

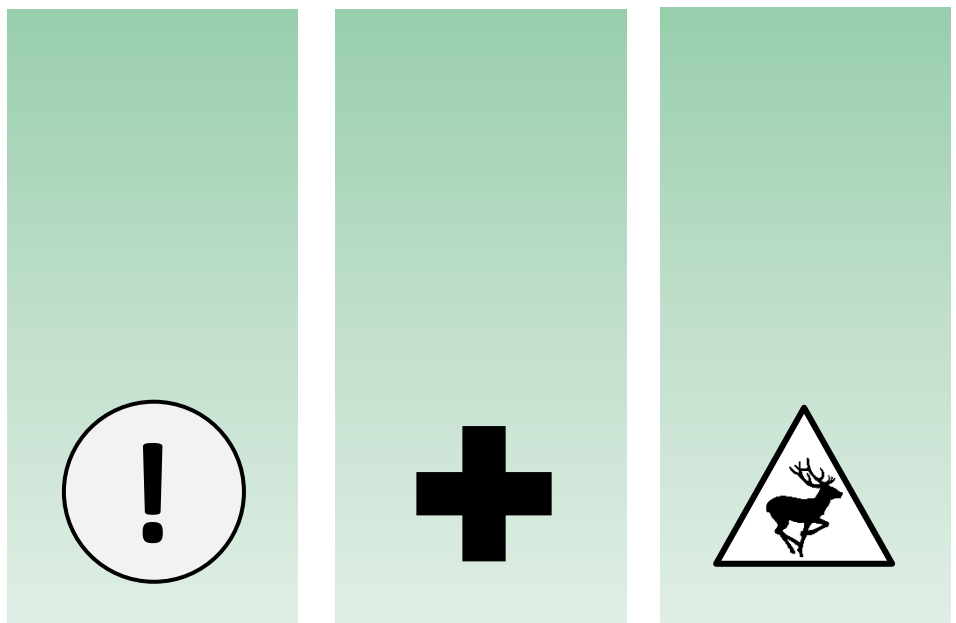
NOISE IMPACT ASSESSMENT

TWO NEW 60T MAIZE SILOS

ENSAFE PROJECT REFERENCE: AC106799- 9R0

REPORT PREPARED FOR: HEINEKEN UK LIMITED

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EXECUTIVE SUMMARY

Ensafe Ltd. have been commissioned by Heineken UK Limited to undertake a Noise Impact Assessment to support the planning application for 2no new 60T Maize Storage Silos to be located to the west of the site adjacent to the Brewhouse towards the Princess Road boundary. This location provides easy access for the Maize Delivery truck to access the Silos and for the discharge pipework to enter the Mill Room.

The proposed Maize Silos will be used to store Maize which will be supplied by delivery truck via a blower pipe into the tops of the silos. The 2 silos will link, via pipework connections, to the adjacent Brewery Building to discharge the Maize into the Mill Room. Stairs, ladders and gantries are provided simply for access and maintenance of the plant and equipment via valves hatches and the like.

According to information provided by Heineken: -

“Noise sources associated with the proposal will be when the maize is delivered, the blower vehicles have a maximum noise level of 95 - 100dB at 1m distance whilst tipping. This is worst case scenario if an older vehicle is used for deliveries. The maize is blown from the delivery vehicle up through the maize intake pipe into each of the silos. Heineken have calculated that they should be able to limit their maize deliveries to occur during daytime hours only ie. Between 0700 HRS & 2300 HRS.

The maize discharge pipe under the silos will have maize blown along it. This discharge pipe will rise up the side of the new staircase, cross a new service bridge to the existing building and run along the external elevation until it turns into the building at the Mill Room location. The blow noise for the discharge pipework is 85dB and will be contained within the Brewery building, therefore there will be minimal noise from the externally located maize discharge pipework.”

It has been assumed that noise will be mainly generated during delivery carried out during daytime period only and therefore, there is no foreseen potential for adverse impact during the night-time.

The noise impact assessment is based on previous (while still REC) and later Ensafes attended ambient sound measurements undertaken at noise sensitive locations at the vicinity of the Site. The noise sensitive locations have been extracted from the Golder Associates surveys dated March 2017, so to allow following-up and facilitate the evaluation of estimated noise egress increasing at the identified noise sensitive receptors (NSRs). Please note that due to an ongoing noise complaint, the assessment has also considered an additional receptor (NSR 6) at the northern direction at a tall building overlooking to the northern Heineken boundary.

