Recover Blaenavon Limited, Blaenavon

Noise Assessment for NRW Permit

16th August 2023

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Version	Comments	Date	Authored By	Checked By	Project Number
1	Noise Impact Assessment for NRW	27th October 2022	Victor Valeron BEng MSc MIOA	Antony Best BSc (Hons) MIOA	22-475
2	NRW Comments	17th February 2023	Victor Valeron BEng MSc MIOA	Neil Morgan MSc MIOA	22-475
3	Reassessment Following Mitigation	26th May 2023	Neil Morgan MSc MIOA	Victor Valeron BEng MSc MIOA	24-475
4	NRW Comments	14th July 2023	Neil Morgan MSc MIOA	Victor Valeron BEng MSc MIOA	24-475
5	NRW Comments	16th August 2023	Neil Morgan MSc MIOA	Victor Valeron BEng MSc MIOA	24-475

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to prepare a Noise Assessment for the Recover Blaenavon Limited's (formerly Capital Valley Plastics & Recycling) operations at Kays & Kears Industrial Estate, Blaenavon, Pontypool, NP4 9AZ, for submission to Natural Resources Wales (NRW) as part of a Permit Application.

The site is operational around the clock and the operator is intending to extend its operations to provide additional throughput capacity.

This report contains details of an original assessment undertaken in October 2022, plus a reassessment of the site, following a significant investment at the site and the implementation of mitigation measures.

This noise assessment is necessarily technical in nature; therefore a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the report is summarised as follows:

- Detailed sound measurements at the closest noise-sensitive receptors to the Site;
- A detailed assessment of the suitability of the Site, in accordance with the relevant policy; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the Noise and Vibration Management: Environmental Permits[1], and BS4142:2014+A1:2019[2].

[1] Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales and Northern Ireland Environment Agency, 2021. Noise and Vibration Management: Environmental Permits.
[2] British Standards Institution, 2019. BS4142:2014+A1:2019: Method for Rating and Assessing Industrial and Commercial Sound.

2. ASSESSMENT FRAMEWORK

2.1. National Policy

2.1.1. Noise and Vibration Management: Environmental Permits

Environmental permits have conditions that require operators to control pollution; this includes controlling noise and vibration. The Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales and Northern Ireland Environment Agency have jointly released guidance to help holders and potential holders of permits apply for, vary, and comply with their permits. The guidance covers:

- how the respective environment agencies will assess noise from certain industrial processes;
- what the law says you must do to manage noise and vibration; and
- advice on how to manage noise – in particular, how to carry out a noise impact assessment and what operators should include in a noise management plan.

This guidance replaces these documents which have been withdrawn:

- Environment Agency Horizontal Guidance for Noise (H3) parts 1 and 2.

It involves determining the appropriate controls for industry to protect the environment through a single permitting process. To gain a Permit, Operators have to show that they have systematically developed proposals to apply the 'Best Available Techniques' (BAT) and meet certain other requirements, taking account of relevant local factors.

In terms of noise specifically, the use of BAT has to be considered and balanced within the wider context of other releases to different media (air, land and water) and taking issues such as usage of energy and raw materials into account. Noise cannot therefore be considered in isolation from other impacts on the environment.

The definition of pollution includes *"emissions which may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment"*. BAT is therefore likely to be similar, in practice, to the requirements of the Statutory Nuisance legislation which requires the use of *"best practicable means"* to prevent or minimise noise nuisance. In the case of noise, *"offence to human senses"* may be judged by the likelihood of complaints. However, the lack of complaint should not necessarily imply the absence of a noise problem. In some cases it may be possible, and desirable, to reduce noise emissions still further at reasonable costs and this may therefore be BAT for noise emissions.

Consequently, the aim of BAT should be to ensure that there is no reasonable cause for annoyance to persons beyond the installation boundary.

In summary, the aim of BAT should be to achieve the following:

- Underpinning of good practice, a basic level of which the operator should employ for the control of noise including adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise. For example, this would include bearings, air handling plant, the building fabric as well as specific noise attenuation measures associated with plant, equipment or machinery;
- Noise levels should not be loud enough to give reasonable cause for annoyance for persons in the vicinity, which is a more appropriate environmental standard than that of Statutory

Nuisance and is normally the aim of most planning or other conditions applied by Local Authorities; and
- Prevention of 'creeping background' (creeping ambient), which is the gradual increase in sound levels as industry expands and areas develop.

The indicative requirements apply to both new and existing activities but it is more difficult to justify departures from them in the case of new activities.

Indeed, because the requirements for noise are likely to be strongly influenced by the local environmental conditions, new installations are expected to meet BAT from the outset and to demonstrate that noise reduction or prevention has been built into the process design. For most existing plant, especially where there are no existing noise limits, the focus is on good practice (BAT) and the need to ensure that there is no reasonable cause for annoyance. In assessing any noise impact it is more normal to monitor existing levels and apply corrections and calculations, rather than rely on predictions.

The guidance refers to BS4142:2014+A1:2019 as the basis for the majority of noise impact assessments.

2.1.2. Planning Policy Wales

The Government's planning policies for Wales are contained in Planning Policy Wales (Edition 11, February 2021). The policy provides overarching requirements for developments to adequately control noise pollution, to provide appropriate soundscapes and to incorporate good acoustic design.

The policy is supplemented by the Noise and Soundscape Action Plan 2018-2023, which provides more detailed guidance on planning for a new development, but does not set out specific assessment methods or criteria. The guidance in this document has been used to inform a qualitative assessment of the effect the proposed development could have on the local soundscape.

2.1.3. Technical Advice Note (Wales) 11

This note provides advice on how the planning system in Wales can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business.

It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

2.2. Assessment Criteria

2.2.1. BS4142:2014+A1:2019

BS4142:2014+A1:2019 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014+A1:2019 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014+A1:2019 states: *"The significance of sound of an industrial and/or commercial 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"*. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- *"Typically, the greater this difference, the greater the magnitude of the impact."*
- *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
- *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."*
- *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

3. Site Description

3.1. Site and Surrounding Area

The site comprises an industrial building, external yard and car park at the Kays & Kears Industrial Estate in Blaenavon.

It should be noted that the building on the western part of the site (labelled as Unit 2 in the image below) was destroyed by a fire in 2021. The area is currently levelled and now comprises a concrete slab with only a small northern section of the building structure remaining standing.

The closest Noise-Sensitive Receptors (NSRs) to the site are residential dwelling on Garn Road, to the north west of the operational building (NSR1) and residential dwellings on West View Terrace, to the south east of the operational building (NSR2). It is noted that due to the topography of the area, NSR1 overlooks the industrial facilities, while NSR2 is at lower level with no direct line of sight to the site.

The prevailing ambient sound environment in the area, in the absence of operations at the site, was noted to be primarily influenced by road traffic noise arising from vehicles using the B4248 Garn Road, along with industrial noise from the wider commercial area.

The site, surrounding area and nearest NSRs are presented in Figure 1.

Figure 1: Location of Site, Surrounding Area and NSRs

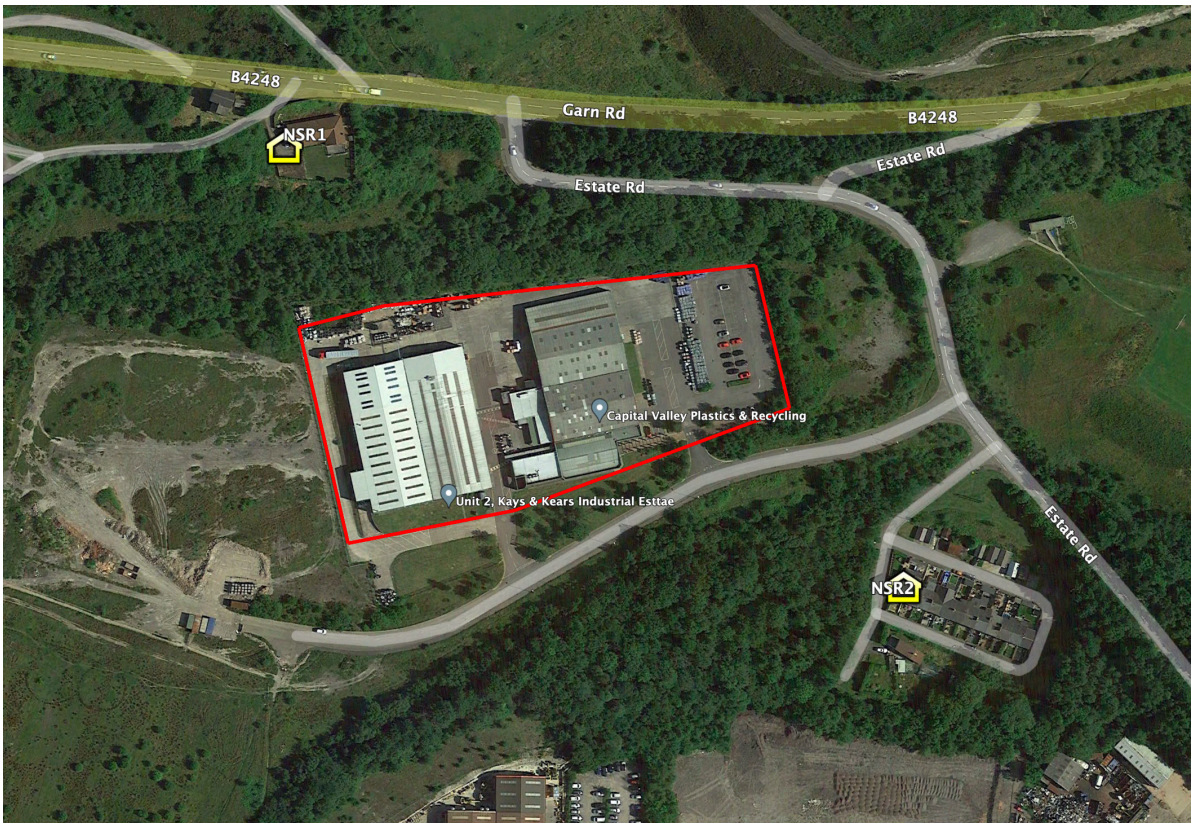


FIGURE 2: SITE PLAN - GENERAL LAYOUT AND FEATURES

3.2. Operations Overview

Recover Blaenavon Limited are a plastic reprocessing company that receives film plastic wastes and uses heat treatment to re-granulate the plastic and reach an end of waste saleable product, currently processing in the order of 36 tonnes per day, with an intention to increase this to a maximum of 48 tonnes per day.

The majority of the plant is fixed and mostly located within the 'Waste treatment building' as shown in Figure 2. Forklifts are the only movable plant used on site to move feedstock materials from the storage area to the east into the building, at shift change times, when the plant is powered down. Three outdoor cooling units to the west of the building provide refrigeration to the plant.

The site operates 24 hours a day.

3.3. Noise Generating Elements

The operations currently comprise the following noise-generating plant, ranked in terms of noise output in Table 1. No new plant is proposed as part of this Environmental Permit Application.

TABLE 1: SUMMARY OF NOISE-GENERATING ELEMENTS

Description	Location	Operational Profile	Grid Coordinates	
			Easting	Northing
1. LEV/Extraction System	Internal Waste Treatment Building	Continuous	324475	209473
2. Chillers	External	On Demand - Regular	324451	209477
3. Diesel-Powered Forklift	Internal and External (yard area east of the building) (Internal only after 20:00)	On Demand - Occasional	324497	209478
4. Electric-Powered Forklift	Internal and External (yard area east of the building) (Internal only after 20:00)	On Demand - Occasional	324500	209452

No other treatment plant was deemed to be acoustically relevant for this assessment.

4. Measurement Methodology – October 2022

4.1. General

The prevailing sound conditions in the area have been determined by a partially attended environmental noise survey conducted during both daytime and night-time periods between Thursday 20th and Monday 24th of October 2022.

Attended periods on Thursday 20th spanned 18:25 to 19:50 at NSR1 and 19:55 to 20:35 at NSR2 on Friday 22nd, including periods of typical site activities along with periods of orchestrated site shut down.

4.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[3].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[4]. A full inventory of this equipment is shown in Table 2 below.

Table 2: Inventory of Sound Measurement Equipment

Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Expiry Date
All	Rion NL-31 Sound Level Meter	00110040	1107106	14/12/2022
	Rion NH-21 Preamplifier	00142	1107106	14/12/2022
	Rion UC-53A Microphone	306449	1107106	14/12/2022
	Cirrus CR:515 Acoustic Calibrator	82506	1131626	23/08/2023

Measurement equipment used during the survey was field calibrated at the start and end of the measurement period, with the following results:

- Before: 94.0 dB After: 93.9 dB (@1kHz)

The weather conditions during the attended survey were conducive to environmental noise measurements, it being dry and with a gentle breeze. For the long-term unattended measurements, however, the survey included periods of unsuitable weather, which were logged with a rain and wind gauge set up on site for the whole survey duration. Wind direction throughout the survey was variable, but with southwestern prevalence. Periods of unsuitable weather were excluded from the dataset used to derive the typical background sound levels, as shown in measurement charts in Appendix B. Full dataset of monitored rain and wind conditions are also presented in Appendix B. The weather station did not record temperatures or cloud cover percentages; however, these were subjectively monitored within the area, throughout the survey and no temperature extremes were experienced during the survey, while cloud cover was variable.

