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THORNFIELD 001 LIMITED

BARNES FARM ANAEROBIC DIGESTION FACILITY

ENVIRONMENTAL RISK ASSESSMENT

NOVEMBER 2022

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ENVIRONMENTAL RISK ASSESSMENT

NOVEMBER 2022

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1 INTRODUCTION

1.1.1 Wardell Armstrong LLP has been commissioned by Thornfield 001 Ltd ("the operator") to prepare an Environmental Risk Assessment support its application to vary the environmental permit (EPR/VP3506PE) for its Barnes Farm Anaerobic Digestion Plant in Rowton, Telford.

1.1.2 The facility is an anaerobic digestion facility permitted to treat up to 90,000 tonnes of biodegradable waste to generate biomethane (gas) for the National Grid and a PAS 110 compliant digestate, which is sold as a land improvement applications. The site is also permitted for a number of directly associated activities (DAAs) which support the process.

1.1.3 The proposed variation includes addition of a centrifuge oil separator to the process, which will separate oil from the biodegradable waste before pasteurisation. