Our Ref: 292922

22nd November 2024

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Report Number: 24_10_292922_DB_01_Rev1

Dear Laurence,

Environmental Noise Survey, Scottow Enterprise Park, Norwich.

Please find enclosed the report relating to the recent Environmental Noise Survey carried out at Scottow Enterprise Park in Norwich, between the 22nd and 23rd of October 2024.

An account for this work will be forwarded to you under separate cover. The work was undertaken according to our General Conditions of Contract.

If we can be of any further assistance to you in this matter, please do not hesitate to contact me.

Yours sincerely
On behalf of **SOCOTEC UK**

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Standard Gas Technologies Ltd

Environmental Noise Survey

Scottow Enterprise Park, Norwich

October 2024

Carried out for:

Laurence Sharrock
Standard Gas Technologies Ltd
Swift Aircraft
Coltishall Airfield
Scottow Enterprise Park
Lamas Road
Norwich
NR10 5FB

Issue date: 22nd November 2024

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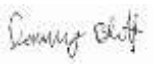
Authorisations

Prepared by	Daniel Bhatt MSc MIOA AFOH | Lead Acoustic Consultant & Occupational Hygiene Technologist | Cirencester	
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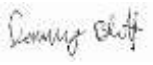
Approved for Issue by	Daniel Bhatt MSc MIOA AFOH | Lead Acoustic Consultant & Occupational Hygiene Technologist | Cirencester	

CONTENTS

EXECUTIVE SUMMARY

This report presents the findings of an environmental noise survey carried out for Standard Gas Technologies Ltd at their site in Scottow Enterprise Park, Norwich. The survey was carried out between the 22nd and 23rd of October 2024 by Daniel Bhatt MSc MIOA AFOH Lead Acoustic Consultant & Occupational Hygiene Technologist of SOCOTEC UK Limited Environment and Safety division.

The purpose of the survey was to determine the noise impact from the cooling tower fans running at 100% and 60% capacity and to make an assessment for the purpose of the planning application (PF/23/1796) and in line with the report issued by Sol Environment Ltd (RPS 182: Application for a Waste R&D Trial; issued number: SOL_23_P077_SGL, issued April 2024). It is understood that the limit criteria were set by North Norfolk District Council (NNDC).

The work undertaken was the measurement of noise generated by the fans on-site (source), and an assessment of the background noise at pre-defined locations as determined prior to the assessment to exclude site related noise emissions. The noise criteria were that fan noise levels at the boundary or noise sensitive receptors must be at or below 50dB during the day time (Monday to Friday 08:00 – 18:00) and Saturday (08:00 – 13:00 as daytime) and at or below 40dB all other times (as night-time). The assessment was in line with BS 4142 methodology and the limit criteria as stated by Sol Environmental Ltd.

The measurements and calculated (CadnaA and standard distance calculations) results of the survey indicate that noise produced by the fans running at 100% capacity would be below the 50dB(A) limit for daytime and below the 40dB(A) limit for night-time at the windows of all the noise sensitive receptors (NSRs).

It can, therefore, be concluded that noise from the current plant of Standard Gas Technologies Ltd is unlikely to exceed the limits as defined by Sol Environmental Ltd and NNDC and therefore unlikely have a material impact at any residential dwellings, or HMP Bure.

Recommendations

For full recommendations see section 9 of this report. The following recommendations have been summarised:

- Ensure that the cooling towers are run at 60% capacity during the hours of 18:00 to 08:00 Monday to Friday and 13:00 to 08:00 Saturday to Monday;
- Consider having consultation with HMP Bure governors regarding the potential for noise emissions from site and keep open channels of communication with local residents;
- Ensure that all external plant is sufficiently maintained to ensure mechanical noise is kept to a minimum;
- Consider fixed noise monitors at boundary locations to provide alerts if noise levels exceed set limits.

1 INTRODUCTION

1.1 This report presents the findings of an environmental noise survey carried out for Standard Gas Technologies Ltd in Scottow Enterprise Park, Norwich. The survey was carried out during the day and night-time between the 22nd and 23rd of October 2024. The survey was undertaken by Daniel Bhatt MSc MIOA AFOH, Lead Acoustic Consultant & Occupational Hygiene Technologist of SOCOTEC UK Limited's Environmental and Safety Division, Cirencester.

1.2 The work undertaken was the measurement of noise generated by the fans on-site (source), and an assessment of the background noise at pre-defined locations as determined prior to the assessment.

1.3 The purpose of the survey was to determine the noise impact from the fans running at 100% capacity and to make an assessment in respect of the planning application (PF/23/1796) and in line with the report issued by Sol Environment Ltd (RPS 182: Application for a Waste R&D Trial; issued number: SOL_23_P077_SGL, issued April 2024).

1.4 This is an amended report number 24_10_292922_DB_01_Rev1 and replaces report number 24_10_292922_DB_01. This revised report was issued because a revision of the acoustic model was required to use the sound pressure levels of the fans measured on site to determine the impact at the nearest noise sensitive receptors. In relation to the amended model a revision of the results and conclusion has also been made. Further amendments have been made for increased clarification of baseline noise measurement locations chosen.

2 SCOPE AND EXCLUSIONS

2.1 To undertake an assessment, with guidance from BS 4142:2014+A1:2019 and the RPS 182: Application for a Waste R&D Trial report issued by Sol Environment Ltd, of the potential noise impact from the externally located cooling fans at the boundary and noise sensitive receptors, during the daytime (07:00 to 23:00) and night-time (23:00 to 07:00).

2.2 The aim of the survey was to determine if noise output levels from the operation of the fans would cause an impact and be above the specified levels at the boundary of the site and the nearest noise sensitive receptors (NSRs). The aim was also to determine if noise control was required to comply with planning/permit application criteria as listed in section 2.4 below.

2.3 It was also the aim to undertake measurement and calculated impacts at pre-defined locations, and the NSRs with the use of two static noise measurement devices and source noise measurements. The source noise measurements, and manufacturer's noise data, were used to calculate the impact at the NSRs using CadnaA acoustic modelling software and the standard distance calculation method, to ensure robustness in the assessment.

2.4 The noise criteria from Condition 19 of the wider planning consent for the site (Planning ref: PF/17/1057) had been stated in the Sol Environmental Ltd report with a rating level of 50dB over a daily average Monday to Friday (08:00 – 18:00) and a Saturday (08:00 – 13:00) and stated that levels should not exceed 40dB at any other time.

2.5 During the assessment noise measurements were made at the top of the fans (approx. 12m) on three sides. These measurements were at 1m from source with care made to minimise air flow speed. These measurements were taken with the fans running at 100% capacity and 60% capacity.

2.6 A summary of the measurement locations are listed in Table 1.1 below.

Table 1.1: Summary of measurement locations

Ref	Location	Distance from source meters (m)
S1	East Fan - North side	1
S2	East Fan - East side	1
S3	East Fan - West side	1
S4	West Fan - North side	1
S5	West Fan - East side	1
S6	West Fan - West side	1
S7	West Fan - North side	1
S8	West Fan - East side	1
S9	West Fan - West side	1
LT1 (MP1)	On site near Frogge Lane	700
LT2 (MP2)	On site boundary near Manor Farm	960

Note: S is source and LT is long-term locations

2.7 Only external noise sources have been included in this assessment. Figure 1 below shows the location of the fans and the NSRs.

2.8 A summary of approximate distance from source to receiver (NSR) are listed in Table 1.2 below.

Table 1.2: Summary of approximate distance from source to receiver

Ref	Location	Distance from western tower (m)	Distance from eastern tower (m)
1	MP1	954	955
2	HMP Bure - Wing	228	235
3	MP2	701	701
4	NSR Filby Rd	410	416
5	NSR Barton Rd	501	503
6	NSR Turnstead Rd	639	638
7	NSR The Fairstead	1713	1712
8	NSR Manor Farm	760	759
9	NSR Frogge Lane	980	981