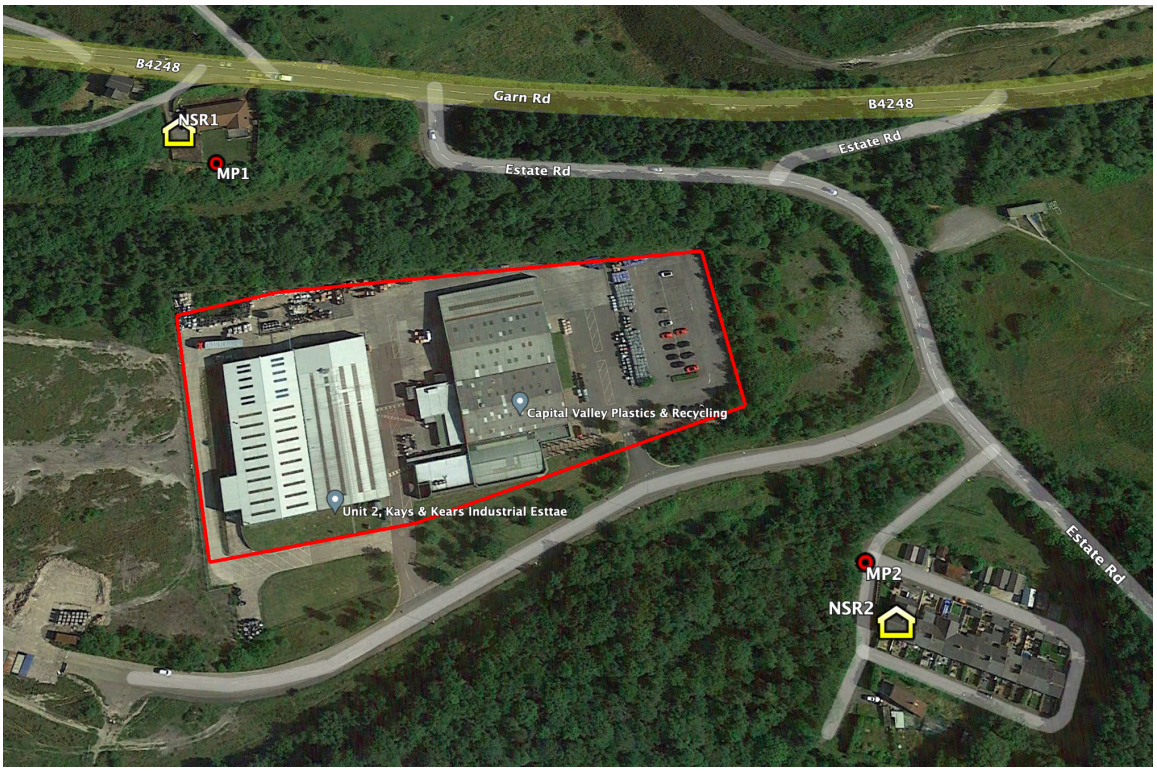
[3] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI.
[4] British Standard 61672: 2013: *Electroacoustics. Sound level meters*. Part 1 *Specifications*. BSI.

The microphone was fitted with a protective windshield for the measurements, with the static positions described in Table 3 and an aerial photograph indicating their locations shown in Figure 3.

TABLE 3: MEASUREMENT POSITIONS DESCRIPTION

Measurement Position	Description
MP1	A partially attended daytime, evening and night-time measurement of sound under free-field conditions, at a height of 1.5 metres above local ground level at the garden boundary of NSR1, representing the closest and most affected noise-sensitive receptor to the Permit Application Site. During the attended measurements on the evening of Thursday 20th October 2022, the sound environment was sustained by continuous noise from the Applicant's site, primarily arising from the indoor elements of the extraction system radiating through the external building fabric, with contributions arising from intermittent road traffic noise from the B4248 Garn Road. During the orchestrated shut down of the site, the noise environment was sustained by continuous industrial noise from the south west, with contributions arising from intermittent road traffic noise from the B4248 Garn Road.
MP2	An attended evening measurement of sound under free-field conditions, at a height of 1.5 metres above local ground level at a position representative of the NSR2 group of dwellings. During the attended measurements on the evening of Thursday 20th October 2022, the sound environment was sustained by continuous industrial noise from the west, unrelated to the Applicant's site, with contributions arising from occasional road traffic noise from Estate Road. During our time on-site, operational noise from Recover Blaenavon Limited was not audibly noticeable at this position, against the residual sound environment.

FIGURE 3: MEASUREMENT POSITIONS



4.3. Summary Results

4.3.1. Attended Survey

Attended measurements were undertaken at MP1 and MP2 on Thursday 20th October 2022.

For the determination of the specific sound level, BS4142:2014+A1:2019 advises the following:

- *Measure the ambient sound level, distinguishing the specific sound from the residual sound. Minimize the influence of sound from other sources by measuring at times and during intervals when the residual sound has subsided to typically low levels.*
- *Measure the residual sound level in the absence of the specific sound.*
- *Correct for the effect of the residual sound by using the following formula:*

$$L_s = 10\lg(10^{L_a/10} - 10^{L_T/10})$$

where:
Ls is the specific sound level;
La is the ambient sound level; and
Lr is the residual sound level.

The calculated Specific Sound Level at the monitoring positions are presented in Table 4. Values have been rounded to the nearest whole number.

The measured L_{Aeq} sound levels for the attended periods are presented in a time-history graph in Appendix B.

TABLE 4: MEASURED SOUND LEVELS AND SPECIFIC SOUND LEVEL CALCULATIONS

Measurement Position	Measurement Description	dB(A)
MP1	Ambient Sound Level (18:40-19:10)	53
	Residual Sound Level (19:30-19:45)	44
	Specific Sound Level	**52**
MP2	Ambient Sound Level (20:20-20:35)	44
	Residual Sound Level (20:00-20:15)	44
	Specific Sound Level	-

It is noted that the Specific Sound Level at NSR1 (MP1) is calculated to be 52 dB(A).

It is not possible to determine the Specific Sound Level at NSR2 (MP2) by measurements alone. As with the ambient sound level ($L_{Aeq,T}$), it was noted that the background sound level ($L_{A90,T}$) remained the same during operational and non-operational periods at MP2. Subjectively, the noise from the site was not audible against the residual acoustic environment. Based on the above, it is concluded

that the noise from the site does not constitute any impact at NSR2, and therefore the assessment of impacts is focused on NSR1.

4.3.2. Unattended Survey

The summarised results of the long-term baseline environmental sound measurements undertaken at MP1, during non-operational periods of the week at Recover Blaenavon Limted are presented in Table 5. Values have been rounded to the nearest whole number.

The parameters reported are the average Equivalent Continuous Sound Level, $L_{Aeq,T}$, the statistical index (typical) Background Sound Level, $L_{A90,T}$, as well as the typical Maximum Sound Pressure Level, L_{AFmax}. An explanation of the sound units presented is given in Appendix A.

The measured L_{Aeq}, L_{AFmax}, and L_{AF90} sound levels are presented in a time-history graph in Appendix B, along with the statistical distribution of the measured background sound levels to derive the typical representative $L_{A90,T}$ values.

TABLE 5: SUMMARY OF BASELINE SOUND MEASUREMENT RESULTS

Measurement Position	Period	$L_{Aeq,T}$ (dB)	$L_{AF90,T}$ (dB)	L_{AFmax} (dB)
MP1 (Friday 21st October 15:00 to Monday 24th October 07:00)	Day	49	**43**	68
	Night	43	**36**	60

4.4. Pre-Mitigation Assessment

4.4.1. Rating Penalty Principle

Section 9 of BS4142:2014+A1:2019 describes how the rating sound level should be derived from the specific sound level, by determining a rating penalty. BS4142:2014+A1:2019 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

a) subjective method;
b) objective method for tonality;
c) reference method."

The subjective method has been adopted to derive the rating sound level from the specific sound level, which is discussed in Section 9.2 of BS4142:2014+A1:2019, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.

Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014+A1:2019 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

Tonality

A rating penalty of +2 dB is applicable for a tone which is *"just perceptible"*, +4 dB where a tone is *"clearly perceptible"*, and +6 dB where a tone is *"highly perceptible"*.

Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is *"just perceptible"*, +6 dB where it is *"clearly perceptible"*, and +9 dB where it is *"highly perceptible"*.

Intermittency

BS4142:2014+A1:2019 states that when the *"specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time … if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."*

Other Sound Characteristics

BS4142:2014+A1:2019 states that where *"the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."*

4.4.2. Rating Penalty Assessment

Considering the content of Section 4.4.1, an assessment of the sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in Table 6 below.

TABLE 6: RATING PENALTY ASSESSMENT

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
General Operations	0 dB	0 dB	0 dB	3 dB	The prevailing noise source from the site is building breakout noise from the indoor extraction system. Contribution from the outdoor cooling units might have an influence although was not clearly distinctive during the attended measurements. Forklift movements were not audible at the NSR during the survey. The extraction system and the cooling plant operates continuously or on regular demand for long periods of

					time, therefore intermittency penalty is not applicable. The noise emissions were found to be fairly broadband with no subjectively distinguishable tonality or impulsivity. The specific sound, however, is readily distinctive against the residual acoustic environment, particularly during evening and night-time periods, so a penalty of +3 dB is applied

Consequently, a +3 dB acoustic feature correction has been applied with the assessment.

4.4.3. Uncertainty

BS4142:2014+A1:2019 requires that the level of uncertainty in the measured data and associated calculations is considered in the assessment. The Standard recommends that steps should be taken to reduce the level of uncertainty.

Measurement Uncertainty

BS4142:2014+A1:2019 states that measurement uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

a) the complexity of the sound source and the level of variability in sound emission from the source;
b) the complexity and level of variability of the residual acoustic environment;
...
d) the location(s) selected for taking the measurements;
...
g) the measurement time intervals;
h) the range of times when the measurements have been taken;
i) the range of suitable weather conditions during which measurements have been taken;
...
k) the level of rounding of each measurement recorded; and
l) the instrumentation used.

Each of the measurement uncertainty factors outlined above have been considered and discussed in Table 7 below.

TABLE 7: MEASUREMENT UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Discussion
a)	Sound sources are fairly constant, hence no correction variability in sound emission from the source
b)	Residual acoustic environment is relatively constant, hence no correction for a complex residual acoustic environment.

Measurement Uncertainty Factor Reference	Discussion
d)	Measuring at a location representative of the closest affected receptors to the site has enabled the determination of robust ambient, residual and background sound levels.
g)	Measurement time intervals were set in accordance with BS4142:2014+A1:2019, hence no further correction needs to be made. 30min or 15min periods were representative of the 1-hour period since both ambient sound and residual sound were steady and continuous in nature
h)	Residual sound measurements were undertaken over a continuous 3-day period, including a weekend, and therefore is considered robust.
i)	Periods of wind and/or precipitation were logged using a wind and rain gauge on site; these periods have been excluded from the data set used to derive the representative background sound levels. An uncertainty factor of ±1 dB is considered therefore appropriate and proportional
k)	Measured values were rounded to 0.1 dB, therefore rounding would not have had a significant impact on the overall typical background sound levels.
l)	The acoustic measurement equipment accorded with Type 1 specification of British Standard 61672.

The overall uncertainty is considered to be small enough that it would not affect the conclusions of the assessment.

4.4.4. Rating Sound Level

Incorporating the rating penalties detailed in Section 4.4.2 with the derived specific sound level, as detailed in Table 4, the rating sound level has been derived and have been detailed in Table 8 below.

TABLE 8: RATING SOUND LEVELS

NSR	Specific Sound Level (dB)	Rating Sound Level (dB)
1	52	55

4.4.5. Pre-Mitigation BS4142:2014+A1:2019 Assessment

The rating sound level, as calculated from the derived specific sound level, has been assessed in accordance with BS4142:2014+A1:2019, at the closest NSR.

The resultant assessment summary, during the daytime period, can be seen in Table 9.

TABLE 9: DAYTIME BS4142:2014+A1:2019 ASSESSMENT SUMMARY

Results	Sound Level (dB)	Notes
Specific Sound Level Daytime	52	As shown in Table 4
Rating Penalty	+3	As discussed in Table 6
Rating Sound Level Daytime	55	-
Daytime Background Sound Level	43	As shown in Table 5
Excess of Rating over Daytime Background Sound Level	+12	Assessment indicates a "**Significant Adverse Impact**".

The resultant assessment summary, during the night-time period, can be seen in Table 10 below.

TABLE 10: NIGHT-TIME BS4142:2014+A1:2019 ASSESSMENT SUMMARY

Results	Sound Level (dB)	Notes
Specific Sound Level Daytime	52	As shown in Table 4
Rating Penalty	+3	As discussed in Table 6
Rating Sound Level Daytime	55	-
Daytime Background Sound Level	36	As shown in Table 5
Excess of Rating over Daytime Background Sound Level	+19	Assessment indicates a "**Significant Adverse Impact**".

It can be seen that the operation of the site in its current form gives rise to a potentially *'Significant Adverse Impact'*.

