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NOISE IMPACT ASSESSMENT

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Date: 13/07/16

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1. Introduction

NOVA Acoustics Ltd has been commissioned by Mr Les Willis to undertake a noise survey at Cherry Barn, Cheadle, ST10 8QS, hereafter named "Site". This assessment has been carried out with specific reference to the noise impact from the installation of 5 No diesel powered generator units upon the residential premises located to the south of the site.

The purpose of this report is to evaluate prevailing noise at the nearest sensitive receptor (NSR), compare these against predicted noise level emissions associated with the units to be installed, determine the likely noise impact and suggest mitigation measures if required.

2. Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance:

- The National Planning and Policy Framework (2012)
- The Noise policy Statement for England (2010)
- BS 4142:2014, Methods for rating and assessing industrial and commercial sound'

2.1. English Planning Policy on Noise Impact – NPPF and NPSE

The NPPF is the over-arching planning and policy document that applies to all new developments in England. The guidance and assessment criteria given (or referred to) in this document can therefore be applied to all standards in terms of assessing the suitability of granting planning permission with respect to noise impact.

The NPPF states that planning policies and decisions should aim to:

- Avoid noise giving rise to significant adverse impact on health and quality of life as a result of a new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from new developments, including through the use of conditions.
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions placed upon them because of changes in nearby land uses since they were established; and
- Identify and protect areas of tranquillity, which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

With specific reference to noise impact, the NPPF document refers to the noise policy statement for England (NPSE). The NPSE provides guidance which enables decisions to be made regarding the acceptable noise burden to place on society, using three key phrases – the No Observed Effect Level (NOEL), the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL).

In order to provide a consistent frame of reference (and to allow a view to be taken on the suitability of the application with reference to the relevant planning guidance), the levels criteria given in other relevant documents used in assessment will be re-framed in terms of the following:

NOEL: The level of noise impact below which no effect can be detected, and there would be no discernible negative effect on health or quality of life.

LOEL: The lowest level of noise impact which adverse effect on health or quality of life can be detected. Designing noise impacts to be less than or equal to LOAEL should see that any adverse effects on health or quality of life are negligible.

SOAEL: The level above which significant adverse effect to health and quality of life occur. Designs should always seek to avoid a noise impact, which would be categorised as SOAEL.

BS 4142:2014

BS 4142:2014 provides a method of rating and assessing industrial and commercial sound. It is a widely used standard by local authorities and consultants to rate noise from fixed installations. The standard advocates the use of $L_{Aeq,T}$.

When used to assess industrial noise, the rating level is determined by correcting, when appropriate, the specific noise level measured and the LA90 background level is subtracted from it. Then, depending on this difference the impact is characterised:

- The greater this difference, the greater the magnitude of the impact
- A difference of about 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 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.

When using the one-third octave method given in BS 4142 within 9.3 Objective methods, a correction of 6dB is to be applied to the specific noise level if a tone is present. In order to decide whether a tone is present or not, an analysis of the third-octave bands is made and the differences that identify a tone between adjacent bands are as follows:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz)
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz)

Draft Guidelines for Noise Impact (2002)

A joint working party of the Institute of Acoustics and Institute of Environment Management and Assessment has produced a draft guidance document on noise impact assessment called Guidelines for Noise Impact Assessment. Although these guidelines are at a draft stage at present they are of use for this assessment. The Working Party has set out an example of how changes in noise level may be assessed, as shown in Table 1.

Sound Level Change dB(A)	Subjective Response	Impact Description
0.0	No change	None
0.1 – 2.9	Imperceptible change in loudness	Slight
3.0 – 4.9	Perceptible change in loudness	Moderate
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial
10.0 or more	More than doubling or halving in loudness	Severe

Table 1

The draft guidelines state that the assessor should set out assessment criteria specific to each assessment. However, the above criteria reflect key benchmarks of human response to changes in noise level. For example, a 3dB (A) change is generally taken to be the smallest change perceptible to the human ear and a 10dB (A) change is heard as a doubling or halving of the loudness of a source. The 5dB (A) category has been included as it provides a greater definition of the assessment of changes in noise level.

3. Site Description & Background

The site under investigation is located at Cherry Barn, Cheadle, ST10 8QS. It is proposed the installation of 5 No. diesel power generators that will support the national grid at times of peak use.

Appendix A shows the location of the generators and the noise sensitive receptor (NSR). The proposed site is to be located on a farm that contains a house within its boundaries and an agricultural building. To the south of the site there is a B&B which is the NSR in the assessment.

5 No. generators will be installed, the proposed units are 400kW Scania open set generators, the generators will be automated and connected to the national grid 24/7. The purpose of the units is to provide re-enforcement to the national grid at times of peak power usage. The units are designed for intermittent usage and the frequency of use is expected to be approximately 200 hours per year. The peak time of energy use is from 16:00 to 19:00, therefore this is the time when the generators are expected to turn on. Purpose built acoustic containers have been designed to accommodate the units. The noise emissions used in the assessment have been provided by the client, a noise level of 65dB(A) was measured from 8 No. generators in operation, installed in the canopies, at a distance of 3m.

