frequency data predicted at the nearest noise sensitive receptors, it is considered unnecessary to apply a tonal correction at any of the receptors;
- **Impulsivity** - The character of the sound from the site is generally constant, with no rapid change in the level or character of noise. It is therefore considered unnecessary to apply an impulsive correction at any of the receptors; and,
- **Intermittency** – The site typically operates 24/7 therefore does not have identifiable on/off conditions. It is therefore considered unnecessary to apply an intermittency correction at any of the receptors.
- **Other sound characteristics** - The proposed boiler house plant is unlikely to be readily distinguishable from the existing residual acoustic environment in terms of overall level and character. For the assessment of the whole site, a 3 dB penalty has been applied to two of the receptors to correct the specific noise level to account for industrial noise impacts where the sound is neither impulsive or tonal but where it is audible against the residual sound level in accordance with EA guidance.

## 5.2 Boiler House Assessment

Prior to context, Table 14 presents the measured specific and rating sound levels, alongside background sound levels and difference between background and rating levels during the night-time (23:00-07:00) for the proposed boiler house plant.

As per BS 4142, the significance of sound of an industrial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. Typically, the greater this difference, the greater the magnitude of impact.



| Results | Noise sensitive receptor location | | | | | Comments |
|---|---|---|---|---|---|---|
| | Bank Lane Farm | Middlefield Road | Parrock Green | Long Croft | Kepplewray Drive | |
| Specific sound level, $L_{Aeq,15min}$ (dB) | 34 | 37 | 35 | 33 | 24 | Section 4.4.1 as determined through calculation (Section 4.2) |
| Character corrections | 0 | 0 | 0 | 0 | 0 | Section 5.1 |
| Rating level, $L_{Ar,15min}$ (dB) | 34 | 37 | 35 | 33 | 24 | |
| Ambient sound level, $L_{Aeq,15min}$ (dB) | 52 | 52 | 52 | 52 | 44 | Section 3.5.2 - inclusive of the existing KC Barrow Mill site |
| Residual sound level, $L_{Aeq,15min}$ (dB) | 43 | 43 | 43 | 43 | 43 | Section 3.5.1 - excludes the existing KC Barrow Mill site |
| Background sound level, $L_{A90,15min}$ (dB) | 37 | 37 | 37 | 37 | 37 | Section 3.5.1 - excludes the existing KC Barrow Mill site |
| **Excess of rating over background level (dB)** | **-3** | **0** | **-2** | **-4** | **-13** | |

*Table 14 BS 4142 assessment – night-time (proposed boiler house plant only)*

At all receptors, the initial assessment of impacts from the proposed boiler house shows that the rating levels do not exceed the existing background sound level during the night-time. This is an indication of low impact, depending on the context.

## 5.3 Whole Site Assessment (Existing Site and Boiler House)

To provide further context, Table 15 presents the measured specific and rating sound levels, alongside background sound levels and difference between background and rating levels during the night-time (23:00-07:00) for the existing site and the proposed boiler house plant.

As per BS 4142, the significance of sound of an industrial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. Typically, the greater this difference, the greater the magnitude of impact.

| Results | Noise sensitive receptor location | | | | | Comments |
|---|---|---|---|---|---|---|
| | Bank Lane Farm | Middlefield Road | Parrock Green | Long Croft | Kepplewray Drive | |
| Specific sound level, $L_{Aeq,15min}$ (dB) | 47 | 49 | 48 | 43 | 38 | Section 4.4.2 as determined through existing measurement source data and calculation (Section 4.2) |
| Character corrections | 3 | 3 | 3 | 0 | 0 | Section 5.1 - +3 dB applied to Bank Lane Farm and Middlefield Road to account for industrial noise likely to be audible against the residual sound level |
| Rating level, $L_{Ar,15min}$ (dB) | 50 | 52 | 51 | 43 | 38 | |
| Ambient sound level, $L_{Aeq,15min}$ (dB) | 52 | 52 | 52 | 52 | 44 | Section 3.5.2 - inclusive of the existing KC Barrow Mill site |
| Residual sound level, $L_{Aeq,15min}$ (dB) | 43 | 43 | 43 | 43 | 43 | Section 3.5.1 - excludes the existing KC Barrow Mill site |
| Background sound level, $L_{A90,15min}$ (dB) | 37 | 37 | 37 | 37 | 37 | Section 3.5.1 - excludes the existing KC Barrow Mill site |
| **Excess of rating over background level (dB)** | **+13** | **+15** | **+14** | **+6** | **+1** | |

*Table 15 BS 4142 assessment – night-time (whole site)*

A difference of 10 dB or more can be an indication of significant adverse impact, depending on the context. A difference of around +5 dB is likely to be an indication of adverse impact depending on the context.

## 5.4 Assessment Context

The Barrow Mill site has been operational for over 55 years and therefore is considered to form part of the existing environment. Additionally, Barrow-in-Furness is a port town with a significant amount of industry both historically and presently, including BAE Systems and other engineering and manufacturing companies, therefore the noise from the site is not out of character for the area. In line with EA guidance, long-standing industry and other industries in the area makes the area inherently less sensitive to sources of industrial noise.

It is acknowledged that the proposed boiler plant will have the potential to be operational 24 hours a day, including during the night-time which is considered to be a more sensitive time period. On this basis the assessment has been undertaken for night-time hours when measured background sound levels are reduced to account for this. Additionally, the existing site is already operational 24 hours a day.

The predicted noise levels indicate that the proposed boiler house plant is unlikely to be distinguishable from the existing residual acoustic environment in terms of overall level and character, particularly given the existing industrial, commercial and transportation noise sources audible at the receptor locations. This is theoretically shown when you compare the noise levels predicted from the proposed plant in isolation, and the existing site operations (see Appendix D), where boiler house plant noise is greater than 10 dB lower than existing site noise.

## 5.5 Assessment Summary

At the most affected noise sensitive receptors to the site, noise from the proposed boiler plant is unlikely to be distinguishable or detectable within the context of the existing acoustic environment. This is an indication of a low impact in line with BS 4142 and EA guidance for noise and vibration management: environment permits. Notwithstanding this, appropriate BAT measures should still be maintained (see Section 6).



# 6 Best Available Techniques (BAT)

The following embedded mitigation measures are proposed to ensure noise levels from the proposed boiler house plant are minimised as far as practicable, and in line with EA guidance for noise and vibration management: environment permits, and the BAT-C (BAT 17) guidance document:

| Noise source | Mitigation implemented | Contribution to off-site receptors[1] | Relevant BAT technique (BAT 17) | BAT Implemented – Yes/No? | Additional actions to be taken to meet BAT and timescales |
|---|---|---|---|---|---|
| Boilers | ▪ Enclosed in the boiler house building comprising brick, cladding, roller shutter doors and double glazing. The minimum specification required by the building envelope is presented in Appendix E.<br>▪ An inspection and maintenance of equipment to prevent failures.<br>▪ All doors to be closed when access is not required by operations. | Low | ▪ **C.** Operational and management techniques in buildings containing noisy equipment<br>▪ **D.** Enclosing noisy equipment and units<br>▪ **G.** Soundproofing of buildings | Yes | No further action |
| Transformer | | | | Yes | No further action |
| Boiler stacks | ▪ Silencers meeting a minimum broadband reduction of 17 dBA to be fitted to the boiler stacks. | Low | ▪ **H.** Noise abatement<br>▪ **E.** Use of low-noise equipment and noise-reducers on equipment and ducts. | Yes | No further action |
| PRMS units | ▪ Located behind the grass bank of the site boundary.<br>▪ An inspection and maintenance of equipment to prevent failures.<br>▪ Enclosed in a GRP enclosure achieving a minimum broadband reduction of 10 dBA. | Low | ▪ **B.** Strategic planning of the location of equipment, units and buildings<br>▪ **C.** Operational and management techniques in buildings containing noisy equipment<br>▪ **D.** Enclosing noisy equipment and units | Yes | No further action |
| **Notes:** | | | | | |