5. Mitigation Measures Implemented

5.1. Background

As a result of the calculated level of noise impact arising from the Recover Blaenavon activities, an environmental permit was not granted.

Consequently, the new owners of the site have investigated the efficiency of the operation and opportunities for noise impacts could be reduced, with the following measures implemented.

5.2. BAT Measures Incorporated into the Site

- Chillers (operating parameters) – Site has an installation of 3 chillers to provide cooled water for reprocessing equipment. The default settings for these chillers were set to 'max'. Site has worked with on-site technical specialists and Aquacool (contractor) to reset these parameters to reduce noise whilst providing sufficient chilled water at the rate required. An example of such changes is that fan speed on adiabatic has now been reduced from 100% to 65% with no loss of efficiency. These changes have audibly reduced noise from this installation.

- Chiller (acoustic screen) – a retained stockpile area for recyclate bales has been located between the chiller installation and NSR1 to reduce noise propagation to the north, where NSR 1 is located. The screening afforded by stockpiling activity in this area will eventually be improved upon via a permanent structure around the chiller units, which should further reduce noise transmission.

  It was noted that the recyclate bales provided a dense screen, that was continuous, imperforate and sealed at the base and given its thickness (circa 1.5m), would dramatically improve on the >15kgm^{-2} panel density that would be specified for a timber barrier in the same situation.

- Local Exhaust Ventilation (LEV) Operation – LEV is provided around reprocessing equipment at five specific points. Changes to operating parameters have now ensured that fume is only extracted at two of the five points. This has enabled LEV fans at three LEV stations to be switched off during normal production. LEV at one of the two remaining positions has been rerouted and now exits at ground level rather than roof level and this has further reduced noise propagation from the exhaust point to the receptor.

- Factory entry/exit doors – These were continually retained in an open position to enable fork truck access/exit to bring in material and to remove finished goods. These are now only required to be open at shift changes where finished goods are moved to the warehouse and sufficient material is moved into the production hall for a full shift. These are now maintained in a closed position at all other times during site operation.

6. Measurement Methodology – May 2023

6.1. General

The prevailing sound conditions in the area have been determined by a fully attended environmental noise survey conducted during the evening of Wednesday 17th May 2023.

As the results of the previous assessment identified, that even in its unmitigated form, the operations were acoustically insignificant at NSR2, this reassessment has focussed entirely on NSR1. An audibility check while on site confirmed this to be the case, with there being no acoustic contributions from Recover Plastics at the formerly assessed NSR2, which lies at a lower elevation than the permit site and is screened by intervening topography.

Several visits were made to NSR2 to confirm this situation and on every occasion, inaudibility was confirmed, thus adding reassurance that the assessment was only required at NSR1, which sits above the site, with an unobstructed line of sight to the operations and noise-generating elements.

6.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[5].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[6]. A full inventory of this equipment is shown in Table 11 below.

Table 11: Inventory of Sound Measurement Equipment

Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Expiry Date
All	Rion NL-31 Sound Level Meter	00110040	1139896	09/02/2025
	Rion NH-21 Preamplifier	00142	1139896	09/02/2025
	Rion UC-53A Microphone	306449	1139896	09/02/2025
	Cirrus CR:515 Acoustic Calibrator	82506	1131626	23/08/2023

Measurement equipment used during the survey was field calibrated at the start and end of the measurement period, with the following results:

- Before: 93.9 dB After: 94.1 dB (@1kHz)

The weather conditions during the attended survey were entirely conducive to environmental noise measurements, it being dry and with no discernible wind; albeit the weather forecasts did show potential light winds from the north, that were not observed to occur in this locality.

[5] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI.
[6] British Standard 61672: 2013: *Electroacoustics. Sound level meters*. Part 1 *Specifications*. BSI.

Cloud cover was observed to be circa 50%, temperatures were observed to be between 13 and 16 degrees centigrade and a hand-held anemometer was used to measure wind speeds, which barely detected any air movement.

The microphone was fitted with a protective windshield for the measurement, which is described in Table 12 with an aerial photograph indicating its locations shown in Figure 4.

TABLE 12: MEASUREMENT POSITIONS DESCRIPTION

Measurement Position	Description
MP1	A fully attended evening measurement of sound under free-field conditions, at a height of 1.5 metres above local ground level at the garden boundary of NSR1, representing the closest and most affected noise-sensitive receptor to the Permit Application Site. The residual acoustic environment was sustained by the sounds of birdsong, local road traffic and commercial activities within the wider industrial area. During operational periods of the site, the ambient acoustic environment was noted to be audibly influenced by process noise arising from within Recover Blaenavon's premises; primarily, from the cooling plant located towards the west of the process building. This was noted to be much less audible than at previous, pre-mitigation visits. Site process noise was noted to be a component of the background sound environment, rather than the ambient sound environment, which was audibly and measurably governed by natural sources. Consequently, the measured L_{A90} was deemed to be more representative of the steady-state site operation noise, with the L_{Aeq} showing little or no correlation to the presence of site activity, but being heavily governed by the proliferation of bird activity and variability of road traffic.

FIGURE 4: MEASUREMENT POSITION

6.3. Post-Mitigation Summary Results

The measured sound levels for the attended survey are presented in Table 13, with a time-history graph presented in Appendix B.

TABLE 13: MEASURED SOUND LEVELS – POST-MITIGATION

Description	Period	$L_{Aeq,T}$ (dB)	$L_{AF90,T}$ (dB)	L_{AFmax} (dB)
External Cooling Plant Only	19:47-20:22	47.8	**Mean: 42.3 Max 5min: 43.6 Min 5min: 41.0**	71.4
Plant Ramping Up to Full Duty	20:22-20:42	43.7	**Mean: 43.7 Max 5min: 44.2 Min 5min: 43.4**	73.4
Plant Fully Operational	20:42-21:17	50.0	**Mean: 44.5 Max 5min: 45.8 Min 5min: 42.6**	71.5
Plant Ramping Down to Total Shut-down	21:17-21:27	46.1	**Mean: 38.5 Max 5min: 39.0 Min 5min: 38.0**	61.5
All Plant Off – Residual Level	21:27-21:52	47.4	**Mean: 37.6 Max 5min: 40.2 Min 5min: 34.4**	64.3
Plant Ramping Up to Full Duty	21:52-22:22	46.5	**Mean: 40.2 Max 5min: 43.4 Min 5min: 37.2**	64.0
Plant Fully Operational	22:22-22:42	46.5	**Mean: 40.4 Max 5min: 41.5 Min 5min: 38.7**	61.4

6.4. Discussion

Given that the facility in its current operational form has been identified to be a component of the background sound environment, rather than a numerical contributor to the ambient sound level, the measured L_{A90} is, as described, a more reliable means of determining the specific sound level.

On this basis, the lowest measured $L_{A90,5\text{-minute}}$ during the fully operational period would be a strong indicator of the specific sound level, given the varying ambient/residual sound environment, primarily as a result of the level of seasonal bird activity. This statistic has been measured at 42.6 dB(A) during the earlier fully operational period, but 38.7 dB(A) during the later period. Given that bird activity had reduced significantly, both in terms of its level and consistency during the later period, it is considered that the lower figure represents the specific sound level of the Recover Blaenavon operations.

As a result of the ambiguity in determining the specific sound level, a predictive exercise has been undertaken based upon source noise levels measured at the site during the evening of Wednesday 17th May 2023.

6.5. Source Measurement Details

The sound source measurements were also undertaken during the evening of Wednesday 17th May 2023.

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[7].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[8]. A full inventory of this equipment is shown in Table 14 below.

TABLE 14: INVENTORY OF SOUND MEASUREMENT EQUIPMENT

Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Expiry Date
All	Rion NL-52 Sound Level Meter	00810638	CONF032203	11/03/2024
	Rion NH-25 Preamplifier	20046	CONF032203	11/03/2024
	Rion UC-59 Microphone	11181	CONF032203	11/03/2024
	Cirrus CR:515 Acoustic Calibrator	82506	1131626	23/08/2023

Measurement equipment used during the survey was field calibrated at the start and end of the measurement period, with the following results:

- Before: 93.8 dB After: 94.0 dB (@1kHz)

6.6. Source Measurement Results

The source measurement results are described and set out in Table 15.

TABLE 15: SOURCE MEASUREMENT RESULTS ($L_{EQ,T}$)

Distance from Source (m)	$L_{Aeq,T}$ - dB	Octave Band (Hz) Sound Level, $L_{eq,T}$ - dB							
		63	125	250	500	1000	2000	4000	8000
Within "Feedstock" Storage Area of Production Building (Eastern Area)									
Internal Reverberant	92.5	81.2	82.4	76.1	78.8	79.7	80.4	84.3	91.5
Within Centrifuge/Finished Product Area of Production Building (East Central Area)									
Internal Reverberant	94.5	83.0	82.0	78.5	79.2	79.2	81.4	86.1	94.0
Within Central Production Area of Production Building (Central Area)									
Internal Reverberant	90.5	83.6	81.5	79.3	78.9	78.5	79.0	82.2	89.2

[7] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI.
[8] British Standard 61672: 2013: *Electroacoustics. Sound level meters*. Part 1 *Specifications*. BSI.

Distance from Source (m)	$L_{Aeq,T}$ - dB	Octave Band (Hz) Sound Level, $L_{eq,T}$ - dB							
		63	125	250	500	1000	2000	4000	8000
Between "Feedstock" Conveyors of Production Building (Western Area)									
Internal Reverberant	87.8	82.8	85.8	82.9	82.3	82.2	76.6	78.0	83.7
Between "Feedstock" Conveyors of Production Building and Western Wall (Western Area)									
Internal Reverberant	86.4	85.5	88.9	85.6	80.8	78.4	75.8	76.7	81.9
Southern Bank of External Chiller Units									
1	70.4	74.7	71.5	70.3	66.4	64.8	60.5	58.7	61.7
Central External Chiller Unit									
1	70.0	74.0	70.5	67.2	65.1	65.1	61.5	59.6	61.6
Northern Bank of External Chiller Units									
1	71.1	80.9	73.6	72.4	68.3	66.2	59.6	53.5	56.7
East Wall Production Area Roller Shutter Door (North) - Closed									
1	70.0	64.3	64.6	59.5	61.2	60.8	60.3	62.0	67.3
East Wall Production Area Man Access Door- Closed									
1	70.6	64.2	64.5	58.2	60.3	60.3	61.3	62.8	68.4
East Wall Production Area Roller Shutter Door (South) - Closed									
1	75.0	67.0	67.6	62.2	60.7	63.2	65.4	67.4	73.2

No external activities were observed to occur, as a result of the alterations to the site operating profile. Activities were noted to be limited to static plant, with infrequent forklift movements occurring within the buildings, only.

The source measurement methodology reflects an established method for isolating noise from individual sources, where several sources may result in a cumulative contribution. Measuring at a distance of 1-metre from point or vertical planar sources enables a robust method of validating an incrementally constructed noise model and is a method that has proved acceptable to NRW officers in the recent past.

7. SUPPLEMENTARY / PREDICTIVE NOISE ASSESSMENT

7.1. Noise Modelling

7.1.1. Noise Source Data

The following sources of noise associated with the Proposed Development have been identified and are considered in this assessment:

- External Cooling Plant; and
- Internal Waste Processing Operations.

7.1.2. Source Data

The sound source data used in the assessment, associated with the various activities/items is based upon the data set out in Table 15.

7.1.3. Building Envelope

In terms of the acoustic performance of the building envelopes, the sound reduction statistics set out in Table 16 have been adopted.

TABLE 16: SOUND REDUCTION INDEX OF BUILDING COMPONENTS

Component	Type / Material	SRI – dB(A)
Wall / Roof Cladding	1mm Profiled Steel	26.0
Roller Shutter Door (North)	Closed	20.0
Roller Shutter Door (South)	Closed	16.0
Man Access Door	Slightly Ajar / Cracked Open	19.0

7.1.4. Calculation Process

Calculations were carried out using Cadna/A, which undertakes its calculations in accordance with guidance given in ISO9613-1:1993 and ISO9613-2:1996.

7.1.5. Sound Data Assumptions

Given that the land between Proposed Development and nearest receptor is mixed, the ground factor has been set to 0.5 in the calculation software. That calculation process also considers two orders of reflection.

7.1.6. Specific Sound Level Map

The sound map showing the specific sound level emissions from the Proposed Development can be seen in Figure 5.

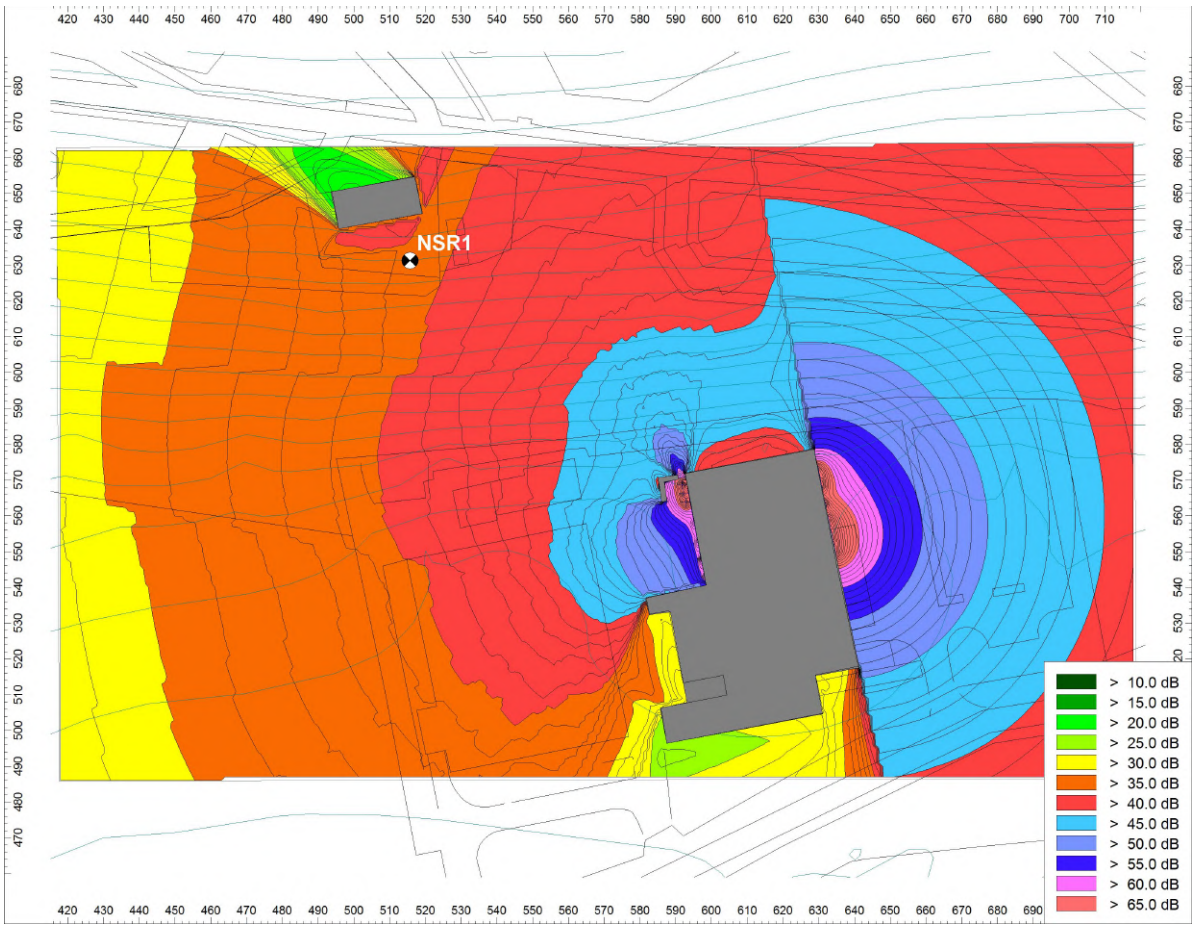
7.1.7. Specific Sound Level Summary

A summary of the predicted specific sound levels at the closest NSRs, based on the sound map shown in Figure 5 can be seen in Table 17.

TABLE 17: PREDICTED SPECIFIC SOUND LEVEL SUMMARY

NSR	Cumulative Specific Sound Level (dB)
1	39.3

FIGURE 5: SPECIFIC SOUND LEVEL MAP



The predictive exercise has added confidence to the measurement-based exercise and has essentially confirmed the derived specific sound level of the operations.

7.2. Assessment

7.2.1. Rating Penalty Assessment

Considering the content of Section 4.4.1, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, has been detailed in Table 18 below.

TABLE 18: RATING PENALTY ASSESSMENT

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
General Operations	0 dB	0 dB	0 dB	3 dB	The dominant noise source at the site is noise from the outdoor cooling units, which were broadband and continuous in their operation. While no overt tonality was audible at the receptor location and no impulsive or intermittent sources were observed, the specific sound, however, is distinctive against the residual acoustic environment, so a penalty of +3 dB is applied

In summary, a rating penalty of +3 dB has been included in the assessment, due to the low level of audibility of the site activities against the residual sound environment.

7.2.2. Uncertainty

BS4142:2014+A1:2019 requires that the level of uncertainty in the measured data and associated calculations is considered in the assessment. The Standard recommends that steps should be taken to reduce the level of uncertainty.

Measurement Uncertainty

Each of the measurement uncertainty factors have been considered and discussed in Table 19.

TABLE 19: MEASUREMENT UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Discussion
b)	Residual acoustic environment is relatively constant, hence no correction for a complex residual acoustic environment.
d)	Measuring at the closest affected receptor to the site has enabled the determination of robust background sound levels (as detailed earlier in this report). Additional noise measurements of the mitigated operations were fully attended, thus further reducing uncertainty.

Measurement Uncertainty Factor Reference	Discussion
g)	Measurement time intervals were set in accordance with BS4142:2014+A1:2019, hence no further correction needs to be made.
h)	Measurements were undertaken during a representative evening period, with robust background sound levels determined as described earlier in this report.
i)	The survey was fully attended, enabling the observation of weather conditions.
k)	Measured values were rounded to 0.1 dB, therefore rounding would not have had a significant impact on the overall typical background sound levels.
l)	The acoustic measurement equipment accorded with Type 1 specification of British Standard 61672, and were deployed with appropriate wind shields.

Calculation Uncertainty

Each of the calculation uncertainty factors have been considered and discussed in Table 20.

TABLE 20: CALCULATION UNCERTAINTY FACTORS

Calculation Uncertainty Factor Reference	Discussion
b)	Sound source levels are based on robust on-site source measurements of existing activities to be carried out at the site and manufacturer data provided by the Applicant. Conversion from internal reverberant to free-field noise levels have been undertaken on a conservative basis.
c)	Calculations were undertaken in accordance with ISO 9613-2, which is considered a *"validated method"* by BS4142:2014+A1:2019.
d)	The real situation has not been simplified for the purposes of this assessment.
e)	ISO 9613-2 indicates that there is a ±3 dB accuracy to the prediction method, therefore, an uncertainty factor of ±1 dB is considered appropriate and proportional, given the separation distances involved.

The overall uncertainty is considered to be small enough that it would not affect the conclusions of the assessment.

7.2.3. Post-Mitigation BS4142:2014+A1:2019 Assessment

The rating sound level, as calculated from the derived specific sound level, has been assessed in accordance with BS4142:2014+A1:2019, at the closest NSR.

The resultant assessment summary, during the daytime period, can be seen in Table 21.

TABLE 21: DAYTIME BS4142:2014+A1:2019 ASSESSMENT SUMMARY

Results	Sound Level (dB)	Notes
Specific Sound Level Daytime	39	As shown in Table 17
Rating Penalty	+3	As discussed in Table 18
Rating Sound Level Daytime	42	-
Daytime Background Sound Level	43	As shown in Table 18
Excess of Rating over Daytime Background Sound Level	-1	Assessment indicates a "**Low Impact**".

The resultant assessment summary, during the night-time period, can be seen in Table 22 below.

TABLE 22: NIGHT-TIME BS4142:2014+A1:2019 ASSESSMENT SUMMARY

Results	Sound Level (dB)	Notes
Specific Sound Level Daytime	39	As shown in Table 17
Rating Penalty	+3	As discussed in Table 6
Rating Sound Level Daytime	42	-
Night-time Background Sound Level	36	As shown in Table 5
Excess of Rating over Daytime Background Sound Level	+6	Assessment indicates a potentially "**Adverse Impact**".

It can be seen that the operation of the site in its current form gives rise to a *'Low Impact'* during the day/evening, with a potentially *'Adverse Impact'* occurring at night.

8. Discussion and Context

8.1. Context

It is noted that Recover Blaenavon Limited is an established industrial facility in Blaenavon, which has been in operation for a number of years, apparently without noise complaints and that the recently implemented mitigation measures have significantly reduced the level of noise generation by approximately 13 dB.

The area is predominantly industrial in nature, with scattered residential development within relatively close proximity to the industrial activities, with that inter-relationship being a longstanding one. The residential receptors have therefore become habituated to some industrial noise within the soundscape, with the recent improvements to the site providing a significant reduction in the degree to which that acoustic contribution occurs.

The absolute level of the specific sound is not high; 39 dB(A), with the character of the sound being broadband, constant and reasonably anonymous, as a result. It also now exists within the background sound environment, rather than being a prominent feature of the ambient sound environment, as was previously the case, thus significantly reducing the degree to which it attracts attention and its potential to influence receptor behaviour.

Further to the above, the Adverse Impact is only deemed to occur during the night-time period, when the use of external amenity areas is likely to be substantially reduced. At other times, a Low Impact has been determined.

The above factors combined are considered vital to interpreting the predicted impacts in context, with the discussed factors considered to reduce the significance of the calculated potentially Adverse Impact at night.

8.2. Best Available Technology

The measures implemented to achieve this noise reduction are, in themselves, considered a robust demonstration of BAT; however, the operators are proposing further measures, in the form of permanent screening around the external cooler units.

The external chiller units have been identified as a source of operational audibility at NSR1, so their forthcoming treatment should be sufficient to demonstrate that all BAT techniques are being employed at the site.

It should be noted, that the noise model does demonstrate that the dominant source of measurable noise is noise breakout through the roof of the building, so while audible phenomena may be reduced by the presence of a barrier, the quantifiable noise level will only be modestly influenced.

Details of this design measure and the residual impact are set out within the following section.

9. Further Mitigation Measures and Residual Effects

9.1. Screening

It is proposed to add a permanent acoustic screen around the external chiller plant to replace the bale stockpile that is currently retained in that area, and used as an acoustic screen for the external plant.

The height of the top of the chiller units is 2.4 metres, meaning that any screen would have to extend meaningfully above that height, in order to offer any significant path difference and consequent acoustic reduction. Consequently, a 4-metre high, localised acoustic barrier with absorptive treatment to the inner face is proposed, which will connect to the western wall of the building, with a 90-degree return, extending for not less than 2 metres to the south of the southernmost chiller unit and standing off the side and front faces by not more than 1.5 metres.

It is proposed to use a local manufacturer; Tilon CG Limited, who produce a modular slatted, absorptive, acoustic barrier system, manufactured from recycled composites, as per details set out on: https://tiloncg.com/noise-barriers/.

9.2. Residual Effects

9.2.1. Calculation Process

Calculations were carried out using Cadna/A, which undertakes its calculations in accordance with guidance given in ISO9613-1:1993 and ISO9613-2:1996.

9.2.2. Sound Data Assumptions

All input assumptions remain as per the previously modelled scenario, but with the barrier attributed an absorption coefficient of 0.6.

9.2.3. Residual Specific Sound Level Map

The sound map showing the specific sound level emissions from the Proposed Development can be seen in Figure 6.

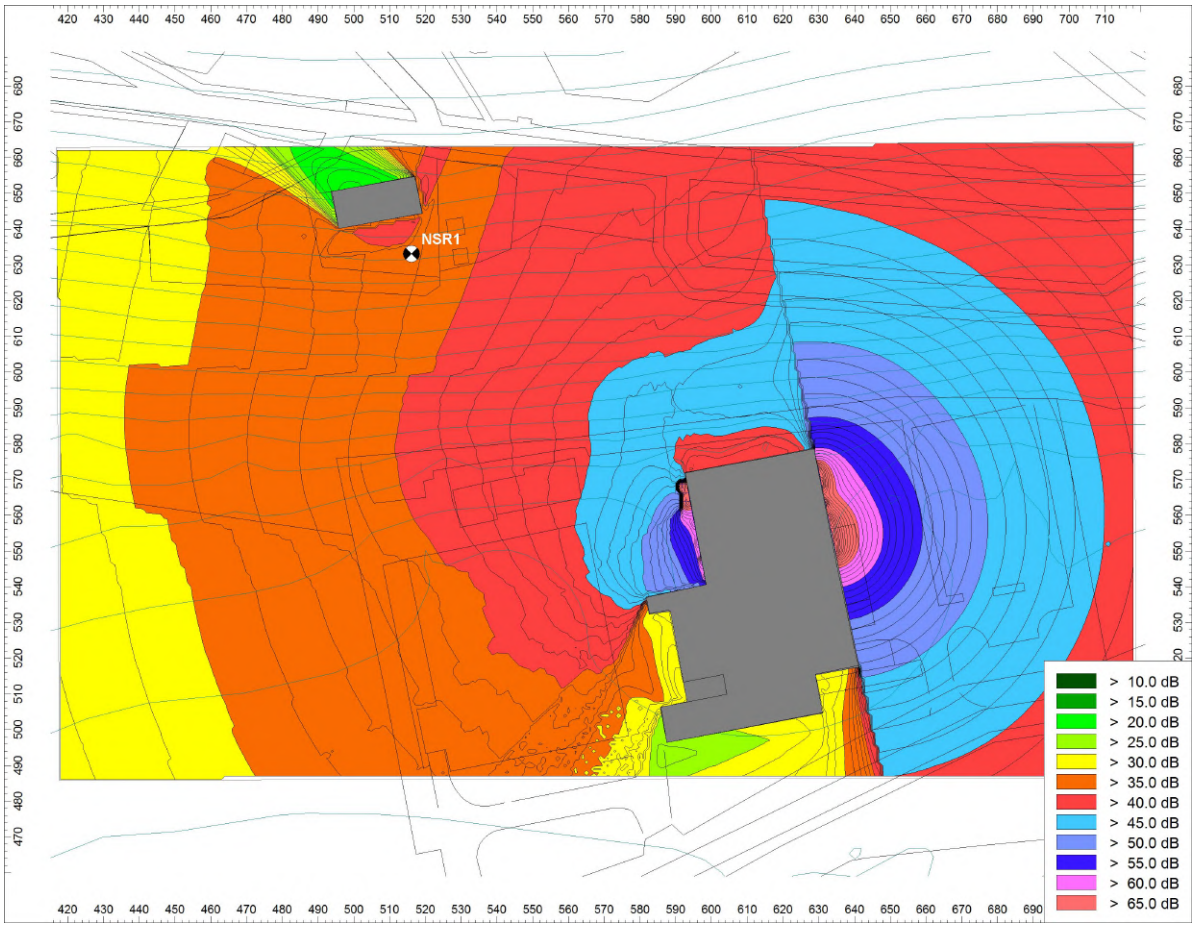
9.2.4. Residual Specific Sound Level Summary

A summary of the predicted specific sound levels at the closest NSRs, based on the sound map shown in Figure 6 can be seen in Table 23.

