Emissions

Appendix 4

1. **Noise Impact Assessment (NP 009129-Noise Impact Assessment-Nova Acoustics Ltd Final)**

Noise Impact Assessment of a Waste to Energy Plant

Client:	Nu-Energy Ltd
Address:	Netherlands Way, Stallingborough, Grimsby, DN41 8DF
Date:	27/04/2023

Version	1	2
Authored By	Mr A Garcigoy, MSc MIOA	
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Date	27/04/2023	
Project Number	NP-009129	

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Contents

Tables

Figures

Executive summary

It is proposed that the existing site at Netherlands Way, Stallingborough, Grimsby, DN41 8DF be developed into a Waste to Energy Plant. The plant will operate 24 hours a day and will generate electricity from waste material. As well as the plant there will also be associated HGV movements and staff vehicle movements, with the HGV movements being restricted to 06:00 – 22:00.

An environmental noise survey and noise impact assessment have been undertaken to assess the potential increase in noise levels from the operation of the Waste to Energy Plant on the surrounding noise sensitive receptors. The measured background sound levels have allowed a BS4142:2014+A1:2019 noise assessment and an Increase in Ambient Noise Level assessment to be carried out. Further to this, an increase in ambient noise level due to the percentage increase in road traffic in the surrounding area was also undertaken.

In order to assess various options in terms of the noise impact of the proposed site, two scenarios have been defined as follows:

- Scenario 1 – 06:00 – 22:00 – Both the Waste to Energy Plant running at full capacity along with HGV movements
- Scenario 2 – 22:00 to 06:00 – The Waste to Energy Plant running at full capacity with no HGV movements.

The BS4142 assessment shows that considering both scenarios, we would expect the proposed site to have a low impact on the surrounding NSRs.

The increase in ambient noise level assessment, considering both scenarios, the increase in ambient noise levels is none. Thus, indicating Not Significant impact on the surrounding NSRs.

The increase in noise level due to the percentage increase in road traffic from the plant shows negligible impact with noise levels increasing less than 1dB.

Mitigation measures have been suggested in the body of the report in order to reduce the impact of the site and account for any uncertainties within the predictions presented. An overview of the mitigation measures can be seen below.

Recommendations and Mitigation Overview
• The Turbine Hall and Fuel Bunker require a minimum sound reduction of 55 dB R_w. The construction detail below should achieve the minimum requirements however any other construction detail providing a minimum of 55 dB R_w could also be installed.   ○ 200mm concrete • All other buildings including the Tipping Hall, Boiler Hall, ACC enclosure and Gas Fuel Filter should be constructed of composite sheet with a minimum sound reduction of 25 dB R_w. However, any other construction that provides a minimum of 25 dB R_w could also be installed. • The plans indicate louvred ventilation systems on the eastern façade of the Boiler House. All louvred vents should provide a minimum of 25 dB R_w.

- It is not known if external plant such as AC units will be installed. If they are to be installed, they should be located on the southern or eastern facades fully shielded from the surrounding NSRs.
- All external AC units should not exceed a noise limit level of 30 dB at the closest NSR
- All roller shutter doors require a minimum sound reduction of 25 dB $R_{w.}$

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

1. Introduction

1.1 Overview

NOVA Acoustics Ltd has been commissioned to update a noise assessment for a Waste to Energy Plant ('the Proposed Development') at Netherlands Way, Stallingborough, Grimsby, DN41 8DF ('the Site') ref. 2516NU from 26/07/2018.

This report details the existing background sound climate at the nearest receptors as shown in the previous report 2516NU, as well as the sound emissions associated with the Proposed Development.

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

1.2 Scope & Objectives

The scope of the noise assessment can be summarized as follows:

- Baseline sound monitoring survey to evaluate the prevailing sound levels at the nearest sensitive receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with ISO9613 – 1 prediction methodology to predict sound levels at the NSR.;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England and Wales, BS4142:2014 and other relative standards.

1.3 Legislation, Policy and Guidance

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

- National Planning Policy Framework (2021)
- Noise Policy Statement for England (2010)
- IEMA Guidelines on Noise Impact Assessments
- British Standard BS 4142:2014+A1:2019
- British Standard BS5228:2009+A1:2014

2. Site Description & Background Information

2.1 Site & Surroundings

The proposed site is located on Netherlands Way, Stallingborough, Grimsby, DN41 8DF. The surrounding area is primarily industrial. To the south of the proposed site, there are multiple industrial/commercial units including the following: 'LINCOL Oil', 'Lincs Haulage Solutions' and 'Clayden Engineering Ltd' the majority of which operate between 08:00 – 18:00 however is assumed that there are some night-time operations at the surrounding haulage yards. To the east of the proposed site, there is a Titanium Oxide Processing Facility 'Cristal' which is assumed to run 24 hours per day. To the west of the proposed site, the area is primarily farmland. The closest residential properties to the site are approximately 670m to the northwest and 1.4km to the east. Due to their close proximity to the proposed development, these properties will be considered the closest Noise Sensitive Receptors (NSR).

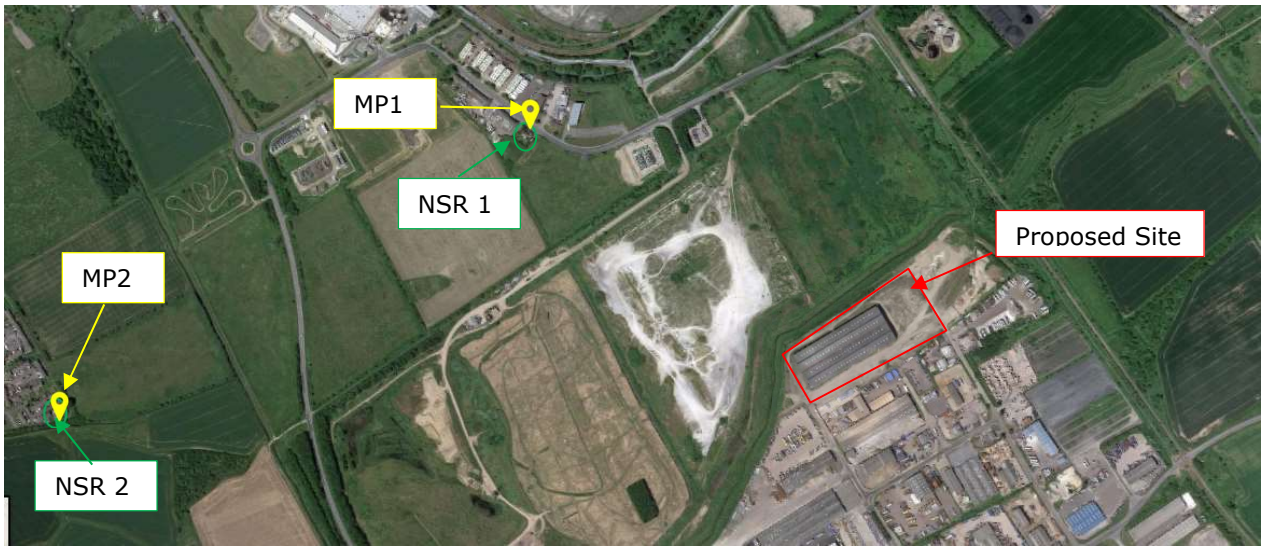


Figure 1.0 - Site and Surroundings

2.2 Background from 2018

The site is currently a disused industrial building. It is proposed that the existing structure be demolished and a Waste to Energy plant be erected. The Waste to Energy Plant will consist of a steel frame / concrete building which will house the combustion chamber, boiler, turbines and waste product filtration system. There will also be an exhaust stack and associated silos.

A brief overview of the operations of the Waste to Energy Plant can be found below:

- Waste material enters site via HGV and all material is tipped from fuel hall into the fuel bunker.
- A crane moves waste material into the combustion hopper.
- The waste material is then burnt using a combustion grate.
- The heat from combustion is used to heat the boiler to create steam.
- The steam is then used to power steam turbines.
- Waste gas and ash are then appropriately treated and filtered and then released via Exhaust stack or collected and taken off site.

A flow chat and annotated diagram can be seen in figure 2.0 and 3.0 below:

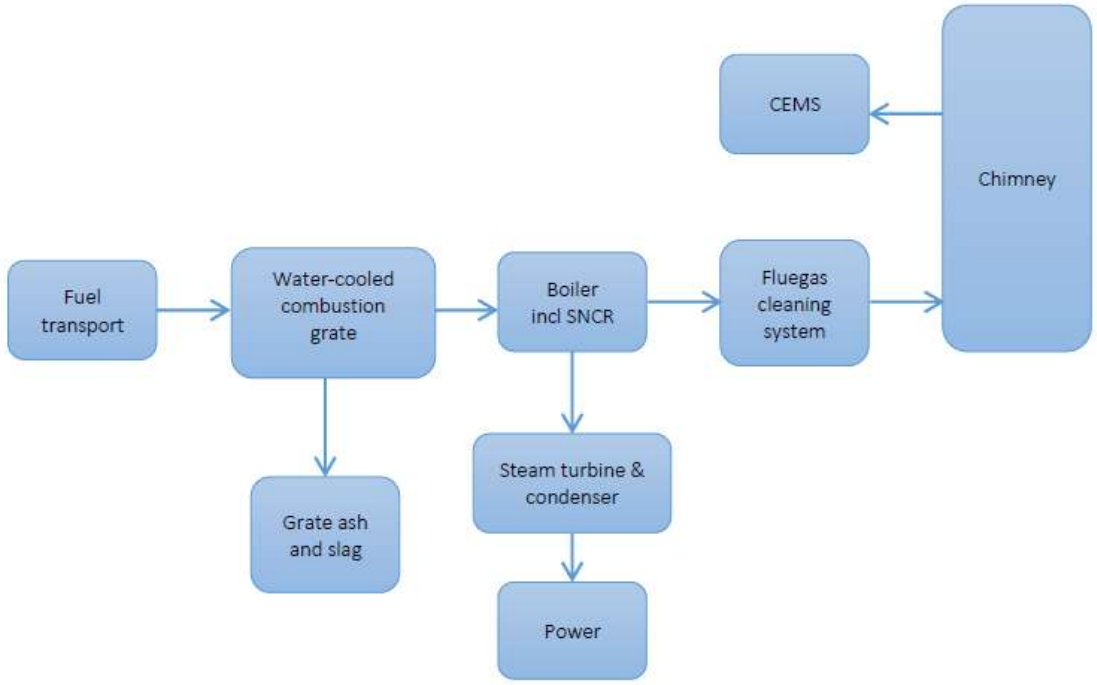


Figure 2.0 - Flow Diagram

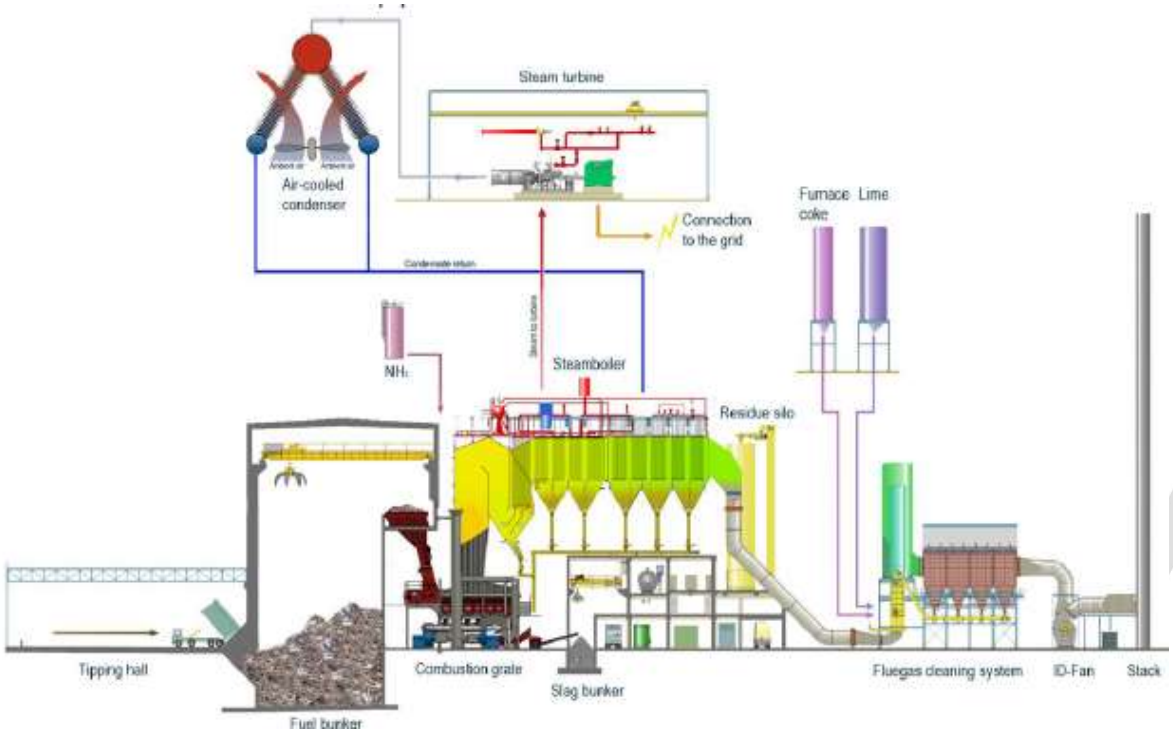


Figure 3.0 - Annotated Diagram

The structure will have the capacity to generate power using two lines and will have two combustion grates, two boilers, two turbines and two waste treatment plants. The total annual power output is expected to be 69.700MWh which has the capacity to power 30,000 homes. It is proposed that the plant run 24 hours per day 7 day per week. Information provided to NOVA Acoustics Ltd states that for the plant to operate efficiently there will be approximately 60 HGV deliveries and 38 staff vehicle movements per 24 hours.

3. Environmental Noise Survey

In order to characterise the sound profile of the area of the proposed development, an environmental sound survey was carried out on 19/06/2018.

3.1 Measurement Methodology

For the sound monitoring, the sound level meter was placed at ground floor level in the vicinity of both NSRs. The microphone was positioned approximately 1.5m away from the ground with no other reflective surfaces within 3m. The monitoring position was chosen in order to collect representative sound levels of the area during the weekday time and night time periods. These positions were representative of the sound levels at the NSR. The measurement position can be found in Figure 1.0.

3.2 Measurement Equipment

Piece of Equipment	Serial No	Calibration Deviation
CESVA SC310 Class 1 Sound Level Meter	T221722	≤0.5
CESVA CB005 Class 1 Calibrator	037771	

Table 1.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective wind shield for the entire measurements period. Calibration certificates can be provided upon request.

3.3 Weather Summary

During the monitoring, the weather was calm with wind speeds of less than 5m/s and no precipitation. The weather conditions were suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise.

3.4 Results

3.4.1 Summary Results

The following table shows a summary of the sound survey results; L_{Aeq}, L_{Amax}, L_{A90} and the L_{A10} for the measurement period.

Measurement Position MP1				
Measurement Period ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Night 1 – 19/06/18 – 05:00 – 07:00	70	95	52	75
Day 1 – 19/06/18 – 07:00 – 08:50	71	93	52	75
Day 1 – 19/06/18 – 21:45 – 22:45	**61**	87	41	70

Measurement Position MP2				
Operational Hours ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Day 1 – 19/06/18 – 09:15 – 11:00	56	83	52	55
Day 1 – 19/06/18 – 22:00 – 23:00	46	65	44	48
Night 2 – 19/06/18 – 23:00 – 01:00	**44**	67	40	46

Table 2.0 – Sound Survey Summary Results

3.4.2 Background Sound Level Summary Results

The following table shows a summary of the background sound level results during the measurement period.

Measurement Position MP1				
Measurement Period ('t')	**$L_{A90,t}$**	**SMR* $L_{A90,t}$**	**Min. $L_{A90,t}$**	**Max. $L_{A90,t}$**
Night 1 – 19/06/18 – 05:00 – 07:00	52	44	43	52
Day 1 – 19/06/18 – 07:00 – 08:50	52	**46**	45	55
Day 1 – 19/06/18 – 21:45 – 22:45	41	**41**	39	43
Measurement Position MP2				
Measurement Period ('t')	**$L_{A90,t}$**	**SMR* $L_{A90,t}$**	**Min. $L_{A90,t}$**	**Max. $L_{A90,t}$**
Day 1 – 19/06/18 – 09:15 – 11:00	52	**49**	46	57
Day 1 – 19/06/18 – 22:00 – 23:00	44	41	40	44
Night 2 – 19/06/18 – 23:00 – 01:00	40	**40**	37	43

Table 3.0 – Background Sound Level Summary Results

**Statistically Most Repeated*

3.5 Subjective Impression & Context

The surrounding acoustic environment at MP1 was moderate to high typical of an industrial/commercial area. The dominant noise source at this location was road traffic noise with a high percentage of HGVs. The commercial/industrial noise from surrounding units was audible but was secondary in nature.

The acoustic environment surrounding MP2 was moderate to low and typical of a residential area. The dominant noise source in this area was road traffic noise however this was moderate to low with the road traffic being that of local residents.

3.6 Assumptions

- It is assumed that the Fuel Bunker and Turbine Halls will be constructed from a minimum 200mm concrete with a minimum sound reduction of 55 dB R_w.
- It is assumed that the remainder of the building including Boiler Hall, Tipping Hall will be constructed from composite sheet with a minimum sound reduction of 25 dB R_w.

- NOVA Acoustics Ltd has been informed that the steam turbine is guaranteed to have a maximum sound pressure of 85 dBA at 1m.
- Internal noise levels within the boiler hall will be a maximum of 95 dBA.

4. Noise Assessment

4.1 BS4142:2014 Noise Assessment

The following assessment defines the specific noise levels at the surrounding NSRs due to the cumulative operations of the proposed site during the day and night time period. Two differing scenarios have been analysed.

4.1.1 Specific Sound Level

The sound sources and relative noise levels that have been inputted into the sound map have been outlined below. The noise data presented has been taken from information provided by the client, noise data measured at similar sites by NOVA Acoustics Ltd and noise impact assessments of similar sites across the UK as well as relative British standards. Further information can be provided upon request. To allow ease of assessment all noise sources inputted into the sound map have been split into three sections: External noise sources, HGV movements, and noise breaking out from the building.

HGV Movements

The table below outlines the expected noise levels due to HGVs manoeuvring around the site during both the day and night-time periods. NOVA Acoustics Ltd has been advised that the HGV movements will be restricted to 06:00 to 22:00 only. In total, the site requires 60 HGV deliveries (120 movements) per 16-hour period. As a robust approach, it is assumed that there will be a maximum of 32 movements per 1-hour daytime assessment period (07:00 – 22:00) and 8 movements per night-time 15min assessment period (06:00 – 07:00).

It has also been considered a site speed limit of 10mph (16kph) and the distance travelled in total as the distance from the site entrance to the furthest end of the loading area, thus representing a conservative scenario as the majority of the lorries will need to drive through a smaller distance. Each movement time has been rounded up to the nearest minute.

Period	L_w (dBA)	Max. No. of Movements	Maximum Distance (m)	Speed (km/h)	Movement Time (minutes)	Time Corrected L_w (dBA)
Day	98.0	32	305	16.0	1.6	96.0
Night	98.0	8	305	16.0	1.6	96.0

Table 4.0 – HGV Specific Sound Level Summary

External Noise Sources

The table below outlines the expected noise levels of all external noise sources, as provided by the client.

Description	Sound Level L_{pA} (dB)	Sound Power L_{wA} (dB)	No. of units
FGT (ID Fan)	85.0	93.0	1

ACC	--	95.0	1

Table 5.0 – External Noise Sources Specific Sound Level Summary

NOVA Acoustics Ltd has been informed that the ID fan has a sound pressure level of 85 dBA at 1m on a free-field condition. Therefore, the sound power level of the ID Fan has been calculated with the formula Lw = Lp + (Q/4*pi*r²); where 'Q' is the Directivity Factor and 'r' is the distance to the source. A 'Q' factor of 2 has been to account for free-field conditions.

The noise emissions of the ACC unit have been taken from the manufacturer's datasheet (SPGDC_Immigham_Proposal_Rev0.pdf) sent by the client, which shows a sound power level of 95 dBA. It has been assumed that the noise will be emanated by the axial fans and also, as a robust approach, by the "heat exchanges bundles". Therefore, the noise emissions of this unit will be modelled as a 95 dBA L_W area source.

Noise Break Out

The following table shows the expected noise break out of the development. The information provided states that internal noise levels will not exceed 85 dBA. However, noise data from previous noise surveys undertaken by NOVA Acoustics Ltd and other noise impact assessments indicate internal noise levels within the Boiler Hall of 95 dBA. To provide a robust and conservative assessment the higher noise level stated above for the Boiler Hall will be used to calculate the noise break out of the building in these areas. Calculated noise levels within the Tipping Hall and Fuel Bunker are based on the noise level of 2 cranes and 2 HGVS tipping simultaneously. The table below indicates the expected sound power of each façade section of the development. The sound power level of each façade is calculated within SoundPlan software assuming: $L_W = L_{P@1m} + 10*\log(S)$.

Noise Breakout Specific Sound Level Summary			
Location	**Internal**	**R_w of Façade**	**External ($L_p - R_w - 6$)**
Tipping Hall	92	25	61
Fuel Bunker	89	55	58
Boiler Hall	95	25	64
Turbine Hall	85	55	24

Table 6.0 –Noise Breakout Specific Sound Level Summary

4.1.2 Noise Modelling

As outlined before, the plant is proposed to operate 24 hours while the HGV movements will be restricted to occur only between 06:00 – 22:00. Therefore, two different scenarios have been assessed they are as follows:

- Scenario 1 – 06:00 – 22:00 – Both the Waste to Energy Plant running at full capacity along with HGV movements
- Scenario 2 – 22:00 to 06:00 – The Waste to Energy Plant running at full capacity with no HGV movements.

The specific sound level at the NSRs has been calculated using SoundPlan 8.0, which undertakes its calculation in accordance with the guidance given in IS09613 – 1:1993 and ISO9613 – 2:1996. The following assumptions have been made within the calculation software:

- To accurately model the land surrounding the development the topographical data has been taken from Google Maps, it is assumed this has an accuracy within the last 3 years.
- The ground between the source and receiver is mixed, 'soft' and 'hard', for the purpose of the assessment the ground has been considered as 'hard'.
- The sound levels stated above have been used to calibrate the sound model.
- The noise emissions of the HGV movements have been modelled as a line source at 1.5m height.
- The noise emissions of the FGT (ID Fan) have been modelled as point sources as per 1816 - 005 - Site plan - Immingham Sec 73 (AK models B).pdf
- The noise emissions of the ACC units have been modelled as area sources.
- For the noise break out, the building fabric elements are deemed to behave as area noise sources which are calculated in the software assuming: $L_W = L_{P@1m} + 10*log(S)$.
- Prediction of two different scenarios as discussed above.

The sound maps showing the specific sound level emissions of the development for both Scenario 1 and 2 can be seen below in Figure 4.0. and 5.0.

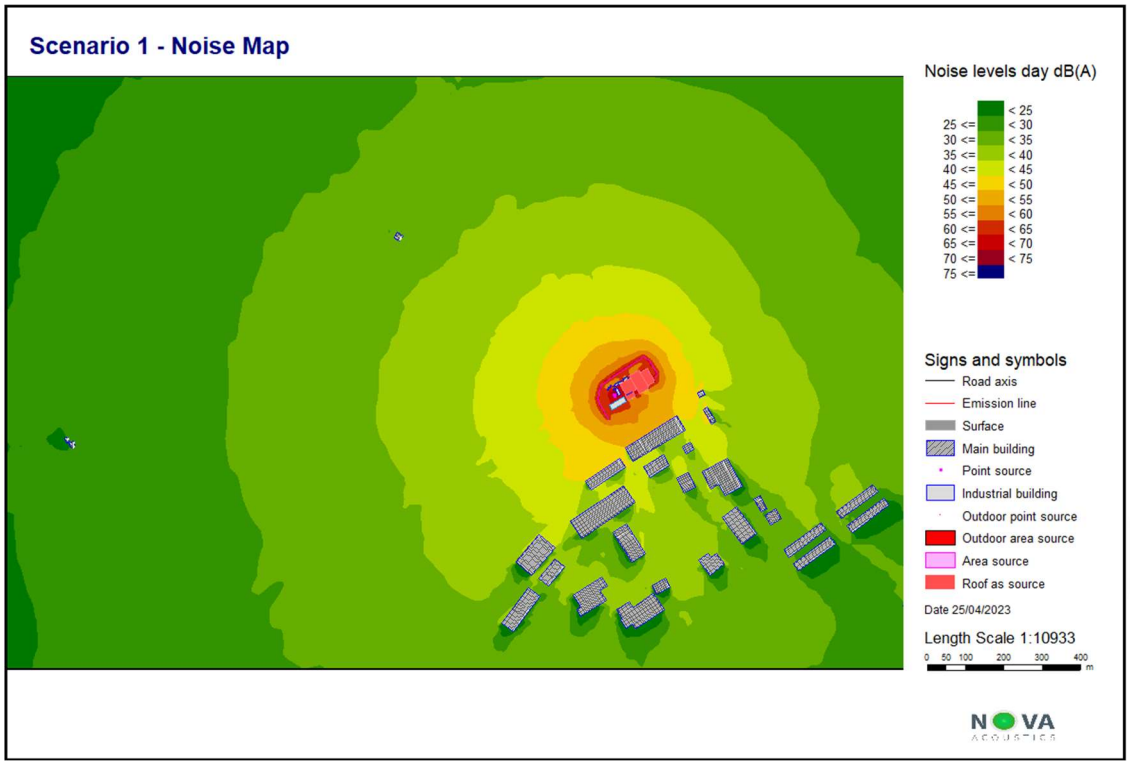


Figure 4.0 – Scenario 1 – Specific Sound Level Map

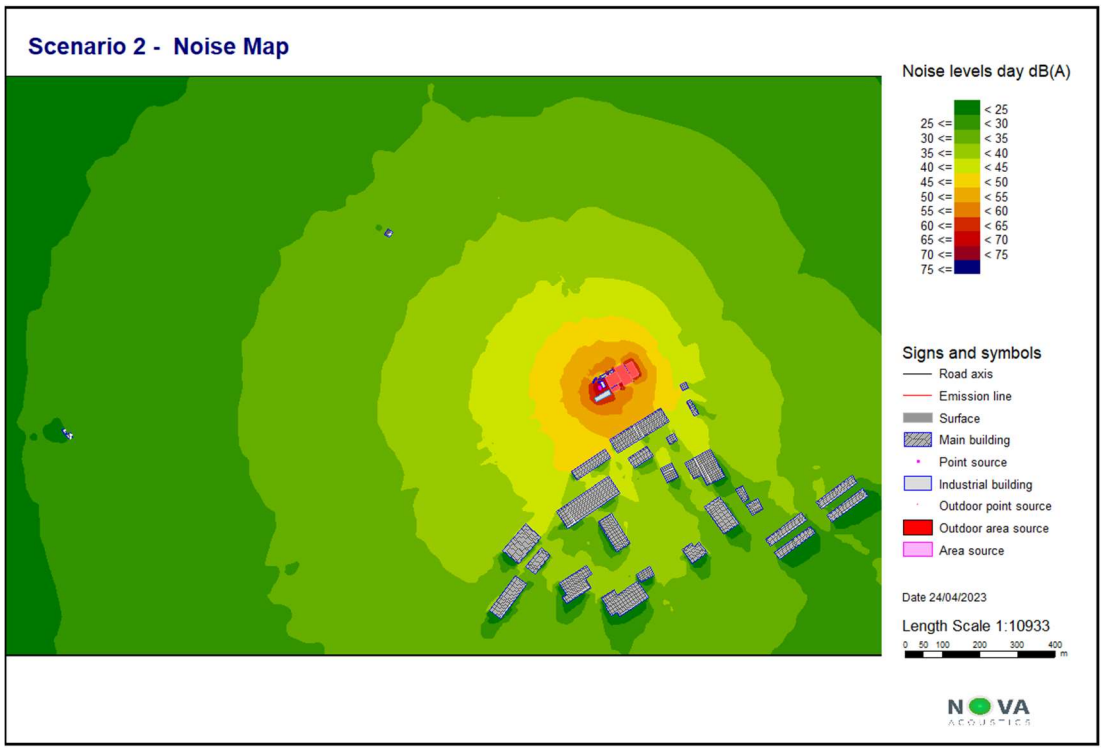


Figure 5.0 – Scenario 2 – Specific Sound Level Map

A summary of the specific sound levels at the NSRs, based on the sound maps shown in the figures above can be seen in the following tables.

Specific Sound Level (dBA)		
NSR	**Scenario 1**	**Scenario 2**
1	36.0	35.0
2	29.0	29.0

Table 7.0 – Specific Sound Level at NSR Summary

4.1.3 Rating Level

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

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

a) subjective method;

b) objective method for tonality;

c) reference method."

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

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

a) Tonality

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

b) Impulsivity

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

c) Other Sound Characteristics

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

d) Intermittency

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

Rating Penalty Assessment

Considering the requirements of the rating penalty, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in the following table.

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
1	--	--	--	--	Due to the distance between source and receiver as well as the context of the surrounding area it is deemed that there will be no acoustic
2	--	--	--	--	

					characteristics definable at the NSRs

Table 8.0 – Rating Penalty Assessment

Rating Level

Incorporating the rating penalties with the specific sound levels, the rating sound levels have been derived and have been detailed in the following table.

Rating Sound Level (dBA)		
NSR	**Scenario 1**	**Scenario 2**
1	36.0	35.0
2	29.0	29.0

Table 9.0 – Summary of Rating Sound Levels

4.1.4 BS4142 Assessment

The rating sound level has been assessed in accordance with BS4142:2014 at all NSRs. The BS4142:2014 assessment at the NSR, during the quietest period (night-time), can be seen in the tables below. It is known that if no exceedance is presented for night-time, then, no exceedance will be for daytime.

BS4142 Assessment Scenario 1			
Results	**NSR 1 (dB)**	**NSR 2 (dB)**	**Notes**
Rating Sound Level	36.0	29.0	As shown in Table 10.0
Operational Period Background Sound Level	41.0	40.0	As shown in Table 11.0
Excess of Rating over Background Sound Level	-5.0	-11.0	Assessment Indicates a 'Low Impact'.
BS4142 Assessment Scenario 2			
Results	**NSR 1 (dB)**	**NSR 2 (dB)**	**Notes**
Rating Sound Level	35.0	29.0	As shown in Table 10.0
Operational Period Background Sound Level	41.0	40.0	As shown in Table 11.0
Excess of Rating over Background Sound Level	-6.0	-11.0	Assessment Indicates a 'Low Impact'.

Table 10.0 – BS4142:2014 Assessment

Discussion

As can be seen in the assessments above, considering both scenarios, we would expect the proposed site to have low impact on the surrounding NSRs.

4.2 Increase in Ambient Noise Level Assessment

The following section analyses the expected increase in ambient noise levels in the surrounding area due to the proposed development. The specific sound levels associated with the proposed development are logarithmically added to the lowest measured residual sound level. The higher the increase in noise levels the higher the impact.

Increase in Ambient Noise Level Assessment				
Description	**Scenario 1 (dB)**		**Scenario 2 (dB)**	
	NSR 1	**NSR 2**	**NSR 1**	**NSR 2**
Lowest Measured Ambient Noise Level	61.0	44.0	61.0	44.0
Specific Noise Level	36.0	29.0	35.0	29.0
Resulting Noise Level	61.0	44.0	61.0	44.0
Increase in Noise Level	+0.0	+0.0	+0.0	+0.0
Expected impact	None	None	None	None

Table 11.0 –Increase in Ambient Noise Level Assessment

Discussion

As can be seen in the assessments above; In both scenarios, the increase in ambient noise levels is none. Thus, indicating negligible impact on the surrounding NSRs.

4.3 Traffic Increase in Ambient Noise Level Assessment

The following section analyses the expected increase in ambient noise levels in the surrounding area due to the proposed increase in road traffic. Daily traffic flow data from the A1173 in 2016 has been taken from the Department of Transport database. No Data from 2017 or 2018 was available. The existing traffic noise level in the area has been predicted using the methodology stated in CRTN. This is then compared with the expected noise level with the percentage of increased road traffic from the development.

The table below outlines the expected vehicle movements from the Site and the existing vehicle movements in the area.

Description	HGVs per day	Cars per day	Total Movements per day
2016 Traffic Flow	722	3278	4000
Traffic from Proposed Site	60	38	98
Expected Total Traffic Flow	782	3316	4098
Percentage Increase	8.3	1.2	2.5

Table 12.0 –Traffic Flow Percentage Increase

As can be seen in the table above the total percentage increase in road traffic due to the development is 2.5%. An assessment of the traffic flow data between 2011 and 2016 shows that the percentage increase in road traffic each year ranges from 2.5 – 4.0%. considering the data used in the assessment is six years old we would expect the actual percentage increase in road traffic to be lower than stated.

The table below shows the expected increase in traffic noise levels in the area. According to the IEMA Guidelines on Noise Impact, the higher the increase in noise level the higher the potential for adverse impact.

Increase in Ambient Traffic Noise Assessment		
Description	**No Development**	**With Development**
Total Traffic	4000	4086
Total HGVs	722	782
Percentage of HGVs	18.1	19.1
Basic Noise Level $L_{10,18hour}$	65.1	65.2
Correction for HGVs and speed (60kph)	2.4	3.0
Road Surface Correction	-1	-1
Total road traffic noise in the area	66.5	67.2
Increase in noise levels	+0.7	
Expected Impact	Not Significant	

Table 13.0 –Traffic Flow Percentage Increase

Discussion

As can be seen in the assessment above the increase in traffic noise in the area due to the development is 0.7 dB. According to the IEMA Guidelines on Noise Impact, an increase in the noise level of this magnitude is Not Significant and thus indicates low impact.

4.4 Recommendations and Mitigation

The following section outlines the mitigation measures that are necessary to reduce the impact of the Proposed Development.

- The Turbine Hall and Fuel Bunker require a minimum sound reduction of 55 dB R_w. The construction detail below should achieve the minimum requirements however any other construction detail providing a minimum of 55 dB R_w could also be installed.
    - 200mm concrete
- All other buildings including the Tipping Hall, Boiler Hall, ACC enclosure and Gas Fuel Filter should be constructed of composite sheet with a minimum sound reduction of 25 dB R_w. However, any other construction that provides a minimum of 25 dB R_w could also be installed.
- The plans indicate louvred ventilation systems on the eastern façade of the Boiler House. All louvred vents should provide a minimum of 25 dB R_w.
- It is not known if external plant such as AC units will be installed. If they are to be installed, they should be located on the southern or eastern facades fully shielded from the surrounding NSRs.
- All external AC units should not exceed a noise limit level of 30 dB at the closest NSR
- All roller shutter doors require a minimum sound reduction of 25 dB R_w.

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

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

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

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

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

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

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

Appendix B – Legislation, Policy and Guidance

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

National Planning Policy Framework (2021)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2021. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 174e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 185 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Noise Policy Statement for England (2010)

Paragraph 185 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life;
- Where possible, contribute to the improvement of health and quality of life.

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that "significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development".

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: "where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'

Overview

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

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

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the

consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

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

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

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

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

e) Tonality

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

f) Impulsivity

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

g) Other Sound Characteristics

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

h) Intermittency

BS4142:2014 states that when the "specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time

interval which contains the greatest total amount of on time … if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."

Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a 'typical' background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142:2014 states: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

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

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;

- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore classified as No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

IEMA Guidelines on Noise Impact Assessments

The IEMA Guidelines for Environmental Noise Assessment address the key principles of noise impact assessment and are applicable to all development proposals where noise effects may occur. The guidelines set out key principles for noise impact assessment relevant to all types of project regardless of size. The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed. The guidance recognizes that the effect associated with a noise impact will be dependent on a number of factors including but not limited to the sensitivity of the receptor, frequency and duration of the noise source and time of day. The Guidelines accept that a simple change in noise levels using a single noise indicator may fail to adequately reveal the actual noise impact of the proposal. The character of the noise must be considered and the Guidelines suggest comparing several noise indicators such as the LAeq, LAmax and LA90 as a more rigorous approach.

Absolute levels such as those set out in WHO Guidelines are also considered and the Guidelines suggest that a change in noise levels in an area where the existing levels are above WHO Guidelines should be considered as having more of an adverse effect than a change in noise levels in an area where existing levels are well below.

The Guidelines stop short of providing specific assessment criteria which developments should achieve but instead suggests that the methodology adopted should be selected on a site by site basis regarding relevant national and local standards.

The Guidelines contain effect descriptors for changes in noise levels and for noise effect levels. These are summarized below:

Effect Descriptors	
Very substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise sensitive receptor, or a 5 to 9.9 dB LAeq change in sound level at a receptor of great sensitivity to noise

Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5dB LAeq change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 14.0 – IEMA Guidelines effect descriptors

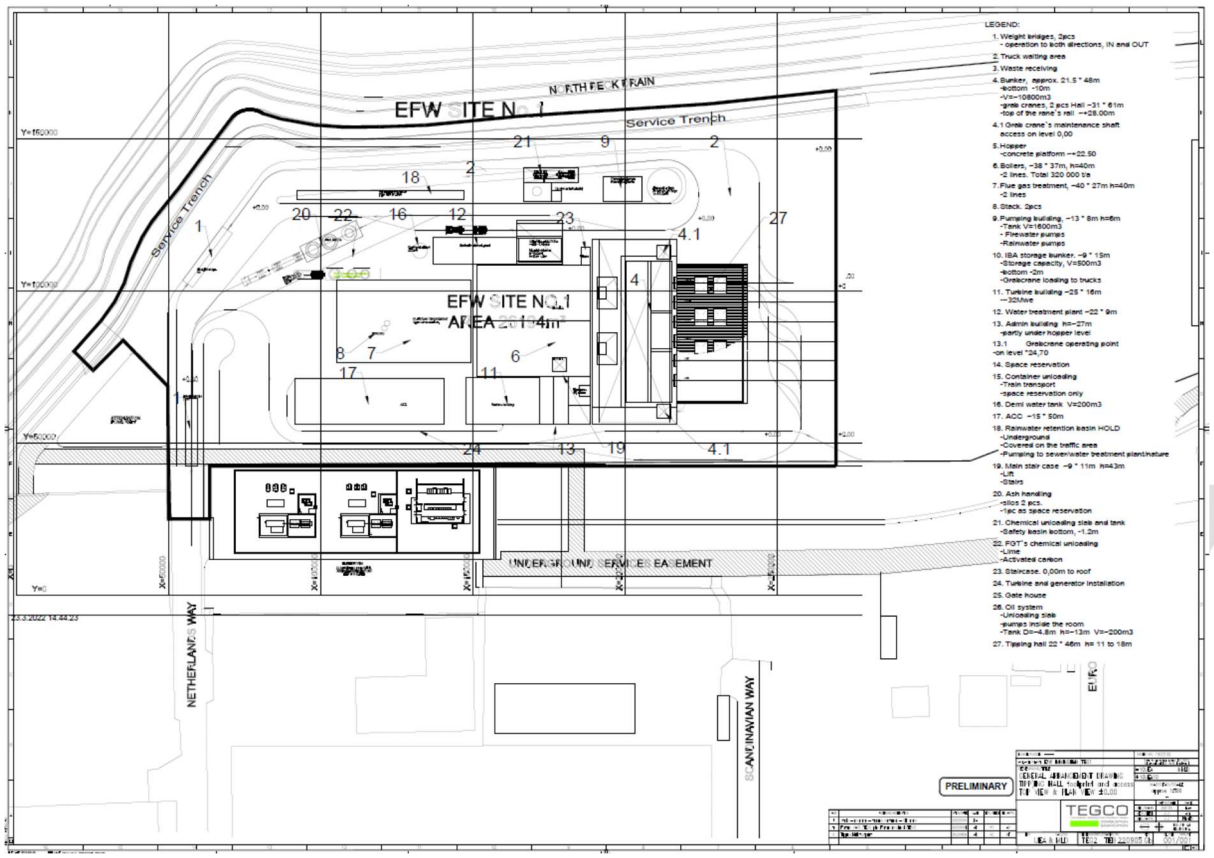
Noise Effect Level		
Time	**Lowest Observed Adverse Effect Level**	**Significant Observed Adverse Effect Level**
07:00 - 23:00	50 dB $L_{Aeq,16\ hour}$	60 dB $L_{Aeq,16\ hour}$
23:00 - 07:00	40 dB $L_{Aeq,8\ hour}$	55 dB $L_{Aeq,8\ hour}$
	60 dB L_{AFMax} (at the facade)	80 dB L_{AFMax} (at the facade)

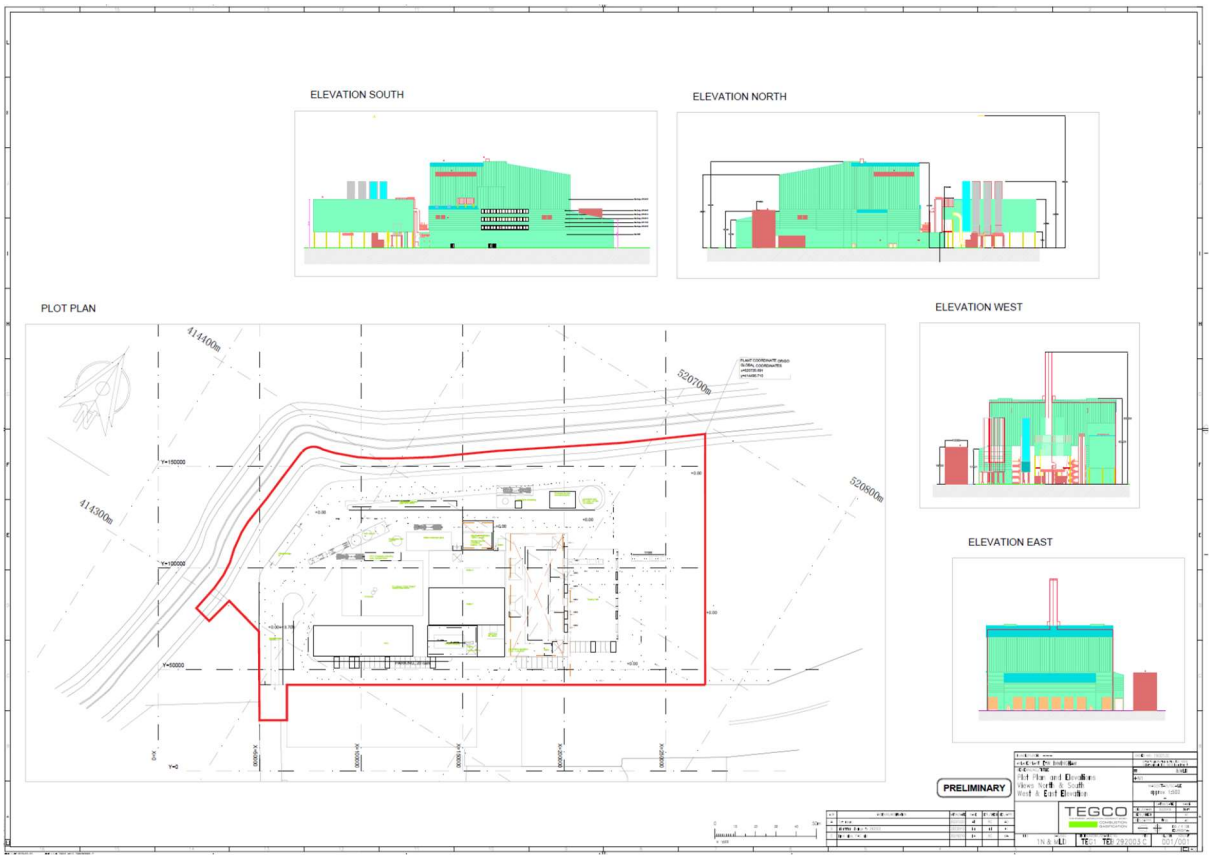
Table 15.0 – IEMA Guidelines noise effect level

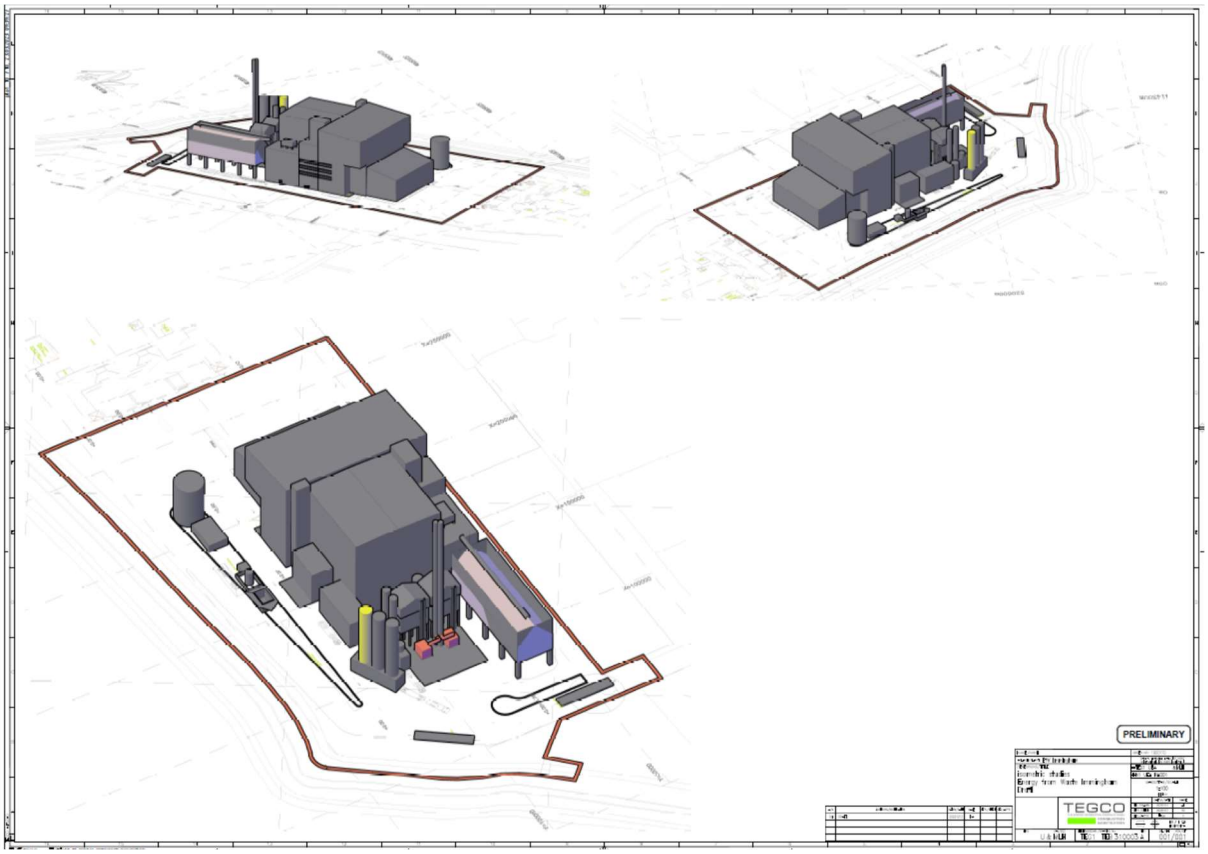
The Guidelines are not prescriptive as to how a noise impact assessment should be carried out, and allow assessors to consider factors such as frequency spectra, days and times of operation, frequency of operation and any other factor which allows the noise to be assessed in context.

Appendix C - Location Plan

Appendix D – Site Plans




ELEVATION SOUTH
ELEVATION NORTH
PLOT PLAN
ELEVATION WEST
ELEVATION EAST
414400m
414300m
520700m
520800m
PRELIMINARY
TEGCO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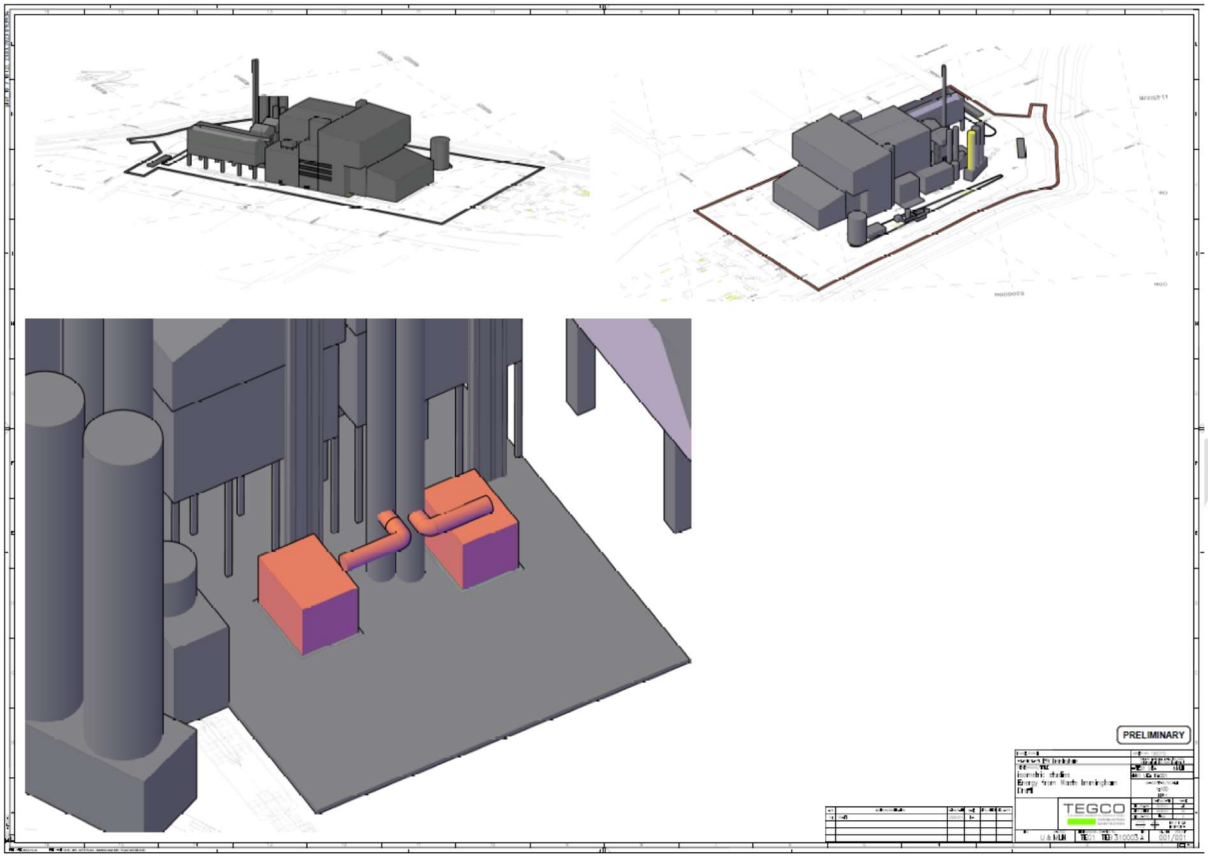
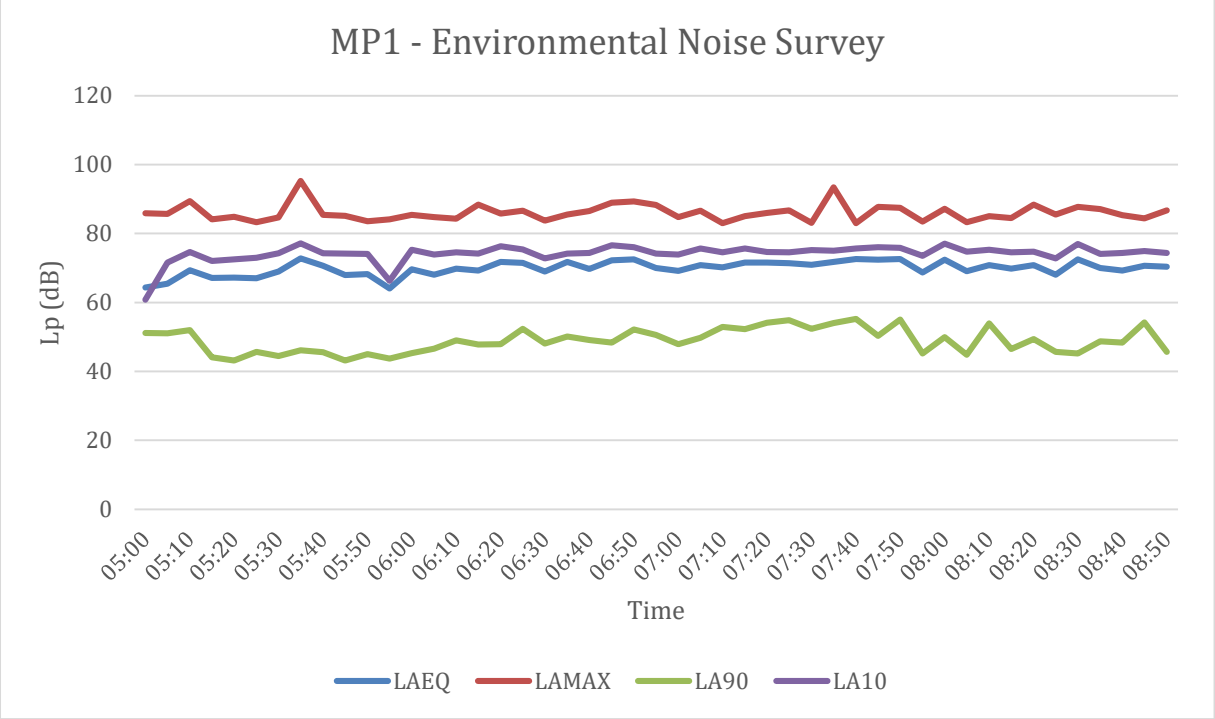
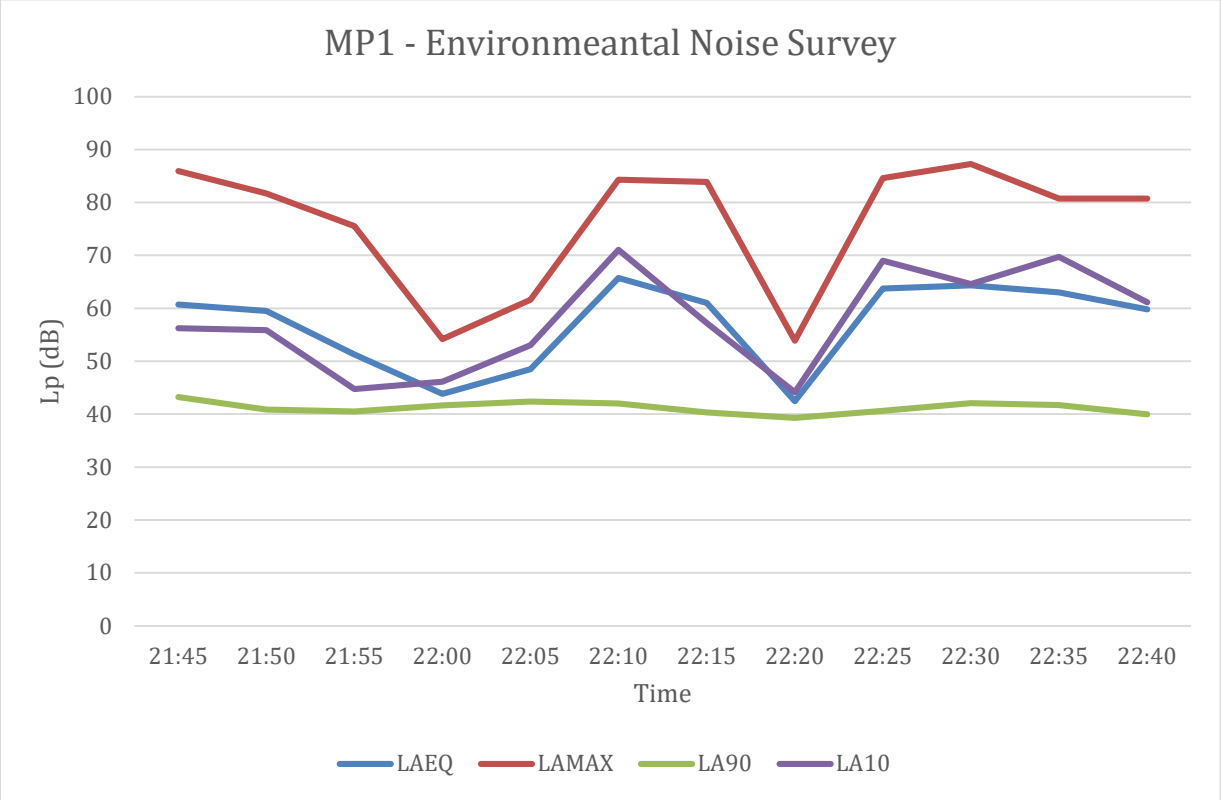
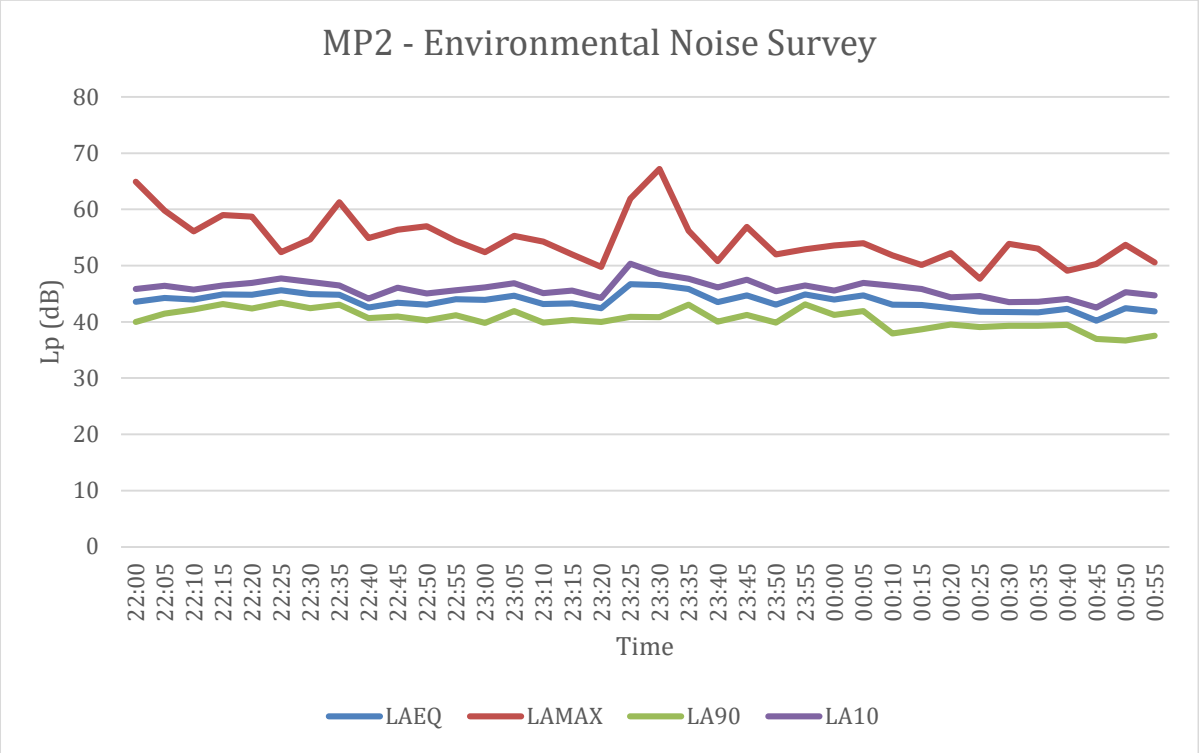
TEGCO

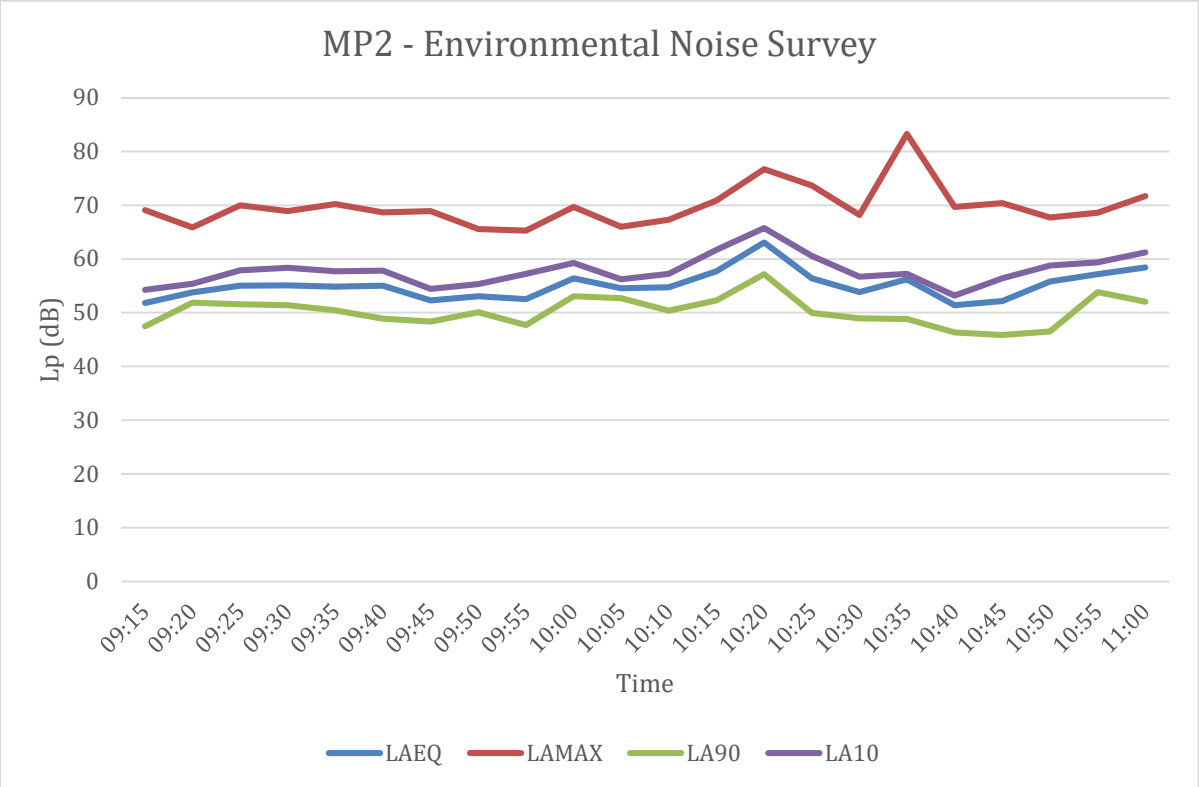

PRELIMINARY
TEGCO

Appendix E – Environmental Sound Survey






MP2 - Environmental Noise Survey
Lp (dB)
80
70
60
50
40
30
20
10
0
22:00
22:05
22:10
22:15
22:20
22:25
22:30
22:35
22:40
22:45
22:50
22:55
23:00
23:05
23:10
23:15
23:20
23:25
23:30
23:35
23:40
23:45
23:50
23:55
00:00
00:05
00:10
00:15
00:20
00:25
00:30
00:35
00:40
00:45
00:50
00:55
Time
LAEQ
LAMAX
LA90
LA10


MP2 - Environmental Noise Survey
Lp (dB)
90
80
70
60
50
40
30
20
10
0
09:15
09:20
09:25
09:30
09:35
09:40
09:45
09:50
09:55
10:00
10:05
10:10
10:15
10:20
10:25
10:30
10:35
10:40
10:45
10:50
10:55
11:00
Time
LAEQ
LAMAX
LA90
LA10