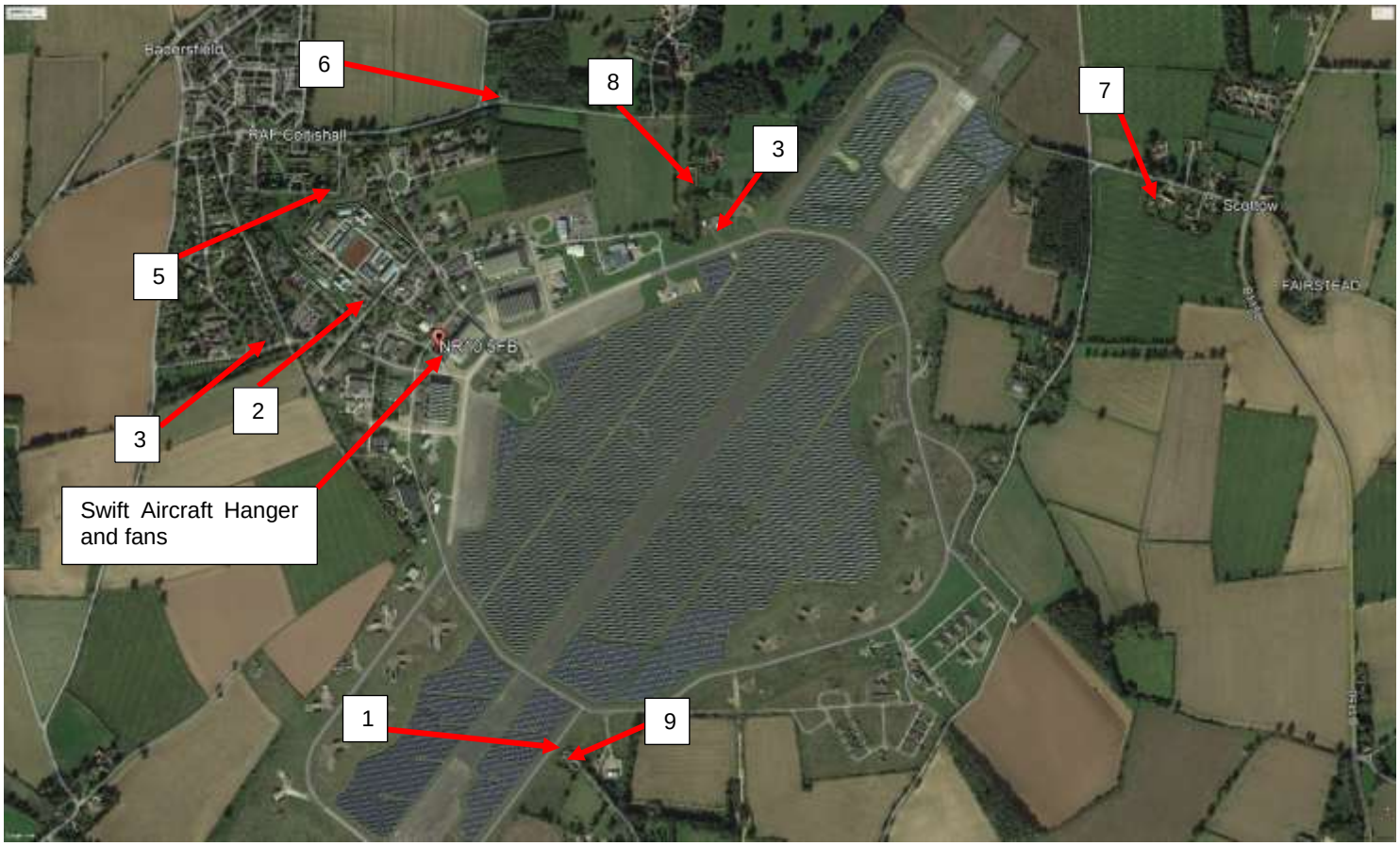


Figure 1: Aerial image of site with measurement and receptor locations.

2.8 During the assessment it was agreed that during the night-time the fans would be powered up for an hour and then shut down. This was done to establish variations in noise levels from the two long-term monitors. The hours of fan on-time were between 00:00 and 01:00 and then again between 07:00 and 08:00 on the morning of 23rd October. The fans were run at 100% capacity during these periods.

2.9 Source noise levels at the top of the fan stack were also taken while they were running at 100% capacity. There was a further assessment of source when the fans were running at 60% capacity, as decided on day 2 of the survey. The client has confirmed with SOCOTEC that between the hours of 18:00 to 08:00 Monday to Friday and 13:00 to 08:00 Saturday to Monday the cooling towers will be running at 60% capacity and the hanger doors will be kept closed to as a form of mitigation to minimise noise impact to the surrounding areas.

2.10 Measurement positions 1 and 2 were chosen due to site activity on the day having an impact at the two closest residential receptors (HMP Bure and Filby Road. Site activity noise at measurement positions 1 and 2 was completely inaudible as noted when deploying the equipment.

3 OBSERVATIONS

3.1 Scottow Enterprise Park was located in a quiet rural area north of Norwich near the village of Badersfield and RAF Coltishall. The airfield was disused and converted into a solar farm with a number of industrial units and converted hangers. Standard Gas Technologies were located in the Swift Aircraft Hanger, located at the northwest of the airfield.

3.2 During the assessment there was some activity on the airfield and some movement of vehicles around the airfield. There was also regular movement of helicopters from Norwich airport, reportedly heading to oil-rigs in the North Sea. These helicopters directly flew over site and it was noted that during the daytime one flew past every couple of hours. There was also noisy activity at other units / hangers adjacent to the Swift Aircraft Hanger and closer to HMP Bure.

3.3 At the long-term measurement locations listed in Table 1 (Section 2) there was a fair bit of activity that created noise, such as gardening (lawnmowers, tractors, strimmers, hedge-cutters) and use of combustion plant (diesel generators, etc.) during the daytime. There was also a double-decker bus that travelled around the airfield once every 15 to 20 minutes.

3.4 The sound character from the cooling fans at the top is considered broadband in nature and did not exhibit any distinct tonal, intermittent or impulsive characteristics and therefore no acoustic penalties (see section 5.7) have been included in this assessment and the rating levels are that of the measured levels.

4 SOURCE NOISE CONTROLS

4.1 Currently the only forms of noise control present were that the motors of the fan units were acoustically enclosed in pre-designed enclosures. The outlet at the top of the fans were not acoustically treated and were open to the elements. The fan blades were housed horizontally and had grid-caging to protect the fans and bar fencing for safety with the top of the fans at 11m, see Figure 2 below.

Figure 2: Top of the fans.

4.2 The building of the Swift Aircraft Hanger provided some screening, and other buildings in the path of sound transmission also provided some screening from the noise generated from the fans.

Figure 3: Fan stacks.

4.3 The top of the towers was observed to generate the highest noise from the tower. Furthermore, the flow of air from the fan operation was directly up which can carry a majority on the noise generated in a vertical direction as seen in Figure 3 above.

5 BACKGROUND INFORMATION

5.1 Noise is generally considered as unwanted sound - it may be too loud, intrusive or simply occur at the wrong time. It can cause annoyance, interfere with work efficiency, induce stress, disturb concentration, adversely affect communication, mask warning signals, or damage hearing. However, it must be noted that some 'wanted' sound, such as loud music, may still cause damage to hearing.

5.2 Environmental Noise

5.2.1 Noise induced hearing loss is not an issue at the exposure levels likely to be experienced by neighbours of noise emitting activities. It can be a potential hazard above noise levels of 80dB(A) and where exposure is over long periods of time. The nature of the response to noise can vary widely between individuals from no response at all to disturbance that can develop into annoyance or anger. Some individuals may experience physical effects arising as a result of emotional stress, such as sleep disturbance or loss of appetite.

5.2.2 Unlike other environmental pollutants, the effects of noise are made up of two components - its energy (an objective component) and its tendency to annoy (a subjective component which differs according to the noise source). Thus, noise has a plethora of measurement units, supported to varying degrees by social survey data establishing their subjective, annoyance factors. All this reflects the fact that, in general, noise affects people rather than the environment itself.

5.2.3 The Public Health Outcomes Framework (PHOF) published in January 2012 quoted that from noise mapping carried out in 2011 (and based on the 2011 census), the total number of people in England exposed to 65dB, $L_{Aeq,16h}$ or more was 2.74 million (5.2% population) in daytime.

5.2.4 From noise mapping carried out in 2011 (and based on the 2011 census), the total number of people in England exposed to 55dB, L_{night} or more was 4.25 million (8% population) at night-time.

5.2.5 These noise sources are regulated by numerous legal measures, with an even larger variety of technical controls available.

5.3 World Health Organisation environmental noise criteria

5.3.1 The World Health Organisation has recommended a number of environmental noise criteria that depend on the source of the noise, whether the measurement location (receptor) is indoors or outdoors, and whether it is daytime, night-time or evening.

5.3.2 Note: British courts have rejected these as the sole criteria of noise nuisance, preferring to take into account a wider range of subjective criteria.

5.4 Information on general Legislation can be found in Appendix D.

Plant Noise emission Criteria

5.5 National Planning Policy Framework (NPPF)

5.5.1 The latest edition of NPPF was published in 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF1[1]) was published in March 2012, with a revision in 2019 - the document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2023 revised edition does not contain any new directions or guidance with respect to noise and all previous references remain present. The paragraph references quoted below relate to the 2023 edition.

5.5.2 Paragraph 174 states that the planning system should contribute to, and enhance the natural and local environment by, (amongst others) "*preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability.*"

5.5.3 The NPPF also states, in Paragraph 185: "*planning policies and decisions should…*"

1. *Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development, - and avoid noise giving rise to significant adverse impacts on health and quality of life;*

2. *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

5.5.4 The NPPF does not refer to other documents or standards related to noise other than the Noise Policy Statement for England (NPSE2)[2].

5.5.5 Paragraph 2 states that "*planning law requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise. The National Planning Policy Framework muse be taken into account in preparing the development plan, and is a material consideration in the planning decision.*"

5.5.6 Paragraph 12 states that "*The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed*".

[1] National Planning Policy Framework, DCLG, March 2012
[2] Noise Policy Statement for England, DEFRA, March 2010

5.5.7 Paragraph 119 states that "*Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land*".

5.6 Noise Policy Statement for England (NPSE)

5.6.1 The Noise Policy Statement for England (NPSE) 2010, which is referred to the in NPPF, includes three aims:

a) Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
b) Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
c) Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

5.7 British Standard 4142 (BS 4142:2014+A1:2019)

This assessment is in line with *BS 4142:2014+A1:2019* and the GOV.UK *Method implementation document (MID) for BS 4142* – Published 27th March 2023.

5.7.1 BS 4142:2014+A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142 includes "*sound from fixed plant installations which comprise mechanical and electrical plant and equipment*".

5.7.2 The procedure contained in BS 4142:2014 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one-hour period for the daytime and a 15-minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

5.7.3 The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

5.7.4 The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "*Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible*."

5.7.5 The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: "*Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just*

perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible."

5.7.6 The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

- 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.

5.7.7 The standard states that "*adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.*"

5.7.8 The standard also notes that: "*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.*"

In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

"*An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context*."

5.7.9 BS 4142 requires uncertainties in the assessment to be considered. Where these uncertainties are likely to affect the outcome of the assessment, steps should be taken to reduce these uncertainties.

5.8 Sol Environmental Ltd

Criteria as listed in the Sol Environmental Ltd report (RPS 182: Application for a Waste R&D Trial).

5.8.1 "*The rating level of the noise emitted from any activity within the Enterprise Park site, either singularly or cumulatively, as measured at any boundary of the Scottow Enterprise Park, shall not exceed 50dB over a daily average between Monday-Friday during the hours of 0800 - 1800 or 0800 - 1300 on Saturdays, nor shall it exceed 40dB at any other time. The noise level assessments shall be made according to BS.4142:1997."*

6 MONITORING METHODS

6.1 See Appendix A – Methods for the test method and equipment used.

6.2 The sound level meter microphone was equipped with a windshield at all times and representative 15-minute measurements of wind-speed were taken at the specified locations with the use of a weather station connected to MP1 measurement equipment.

Time weighting:	Fast
Frequency weighting:	A
Logging Intervals:	2 minutes to 15-minutes
Parameters:	L_{Aeq} L_{Amax} L_{A10} L_{A90} (Environmental), L_{Aeq} (Source)

6.3 The sound level meters were field calibrated to 114dB with an electronic calibrator prior to the readings being taken and again on completion of the monitoring to record any drift. The drift was less than ± 0.5dB for the source and MP1 and ± 0.7dB for MP2. Further investigation of the meter used for MP2 was made and found that the calibration was within limits as prescribed in the standard and therefore considered adequate for use.

6.4 All background readings (MP1 and MP2) taken were “free field”, i.e. at least 3.5m away from any facade or reflecting surface other than the ground. The microphone was located 1.5m above ground level. Source readings were taken at 1 meter from source with care taken to ensure that airflow did not influence readings. Any site related noise was inaudible at these locations.

6.5 Source noise distance from noise sources to measurement locations had been made with the use of a laser measuring device to ensure accuracy of 1 meter could be maintained.

6.6 SOCOTEC UK Limited personnel were in attendance throughout the daytime survey and Standard Gas Technologies Ltd staff were present during the night-time to switch the towers on and off.

6.7 All noise monitoring/assessments were carried out when the weather conditions satisfied the meteorological constraints as defined BS 4142:2014+A1:2019, “*Methods for rating and assessing industrial and commercial sound*” i.e. mean wind speed less than 5 ms^{-1} and no significant rainfall. Wind speeds were measured every 15 minutes using a weather station at MP1 location.

6.8 Sound pressure level impacts have been made with the use of CadnaA acoustic modelling and standard distance calculation equations.

7 RESULTS/ DISCUSSION

7.1 Existing Noise Climate

7.1.1 The environmental noise survey was undertaken to establish the typical background noise levels at location representative of the noise climate at the boundary of the site.

7.1.2 The results of the environmental noise survey are summarised in Table 2.1 and 2.2 below. The background noise levels were measured using MP 1 and MP 2 as it was observed that noise from the fan was inaudible at these locations.

Table 2.1: Summary of survey results at MP1

Measurement period	Range of sound pressure levels (dB)			
	$L_{Aeq,(15min)}$	$L_{AFmax,(15min)}$	$L_{A10,(15min)}$	$L_{A90,(15min)}$
Day (07:00 - 23:00) Max	56	77	60	**39**
Day (07:00 - 23:00) Min	21	34	23	**18**
Night (23:00 - 07:00) Max	48	79	46	**32**
Night (23:00 - 07:00) Min	19	35	19	**18**

Table 2.2: Summary of survey results at MP2

Measurement period	Range of sound pressure levels (dB)			
	$L_{Aeq,(15min)}$	$L_{AFmax,(15min)}$	$L_{A10,(15min)}$	$L_{A90,(15min)}$
Day (07:00 - 23:00) Max	66	94	61	**40**
Day (07:00 - 23:00) Min	27	34	28	**24**
Night (23:00 - 07:00) Max	44	66	39	**32**
Night (23:00 - 07:00) Min	26	38	27	**24**

7.1.3 Further statistical analysis has been undertaken on the data collected data with the mean, mode and median values listed on Table 3.1 to Table 3.4 below:

Table 3.1: Statistical analysis of $L_{A90,(15min)}$, daytime at MP1

L_{A90}, daytime period (dB)	
Mean	28
Mode	32
Median	30

Table 3.2: Statistical analysis of $L_{A90,(15min)}$, night-time at MP1

L_{A90}, daytime period (dB)	
Mean	22
Mode	18
Median	20

Table 3.3: Statistical analysis of $L_{A90,(15min)}$, daytime at MP2

L_{A90}, daytime period (dB)	
Mean	33
Mode	33
Median	33

Table 3.4: Statistical analysis of $L_{A90,(15min)}$, night-time at MP2

L_{A90}, daytime period (dB)	
Mean	26
Mode	24
Median	25

7.1.4 From a review of the collected SPL data, the L_{A90} this was found to be considerably low. In rural areas, noise criteria below around 30dB(A) is difficult to meet, considering the context of environmental factors including transportation noise, wind and wildlife. Therefore, a general background of 32dB(A) for daytime and 30dB(A) for night-time is considered appropriate when determining baseline background levels in the environment. Domestic appliances, such as fridge freezers, in the home produce noise levels above 30dB(A).

7.1.5 Therefore, based on the environmental noise measurements taken for the long-term monitors, 32dB(A) is considered representative of the existing background sound pressure levels at the nearest noise sensitive receptors for the daytime and 30dB(A) for the night-time.

7.2 Measurement of plant noise emissions

7.2.1 The current fans were measured at source and the sound pressure levels (SPLs) were used for the purpose of distance calculations and CadnaA modelling with the use of manufactures data to verify modelling results. The results in Table 4 overleaf were the source noise levels measured on site.

7.2.2 The difference between fan noise at 100% and at 60% capacity was measured at 15dB(A).

Table 4: Site source noise measurements

No.	Description	Measure distance (m)	Measured dB(A) 100% L_{eq}	Measured dB(A) 60% L_{eq}
1	East Fan - North side	1	90	N/A
2	East Fan - East side	1	89	N/A
3	East Fan - West side	1	90	N/A
4	West Fan - North side	1	90	75
5	West Fan - East side	1	91	76
6	West Fan - West side	1	91	76

7.3 Calculation and assessment of cooling tower fan noise emissions

7.3.1 Table 5 below shows the calculated noise levels at the seven NSRs and two measurement locations, using CadnaA and the standard distance formula, with the plant running at 100% and at 60% capacity. It can be seen that at 100% capacity the noise levels at the closest NSR (HMP Bure) is below the limit of 50dB for daytime and 40dB for all other times outside of 08:00 to 18:00 Monday to Friday and 08:00 to 13:00 Saturday. For the purpose of ease of reference, the 50dB limit is refer to as day and the 40dB limit night.

7.3.2 The table below has been colour coded as follows to show exceedance or compliance with North Norfolk District Council's boundary criteria.

Colour code	Compliance with North Norfolk District Council criteria
	Exceedance of boundary criteria
	Below boundary criteria

Note: North Norfolk District Council (NNDC)

Table 5: CadnaA and distance calculated plant noise impact at NSRs

Ref No.	NSR location	CadnaA Calculated L_{Aeq} (dB) – Day and night		Distance Calculated L_{Aeq} (dB) – Day and night	
		100% capacity – 50dB(A) Day	60% capacity – 40dB(A) Night	100% capacity – 50dB(A) Day	60% capacity – 40dB(A) Night
1	MP1	34	19	33	18
2	HMP Bure - Wing	44	29	46	29
3	MP2	25	10	36	21
4	NSR Filby Rd	41	26	41	26
5	NSR Barton Rd	28	13	39	24
6	NSR Turnstead Rd	26	11	37	22
7	NSR The Fairstead	19	4	28	13
8	NSR Manor Farm	23	8	35	20
9	NSR Frogge Lane	34	19	33	18

7.3.3 The standard distance calculation assessment used Google earth to estimate distance from source to receiver and does not include screening or any other forms of attenuation. The CadnaA model includes screening attenuation. Where there is direct line of sight between the source and receiver (HMP Bure and Filby Road) there is a correlation of 1 or 2dB between the CadnaA and the distance calculated results.

7.3.4 The figures overleaf are graphics of the CadnaA model. Figure 4 is the plant running at 100% and Figure 5 is the plant running at 60%.

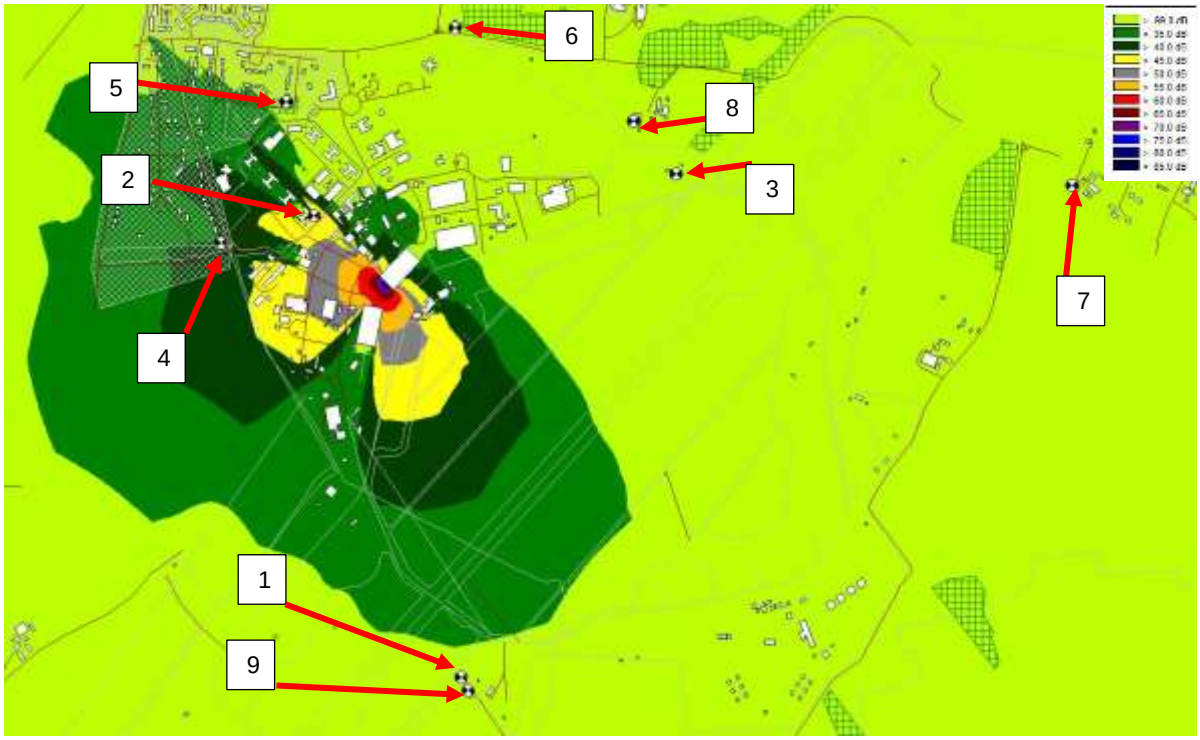


Figure 4: CadnaA model with fans at 100%.

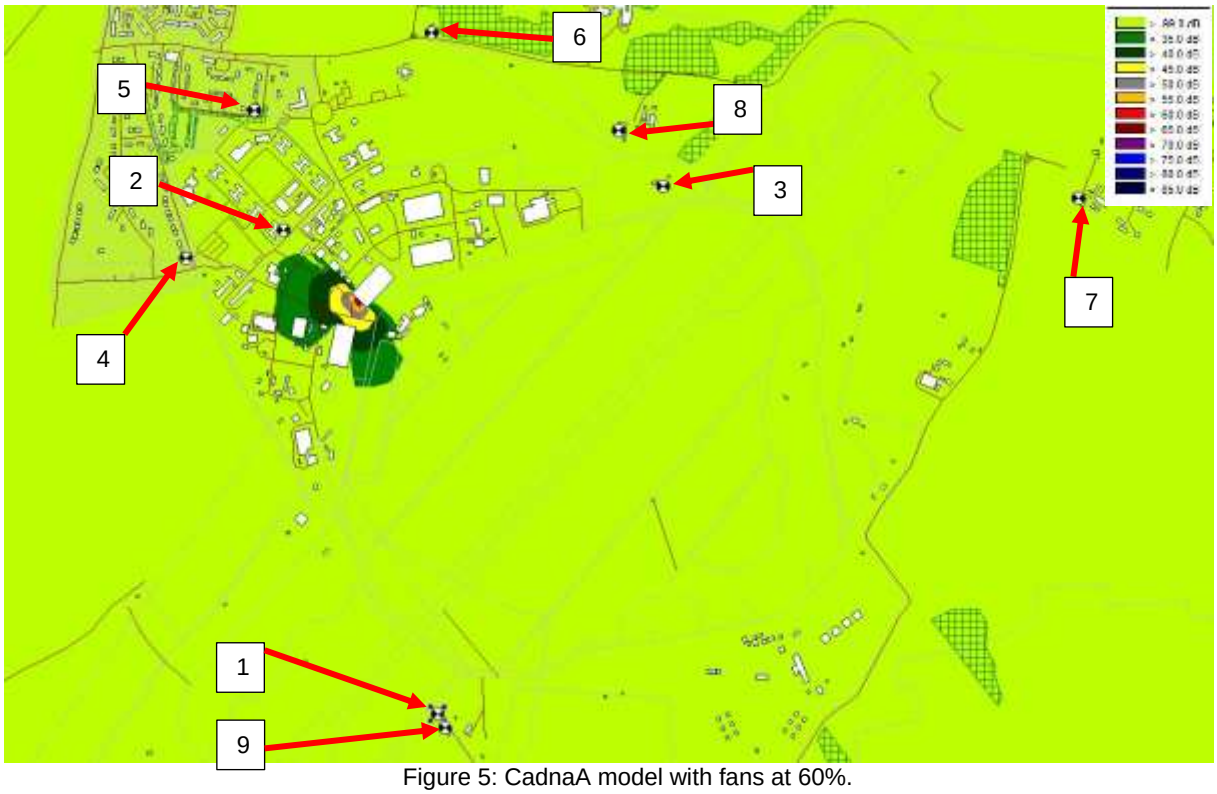


Figure 5: CadnaA model with fans at 60%.

7.4 Fixed location measured levels

7.4.1 A further assessment was made using the measurement method. This was undertaken from measurement position 1 and 2 for the long-term locations. During the night time on the 23rd of October the plant was run for one hour between 00:00 and 01:00 and then again between 07:00 and 08:00. The graphs overleaf show then measured levels between those times for measurement position 1. Figure 5.1 and 5.2 are for the periods of 00:00 to 01:00 and 07:00 to 08:00. Two hours before and after have been included to show context to the noise levels in the area during the assessment period and the L_{A90} have also been included to show context.

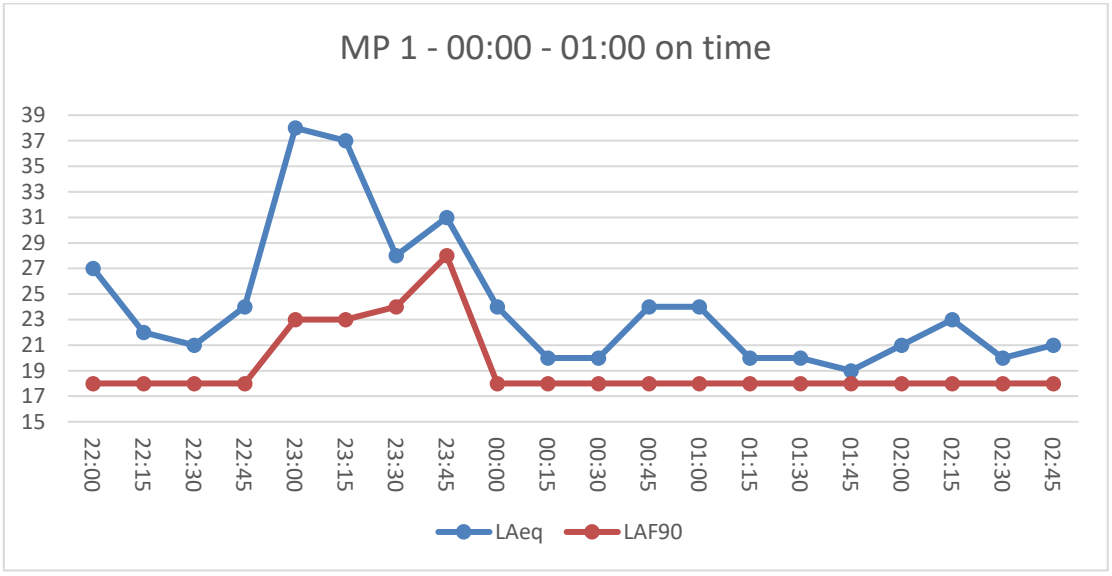


Figure 5.1: Measurement on plant noise at MP1 between 00:00 and 01:00.

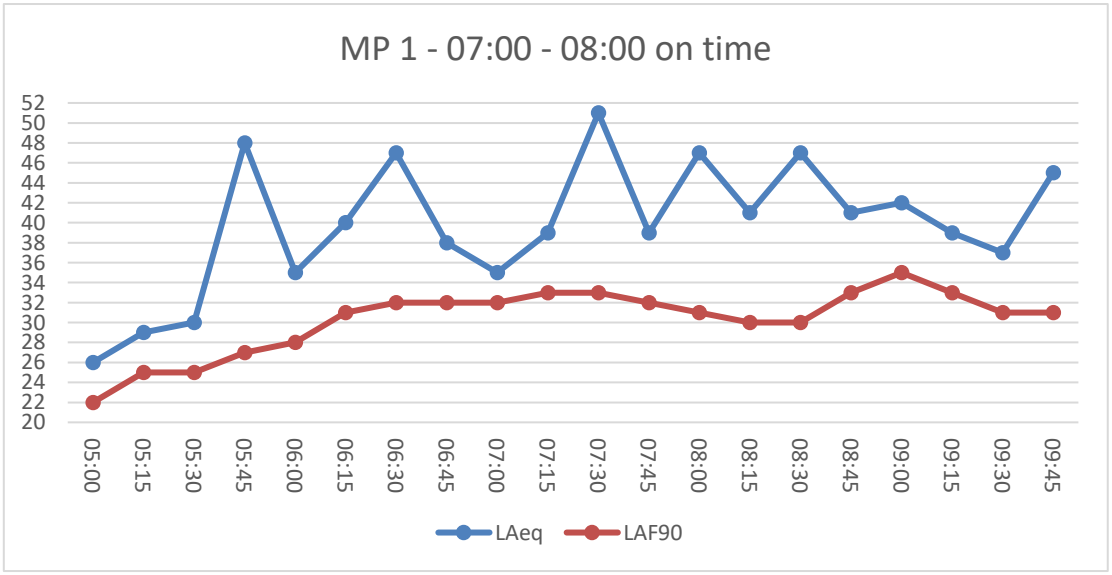


Figure 5.2: Measurement on plant noise at MP1 between 07:00 and 08:00.

7.4.2 Figure 5.1 appears to show that general noise levels were higher prior to the plant being activated at 00:00 and deactivated at 01:00. Furthermore, the graphs (Figure 5.2) show that between 07:00 and 08:00 noise levels fluctuated. This is an indication that there were other sources influencing the noise levels at this location and is unlikely to have been caused by the fans running.

7.4.3 Figure 5.3 and 5.4 are for the periods of 00:00 to 01:00 and 07:00 to 08:00 for MP2.

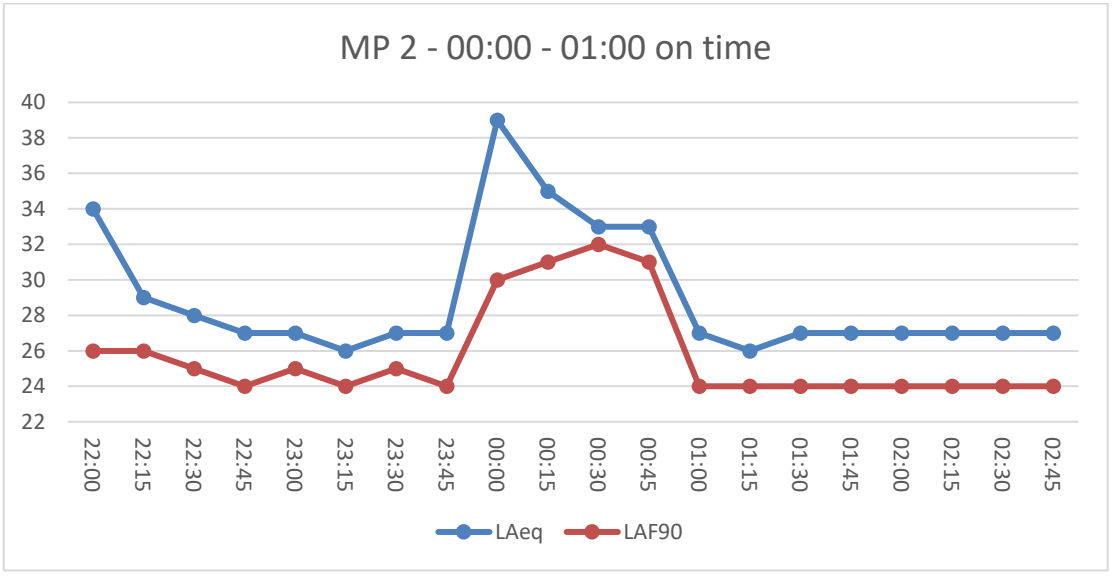


Figure 5.3: Measurement on plant noise at MP2 between 00:00 and 01:00.

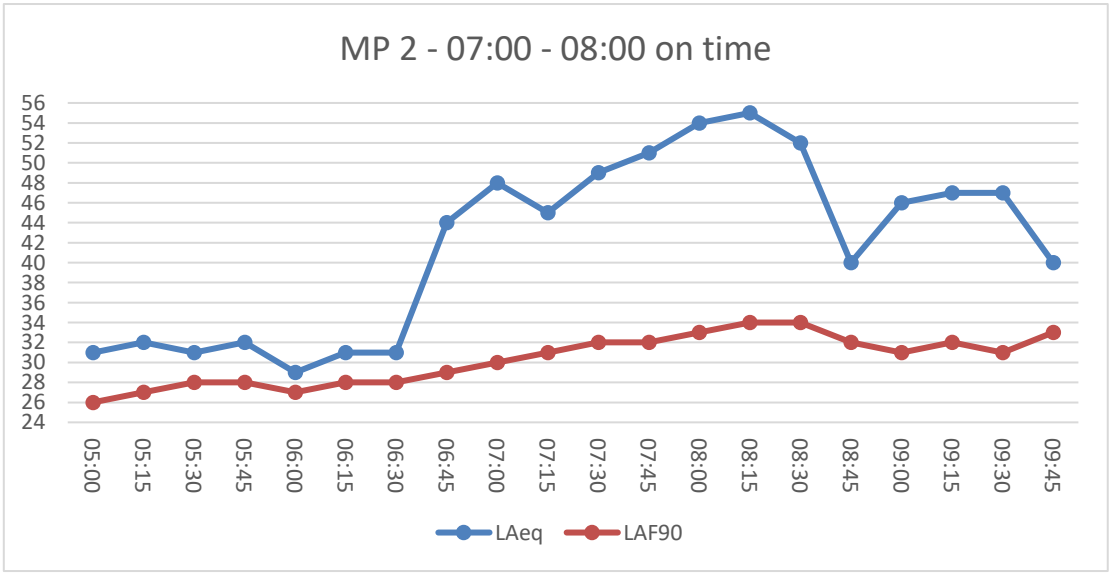


Figure 5.4: Measurement on plant noise at MP2 between 07:00 and 08:00.

7.4.4 Figure 5.3 appears to show that general noise levels were higher during the plant being activated at 00:00 and deactivated at 01:00. This is an indication that noise levels at this location were influenced by the fan and could also be caused by the wind direction. However, the graph (Figure 5.4) shows that between 07:00 and 08:00 noise increased and this continued up until 08:30, when levels dropped significantly, but then increased from 09:00. The L_{A90} changes were much less pronounced. This is an indication that there were other factors influencing the noise climate, potentially from local short-term noise events in this area, that were likely caused by other industrial activity in the nearby yards and farms.

7.4.5 Where possible uncertainties in the above assessment has been minimised by taking the following steps:

- The sound level meters and calibrators have a traceable laboratory calibration and the meters were field calibrated before and after the measurements;
- Uncertainty in the measurements of source noise by ensuring that plant was running at varying loads, (100% and 60%);
- Measurement positions were taken with the use of a laser measuring device to ensure accurate distances from source;
- Extra care was taken to ensure that high wind noise was not included in the source noise measurements taken. The microphone of the sound level meter was positioned outside of the vertical air column;
- All source measurements were taken above 1.5m from ground, or reflective surfaces to minimise ground reflections;
- Uncertainty in the calculated impact has been reduced by the use of CadnaA modelling and standard distance calculations.
    - It should be noted that the standard distance calculations do not factor screening attenuation;
- Assessment was undertaken during appropriate atmospheric and weather conditions; any periods of adverse weather were excluded;
- The measurement method was adopted in conjunction with the calculation method for robustness of assessment;
- Atmospheric and screening attenuation have been included with the CadnaA model but not the distance calculation and measurement assessment.

7.4.6 As BS 4142:2014 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. Therefore, the following must also be taken into consideration when determining the potential impact that may occur.

- The assessment calculations have been based on the general context of the site, and measured background noise levels were, in many cases, below 30dB(A) L_{90}. Achieving levels in the environment of below 30dB(A) is unrealistic and therefore a baseline level of 32dB(A) for daytime and 30dB(A) for night-time is considered appropriate for the circumstances and environment.

- There were other non-site related noise sources, such as air traffic, agricultural noise, and other industries in the area.

7.4.7 Wind speeds and direction, and other meteorological data was recorded every 15-minutes and averaged out for day and night. The average day temperature was 11°C with wind speeds <1 m/s, no high gusts were recorded. Wind direction was from southwest and a relative humidity was 83%. The average night temperature was 7°C with wind speeds <1 m/s and no high gusts recorded. Wind direction was from the south and relative humidity was 95%. Full 15-minute meteorological data is available upon request.

8 CONCLUSION

8.1 Based on this environmental noise survey following the methodology of BS 4142:2014+A1:2019 and NNDC criteria (as reported by Sol Environmental Ltd), this assessment indicates that noise emission from the external fans of the cooling towers operated by Standard Gas Technologies Ltd are compliant with NNDCs boundary noise criteria of 50dB(A) during the daytime (08:00 – 18:00 Monday to Friday / 08:00 – 13:00 Saturday) and 40dB(A) during all other times. The noise emissions will apply to the criteria if run at 100% capacity during the daytime and 60% capacity at all other times.

8.2 However, due to the extremely low measured background (L_{A90}) levels taken during the survey, there is potential that inmates at HMP Bure and residents at Filby Road, Barton Road, Turnstead Road and Manor Farm may hear the fans running during the daytime if their windows are open. Noise levels would be considered as a significant adverse impact in accordance with BS 4142 at HMP Bure, Filby Road and Frogge Lane during the daytime but are considered low at all NSRs during the nigh-time. It should be noted that BS 8233 suggests that 15dB attenuation is achieved through partially open windows. However, BS 8233 does not indicate if this is from industrial or transportation noise, and therefore should only be used as guidance. BS 8233 also suggests that 30dB of attenuation is achievable through standard glazing of fully closed windows.

8.3 It is highly unlikely that any NSR would hear the fan noise if their windows are closed. It is therefore concluded that noise from the fans running at 100% during the daytime and 60% at all other times is less likely to cause an impact at any NSR based on this assessment.

9 RECOMMENDATIONS

9.1 The following measures should be considered when operating the external cooling tower fans, to ensure that noise levels emanating from site are kept to a minimum:

- As advised by the client ensure that when the cooling tower fans are run at 100% capacity this is kept to the times of 08:00 – 18:00 Monday to Friday and 08:00 – 13:00 on Saturdays. Ensure that all other times the fans are run at 60% capacity;
- Consider having consultation with HMP Bure governors regarding the potential for noise emissions from site advising them that all measures are being taken to minimise any impact;
- Consider keeping open channels of communication with other local residents for any concerns that may be raised relating to noise emissions from the site;
- Ensure that the housing of the fan motors is sufficiently maintained to ensure that mechanical noise is kept to a minimum.
- Consider fixed noise monitors at boundary locations close to the nearest NSRs for continued noise monitoring for alerts if threshold limits are exceeded.
    - This can be a useful tool to adjust site operations to minimise impact and also show the local authority and residents that noise impact has been thoroughly considered.

9.2 The following ‘good housekeeping’ measures should continue to be considered when operations are carried out on site, to ensure that noise levels emanating from site are kept to a minimum:

- Ensure that all site equipment is maintained to minimise wear and tear;
- Encourage employees to report any defects that may give rise to increased noise output from the fans and motors.

10 REFERENCES

1. ISO1996-1:2016 Acoustics -- Description, Measurement and Assessment of Environmental Noise -- Part 1: Basic Quantities and Assessment Procedures.

2. ISO1996-2:2017 Acoustics – Description, Measurement and Assessment of Environmental Noise – Part 2: Determination of Sound Pressure Levels

3. British Standard: BS 7445. Description and Measurement of Environmental Noise (2003/2008).

    - Part 1. Guide to Quantities and Procedures;
    - Part 2. Guide to the Acquisition of Data Pertinent to Land Use;
    - Part 3. Guide to Application to Noise limits.

4. British Standard: BS 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound.

5. Method implementation document (MID) for BS 4142. UK Government Environmental Agency (Published 27th March 2023).

6. Environment Agency; Horizontal Guidance Note IPPC H3, Part 2 – Noise Assessment and Control

7. World Health Organisation: 2018: Environmental Noise Guidelines for the European Region

8. British Standards Institution BS EN 61672-1:2013 Electroacoustics. Sound level meters. Specifications. London, BSI.

9. British Standards Institution BS EN IEC 60942:2018. Electroacoustics. Sound calibrators. London, BSI.

10. National Planning Policy Framework (NPPF), HCLG, September 2023.

11. Noise Policy Statement for England (NPSE), DEFRA, March 2010.

12. RPS 182: Application for a Waste R&D Trial report by Sol Environmental Ltd (issue number: SOL_23_P077_SGL issue April 2024).