Table 23: Predicted Specific Sound Level Summary

NSR	Cumulative Specific Sound Level (dB)
1	38.8

FIGURE 6: RESIDUAL SPECIFIC SOUND LEVEL MAP



9.2.5. Residual Effects Summary

The analysis set out above identifies that the addition of the permanent barrier around the external chiller plant is predicted to offer a reduction in the specific noise level of 0.5 dB over the existing scenario, relying on the mitigative effects of the recyclate bale stockpile.

The introduction of the barrier is calculated to reduce the specific sound level of the external chillers from 34.0 dB(A) to 29.7 dB(A); a reduction of 4.3 dB from that source.

For the purposes of comparison and context, the calculated total specific sound level without both the permanent barrier and the recyclate bale stockpile is 40.1 dB(A), meaning that the measure offers a predicted overall reduction of only 1.3 dB, as a result of the acoustic dominance of noise breakout through the roof of the building, which is predicted to be 37.9 dB(A) in isolation.

When the rounding required by the BS4142 methodology is applied, the assessment outcomes set out in Table 21 and Table 22 remain unchanged, with a Low Impact identified during the day and a potentially Adverse Impact identified at night, which should be considered in the context set out in Section 9.1.

Notwithstanding the above, it is considered that the measures already employed, as summarised in Section 5.2 of this report, in conjunction with the incorporation of a permanent acoustic barrier

around the external chiller plant, as described in Section 9.1, demonstrate that the operator has committed to employ all reasonably practicable measures to reduce noise from the site, amounting to in excess of 13 dB of net acoustic benefit, over the previous operating scenario.

Consequently, the combination of existing and committed measures is considered to represent a robust demonstration of BAT on behalf of the operator.

10. Conclusion

inacoustic has been commissioned to prepare a Noise Assessment for the Recover Blaenavon Limited operations at Kays & Kears Industrial Estate, Blaenavon, Pontypool, NP4 9AZ, for submission to Natural Resources Wales (NRW) as part of a Permit Application.

The assessment has identified that noise impacts have been substantially reduced at the closest NSR to the site. The noise effects associated with the proposals are now within the acoustic context of the area; however, it is noted that while a Low Impact now occurs during the day/evening, that a potentially Adverse Impact still occurs at night, when assessed in accordance with the steering principles of BS4142:2014+A1:2019.

Further mitigation measures are proposed, which should reduce noise emissions from the operations to within the Low Impact range during all times of the day, evening and night and would comprehensively demonstrate that all possible BAT measures are implemented at the site.

The assessment indicates that when operated in the manner described in this report, the Site can be brought forward in compliance with the requirements of the Noise and Vibration Management: Environmental Permits, demonstrating BAT where possible, as outlined in Section 8.

In light of the above, it is considered that this report provides sufficient information to the grant the Application for a Permit for the Site and that the current operational restrictions should be removed.

11. APPENDICES

11.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 24: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

11.2. Appendix B – Full Measurement Results

11.2.1. Monitoring Position 1

FIGURE 7: UNATTENDED BASELINE SOUND SURVEY AT MP1 (NSR1) – SITE NON-OPERATIONAL (PRE-MITIGATION)

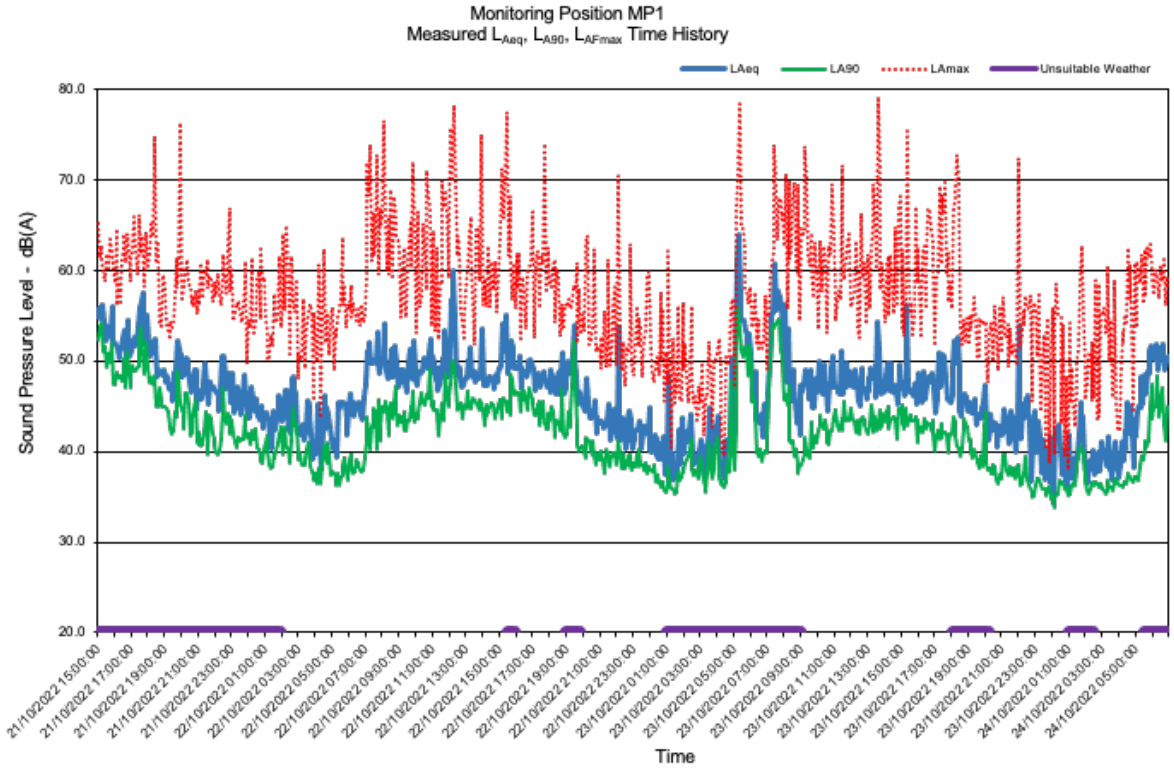


FIGURE 8: STATISTICAL ANALYSIS OF L_{A90} BACKGROUND – DAYTIME - MP1 – SITE NON-OPERATIONAL

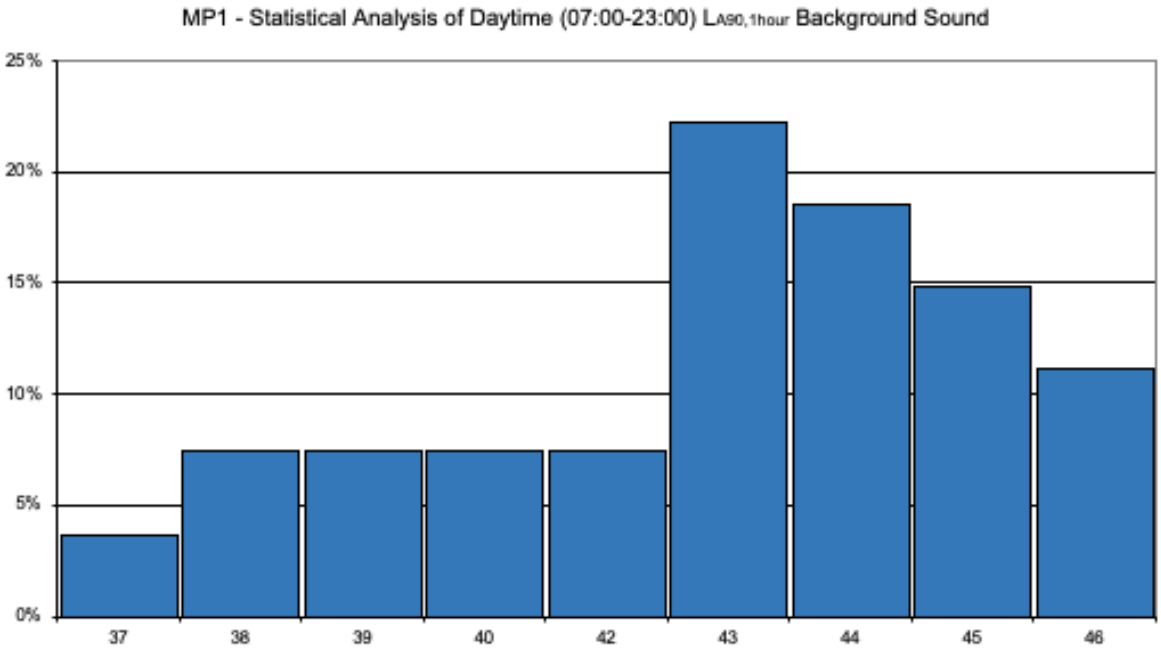


FIGURE 9: STATISTICAL ANALYSIS OF L_{A90} BACKGROUND – NIGHT-TIME - MP1 – SITE NON-OPERATIONAL

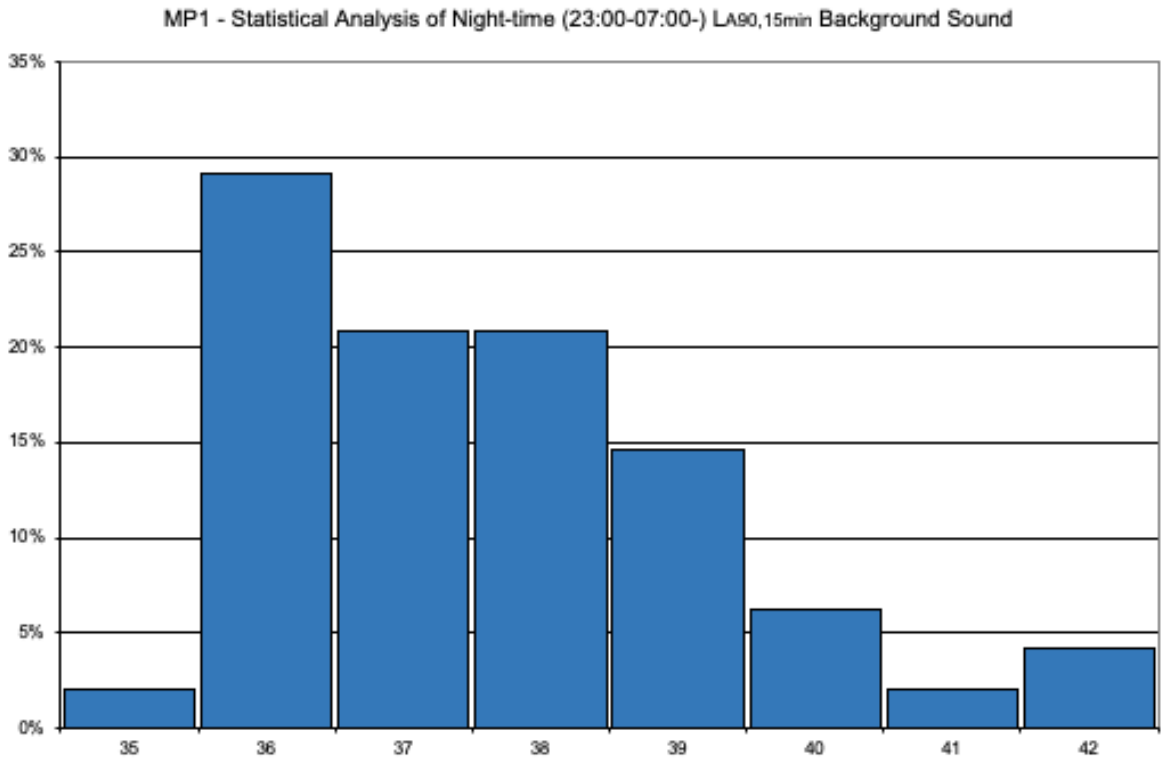


FIGURE 10: ATTENDED SOUND SURVEY AT MP1 (NSR1)