| Noise source | Mitigation implemented | Contribution to off-site receptors[1] | Relevant BAT technique (BAT 17) | BAT Implemented – Yes/No? | Additional actions to be taken to meet BAT and timescales |
|---|---|---|---|---|---|
| [1] Contribution to off-site receptors based on predicted noise levels (see Section 4.4.1). The contributions are categorised as follows: 'low' – indistinguishable off-site, 'medium' – just perceptible off-site and 'high' – clearly perceptible off-site. | | | | | |

*Table 16 BAT summary*

The above measures are considered to be the best available techniques (BAT) for the site to prevent, or where that is not practicable to minimise noise from the proposed boiler house.



# 7 Uncertainty

BS 4142:2014+A1: 2019 requires that the assessment considers the level of uncertainty in the data and associated calculations. Consideration of the uncertainty can enable a more informed decision regarding the likely significance of impact, within the context of assessment. It is accepted that uncertainty may arise from all levels of measurement and assessment and reasonably practicable steps have been made at all stages with the aim of reducing uncertainty.

Specific sound level propagation for the proposed boiler house and wider site has been calculated in accordance with the requirements of BS ISO 9613-2:2024 which is the widely accepted procedure for the calculation of sound propagation, including favorable wind conditions from source to receiver. Source data for the boiler plant and PMRS (including frequency data) was provided by the project team. The transformer broadband level was provided by the project team, with frequency data assumed based on a transformer of a similar size.

The noise survey was short-term in duration which may introduce some uncertainty, however survey observations confirmed that the dominant noise sources at the monitoring locations were steady-state noise from the existing Barrow Mill site, other local industry in the area, and road traffic noise. This is reflected in the measured data at AL1 and AL2 which is relatively consistent between measurements. Additionally, to limit uncertainty related to the survey duration, the lowest $L_{A90,15min}$ at each monitoring location was used to inform the assessment.

The following measures were also taken during the noise surveys to limit uncertainty:

- The survey and assessment have been undertaken by suitability qualified acousticians who are members of the Institute of Acoustics (IOA);
- Although the noise survey was undertaken in 2022, there are no additional significant sources of noise in the local area based on an observational site visit in November 2025 and review of aerial imagery. The dominant noise sources were industrial noise associated with local industry and road traffic noise from the A590 which is still the case;
- It should be considered that the measurements were undertaken during a period where road traffic noise and other local noise sources may have been reduced due to the Christmas bank holidays. As the noise environment is influenced by road traffic noise (including from the A590) and other industrial premises, 37 dB LA90,15min may be lower than during normal conditions. This background sound level has also been taken to be representative of all receptors. In reality, the background sound level is likely to be higher with proximity to the A590 and industrial/commercial premises located along the A590, therefore 37 dB LA90,15min represents a more onerous criterion for receptors located closer to the A590.
- Use of monitoring equipment in accordance with Section 5 of BS 4142: 2014+A1: 2019, using Class 1 instrumentation; and,
- Measurement procedures followed in general accordance with Section 6 of BS 4142: 2014+A1: 2019 with all precautions taken to minimise interference whilst maintaining the security of both personnel and monitoring equipment. Weather conditions were monitored throughout the duration of the survey to ensure weather conditions were conducive to noise monitoring.

Overall, based on the above, uncertainty related to the survey data is not expected to have any significance to the outcome of the assessment.

# 8 Summary

RSK Acoustics has been instructed by Kimberly-Clark Limited (KC) to undertake a noise impact assessment to inform a permit variation for a new duel fuel (hydrogen and natural gas) boiler plant room at the existing Kimberly Clark Barrow Mill in in Barrow-in-Furness, Cumbria.