4. Environmental Noise Survey

In order to determine the sound profile of the area, a long-term environmental noise survey was carried out between Friday 20th May and Monday 23rd May 2016. Continuous automated noise monitoring was undertaken for the duration of the survey. The acoustic parameters LAeq, LAmax, LA90 and LA10 were measured.

The table below presents a summary of the relevant parameters averaged over the day, evening and night periods of the days measured. A time history graph can be found in appendix E.

Time	LAeq	LA90
Day 1	46.4	40.6
Evening 1	49.8	**37.4**
Night 1	48.3	37.5
Day 2	53.6	40.0
Evening 2	31.4	**30.6**
Night 2	49.2	30.4
Day 3	53.6	37.8
Evening 3	38.9	**34.1**
Night 3	44.1	26.5

Table 2

The measurement equipment was calibrated before and after measurements with negligible deviation (<0.1dB) calibration was verified at 114.0dB @ 1kHz.

The equipment used for the measurements were as follows:

- SVANTEK Sound Level Meter SVAN 977
- SVANTEK Calibrator SV31

As the environmental noise survey was carried out over a long and unmanned period, no records of the weather conditions are held. However, during the set up and collection of the equipment the weather conditions were suitable for the measurement of environmental noise. The met office data for a local weather station was analysed and for the duration of the measurement the wind speed was less than 5m/s with no precipitation occurred and the temperature was in the range of 10-15 C°.

5. Assessment Methodology

Assessment of the specific noise level from the proposed units is estimated based on the information provided by the client. The significance of the noise impact upon the noise sensitive receptors is assessed using the methodology contained within BS4142:2014. The aim is to reduce the likelihood of an adverse impact upon the NSR. The background noise level is determined after a statistical analysis that provides the most repeated value of the LA90 during the primary operating time of the three days measured.

The change in ambient noise levels is also assessed and used in conjunction with the BS4142 assessment to generate a broader picture of the situation. The basis of this type of assessment can be found in the consultation draft 'Guidelines for Noise Impact Assessment' issued by the institute of Environmental management and Assessment (IEMA) and the institute of acoustics. (IOA). The guidelines state that once the basic level change has been evaluated, other factors must be examined to determine whether the impact is relatively or less than indicated by the numerical difference found for the basic change. From that, the overall impact at the property and for the individuals that live or work there can be found.

To assist in the assessment process, the guidelines categorise the significance of a range of basic changes, shown in Table 3.

Sound Level Change dB(A)	**Subjective Response**	**Impact Description**
0.0	No change	None
0.1 – 2.9	Imperceptible change in loudness	Slight
3.0 – 4.9	Perceptible change in loudness	Moderate
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial
10.0 or more	More than doubling or halving in loudness	Severe

Table 3

It should be noted that the use of one decimal place is not a reflection of the accuracy of any assessment undertaken but is merely intended to avoid ambiguities over categorisation of boundaries.

The guidelines state that for any assessment, the words used to describe the impact should be determined by the assessor based upon the evidence including averaging the time period used, the time of day, the nature and spectral characteristics of the source and how frequently it occurs.

It is considered that the range of sound level changes given above provide a good indication as to the likely significance of changes on noise levels in this case and have been used to assess the impact of the sites emissions.

The assessment of noise impact associated with the operations of the site has been undertaken using noise modelling to predict the noise level at the closest sensitive receptor. SoundPlan Essential 3.0 noise modeling software is used to predict the noise levels at the receptors.

6. Noise Impact Assessment

BS 4142:2014 provides a method of rating the likelihood of complaints when introducing an industrial noise source into an existing residential area. This assessment draws a comparison between the industrial noise emissions generated by the site and the existing background sound levels at the existing noise sensitive receptors.

6.1 Specific Sound Level & Rating Level

As the source is not yet in operation, the specific noise levels used in the assessment are the noise levels provided by the client of the proposed units operating in an acoustic container. The specific noise level to be used is 65dB(A) at 3m. The specific noise level at the NSR is shown in table 4.0, 8 receiver points have been used to analyse the noise levels at varying points around the building.

Receiver	Specific noise level (dBA)
1	**37.5**
2	37.1
3	22.6
4	20.7
5	28.0
6	**37.5**
7	21.9
8	35.0

Table 4

As can be seen in Table 4 the highest specific noise level at the NSR is 37.dB (A), this level will be used in the assessment.

Generators typically have tonal components in the low frequency region that dominate the character of the sound. Thus a tonal correction of + 3dB will be applied in the assessment. No source data is held for the units, therefore an objective assessment of the tonal components has not been carried out.

6.2 Background Sound Level

The background sound level, LA90, is calculated by means of a statistical analysis in which the most repeated value of LA90 is determined over a certain period of time. Below, are presented the three statistical analysis for the three different days in which the noise survey was undertaken. The period chosen to carry out the analysis is from 17:00 to 22:00 as it is deemed as the period of peak electricity usage and therefore the period when the generators are likely to be activated. This provides a conservative approach, as the generators are unlikely to be in operation after 19:00, however the background sound levels between 19:00 – 22:00 are lower.