The estimated levels at the NSR 3 and NSR 4 receptors façade exceeds the ambient background noise levels however, there is no designated amenity area for those housings and the potential for adverse impact has been evaluated indoors. The likelihood for adverse impact is offset by the transmission loss of an open window and therefore unlikely to generate complaints.

The predicted effect is considered as Low Observed Adverse Effect Level (LOAEL), i.e., perceived as 'noticeable and not intrusive', would be achieved for all external and internal areas resulting in the following observation:

"Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life."

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1. INTRODUCTION

Ensafe Limited have been commissioned by Heineken UK Limited to undertake a Noise Impact Assessment to estimate the overall noise egress levels considering the additional two new 60T maize silos to the Heineken Brewery site in Manchester, and to be referred to hereafter as '*the facility*'.

This assessment has been undertaken to quantify the resulting noise levels upon the existing ambient noise climate and potential for adverse impact on the identified nearest noise sensitive receptors (NSRs).

The main source of noise is foreseen to be generated by the delivery vehicle blower which will be occurring during daytime only, i.e., between 07:00 and 23:00 hours.

The noise impact assessment has been carried out aid by the 3D CadnaA software and the noise propagation map is found in Appendix III of this report.

The overall noise generated within the facility is understood to occur 24/7 and therefore, according to the BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound, the 3D CadnaA calculation results have been adjusted to the likely acoustics characteristic of the plant items and the resultant rated levels, L_{Ar} (dB), have been compared to the daytime and night-time ambient background noise levels to evaluate the likelihood of complaint.

Traffic noise of the network roads around the site, although perceived as a continuous ambient noise background, has not been considered in this instance to contribute to Heineken's noise egress evaluation. Therefore, it is understood that this approach provides the likely worst-case scenario for the noise impact assessment.

All acronyms used within this report are defined in the Glossary presented in Appendix II.

1.1 Site Location, NSRs & Proposed Development

The brewery is located within a mixed-use area and is surrounded by existing commercial and residential uses.

The closest Noise Sensitive Receptors (NSRs) to the Site and with a direct line of sight to the facility, i.e., not having any obstacle, wall or building between source and receptors, have been identified as follows:

- NSR1 – Quinney Crescent to the south west;
- NSR2 – Barnhill Street to the south;
- NSR3 – Charles Halle Road to the east;
- NSR4 – Greenheys Lane to the north; and
- NSR5 – Westwood Street to the south east.

The identified NSRs have been adopted from a previously completed Noise Impact Assessment undertaken by Golder Associates in March 2017 to facilitate comparison and validate the estimated effect.

A sixth location has been added to the noise impact assessment since a noise related complaint has been allocated with the Local Council. Therefore, the additional receptor location is identified to be: -

- NSR 6 - at the 7th floor of the Fulton Court building overlooking directly to the Heineken's site.

The approx. location of the two proposed silos is highlighted with a red line in Figure 1 below.



Figure 1 – Site of the proposed 2 Maize Silos

This assessment has been undertaken with due regard to the supplied Site plan shown on the following planning drawing:

- Site Block Plan (drawing number 8540 Proposed Plan) issued by Norder.

1.2 Limitations

Where mitigation measures are specified in our report, it should be noted that these measures are relative to a specific sound source, both in terms of the measured sound pressure level and the

character of the source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, Ensafe cannot be held responsible for any subsequent variations in the proposed mitigation performance.

Further limitations of this report are presented in Appendix I.

1.3 Confidentiality

Ensafe has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Ensafe; a charge may be levied against such approval.

2. ASSESSMENT CRITERIA

2.1 Local National Planning Practice Guidance

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment.

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The Observed Effect Levels are as follows:

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 1 summarises the noise exposure hierarchy, based on the likely average response.

Table 1 Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect - NOEL			
Not Noticeable	No Effect	No Observed Adverse Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Low Observed Adverse Effect Level - LOAEL			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level - SOAEL			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Effect	Avoid

Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent
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The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on the context and how various factors combine in any particular situation.

These factors and context to be considered include:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise; and
- The spectral content of the noise and the general character of the noise. The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area;
- Where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations; and
- If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.2 Local Authority Guidance and Criteria – Manchester City Council (2015)

‘Planning & Noise Technical Guidance’ – Industrial/commercial developments.