The noise assessment includes consideration of background and residual sound levels, and specific sound levels from the proposed plant including relevant corrections, based on the methodology as described within BS 4142:2014+A1:2019. The proposals incorporate the relevant BAT techniques, and as a result, accounting for the context of the acoustic environment in line with B4142 and EA guidance, the proposed boiler house is unlikely to result in adverse effects at the nearest noise sensitive receptors, with no changes to the existing noise environment anticipated.

# Appendix A – Glossary

| Term | Definition |
|---|---|
| **Ambient sound** | The total sound at a given place, usually a composite of sounds from many sources near and far. |
| **Background sound, $L_{A90,T}$** | A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval. |
| **dB** | Decibel. Scale for expressing sound pressure level. It is defined as 20 times the logarithm of the ratio between the root mean square pressure of the sound field and a reference pressure i.e. $2x10^{-5}$ Pascal. |
| **dB(A)** | A-weighted decibel. This provides a measure of the overall level of sound across the audible spectrum with a frequency weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies. Example sound levels include:<br>140 dB(A) Threshold of pain<br>120 dB(A) Threshold of feeling<br>100 dB(A) Loud nightclub<br>80 dB(A) Traffic at busy roadside<br>60 dB(A) Normal speech level at 1m<br>40 dB(A) Quiet office<br>20 dB(A) Broadcasting studio<br>0 dB(A) Median hearing threshold (1000 Hz) |
| **Frequency** | The repetition rate of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted as kHz, e.g. 2 kHz = 2000 Hz. Human hearing ranges approximately from 20 Hz to 20kHz. |
| **$L_{Aeq,T}$** | This is defined as the notional steady sound level over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period. |
| **Rating level** | Specific sound level of a source plus any adjustment for the characteristic features of the sound. |
| **Residual sound** | Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound. |
| **Sound absorption** | Process whereby sound energy is converted in to heat. Sound absorption properties is expressed as the sound absorption coefficient α or the sound absorption class (A-E). |
| **Sound insulation** | The reduction or attenuation of airborne sound by a solid element between source and receiver. |
| **Specific sound** | Sound pressure level produced by the source being assessed at the assessment location. |

*Table A 1 Glossary*

# Appendix B – Noise Survey Photographs

*Figure B.1 UL1*

*Figure B.2 AL1*

*Figure B.3 AL2*

# Appendix C – Noise Survey Results

| Date | Time | Measured noise levels (dB) | | |
|---|---|---|---|---|
| | | $L_{Aeq,T}$ | $L_{AFmax,T}$ | $L_{A90,T}$ |
| Monday 26/12/2022 | 00:00-07:00 | 55 | 85 | 45 |
| | 07:00-23:00 | 58 | 83 | 51 |
| | 23:00-07:00 | 45 | 69 | 38 |
| Tuesday 2712/2022 | 07:00-23:00 | 51 | 87 | 43 |
| | 23:00-07:00 | 51 | 87 | 43 |
| Wednesday 26/12/2022 | 07:00-13:00 | 60 | 93 | 45 |

*Table C.1 Noise monitoring data – UL1*

# Appendix D – Existing Site - Source Measurements

To quantify the noise emissions generated from the existing Barrow Mill site, a collection of short-term source measurements were undertaken across the site in May 2023. This comprised external boundary measurements and internal/external sample measurements of specific plant items and processes.

The measurement data and monitoring locations are presented below.