20th Friday, 17:00-22:00

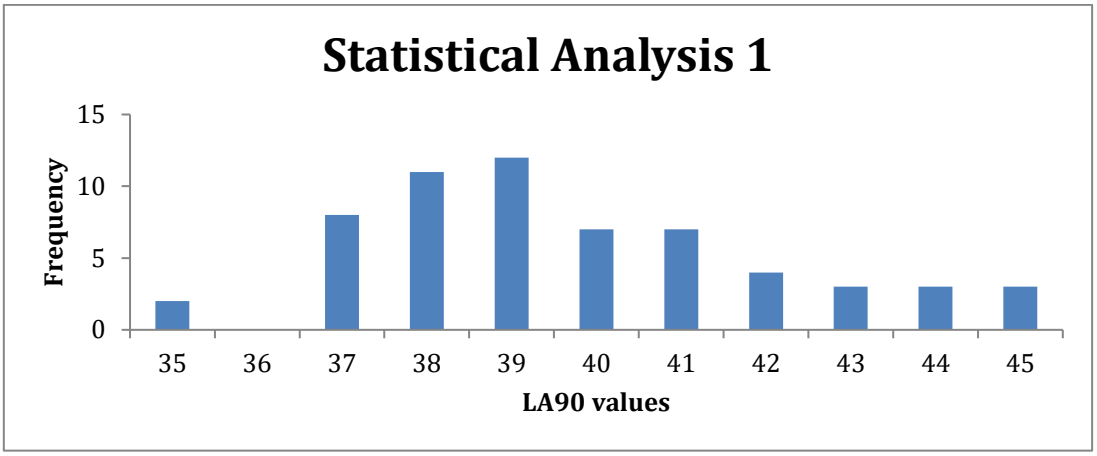


Figure 1

21st Saturday, 17:00-22:00

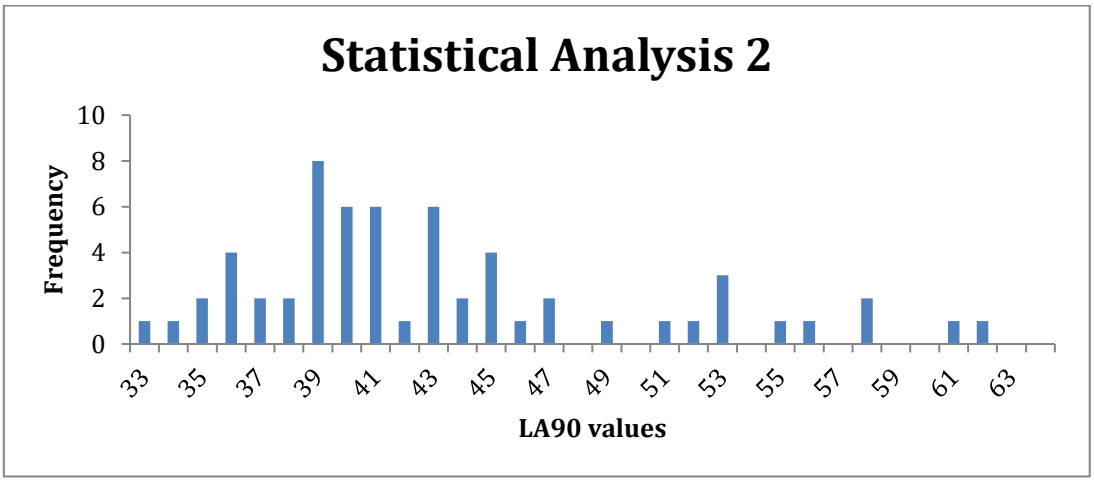


Figure 2

22nd Sunday, 17:00-22:00

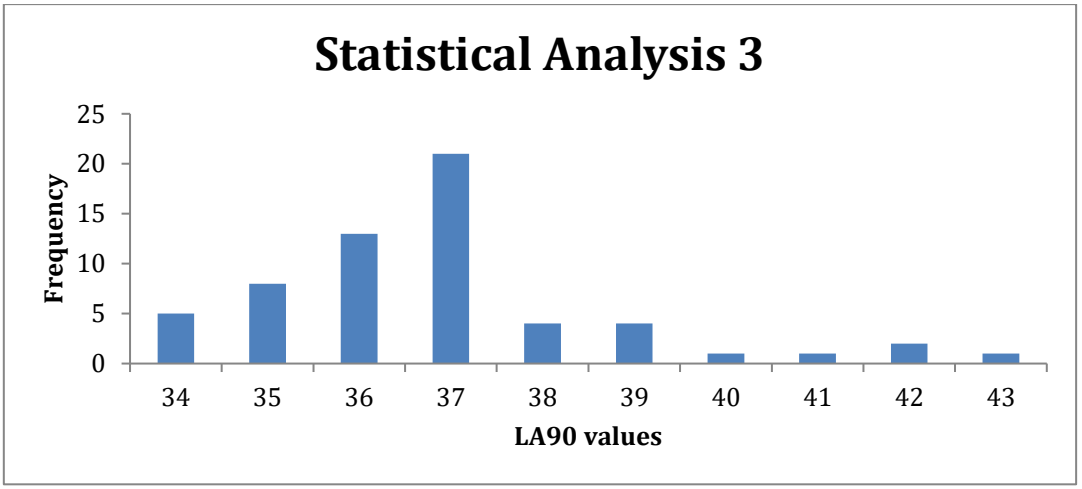


Figure 3

Period	LA90 most repeated values	frequency
20th	39.0	20.0 %
21st	39.0	13.3 %
22nd	**37.0**	**35.0 %**

Table 5

According to the statistical analysis presented above, the most repeated value of LA90 during the peak times of electricity usage is 37.0 dBA, which is the value of the background sound during 35% of the time from the 17:00 to 22:00 period of Sunday 22nd. This is the value that is used in the BS4142 noise impact assessment.

6.3 Noise Impact Assessment

Table 6.0 shows the BS4142 assessment.

Results		Relevant clause	Commentary
Background sound level	37.0	8.3	Most representative value used for background sound level.
Specific sound level at NSR	37.5	7.3.4	Predicted sound level from the sources of sound. Accounting only for spherical propagation.
Acoustic feature correction	+3 dB	9.2	+3dB penalty for tonal component
Rating level	40.5	9.2	Level to be used to assess the impact.
Background sound level	37.0	8	Actual background sound level, without the sources of sound
Excess of rating over the background sound level	40.5-37.0		The specific sound level is 3.5 dB above the background sound level

Table 6.0

Table 7.0 shows the exceedance over the lowest background sound level measured during the environmental noise survey.

Minimum Evening background noise level measured	Specific noise level at NSR	Excess over minimum background noise level
30.6dB	37.5dB	7.1dB

Table 7.0

Table 8.0 shows the increase in ambient noise level expected at the NSR.

Period	**Residual Noise (dB L_{Aeq})**	**Specific Noise at receptor**	**Total Noise (dB L_{Aeq})**	**Difference**	**Impact**
Peak time	42.4	37.5	43.6	1.2	Slight

Table 8.0

Discussion