BS 4142 should be used to assess the likely impact of noise from industrial and commercial sources at noise sensitive premises. One of the indications of the impact of a BS 4142 assessment is 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 Council consider that new developments should contribute and enhance the area in which they are located and where possible, contribute to the improvement of people’s health and quality of life as per the NPSE. With the outlined context in mind, the design objective should be:

‘The development should be designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location’.

Where this criterion cannot be achieved, the various noise control measures considered as part of the assessment should be fully explained (i.e. relocation of noise sources, use of quieter equipment, enclosures, screening, restriction of the hours of operation) and the achievable noise level should be identified. This information will allow us to make a judgement concerning the application and its likely impact on the surrounding area.

In addition to the above, maximum noise levels should also be adequately controlled. Where Uses generate high noise levels of a short duration (e.g. loud bangs) on a regular basis, these should aim to be controlled so as not to exceed 60 dB (L_{Amax}) at the façade of noise sensitive premises nearby in accordance with the recommendations of the World Health Organisation.

Deliveries and collections are usually controlled by restricting operational hours but depending on the extent of these activities, a Noise Management Plan (NMP) may be requested, which would include an assessment of noise. This would usually involve assessing the noise upon arrival, loading/unloading period and then departure.

The NMP may also need to include controls such as acoustically sealed delivery bays, and restrictions on vehicle mounted refrigeration units and audible alarm systems. Where applicable, the noise assessment will take account of multiple noise sources operating simultaneously and the state cumulative level of these.

2.3 BS4142: 2014 ‘Methods for rating and assessing industrial and commercial sound’

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted noise level ‘the specific noise level’ from any of the above detailed noise sources with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.’

The specific noise level also acknowledges the following reference time intervals depending upon whether the noise source operates during daytime or night-time periods:

- Daytime (07:00 – 23:00) 1 hour; and
- Night-time (23:00 – 07:00) 15 minutes.

There are a number of 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows. These penalties vary in their weighting depending upon the severity of the acoustic feature, as follows:

Tonality

- +2dB: where the tonality is just perceptible;
- +4dB: where the tonality is clearly perceptible; and
- +6dB: where the tonality is highly perceptible.

Impulsivity

- +3dB: where the impulsivity is just perceptible;
- +6dB: where the impulsivity is clearly perceptible; and
- +9dB: where the impulsivity is highly perceptible.

Intermittency

- +3dB: where the intermittency is readily distinctive against the acoustic environment.

In addition to the above acoustic features, there is a penalty for 'other sound characteristics' of +3dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment.

BS4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

Assessment of the rating level relative to the background noise level can yield the following commentary:

- Typically, the greater this difference (between the rating level and the background sound level), the greater the magnitude of 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; and
- 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

Note that according to the BS4142:2014 guidelines, Section 8.5:

"Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it ought to be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation."

3. NOISE SURVEYS

All survey locations are shown in Figure 2, Appendix III.

3.1 Background and Residual Sound Surveys – Proxy Monitoring Positions

Ensafe has conducted attended Background and Residual Sound Surveys in order to quantify the existing levels of background sound at the closest residential receptors to the Brewery but in the absence of noise from such. The survey was carried out over the following time periods:

- 01:30 to 04:40 Wednesday 9th January 2019; and
- 18:30 to 00:00 Wednesday 9th January 2019.

The above periods relate to the most sensitive daytime and night-time periods and are considered to inform a worst-case assessment scenario.

The following noise measurement positions were chosen for the Survey and relate to the Alternative Monitoring Positions given in the March 2017 Assessment:

- Proxy Monitoring Position 1/2 (P1/P2): On Quinney Crescent, equidistant from Princess Road but to the south of the NSR1. Dominant sources of noise included road traffic sound;
- Proxy Monitoring Position 3 (P3): Denmark Road/Pencroft Way Junction to the east of the NSR3. Dominant sources of noise included road traffic sound;
- Proxy Monitoring Position 4 (P4): Boundary Lane/Coupland Street Junction to the north east of the brewery and NSR4. Dominant sources of noise included road traffic sound; and
- Proxy Monitoring Position 5 (P5): Moss Lane East/Acomb Street Junction to the east of the brewery and NSR5. Dominant sources of noise included road traffic sound.

Table 2 details the measured background and residual sound levels.

Table 2 Measured Background and Residual Sound Pressure Levels

Location	Measured Period	Measure Residual Sound Pressure Level, $L_{Aeq,T}$ (dB)	Measured Background Sound Pressure Level, $L_{A90,T}$ (dB)
P1/P2	18:28 – 19:28	58.2	52.5
	19:28 – 20:28	58.2	52.5
	01:30 -01:45	53.6	47.0
	01:45- 02:00	53.3	46.7
	03:11 – 03:26	52.8	45.3
	03:26 – 03:41	55.3	47.7
P3	21:57 – 22:57	60.5	45.4
	02:07 – 02:22	55.6	46.9
	03:48 – 04:03	52.9	43.6
P4	23:04 – 00:04	64.9	48.3
	02:30 – 02:45	52.9	48.1
	04:07 – 04:22	49.9	48.8
P5	20:47 – 21:47	64.2	48.5
	02:50 – 03:05	57.5	44.0
	04:27 – 04:42	56.5	45.2

3.2 Baseline Specific Sound Surveys – NSRs Positions

Ensafe has conducted attended specific sound surveys at each NSR during the daytime and night-time periods to quantify a baseline level of sound due to the brewery. The surveys were carried out over the following time periods:

- 01:25 to 04:33 Wednesday 9th January 2019; and
- 18:20 to 23:49 Wednesday 9th January 2019.

Measurements were undertaken at positions representative of the closest NSRs (as stated in Section 1.2) in positions shown in Figure 1 of Appendix III.

Table 3 details the average measured specific noise levels.

Table 3 Specific noise levels recorded at the NSRs

Location	Measured Period	Measure Specific Sound Pressure Level, $L_{Aeq,T}$ (dB)	Observations
NSR 1	18:20 – 19:20	62.6	Site inaudible over road traffic sound
	01:25 – 01:40	53.4	Barely audible over road traffic. Steady hum in background
	03:12 – 03:27	58.2	
NSR 2	19:27 – 20:27	59.5	Inaudible when traffic moving. Specific sound level includes road traffic sound.
	01:47 – 03:02	53.8	Barely audible over road traffic. Steady hum in background
NSR 3	20:32 – 21:32	57.9	HGV movements audible here as well as fixed plant.
	02:32 – 02:47	58.9	
	03:56 – 04:11	51.9	
NSR 4	21:40 – 22:40	65.8	Not audible over road traffic.
	02:51 – 03:06	64.2	
	04:18 – 04:33	58.3	
NSR 5	22:49 – 23:49	58.0	Fixed plant only audible when road traffic is low.
	02:08 – 02:23	53.3	
	03:35 – 03:50	50.6	

The following equipment was used for the Noise Surveys. Calibration due dates relate to those at the time of the surveys.

Table 4 Noise Measurement Equipment

Equipment Description	Manufacturer & Type No.	Serial No.
Sound level meter	01dB – Metravib Black Solo	65771
Pre-amplifier	01dB – Metravib PRE 215	16640
Microphone	01dB – Metravib MCE212	16539
Calibrator	01dB – Metravib CAL-21	34634218
Sound level meter	01dB – Metravib PRE 215	11536
Pre-amplified	01dB – Metravib	internal
Microphone	GRAS 40CE	291871
calibrator	01dB-Metravib CAL-21	34554787

The sound level meters were field-calibrated on Site prior to and after noise measurements were taken. No significant drift was witnessed. Calibration certificates are available upon request.

4. NOISE IMPACT ASSESSMENT

When considering the introduction of a new plant item into an existing industrial premise, it is important to consider the likely noise egress levels at the identified NSRs.

Ensafe has carried out various site noise monitoring and measured the most representative sources of noise and the loudest plant items across the entire brewery in order to inform a noise model. A previous report for the Site, undertaken in March 2017, determined that the sound from the brewery was secondary to road traffic.

However, to be representative of the worst case scenario and follow the BS4142 guidelines, the noise egress of the facility have been evaluated in this instance, without traffic noise contribution, and therefore considered as quite conservative and with a significant margin to accommodate any unforeseen error such as wind direction, i.e., the NSRs are all considered downwind from the facility.

Additionally, to the existing monitored plant items the noise impact assessment of the proposed Maize Silos have been evaluated in combination with the new proposed DPV, Glycol Plant items and MCC rooms.