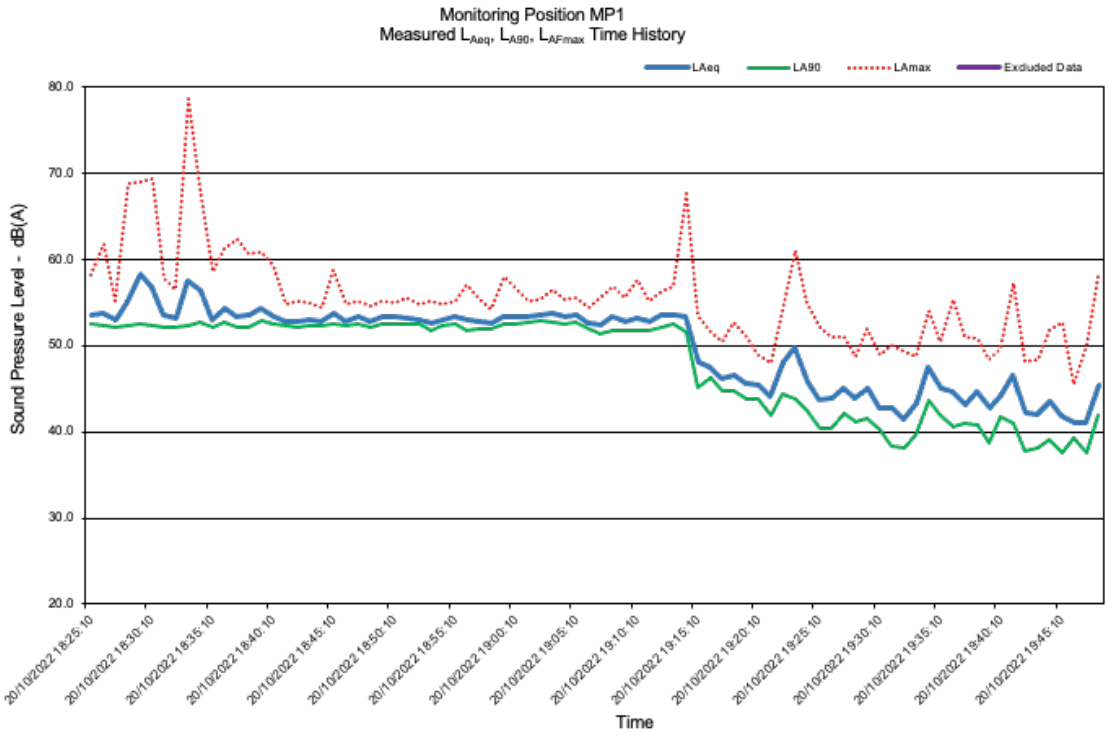
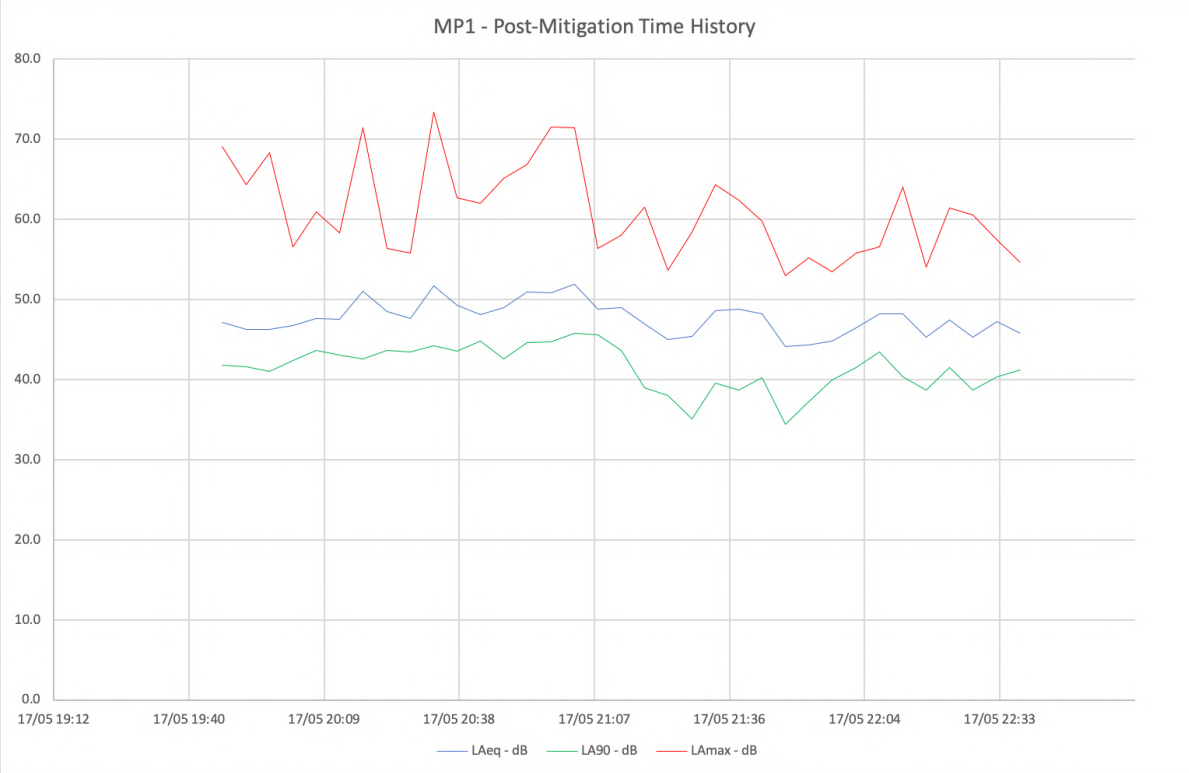
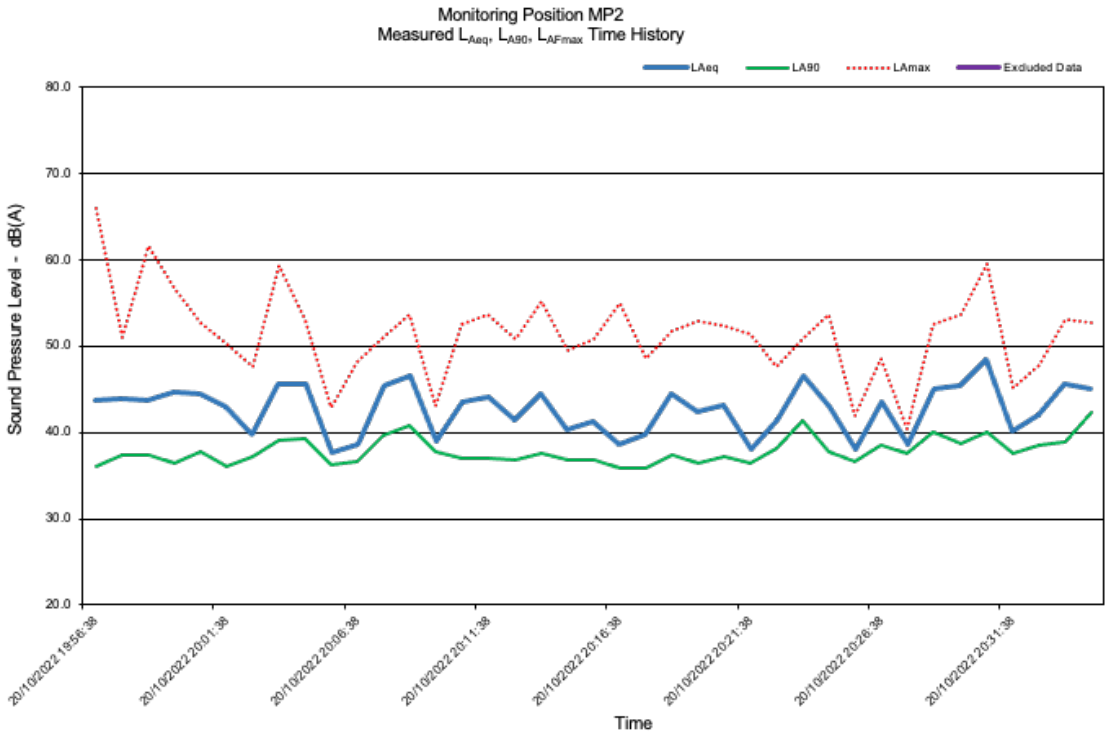


FIGURE 11: SOUND SURVEY AT MP1 (NSR1) – POST-MITIGATION



11.2.2. Monitoring Position 2

FIGURE 12: ATTENDED SOUND SURVEY AT MP2 (NSR2)



11.2.3. Weather Monitoring

TABLE 25: RAIN MONITORING

Time	Rain Event
21/10/2022 01:50	Yes
21/10/2022 03:02	Yes
21/10/2022 06:35	Yes
21/10/2022 06:40	Yes
21/10/2022 07:00	Yes
21/10/2022 07:15	Yes
21/10/2022 09:32	Yes
21/10/2022 09:34	Yes
21/10/2022 09:35	Yes
21/10/2022 09:36	Yes
21/10/2022 09:45	Yes
21/10/2022 11:15	Yes
21/10/2022 11:21	Yes

Time	Rain Event
21/10/2022 11:22	Yes
21/10/2022 11:23	Yes
21/10/2022 11:26	Yes
21/10/2022 12:41	Yes
21/10/2022 12:52	Yes
21/10/2022 12:58	Yes
21/10/2022 13:00	Yes
21/10/2022 13:02	Yes
21/10/2022 13:05	Yes
21/10/2022 13:35	Yes
21/10/2022 14:57	Yes
21/10/2022 15:10	Yes
21/10/2022 15:14	Yes
21/10/2022 15:18	Yes
21/10/2022 15:20	Yes
21/10/2022 15:22	Yes
21/10/2022 15:23	Yes
21/10/2022 15:28	Yes
21/10/2022 15:29	Yes
21/10/2022 15:33	Yes
21/10/2022 15:37	Yes
21/10/2022 15:47	Yes
21/10/2022 15:51	Yes
21/10/2022 15:53	Yes
21/10/2022 15:54	Yes
21/10/2022 15:57	Yes
21/10/2022 15:58	Yes
21/10/2022 16:09	Yes
21/10/2022 16:46	Yes
21/10/2022 17:09	Yes
21/10/2022 17:22	Yes
21/10/2022 17:29	Yes
21/10/2022 17:33	Yes
21/10/2022 17:35	Yes
21/10/2022 17:38	Yes

Time	Rain Event
21/10/2022 17:40	Yes
21/10/2022 17:41	Yes
21/10/2022 17:42	Yes
21/10/2022 17:43	Yes
21/10/2022 17:44	Yes
21/10/2022 17:45	Yes
21/10/2022 17:46	Yes
21/10/2022 17:51	Yes
21/10/2022 17:53	Yes
21/10/2022 17:54	Yes
21/10/2022 17:57	Yes
21/10/2022 17:59	Yes
21/10/2022 18:02	Yes
21/10/2022 18:09	Yes
21/10/2022 18:31	Yes
21/10/2022 18:43	Yes
21/10/2022 18:48	Yes
21/10/2022 18:51	Yes
21/10/2022 18:57	Yes
21/10/2022 19:05	Yes
21/10/2022 19:14	Yes
21/10/2022 19:38	Yes
21/10/2022 19:49	Yes
21/10/2022 19:50	Yes
21/10/2022 19:53	Yes
21/10/2022 19:55	Yes
21/10/2022 20:09	Yes
21/10/2022 20:48	Yes
21/10/2022 20:51	Yes
21/10/2022 21:51	Yes
21/10/2022 22:26	Yes
21/10/2022 23:14	Yes
21/10/2022 23:27	Yes
22/10/2022 00:07	Yes
22/10/2022 00:29	Yes

Time	Rain Event
22/10/2022 01:08	Yes
22/10/2022 01:52	Yes
22/10/2022 15:42	Yes
22/10/2022 15:50	Yes
22/10/2022 15:51	Yes
22/10/2022 18:56	Yes
22/10/2022 19:10	Yes
22/10/2022 19:23	Yes
22/10/2022 19:28	Yes
22/10/2022 19:32	Yes
22/10/2022 19:34	Yes
23/10/2022 01:09	Yes
23/10/2022 02:15	Yes
23/10/2022 03:58	Yes
23/10/2022 04:48	Yes
23/10/2022 05:06	Yes
23/10/2022 05:12	Yes
23/10/2022 05:14	Yes
23/10/2022 05:15	Yes
23/10/2022 05:16	Yes
23/10/2022 05:17	Yes
23/10/2022 05:18	Yes
23/10/2022 05:19	Yes
23/10/2022 05:20	Yes
23/10/2022 05:21	Yes
23/10/2022 05:22	Yes
23/10/2022 05:23	Yes
23/10/2022 05:24	Yes
23/10/2022 05:26	Yes
23/10/2022 05:28	Yes
23/10/2022 05:29	Yes
23/10/2022 05:33	Yes
23/10/2022 05:34	Yes
23/10/2022 05:38	Yes
23/10/2022 05:40	Yes