The BS4142 assessment shows that the specific sound level will be 3.5dB above the background sound level, when considering the peak period of usage. This is an indication of adverse impact. Further analysis has been carried out, comparing the specific noise level to the lowest background sound level measured. The specific sound level will be 7.1dB above the lowest background sound level. This is an indication of adverse impact. The variation between the assessment considering the lowest value and the most repeated value of background sound is low, and does not breach the BS4142 threshold of significant adverse impact. The assessment of the increase in ambient noise level shows a slight increase in ambient noise during peak times. The assessment carried out is considered to be robust and a conservative approach to objectively analysing the impact.

Context must be considered within the assessment and the frequency of usage. The units are expected to be in use for 200 hours per year, this significantly reduces the expected impact at the receiver.

7. Further Mitigation

The level of impact when considering the context and frequency of usage, is expected to be low. To ensure a robust solution is provided and risk is minimised it is advisable to install an acoustic fence around the units. This acoustic fence should have a minimum height of 3m and a minimum density of 10Kg/m2. With such a fence, the noise levels at the NSRS would be as follows.

Receiver	Specific noise level (dBA)
1	**35.4**
2	**33.7**
3	22.2
4	20.6
5	28.0
6	**34.8**
7	21.6
8	32.3

Table 9.0

Results		**Relevant clause**	**Commentary**
Background sound level	35.4	8.3	Most representative value used for background sound level.
Specific sound level at NSR	37.5	7.3.4	Predicted sound level from the sources of sound. Accounting only for spherical propagation.
Acoustic feature correction	+3 dB	9.2	+3dB penalty for tonal component at 50Hz
Rating level	38.4	9.2	Level to be used to assess the impact.
Background sound level	37.0	8	Actual background sound level, without the sources of sound
Excess of rating over the background sound level	38.4-37.0		The specific sound level is 1.4 dB above the background sound level

Table 10.0

Period	**Residual Noise (dB L_{Aeq})**	**Specific Noise at receptor**	**Total Noise (dB L_{Aeq})**	**Difference**	**Impact**
Peak time	42.4	35.4	43.2	0.8	Slight

Table 11.0

The configuration with the fence would further reduce the noise levels at the NSRs by 2dB.

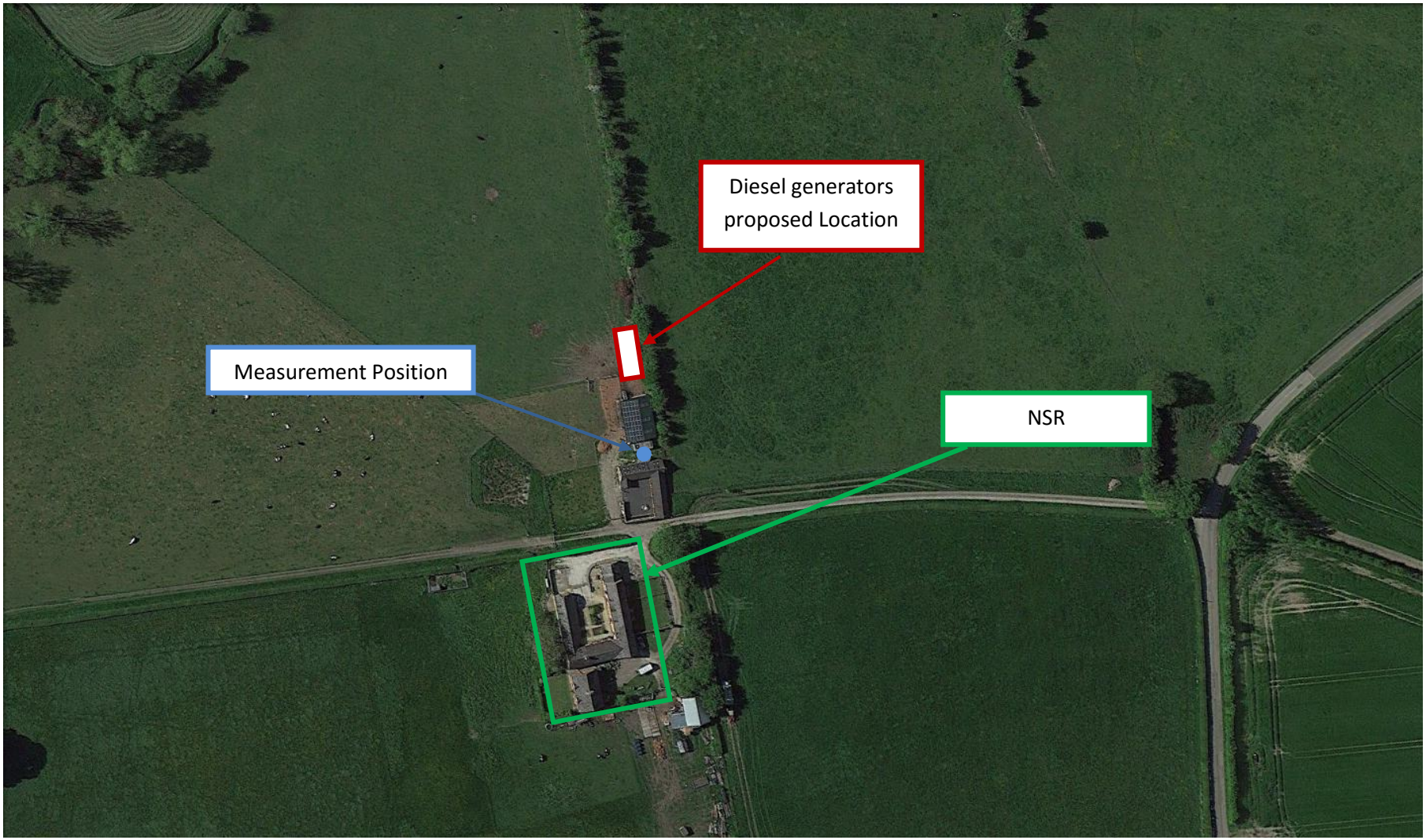
8. Conclusion

An environmental noise survey and noise impact assessment has been undertaken to assess the potential increase in noise levels from te installation of 5 No. Generators, on the surrounding noise sensitive receptors. The measured noise background sound levels have allowed a BS4142:2014 noise assessment to be carried out.

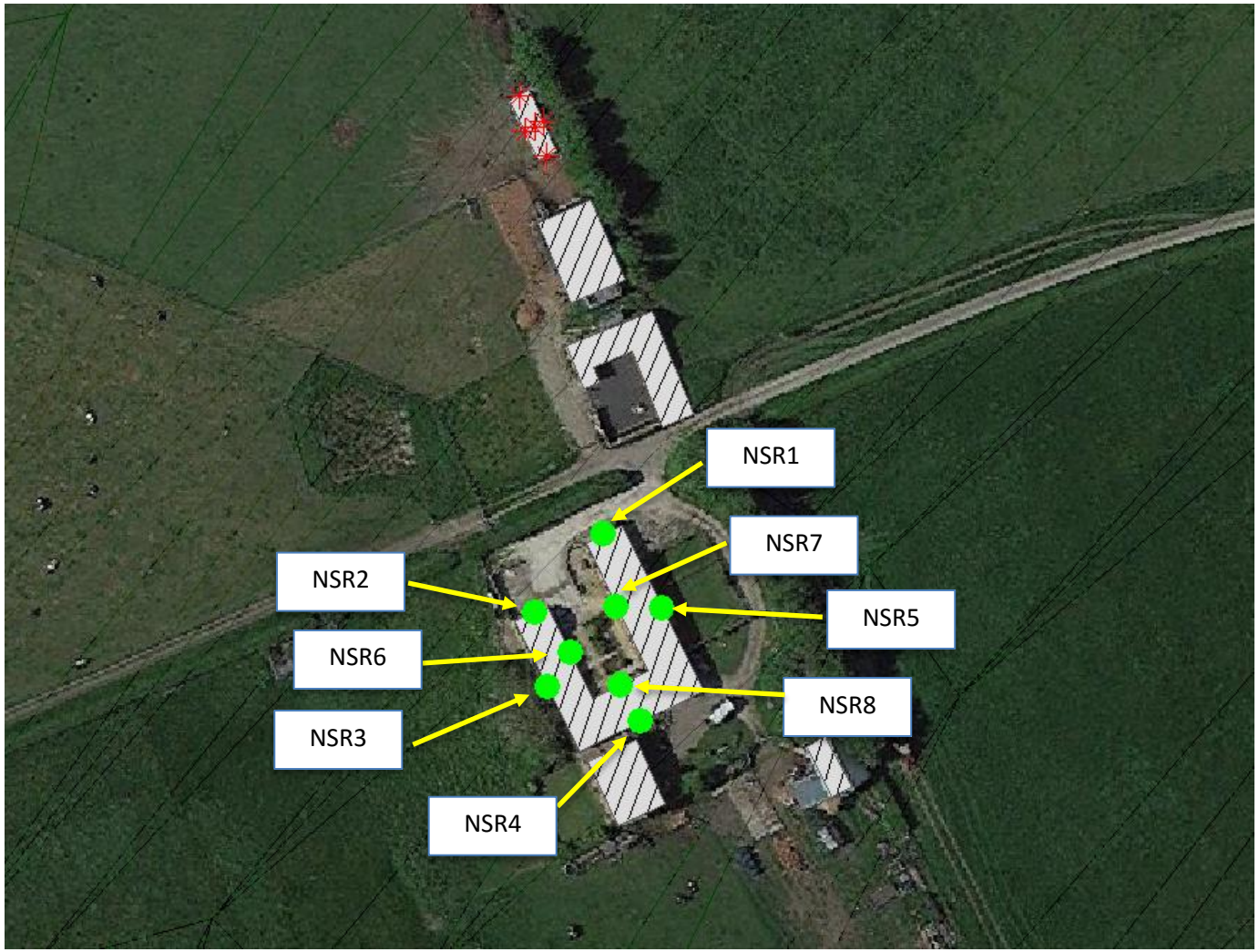
The BS4142 assessment shows that adverse impact is expected, however when considering the context of the assessment, frequency of usage and time of day the units will be in operation, that the impact is expected to be reduced. Further mitigation has been recommended to minimise uncertainty in the predictions presented and ensure the amenity of the NSR's is protected.

The findings of this report will require written approval from the Local Authority prior to work commencing.