The specific noise levels used to model the new Maize Silos and associated operational noise are: -

*“Noise sources associated with the proposal will be when the maize is delivered, the blower vehicles have a maximum noise level of **95 - 100dB at 1m** distance whilst tipping. This is worst case scenario if an older vehicle is used for deliveries. The maize is blown from the delivery vehicle up through the maize intake pipe into each of the silos. Heineken have calculated that they should be able to limit their maize deliveries to occur during daytime hours only ie. Between 0700 HRS & 2300 HRS.*

*The maize discharge pipe under the silos will have maize blown along it. This discharge pipe will rise up the side of the new staircase, cross a new service bridge to the existing building and run along the external elevation until it turns into the building at the Mill Room location. The blow noise for the **discharge pipework is 85dB** and will be contained within the Brewery building, therefore there will be minimal noise from the externally located maize discharge pipework.”*

For the BS4142:2014 assessments, penalties are applied to the specific sound level in order to provide the rating level. These penalties relate to the acoustic features of the sound source. Accordingly, the following objective and subjective features have been accounted for in the assessment, in accordance with the subjective method detailed in BS4142:2014, for the Site as a whole operation. Note, not all penalties will apply to all NSRs as they are subject to different sources and are subject to different acoustic features.

The specific sound power levels associated with the maize delivery truck blower have been used as the main related source of noise in the noise propagation model. The calculation is based during a delivery event and rated with +5dB penalty to consider tonality from fans and intermittence between delivery events.

Table 5 Acoustic Penalties

Source	Acoustic characteristics	Attributable Penalty	Comment
The facility	Tonality	Yes, 2 dB	Given the distances and direction to the receptors and the dominance of road traffic the tone is considered just to clearly perceptible.
	Impulsivity	No	No impulsivity associated with the operations.
	Intermittency	Yes, 3dB	Intermittent movements of HGVs, may be audible at the nearest NSRs.
	Other clearly perceived characteristics	No	n.a.

4.1 BS4142:2014 Daytime Assessment

The Noise Model has been used to predict the specific noise level at the receptors during the daytime period generated within the facility. The specific noise sources are representative of all existing and approved DPV, MCC and Glycol Plant Room plant items, plus the proposed new maze silo units.

The grid noise map is shown in Figure 2 of Appendix III.

Table 6 details these calculated specific noise levels at the receptors, applies the penalties and compares the rating level with the lowest measured 1-hour background sound levels (rounded to the nearest decibel).

Table 6 BS4142:2014 Assessment – Daytime Assessment

Receptor ID	Predicted specific noise level $L_{Aeq,1hr}$ (dB)	Acoustic penalties (dB) (Table 5)	Rating level $L_{Ar,T}$ (dB) (rounded the nearest dB)	Ambient background sound level $L_{A90,T}$ (dB)	Difference +/- (dB)
NSR 1	48.5	5	53.5	53	0.5
NSR 2	40.3	5	45.3	53	-7.7
NSR 3	47.8	5	52.8	45	7.8
NSR 4	45.3	5	50.3	48	2.3
NSR 5	39.1	5	44.1	49	-4.9
NSR 6	39.1	5	44.1	47	-2.9

The summary of results presented in Table 6 indicates an exceedance of noise levels at receptors NSR 3 and NSR 4. Although there is predicted to be an exceedance at those receptors no external areas exist here and, as such, is considered more prudent to assess the indoor levels. This results in indoor levels in the order of 35dB assuming open windows with a transmission loss of 12dB. As the site runs continuously, the application of BS8233:2014 here is considered robust.

4.2 BS4142:2014 Night-time Assessment

Please note that no deliveries will be carried out during the night-time and therefore the BS4142 noise impact assessment is not necessary.

5. CONCLUSION

Ensaf Limited have been commissioned by Heineken (UK) Limited to undertake a Noise Impact Assessment for the two Maize Silos to be installed at the existing Heineken Brewery in Manchester.

This assessment provides the revised noise impact assessment considering the existing facility noise climate in addition to the new proposed MCC and the Glycol Plant rooms to the approved Dual-Purpose Fermentation Vessels planning application.

The Noise Impact Assessment has indicated that the proposed two Maize Silos will exceed the ambient background at NSR 3 and NSR 4, however there are no designated amenity area for those units and the noise levels have been evaluated indoors and with windows open. Indoors the facility specific rated noise levels will not exceed the BS8233 precautionary $L_{Aeq,T}$ 35dB daytime levels.

There will be no related delivery to the Maize Silos during the night-time and therefore no further evaluation has been carried out.