Time	Rain Event
23/10/2022 05:43	Yes
23/10/2022 05:44	Yes
23/10/2022 05:47	Yes
23/10/2022 05:49	Yes
23/10/2022 05:53	Yes
23/10/2022 06:01	Yes
23/10/2022 06:03	Yes
23/10/2022 06:11	Yes
23/10/2022 06:17	Yes
23/10/2022 07:03	Yes
23/10/2022 07:12	Yes
23/10/2022 07:17	Yes
23/10/2022 07:19	Yes
23/10/2022 07:21	Yes
23/10/2022 07:23	Yes
23/10/2022 07:26	Yes
23/10/2022 07:28	Yes
23/10/2022 07:31	Yes
23/10/2022 07:33	Yes
23/10/2022 07:36	Yes
23/10/2022 07:38	Yes
23/10/2022 07:41	Yes
23/10/2022 07:43	Yes
23/10/2022 07:45	Yes
23/10/2022 07:47	Yes
23/10/2022 07:50	Yes
23/10/2022 07:54	Yes
23/10/2022 08:00	Yes
23/10/2022 08:05	Yes
23/10/2022 08:18	Yes
23/10/2022 08:22	Yes
23/10/2022 18:09	Yes
23/10/2022 19:03	Yes
23/10/2022 20:03	Yes
23/10/2022 20:05	Yes

Time	Rain Event
24/10/2022 01:19	Yes
24/10/2022 01:29	Yes
24/10/2022 01:40	Yes
24/10/2022 01:43	Yes
24/10/2022 01:54	Yes
24/10/2022 02:12	Yes
24/10/2022 05:33	Yes
24/10/2022 05:57	Yes
24/10/2022 06:13	Yes
24/10/2022 06:20	Yes
24/10/2022 06:30	Yes
24/10/2022 06:39	Yes
24/10/2022 09:35	Yes
24/10/2022 09:55	Yes

TABLE 26: WIND MONITORING

Time	Wind Direction	Wind Speed (m/s)
20/10/2022 18:00:00	196.85	0.35
20/10/2022 18:15:00	106.39	0.27
20/10/2022 18:30:00	83.63	0.40
20/10/2022 18:45:00	128.80	0.26
20/10/2022 19:00:00	150.36	0.59
20/10/2022 19:15:00	207.71	0.69
20/10/2022 19:30:00	134.85	0.70
20/10/2022 19:45:00	95.72	0.57
20/10/2022 20:00:00	81.17	0.56
20/10/2022 20:15:00	157.56	0.71
20/10/2022 20:30:00	241.20	0.88
20/10/2022 20:45:00	229.13	0.65
20/10/2022 21:00:00	195.54	0.58
20/10/2022 21:15:00	194.09	0.69
20/10/2022 21:30:00	141.39	0.66
20/10/2022 21:45:00	82.34	0.71
20/10/2022 22:00:00	99.80	0.60
20/10/2022 22:15:00	78.31	0.79
20/10/2022 22:30:00	76.49	0.82
20/10/2022 22:45:00	68.20	0.68
20/10/2022 23:00:00	76.58	0.68
20/10/2022 23:15:00	76.74	0.45
20/10/2022 23:30:00	75.87	0.66
20/10/2022 23:45:00	73.11	0.64
21/10/2022 00:00:00	82.18	0.64
21/10/2022 00:15:00	82.67	0.63
21/10/2022 00:30:00	84.36	0.70
21/10/2022 00:45:00	83.71	0.63
21/10/2022 01:00:00	81.64	0.70
21/10/2022 01:15:00	84.80	0.66
21/10/2022 01:30:00	90.68	0.68
21/10/2022 01:45:00	103.05	0.66
21/10/2022 02:00:00	76.39	0.86
21/10/2022 02:15:00	76.29	0.82

Time	Wind Direction	Wind Speed (m/s)
21/10/2022 02:30:00	75.06	0.77
21/10/2022 02:45:00	148.84	0.59
21/10/2022 03:00:00	77.67	0.80
21/10/2022 03:15:00	91.01	0.51
21/10/2022 03:30:00	77.58	0.89
21/10/2022 03:45:00	76.22	0.78
21/10/2022 04:00:00	73.36	0.96
21/10/2022 04:15:00	72.80	0.76
21/10/2022 04:30:00	80.07	0.80
21/10/2022 04:45:00	71.29	0.77
21/10/2022 05:00:00	77.09	0.85
21/10/2022 05:15:00	79.61	0.89
21/10/2022 05:30:00	129.07	0.81
21/10/2022 05:45:00	109.31	1.22
21/10/2022 06:00:00	123.42	1.19
21/10/2022 06:15:00	191.39	1.14
21/10/2022 06:30:00	160.37	1.29
21/10/2022 06:45:00	191.08	1.25
21/10/2022 07:00:00	144.53	1.22
21/10/2022 07:15:00	185.58	1.35
21/10/2022 07:30:00	192.03	1.34
21/10/2022 07:45:00	177.05	1.56
21/10/2022 08:00:00	201.97	1.58
21/10/2022 08:15:00	201.89	1.34
21/10/2022 08:30:00	177.16	1.65
21/10/2022 08:45:00	182.35	1.49
21/10/2022 09:00:00	188.62	1.76
21/10/2022 09:15:00	195.41	1.35
21/10/2022 09:30:00	208.91	1.52
21/10/2022 09:45:00	183.76	1.60
21/10/2022 10:00:00	216.79	1.44
21/10/2022 10:15:00	232.62	1.60
21/10/2022 10:30:00	211.21	1.41
21/10/2022 10:45:00	195.68	1.33
21/10/2022 11:00:00	218.49	1.31

Time	Wind Direction	Wind Speed (m/s)
21/10/2022 11:15:00	189.81	1.51
21/10/2022 11:30:00	212.19	1.29
21/10/2022 11:45:00	217.86	1.56
21/10/2022 12:00:00	189.91	1.33
21/10/2022 12:15:00	155.72	1.40
21/10/2022 12:30:00	169.94	1.50
21/10/2022 12:45:00	198.50	1.70
21/10/2022 13:00:00	224.63	1.78
21/10/2022 13:15:00	229.60	2.48
21/10/2022 13:30:00	239.87	2.10
21/10/2022 13:45:00	225.49	1.62
21/10/2022 14:00:00	204.58	1.51
21/10/2022 14:15:00	197.63	1.60
21/10/2022 14:30:00	195.31	1.39
21/10/2022 14:45:00	203.18	1.47
21/10/2022 15:00:00	183.71	1.34
21/10/2022 15:15:00	152.06	1.22
21/10/2022 15:30:00	122.94	1.35
21/10/2022 15:45:00	163.26	1.32
21/10/2022 16:00:00	124.24	1.35
21/10/2022 16:15:00	215.50	1.48
21/10/2022 16:30:00	227.06	1.97
21/10/2022 16:45:00	225.84	1.84
21/10/2022 17:00:00	223.36	1.53
21/10/2022 17:15:00	203.69	1.56
21/10/2022 17:30:00	205.36	1.09
21/10/2022 17:45:00	136.09	1.16
21/10/2022 18:00:00	152.87	1.42
21/10/2022 18:15:00	211.53	1.82
21/10/2022 18:30:00	229.42	1.66
21/10/2022 18:45:00	242.07	1.72
21/10/2022 19:00:00	227.58	1.66
21/10/2022 19:15:00	225.98	1.78
21/10/2022 19:30:00	235.78	2.60
21/10/2022 19:45:00	224.17	3.34

Time	Wind Direction	Wind Speed (m/s)
21/10/2022 20:00:00	227.02	3.83
21/10/2022 20:15:00	232.69	3.95
21/10/2022 20:30:00	227.93	3.69
21/10/2022 20:45:00	224.49	3.74
21/10/2022 21:00:00	226.60	3.24
21/10/2022 21:15:00	234.94	3.66
21/10/2022 21:30:00	225.64	3.80
21/10/2022 21:45:00	227.91	3.54
21/10/2022 22:00:00	232.61	3.55
21/10/2022 22:15:00	231.56	3.31
21/10/2022 22:30:00	224.71	3.98
21/10/2022 22:45:00	223.89	3.96
21/10/2022 23:00:00	222.81	3.79
21/10/2022 23:15:00	223.69	3.19
21/10/2022 23:30:00	222.98	3.60
21/10/2022 23:45:00	227.54	3.84
22/10/2022 00:00:00	230.26	3.36
22/10/2022 00:15:00	229.03	3.48
22/10/2022 00:30:00	231.25	3.83
22/10/2022 00:45:00	235.01	3.77
22/10/2022 01:00:00	226.23	4.10
22/10/2022 01:15:00	232.04	3.32
22/10/2022 01:30:00	233.24	3.52
22/10/2022 01:45:00	240.62	3.88
22/10/2022 02:00:00	243.58	4.31
22/10/2022 02:15:00	252.32	4.08
22/10/2022 02:30:00	240.04	4.13
22/10/2022 02:45:00	242.32	4.73
22/10/2022 03:00:00	242.32	4.06
22/10/2022 03:15:00	235.48	3.52
22/10/2022 03:30:00	241.15	4.08
22/10/2022 03:45:00	246.45	3.53
22/10/2022 04:00:00	249.08	3.10
22/10/2022 04:15:00	240.19	3.57
22/10/2022 04:30:00	235.37	3.43

Time	Wind Direction	Wind Speed (m/s)
22/10/2022 04:45:00	237.31	4.35
22/10/2022 05:00:00	240.47	3.16
22/10/2022 05:15:00	239.02	3.11
22/10/2022 05:30:00	235.53	2.48
22/10/2022 05:45:00	230.84	2.73
22/10/2022 06:00:00	228.67	2.46
22/10/2022 06:15:00	232.38	2.59
22/10/2022 06:30:00	232.30	2.99
22/10/2022 06:45:00	223.05	2.17
22/10/2022 07:00:00	228.46	2.20
22/10/2022 07:15:00	222.89	2.60
22/10/2022 07:30:00	227.32	2.51
22/10/2022 07:45:00	226.92	1.90
22/10/2022 08:00:00	229.19	2.54
22/10/2022 08:15:00	223.21	2.54
22/10/2022 08:30:00	222.77	2.51
22/10/2022 08:45:00	228.33	2.18
22/10/2022 09:00:00	224.25	1.99
22/10/2022 09:15:00	228.58	2.22
22/10/2022 09:30:00	224.26	2.12
22/10/2022 09:45:00	225.36	2.35
22/10/2022 10:00:00	223.99	2.34
22/10/2022 10:15:00	223.79	2.74
22/10/2022 10:30:00	227.43	2.69
22/10/2022 10:45:00	220.39	2.49
22/10/2022 11:00:00	229.89	2.40
22/10/2022 11:15:00	222.97	1.83
22/10/2022 11:30:00	218.99	1.75
22/10/2022 11:45:00	224.60	2.44
22/10/2022 12:00:00	226.89	2.56
22/10/2022 12:15:00	221.07	2.27
22/10/2022 12:30:00	216.68	1.68
22/10/2022 12:45:00	230.09	1.66
22/10/2022 13:00:00	221.61	1.88
22/10/2022 13:15:00	237.61	1.76

Time	Wind Direction	Wind Speed (m/s)
22/10/2022 13:30:00	227.69	2.06
22/10/2022 13:45:00	224.34	1.98
22/10/2022 14:00:00	233.39	2.01
22/10/2022 14:15:00	230.46	1.75
22/10/2022 14:30:00	231.84	1.75
22/10/2022 14:45:00	238.19	1.47
22/10/2022 15:00:00	244.08	1.34
22/10/2022 15:15:00	240.09	1.39
22/10/2022 15:30:00	219.78	1.11
22/10/2022 15:45:00	216.95	0.98
22/10/2022 16:00:00	213.83	0.93
22/10/2022 16:15:00	239.80	0.97
22/10/2022 16:30:00	213.95	1.24
22/10/2022 16:45:00	217.53	1.06
22/10/2022 17:00:00	219.33	1.10
22/10/2022 17:15:00	228.88	1.02
22/10/2022 17:30:00	235.41	1.01
22/10/2022 17:45:00	230.82	0.98
22/10/2022 18:00:00	229.03	1.47
22/10/2022 18:15:00	244.69	1.40
22/10/2022 18:30:00	243.87	1.24
22/10/2022 18:45:00	228.92	1.44
22/10/2022 19:00:00	231.73	1.59
22/10/2022 19:15:00	226.14	1.26
22/10/2022 19:30:00	222.43	1.26
22/10/2022 19:45:00	235.90	1.36
22/10/2022 20:00:00	243.45	1.24
22/10/2022 20:15:00	241.83	1.08
22/10/2022 20:30:00	212.95	0.74
22/10/2022 20:45:00	244.61	0.85
22/10/2022 21:00:00	223.44	1.10
22/10/2022 21:15:00	232.72	0.78
22/10/2022 21:30:00	232.00	1.05
22/10/2022 21:45:00	254.19	1.09
22/10/2022 22:00:00	241.76	1.22