| Monitoring Location | Ref: | Distance (m) | Duration of measurement | Sound Pressure Level ($L_{Aeq,T}$ dB) |
|---|---|---|---|---|
| Left of the compressor house (Area 3) | 1 | 1.5m from shutters | 1min | 81 |
| | 2 | 3m " " | 1min | 81 |
| | 3 | 5m " " | 1min | 82 |
| | 4 | 8m " " | 1min | 81 |
| | 5 | 12m " " | 1min | 81 |
| | 6 | 20m " " | 1min | 75 |
| | 7 | 30m" " | 1min | 72 |
| | 8 | 40m " " | 1min | 70 |
| West side of site (between Area 1 and 4) | 9 | 1m from shutters & door | 1min | 77 |
| | 10 | 5m " " | 1 min | 78 |
| | 11 | 10m " " | 1 min | 78 |
| | 12 | 20m " " | 1 min | 76 |
| | 13 | 30m " " | 1 min | 73 |
| | 14 | 40m " " | 1 min | 72 |
| West side of site (along Area 4) | 15 | 10m from new cladding | 1 min | 78 |
| | 16 | 20m " " | 1 min | 75 |
| | 17 | 30m " " | 1 min | 72 |
| | 18 | 40m " " | 1 min | 71 |
| Mezzanine above waste heat transfer area including mist remover scrubber and fan, and hood exhaust (Area 3) | 19 | 1m from fan | 1 min | 88 |
| | 20 | 1m from fan | 1 min | 86 |
| | 21 | 1m from fan | 1 min | 88 |
| | 22 | 1m from fan | 1 min | 87 |
| | 23 | 3m from fan | 1 min | 85 |
| | 24 | 5m from fan | 1 min | 82 |
| Mezzanine above dryer building including wet dust scrubber and fan (Area 3) | 25 | 1m from fan | 1 min | 86 |
| | 26 | 1m from fan | 1 min | 86 |
| | 27 | 1m from fan | 1 min | 86 |
| TM3 | 28 | 1m from PM3 façade | 1 min | 89 |
| | 29 | 1m from PM3 façade | 1 min | 84 |
| | 30 | 1m from PM3 façade | 1 min | 82 |
| | 31 | 1m from PM3 façade | 1 min | 80 |
| | 32 | 1m from PM3 façade | 1 min | 82 |



| Monitoring Location | Ref: | Distance (m) | Duration of measurement | Sound Pressure Level ($L_{Aeq,T}$ dB) |
|---|---|---|---|---|
| | 33 | 1m from PM3 façade | 1 min | 76 |
| Pulper Building (Area 1) | 34 | 1m from fan | 1 min | 85 |
| Broke Tower (Area1) | 35 | 1m from fan | 1 min | 75 |
| Area between boiler house and Area 4 | 36 | N/A | 1 min | 76 |
| Site boundary | B1 | N/A | 15 min | 69 |
| | B2 | N/A | 15 min | 69 |

*Table D.1 Source measurements (existing site)*


*Figure D.1 Source measurement locations (existing site)*

The specific sound levels used for the assessment for the existing site are presented below

| Noise sensitive receptor | Specific sound level, $L_{Aeq,15min}$ (dB) |
|---|---|
| Bank Lane Farm | 47 |
| Middlefield | 49 |
| Parrock Green | 48 |
| Long Croft | 43 |
| Kepplewray Drive | 38 |

*Table D.2 Specific sound levels (whole site existing)*

# Appendix E – Boiler House - Building Envelope Specifications

The building envelope of the boiler house comprises the following minimum specification:

| Item | Octave band centre frequency (Hz) - $R_w$ dB | | | | | | | | $R_w$ dB |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Kingspan QuadCore AWP-S panel | 14 | 19 | 21 | 25 | 21 | 34 | 47 | 53 | **26** |
| Kingspan QuadCore Lo-Pitch Roof panels | 20 | 18 | 20 | 24 | 20 | 29 | 39 | 47 | **25** |
| Louvres | - | - | - | - | - | - | - | - | **-** |
| Single leaf brick 125mm | 30 | 36 | 37 | 40 | 46 | 54 | 57 | 59 | **45** |
| Roller shutter doors | 2 | 7 | 10 | 15 | 17 | 20 | 20 | 22 | **18** |
| Double glazing 4 / 8 / 4mm | 14 | 18 | 17 | 24 | 35 | 41 | 35 | 35 | **29** |
| Steel door single leaf with seal, T30 | 22 | 22 | 28 | 28 | 24 | 23 | 23 | 23 | **25** |
| Double swing door system | 9 | 9 | 15 | 17 | 17 | 19 | 19 | 19 | **18** |

*Table E.1 Sound reduction index - octave band data*

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