13. North Norfolk District Council decision notice: NNDC Ref: PF/23/1796 (18th December 2023)

14. British Standard: BS 8233:2014. Guidance on sound insulation and noise reduction for buildings.

APPENDIX A – METHODS

Process	Environmental Noise Measurements
Reference Documentation	British Standard BS 7445, ISO 1996-1:2016, ISO-1996-2:2017, BS EN 5228-1:2009+A1:2014, BS EN 61672-1:2013, BS EN IEC 60942:2018 SOCOTEC in house procedure – Noise Surveys - SCI/ENV/04-7
Monitoring equipment / Serial Number / Calibration status	Svantek SV307 Precision Integrating/Logging Sound Level Meter, serial no. 87833, calibrated 08/02/2024 & 94134 calibrated 04/07/2024 fitted with windshield and calibration checked before and after survey, used with Svnatek SV 33B, serial no. 125697 calibrated 05/01/2024. 01dB Fusion Precision Integrating/Logging Sound Level Meter, serial no. 10858, calibrated 04/01/2024 fitted with windshield and calibration checked before and after survey, used with Svnatek SV 33B, serial no. 125697 calibrated 05/01/2024.
Analysis/Reporting Laboratory	SOCOTEC UK Cirencester
Accreditation Status	Not Accredited