Time	Wind Direction	Wind Speed (m/s)
22/10/2022 22:15:00	250.04	1.02
22/10/2022 22:30:00	206.67	0.72
22/10/2022 22:45:00	208.98	0.82
22/10/2022 23:00:00	183.46	0.86
22/10/2022 23:15:00	137.32	0.74
22/10/2022 23:30:00	108.39	0.67
22/10/2022 23:45:00	127.96	0.81
23/10/2022 00:00:00	150.87	0.79
23/10/2022 00:15:00	108.31	0.83
23/10/2022 00:30:00	87.85	0.79
23/10/2022 00:45:00	83.89	0.82
23/10/2022 01:00:00	91.16	0.84
23/10/2022 01:15:00	125.29	0.63
23/10/2022 01:30:00	158.85	0.58
23/10/2022 01:45:00	79.79	0.89
23/10/2022 02:00:00	79.38	0.94
23/10/2022 02:15:00	116.75	0.94
23/10/2022 02:30:00	93.68	0.97
23/10/2022 02:45:00	67.68	0.82
23/10/2022 03:00:00	120.06	0.77
23/10/2022 03:15:00	79.41	0.83
23/10/2022 03:30:00	77.98	0.87
23/10/2022 03:45:00	88.71	0.89
23/10/2022 04:00:00	92.00	0.54
23/10/2022 04:15:00	77.34	0.75
23/10/2022 04:30:00	77.42	0.79
23/10/2022 04:45:00	74.94	0.94
23/10/2022 05:00:00	107.63	0.57
23/10/2022 05:15:00	140.66	0.93
23/10/2022 05:30:00	135.01	1.47
23/10/2022 05:45:00	107.79	0.97
23/10/2022 06:00:00	79.16	0.75
23/10/2022 06:15:00	92.02	1.00
23/10/2022 06:30:00	92.38	1.06
23/10/2022 06:45:00	83.69	0.98

Time	Wind Direction	Wind Speed (m/s)
23/10/2022 07:00:00	82.01	1.05
23/10/2022 07:15:00	79.03	0.85
23/10/2022 07:30:00	82.74	0.98
23/10/2022 07:45:00	91.41	0.97
23/10/2022 08:00:00	84.08	1.03
23/10/2022 08:15:00	85.27	1.42
23/10/2022 08:30:00	93.08	1.30
23/10/2022 08:45:00	96.64	1.24
23/10/2022 09:00:00	102.98	1.00
23/10/2022 09:15:00	117.19	0.82
23/10/2022 09:30:00	143.84	0.65
23/10/2022 09:45:00	141.96	0.69
23/10/2022 10:00:00	98.18	0.73
23/10/2022 10:15:00	102.89	0.62
23/10/2022 10:30:00	81.22	0.72
23/10/2022 10:45:00	110.88	0.70
23/10/2022 11:00:00	129.81	0.83
23/10/2022 11:15:00	111.42	1.05
23/10/2022 11:30:00	143.19	0.99
23/10/2022 11:45:00	141.25	0.79
23/10/2022 12:00:00	137.13	0.89
23/10/2022 12:15:00	159.12	0.84
23/10/2022 12:30:00	135.04	0.59
23/10/2022 12:45:00	124.89	0.76
23/10/2022 13:00:00	111.25	0.77
23/10/2022 13:15:00	101.93	0.63
23/10/2022 13:30:00	118.01	0.87
23/10/2022 13:45:00	156.86	0.92
23/10/2022 14:00:00	169.11	0.91
23/10/2022 14:15:00	135.24	1.09
23/10/2022 14:30:00	165.32	0.92
23/10/2022 14:45:00	177.27	1.01
23/10/2022 15:00:00	231.61	1.10
23/10/2022 15:15:00	171.51	1.11
23/10/2022 15:30:00	176.89	1.00

Time	Wind Direction	Wind Speed (m/s)
23/10/2022 15:45:00	187.63	0.76
23/10/2022 16:00:00	189.30	0.65
23/10/2022 16:15:00	190.56	0.64
23/10/2022 16:30:00	149.73	0.67
23/10/2022 16:45:00	154.48	0.66
23/10/2022 17:00:00	126.75	0.56
23/10/2022 17:15:00	134.96	0.74
23/10/2022 17:30:00	120.64	0.54
23/10/2022 17:45:00	232.79	0.73
23/10/2022 18:00:00	174.34	0.83
23/10/2022 18:15:00	51.70	1.13
23/10/2022 18:30:00	72.54	0.99
23/10/2022 18:45:00	95.72	0.53
23/10/2022 19:00:00	60.33	0.62
23/10/2022 19:15:00	118.54	0.81
23/10/2022 19:30:00	59.60	0.41
23/10/2022 19:45:00	124.58	0.25
23/10/2022 20:00:00	124.22	0.71
23/10/2022 20:15:00	83.44	0.54
23/10/2022 20:30:00	76.70	0.55
23/10/2022 20:45:00	133.79	0.59
23/10/2022 21:00:00	70.97	0.57
23/10/2022 21:15:00	115.52	0.38
23/10/2022 21:30:00	188.02	0.36
23/10/2022 21:45:00	78.42	0.42
23/10/2022 22:00:00	173.19	0.61
23/10/2022 22:15:00	258.24	0.72
23/10/2022 22:30:00	305.95	0.74
23/10/2022 22:45:00	309.59	1.00
23/10/2022 23:00:00	223.25	0.90
23/10/2022 23:15:00	72.36	0.76
23/10/2022 23:30:00	148.87	0.40
23/10/2022 23:45:00	159.96	0.96
24/10/2022 00:00:00	264.04	0.91
24/10/2022 00:15:00	257.81	0.91

Time	Wind Direction	Wind Speed (m/s)
24/10/2022 00:30:00	208.80	1.43
24/10/2022 00:45:00	321.76	1.57
24/10/2022 01:00:00	317.53	1.45
24/10/2022 01:15:00	267.58	1.96
24/10/2022 01:30:00	271.98	2.74
24/10/2022 01:45:00	275.27	3.53
24/10/2022 02:00:00	284.71	2.64
24/10/2022 02:15:00	284.83	3.07
24/10/2022 02:30:00	281.82	2.93
24/10/2022 02:45:00	275.37	3.22
24/10/2022 03:00:00	274.18	2.80
24/10/2022 03:15:00	270.50	2.76
24/10/2022 03:30:00	262.24	2.84
24/10/2022 03:45:00	262.02	3.21
24/10/2022 04:00:00	261.87	3.43
24/10/2022 04:15:00	260.89	3.12
24/10/2022 04:30:00	260.13	3.41
24/10/2022 04:45:00	257.13	3.25
24/10/2022 05:00:00	254.06	3.28
24/10/2022 05:15:00	255.82	2.56
24/10/2022 05:30:00	249.49	2.94
24/10/2022 05:45:00	251.71	3.27
24/10/2022 06:00:00	247.21	3.21
24/10/2022 06:15:00	239.88	2.81
24/10/2022 06:30:00	244.71	2.73
24/10/2022 06:45:00	254.72	2.83
24/10/2022 07:00:00	250.48	2.70
24/10/2022 07:15:00	247.47	2.73
24/10/2022 07:30:00	242.82	2.55
24/10/2022 07:45:00	239.93	2.94
24/10/2022 08:00:00	240.65	3.01
24/10/2022 08:15:00	238.60	2.30
24/10/2022 08:30:00	226.74	2.21
24/10/2022 08:45:00	233.58	2.98
24/10/2022 09:00:00	230.01	3.16

Time	Wind Direction	Wind Speed (m/s)
24/10/2022 09:15:00	229.49	2.89
24/10/2022 09:30:00	226.18	2.89
24/10/2022 09:45:00	1049.71	2.39

11.3. Appendix C – Qualifications etc

The company is directed and led by Antony Best BSc (Hons) MIOA, Neil Morgan MSc MIOA and Victor Valeron BEng MSc MIOA, who have a combined experience of over 45 years in the acoustic industry; covering a range of project types and assessment scenarios, including numerous submissions to the Environment Agency.

Neil Morgan MSc MIOA produced this report, and it was reviewed by Victor Valeron BEng MSc MIOA.

Professional Qualifications for Neil Morgan

- MSc in Applied Acoustics from the University of Derby
- Institute of Acoustics Post Graduate Diploma in Acoustics and Noise Control, Institute of Acoustics, University of the West of England
- BSc (Hons) in Surveying for Resource Development from the University of Glamorgan
- Corporate Member of the Institute of Acoustics (MIOA)

Professional Experience for Neil Morgan

- 2017 to Present inacoustic (Director)
- 2013 to 2017 MLM Acoustics (Technical Director)
- 2009 to 2013 Innovate Acoustics (Associate Director)
- 2007 to 2009 SLR Consulting (Senior Consultant)
- 2006 to 2007 Grontmij (Senior Engineer)
- 1996 to 2006 Capita Symonds (Various Positions)

Professional Qualifications for Victor Valeron

- MSc in Architectural and Environmental Acoustics from La Salle Ramon Llull University
- Corporate Member of the Institute of Acoustics

Professional Experience for Victor Valeron

- 2021 to Present inacoustic (Technical Director)
- 2020 to 2021 Sweco (Principal Acoustic Consultant)
- 2014 to 2020 MLM Group (Principal Acoustic Consultant)
- 2012 to 2014 Innovate Acoustics (Senior Acoustic Consultant)
- 2009 to 2012 i2A Acoustic & Audiovisual Engineering
- 2007 to 2009 Notson Acustica
- 2006 to 2007 Audioscan

11.4. Appendix D – Calibration Certificates

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 14 December 2020 CERTIFICATE NUMBER: **1107106**

BS EN ISO 9001:2015 APPROVED BY **LR**

CERT No 10045223

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Tel: +44 1603 279557

Page 1 of 3

Approved Signatory

Electronically Authorised Document

- ☐ P K CLARK
- ☐ R J WADE
- ☐ M A FROST
- ☒ M S PARDOE
- ☐ J FRYER

Customer	**INACOUSTIC**
Order No	**CAL20-FINAL**
Equipment Description	**SOUND LEVEL METER**
Manufacturer	**RION CO LTD**
Model	**NL-31**
Serial No	**00110040**
Ident No	**320/00354**
Date Of Calibration	**14 DECEMBER 2020**

INSTRUMENT CONDITION

Adjustments Made	**YES**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22ºC ± 3ºC and 45% ± 15% RH.

PROCEDURE

Measurements were performed in accordance with the in house laboratory procedure 5970
All equipment used has been calibrated/verified against measurement standards or reference equipment traceable to International or National Measurement Standards as specified in our control procedure WI64
The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 23 August 2022 CERTIFICATE NUMBER: **1131626**

BS EN ISO 9001:2015 APPROVED BY **LRQA**

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Approved Signatory

Electronically Authorised Document

- ☐ P K CLARK
- ☐ J FRYER
- ☐ R J WADE
- ☐ M FOY
- ☐ M A FROST
- ☒ M S PARDOE

Customer	**INACOUSTIC**
Order No	**CAL22-LW-BRIS-82506**
Equipment Description	**ACOUSTIC CALIBRATOR**
Manufacturer	**CIRRUS RESEARCH PLC**
Model	**CR:515**
Serial No	**82506**
Ident No	**NOT KNOWN**
Date Of Calibration	**23 AUGUST 2022**

INSTRUMENT CONDITION

Adjustments Made	**NO**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22 ºC ± 3 ºC and 45 %RH ± 15 %RH.

PROCEDURE

Measurements were performed in accordance with the in house laboratory procedure 2124
All equipment used has been calibrated/verified against measurement standards or reference equipment traceable to International or National Measurement Standards as specified in our control procedure WI64
The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
The attached results are a true record of the levels required to confirm the instrument meets the original stated manufacturer's specification and accuracy where shown.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 9 February 2023 CERTIFICATE NUMBER: **1139896**

BS EN ISO 9001:2015 APPROVED BY **LRQA**

CERT No 10045223

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Norwich
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NR3 2BT

Tel: +44 1603 279557

Approved Signatory

Electronically Authorised Document

- ☒ P K CLARK
- ☐ J FRYER
- ☐ R J WADE
- ☐ M FOY
- ☐ M A FROST
- ☐ M S PARDOE

Customer	**INACOUSTIC**
Order No	**CAL23-NL31**
Equipment Description	**SOUND LEVEL METER**
Manufacturer	**RION CO LTD**
Model	**NL-31**
Serial No	**00110040**
Ident No	**320/00354**
Date Of Calibration	**9 FEBRUARY 2023**

INSTRUMENT CONDITION

Adjustments Made	**NO**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22 ºC ± 3 ºC and 45 %RH ± 15 %RH.

PROCEDURE

Measurements were performed in accordance with the in house laboratory procedure 5970
All equipment used has been calibrated/verified against measurement standards or reference equipment traceable to International or National Measurement Standards as specified in our control procedure WI64
The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
The attached results are a true record of the levels required to confirm the instrument meets the original stated manufacturer's specification and accuracy where shown.

MEASUREMENT SYSTEMS

CERTIFICATE OF CONFORMANCE

Date of Issue	**11 March 2022**
Customer	**Inacoustic**
Certificate Number	**CONF032203**

	Manufacturer	Type	Serial Number
Sound Level Meter	Rion	NL-52	00810638
Preamplifier	Rion	NH-25	11181
Microphone	Rion	UC-59	20046

This is to certify that the instrument was tested and calibrated at the Manufacturer's factory according to their specification and that the product satisfied all the relevant requirements of the following Standards:

IEC 61672-1:2013 Class 1.

The instrument also received a functional check by ANV Measurement Systems prior to despatch in the UK, in accordance with our standard procedures.

Signed..... Position. Calibration Technician Date. 11 March 2022

B. Bogdan

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