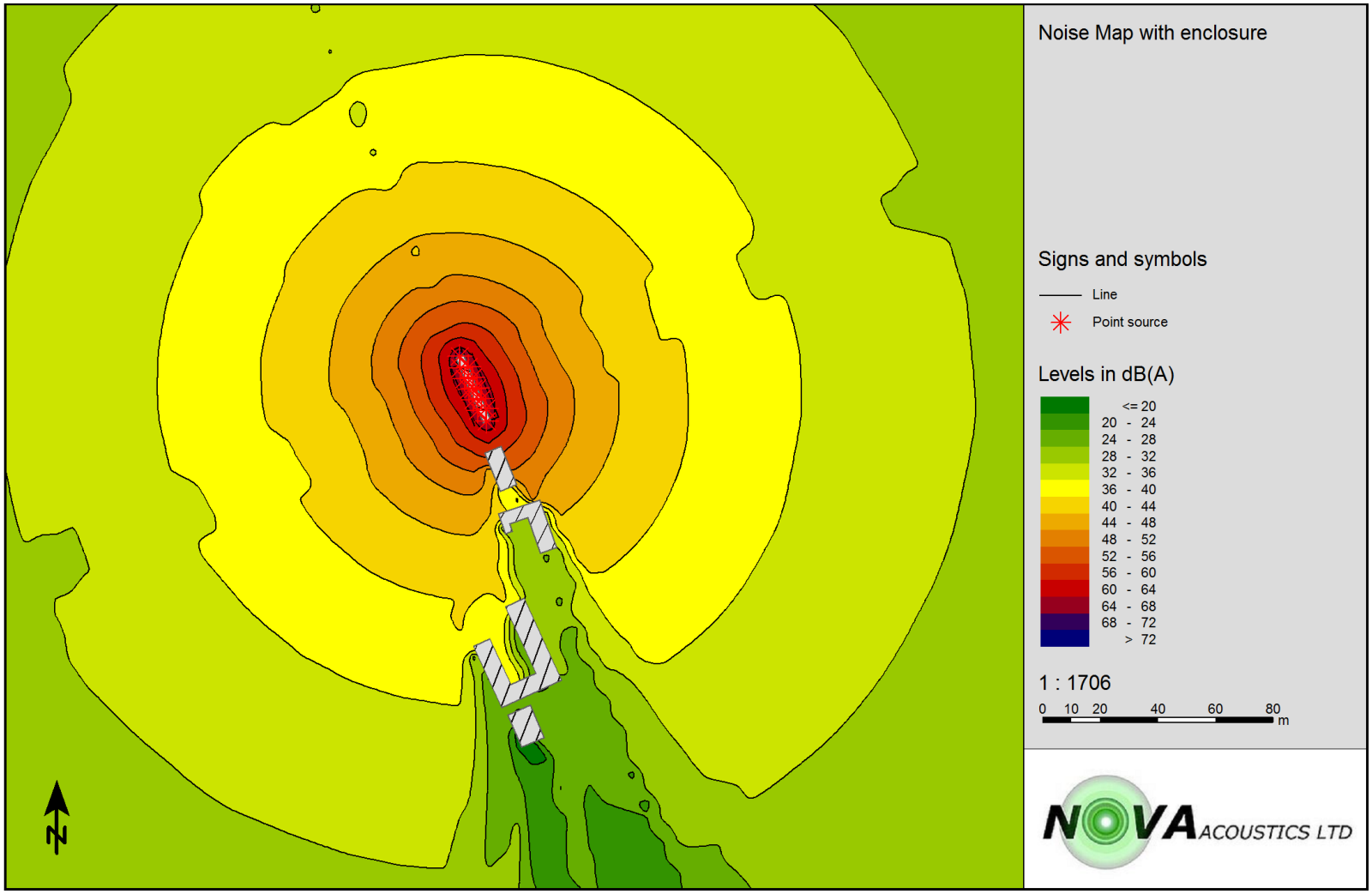
APPENDIX A – SITE PLAN



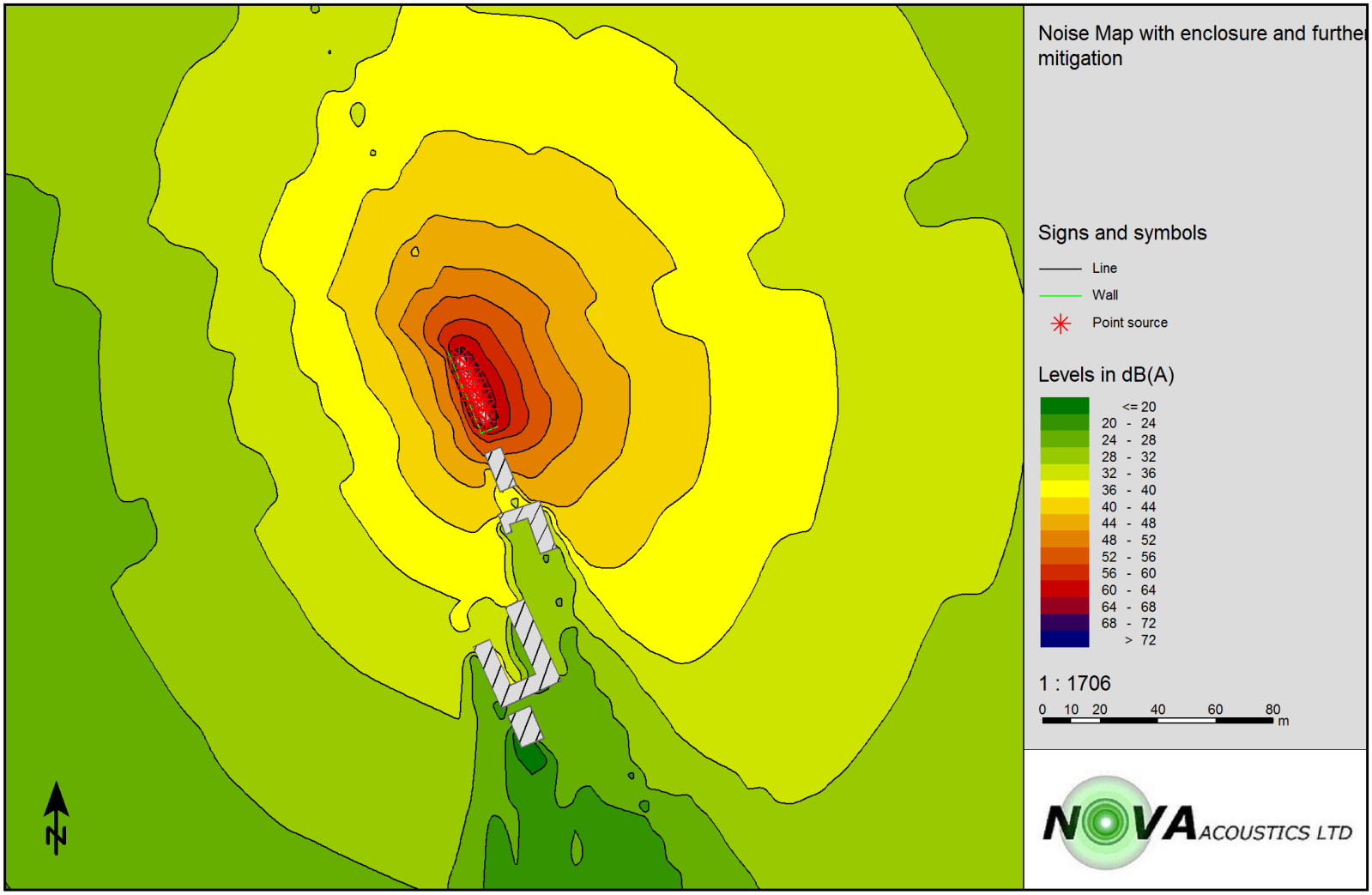
APPENDIX B – NSR location in the acoustic model



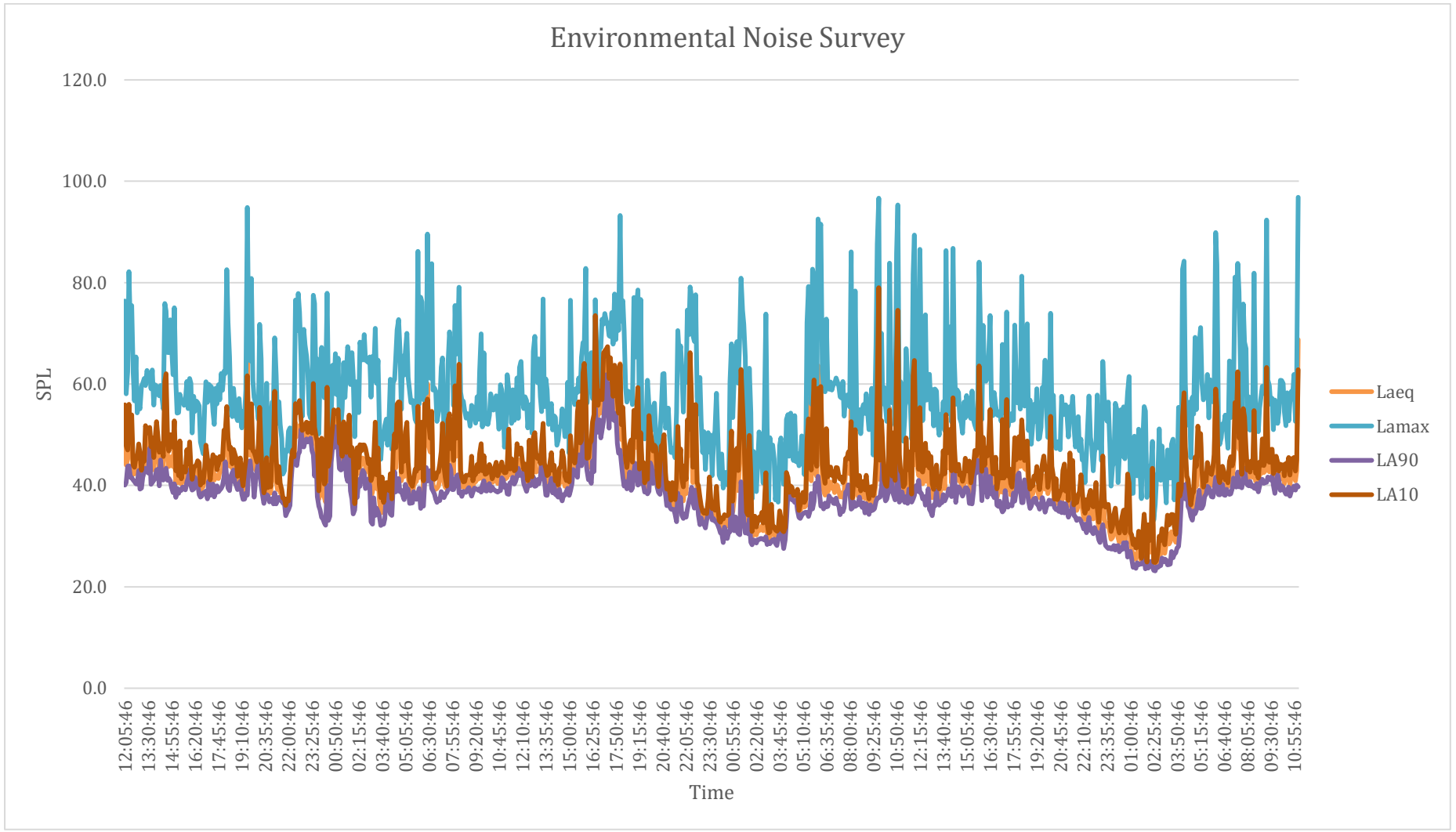
APPENDIX C – Noise Map with enclosure



APPENDIX D – Noise Map with enclosure and further mitigation



APPENDIX E – ENVIRONMENTAL NOISE SURVEY



Disclaimer

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