APPENDIX B – ENVIRONMENTAL NOISE RAW RESULTS

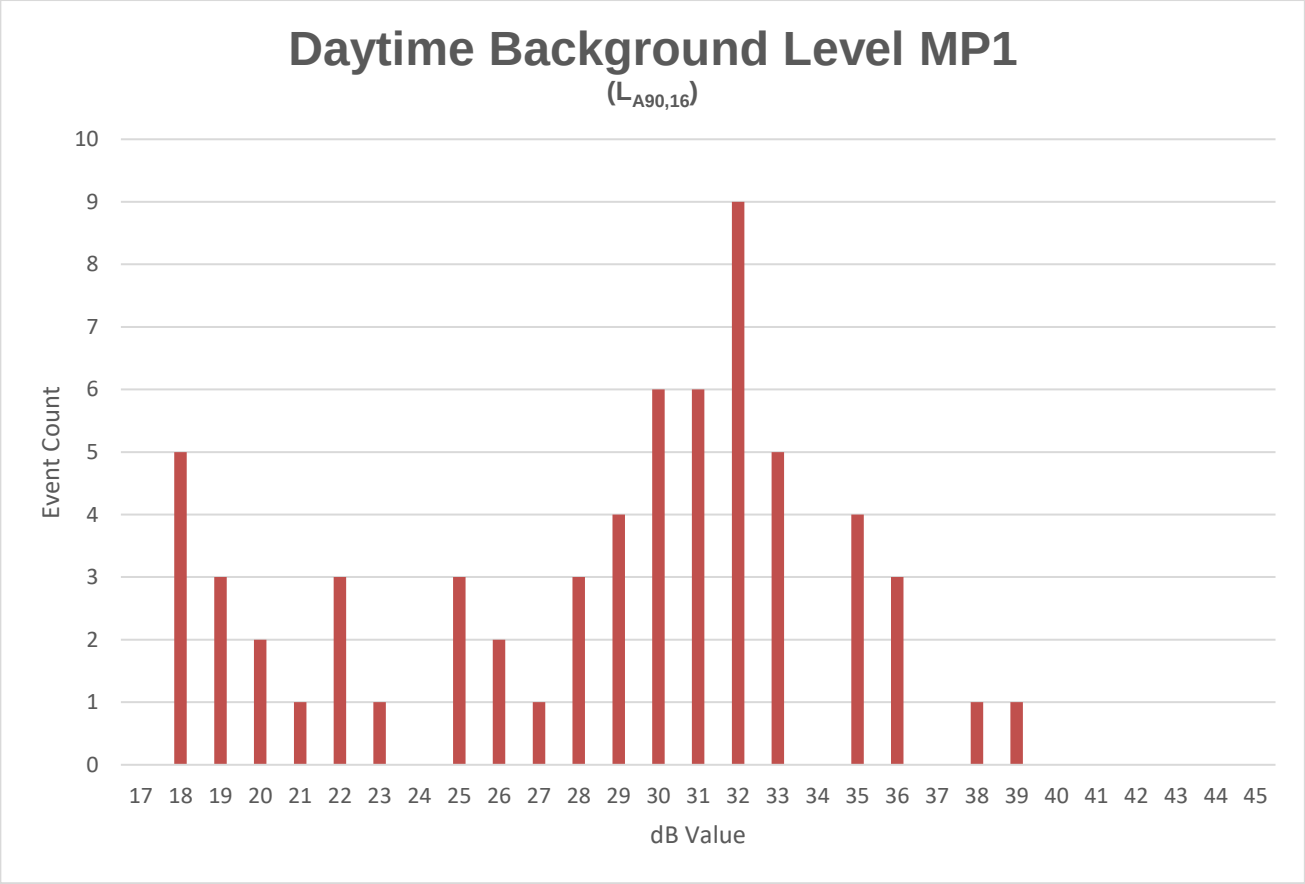


Figure B1: Environmental noise results daytime for MP1

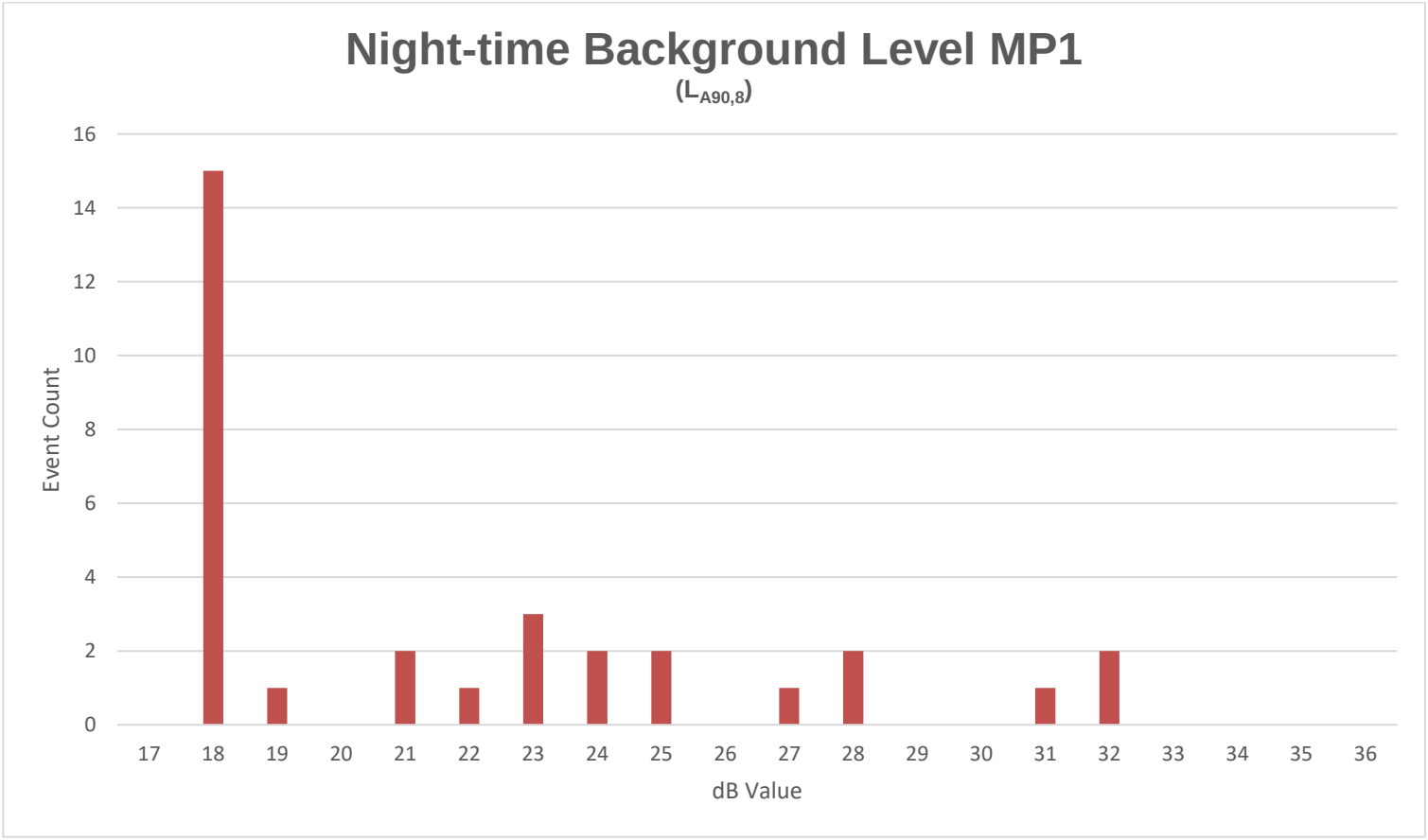


Figure B2: Environmental noise results night-time for MP1

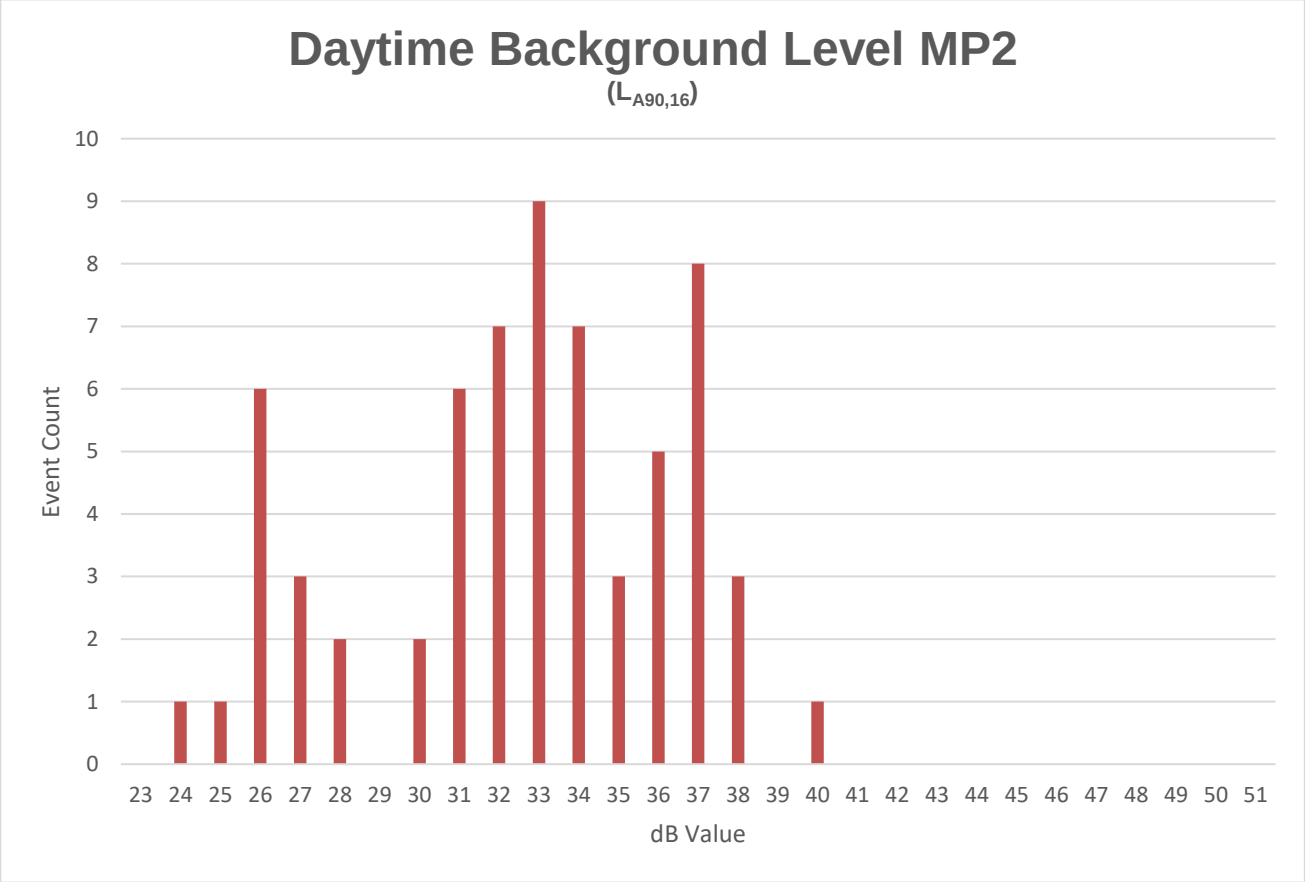


Figure B3: Environmental noise results daytime for MP2

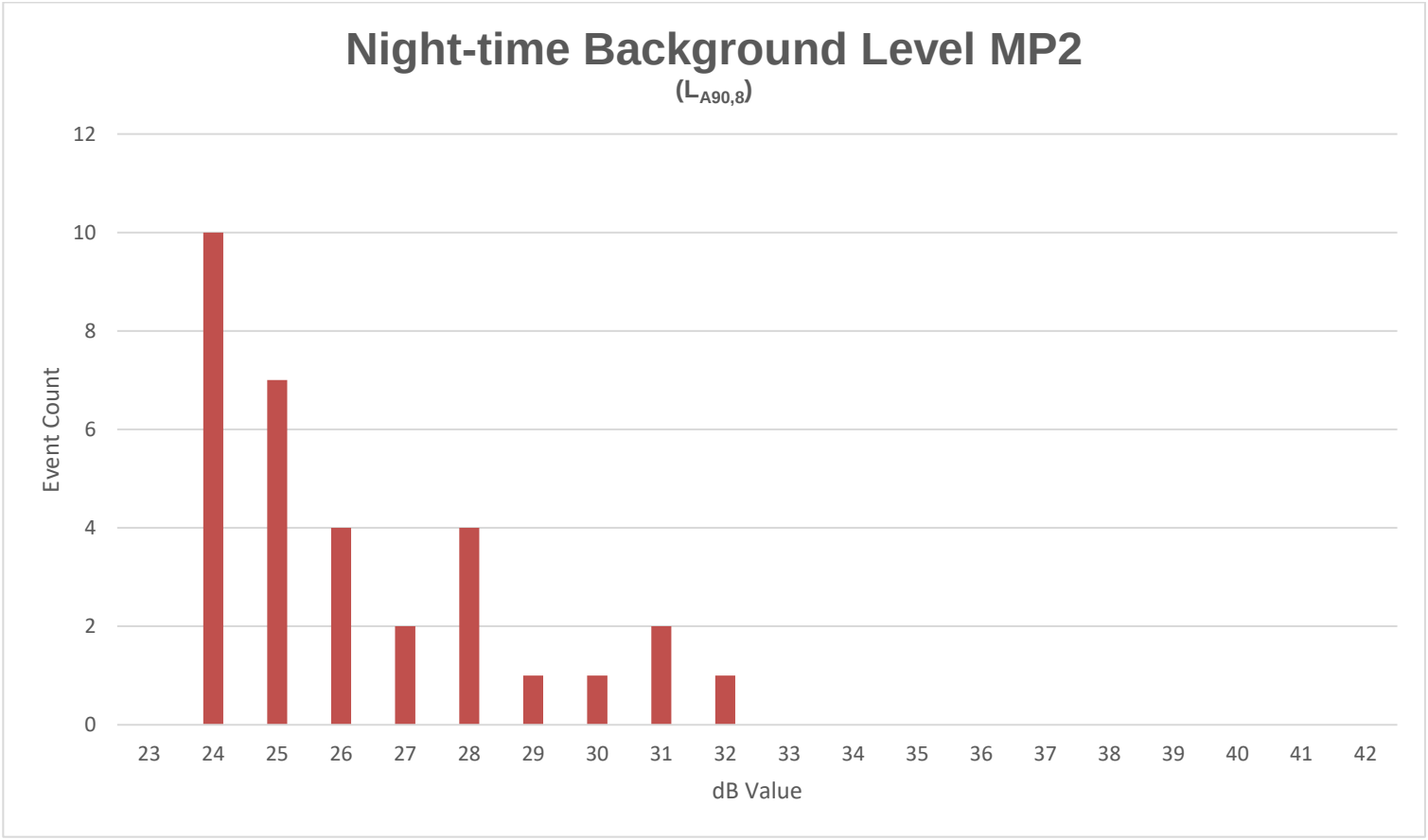


Figure B4: Environmental noise results night-time for MP2

APPENDIX C – NOISE TERM GLOSSARY

Decibel (dB)	The unit of measure for sound pressure level, defined as the logarithm of the ratio between the actual sound pressure and a reference sound pressure (20μPa). Thus, a wide set of values can be compressed into a small set of numbers.
L_{Aeq}	The equivalent continuous A-weighted noise level averaged over the measurement period.
'A' Weighting	The 'A' weighted acoustic energy scale corresponds closely with the response of the human ear.
L_{A90}	The noise level exceeded for 90% of the time.
L_{A10}	The noise level exceeded for 10% of the time.
Max L	The maximum root mean square level of weighted sound pressure level over the reference period.
Max P	The maximum level of un-weighted sound pressure level measured over the reference period.
SPL (Leq)	The constant level which if maintained for a period of 1 second would have the same acoustic energy as the measured noise event.
Sound Power Level SWL (L_W)	Sound Power Level is the total amount of sound energy per unit of time generated by a particular sound source independent of the acoustic environment that it is in. It is a logarithmic measure of the sound power in comparison to a specific reference level $W_0 = 10^{-12}$.
Background Noise Level	The noise level exceeded for 90% of the time, which corresponds to the quieter periods. BS 4142:2014+A1:2019 defines a measure of background noise in terms of L_{A90} and a 1-hour day time reference period.
Rating Level	The specific noise level plus any adjustments for characteristic features of the noise.
Specific Noise Level	The equivalent continuous 'A' weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.
Residual Noise	The equivalent continuous 'A' weighted sound pressure level at the assessment position, without the specific noise source present, over a given reference time interval.

APPENDIX D – ENVIRONMENTAL NOISE LEGISLATION

Legal duties and liabilities

Legal implications of environmental noise fall into three categories:

- Common law
- Criminal liabilities.
- Rights to compensation or sound insulation.

In addition, the European Union has much legislation fixing maximum sound power levels for vehicles, machines and aircraft – although this is created to aid development of the single market rather than as a specifically environmental measure.

Common Law Duties

A duty not to interfere with use or enjoyment of land and rights in connection with it, expanded by statute law to provide clearer remedies for complainants and local authorities. The noise standards applied to common law and statutory nuisances are entirely within the remit of the courts, but environmental health offices are employed by local authorities to deal with noise (and other public health) complaints from the public. This category of nuisance applies to all owners or occupiers of property, including vehicles in the street.

Reference should be made to:

- Noise and statutory nuisance Act 1993 – (England & Wales).
- Circular on the 'Noise and statutory nuisance Act 1993, DoE Circular 9/97– (England & Wales).
- Law of statutory nuisance – part 1 premises– (England & Wales).

Principles of Noise Nuisance

Some important points have to be satisfied before any noise nuisance action (or defence) can be successful. The principles apply whichever type of proceedings are taken:

- The nuisance must cause definite and substantial interference with personal comfort or enjoyment of property.
- The noise need not be injurious to health.
- There is no fixed standard of comfort, indicating that local conditions (such as background noise) will be taken into account.
- Complainants who newly occupy property already subject to noise have as many rights to redress as occupiers newly affected by noise ('coming to the nuisance').
- Temporary noise sources will not generally be accepted as nuisances. **Note** that 'temporary' is not the same as 'intermittent'.
- Buildings operations managed in a reasonable manner are unlikely to be successfully interfered with by the courts.
- Malice by a complainant or defendant will be taken into account.