APPENDIX I LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Limited and the Client as indicated in Section 1.2.
2. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
3. REC cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by REC is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by REC in this connection without their explicit written agreement there to by REC.

APPENDIX II GLOSSARY OF ACOUSTICAL TERMINOLOGY

Noise

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A1 Typical Sound Pressure Levels

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

Table A2 Terminology

Descriptor	Explanation
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10 ⁻⁵ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
L _{Aeq, T}	L _{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L _{Amax}	L _{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L _{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, 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 ₁₀ & L ₉₀	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L _n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L ₁₀ is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L ₉₀ is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L ₁₀ index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Fast	A time weighting used in the root mean square section of a sound level meter with a 125millisecond time constant.
Slow	A time weighting used in the root mean square section of a sound level meter with a 1000millisecond time constant.

APPENDIX III FIGURES

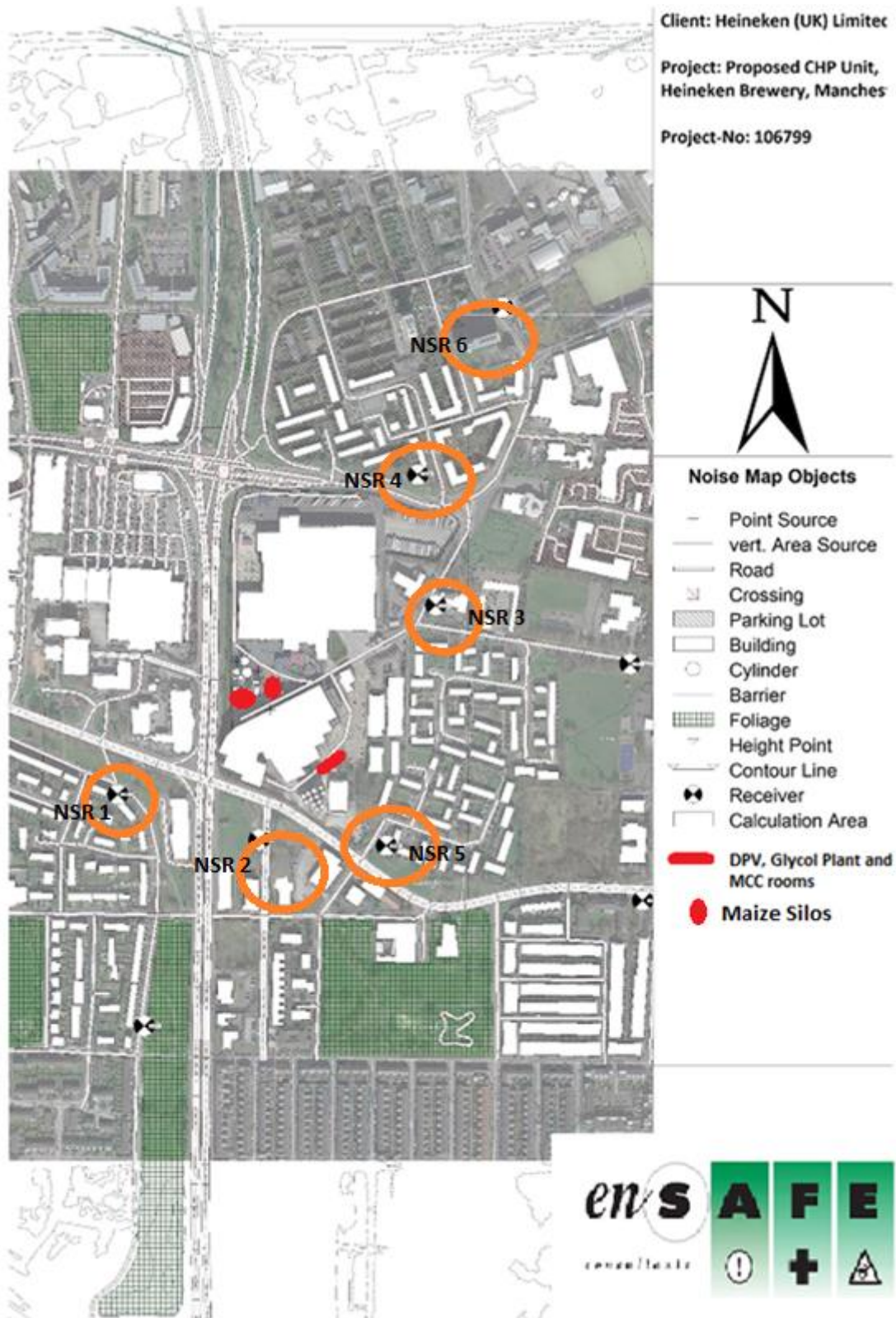




Figure 2 – noise contour map without proposed Maze Silos

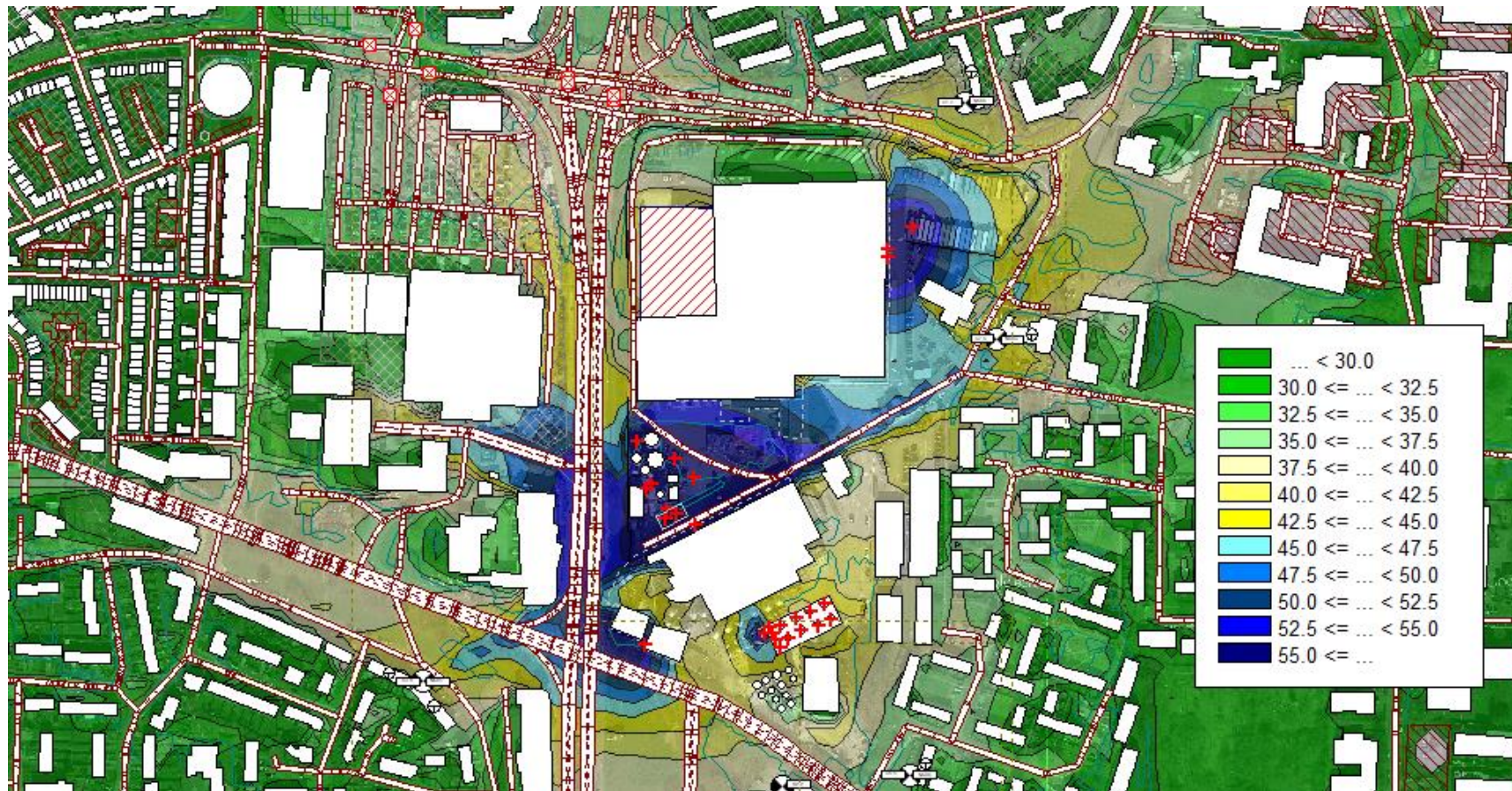


Figure 3 – noise contour map with proposed Maze Silos