- In civil proceedings it is not sufficient to show that all reasonable steps have been taken to prevent the noise occurring. By contrast in statutory proceedings, businesses have a defence that they used the best practicable means to deal with noise when legal action is taken by EHO's under the 'Environmental Protection Act 1990'.
- Noise resulting from an activity granted planning consent, and which causes a change in the character of a neighbourhood may not be a nuisance.
- Complainants have to show the defendant knew, or ought to have known of the nuisance.

APPENDIX E – STANDARD DISTANCE CALULATIONS

Sound level distance calculations free-field:

$$L_{P2} = L_{P1} - 20*\text{Log}(r_2/r_1)$$

L_{P2} = sound pressure level at receiver
L_{P1} = sound power level at source
r_2 = distance in meters from source to receiver
r_1 = distance in meters from source to measurement position

APPENDIX F – MANUFACTURER'S NOISE DATA

STANDARD GAS, SCOTTOW
ENVIRONMENTAL NOISE IMPACT ASSESSMENT
P2109-REP01-REV A-BDH

sol acoustics

Full Speed Complete Sound Data

evapco

James Andrews
Providence Hall
Oriental Place
Bradford. BD15 8AD
West Yorkshire. UK
t.- +447787226867
@ James@coolpartservices.co.uk

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

Model ESW4 9-4SL12-SP-Z
Motor 18.50 kW
Motors 1
Speed Full Speed

1 Cell Data

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		
Band	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	Sound Power Level (db)
63 HZ	78	62	78	63	78	62	78	62	79	63	105
125 HZ	80	62	80	63	80	62	80	62	83	62	104
250 HZ	80	62	81	65	80	62	80	62	84	66	105
500 HZ	73	53	74	55	73	53	73	53	79	62	98
1 KHZ	68	49	70	50	68	49	68	49	73	52	92
2 KHZ	64	43	66	44	64	43	65	43	71	51	89
4 KHZ	65	41	66	42	65	41	65	41	69	49	87
8 KHZ	66	39	66	39	66	39	66	39	66	45	85
Calc dBA	76	57	77	58	76	57	76	57	81	62	101

Sound option(s) selected: None

Remarks:
1. Sound Pressure Levels are according to CTI Standard ATC-128 and verified by an independent CTI-licensed sound test agency
2. Sound Power Levels are calculated according to the Small Units Section 3
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

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Figure E1: Noise data for Cooling tower CT2601 (i.e., smaller) – standard fan

STANDARD GAS, SCOTTOW
ENVIRONMENTAL NOISE IMPACT ASSESSMENT
P2109-REP01-REV A-BDH

sol acoustics

66% Speed Complete Sound Data

evapco

James Andrews
Providence Hall
Cranford Place
Bradford, BD15 0AD
West Yorkshire, UK
[redacted]

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

Model ESWA 9-43L12-SP-Z
Motor 18.50 kW
Motors 1
Speed 2/3 Speed

1 Cell Data

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		Sound
Band	5.0 ft (1.5m)	50.0 ft (15.2m)	5.0 ft (1.5m)	50.0 ft (15.2m)	5.0 ft (1.5m)	50.0 ft (15.2m)	5.0 ft (1.5m)	50.0 ft (15.2m)	5.0 ft (1.5m)	50.0 ft (15.2m)	Power Level (db)
63 HZ	72	64	72	65	72	64	72	64	74	64	90
125 HZ	75	63	75	64	75	63	75	63	80	63	95
250 HZ	75	63	75	65	75	63	75	63	80	67	96
500 HZ	73	55	72	57	71	55	73	55	76	64	91
1 KHZ	72	56	71	57	71	56	71	56	70	58	88
2 KHZ	68	51	70	52	68	51	69	52	67	55	84
4 KHZ	71	51	71	51	71	51	71	51	67	55	84
8 KHZ	73	51	73	51	73	51	73	51	67	54	84
Calc dbA	78	61	78	62	78	61	78	61	77	66	94

Sound option(s) selected: None

Remarks:
1. Sound Pressure Levels are according to CTI Standard ATC-128 and verified by an independent CTI-licensed sound test agency
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure E2: Noise data for Cooling tower CT2601 (i.e., smaller) – standard fan at 66% speed

STANDARD GAS, SCOTTOW
ENVIRONMENTAL NOISE IMPACT ASSESSMENT
P2109-REP01-REV A-BDH

sol acoustics

Full Speed Complete Sound Data

evapco LPE

James Andrews
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+447787226887
jamesa@coolpartservices.co.uk

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

Model ESW4 9-43L12-SP-Z
Motor 18.50 kW
Motors 1
Speed Full Speed

1 Cell Data

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		
Band	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	Sound Power Level (db)
63 HZ	73	55	74	61	73	55	78	63	74	58	101
125 HZ	71	56	76	58	71	56	72	55	77	59	99
250 HZ	66	47	67	48	66	47	65	47	69	53	91
500 HZ	65	45	67	47	65	45	65	45	66	51	89
1 KHZ	67	47	68	48	67	47	67	47	65	47	89
2 KHZ	63	41	66	43	63	41	64	43	64	45	85
4 KHZ	65	40	65	40	65	40	65	40	61	42	84
8 KHZ	66	39	66	39	66	39	66	39	62	41	84
Calc dBA	72	51	74	52	72	51	73	51	71	53	94

Sound option(s) selected: Super Low Sound Fan

Remarks:
1. Sound Pressure Levels are according to CTI Standard ATC-128 and verified by an independent CTI-licensed sound test agency
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure E3: Noise data for Cooling tower CT2601 (i.e., smaller) – super low noise fan

STANDARD GAS, SCOTTOW
ENVIRONMENTAL NOISE IMPACT ASSESSMENT
P2109-REP01-REV A-BDH

sol acoustics

Full Speed Complete Sound Data

evapco Ltd

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West Yorkshire. UK
+447787226697
James@coolpartservices.co.uk

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

Model ESWI 12-44N18-SF-Z
Motor 30.00 kW
Motors 1
Speed Full Speed

1 Cell Data

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr Side		Top		
Band	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	Sound Power Level (db)
63 HZ	82	67	78	64	82	67	78	64	80	65	107
125 HZ	83	67	81	64	83	67	81	64	86	68	108
250 HZ	81	61	81	61	81	61	81	61	84	68	106
500 HZ	75	54	75	55	75	54	75	55	79	63	100
1 KHZ	66	48	67	49	66	48	67	49	73	54	92
2 KHZ	64	43	65	45	64	43	65	45	71	51	89
4 KHZ	65	42	66	43	65	42	66	43	69	48	87
8 KHZ	66	38	67	41	66	38	67	41	64	42	85
Calc dBA	77	57	77	57	77	57	77	57	81	64	102

Sound option(s) selected: None

Remarks:
1. Sound Pressure Levels are according to CTI Standard ATC-128 and verified by an independent CTI-licensed sound test agency
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Page 10 of 11

Figure E4: Noise data for Cooling towers CT3501A and B (i.e., larger) – standard fan

STANDARD GAS, SCOTTOW
ENVIRONMENTAL NOISE IMPACT ASSESSMENT
P2109-REP01-REV A-BDH

sol acoustics

66% Speed Complete Sound Data

evapco

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Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

Model ESWI 12-44N18-SF-Z
Motor 30.00 kW
Motors 1
Speed 2/3 Speed

1 Cell Data

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		
Band	5.0 ft (1.5m)	50.0 ft (15.2m)	5.0 ft (1.5m)	50.0 ft (15.2m)	5.0 ft (1.5m)	50.0 ft (15.2m)	5.0 ft (1.5m)	50.0 ft (15.2m)	5.0 ft (1.5m)	50.0 ft (15.2m)	Sound Power Level (db)
63 HZ	75	69	71	66	75	69	71	66	75	64	99
125 HZ	77	69	76	65	77	69	76	65	81	69	100
250 HZ	76	63	76	63	76	63	76	63	78	70	97
500 HZ	73	58	74	58	73	58	74	58	73	65	92
1 KHZ	69	57	69	58	69	57	69	58	70	58	89
2 KHZ	68	53	69	56	68	53	69	56	68	56	87
4 KHZ	71	53	71	54	71	53	71	54	67	55	86
8 KHZ	72	51	73	54	72	51	73	54	66	53	84
Calc dBA	78	63	78	64	78	63	78	64	77	67	96

Sound option(s) selected: None

Remarks:
1. Sound Pressure Levels are according to CTI Standard ATC-128 and verified by an independent CTI-licensed sound test agency
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure E5: Noise data for Cooling towers CT3501A and B (i.e., larger) – standard fan at 66% speed

STANDARD GAS, SCOTTOW
ENVIRONMENTAL NOISE IMPACT ASSESSMENT
P2109-REP01-REV A-BDH

sol acoustics

Full Speed Complete Sound Data

evapco LITE

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Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

Model ESW4 12-44N18-SF-Z
Motor 30.00 kW
Motors 1
Speed Full Speed

1 Cell Data

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		
Band	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	10.8 ft (3.3m)	164.0 ft (50.0m)	Sound Power Level (dB)
63 HZ	72	57	72	57	72	57	72	57	70	48	98
125 HZ	68	52	68	52	68	52	68	52	72	52	94
250 HZ	62	45	63	44	62	45	62	44	66	49	88
500 HZ	66	45	66	45	66	45	66	45	65	46	87
1 KHZ	66	46	66	47	66	46	66	47	64	46	89
2 KHZ	63	42	65	45	63	42	65	45	62	44	88
4 KHZ	65	42	65	43	65	42	65	43	61	42	85
8 KHZ	66	38	67	41	66	38	67	41	62	40	84
Calc dBA	72	50	73	52	72	50	73	52	70	51	94

Sound option(s) selected: Super Low Sound Fan

Remarks:
1. Sound Pressure Levels are according to CTI Standard ATC-128 and verified by an independent CTI-licensed sound test agency
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure E6: Noise data for Cooling towers CT3501A and B (i.e., larger) – super low noise fan

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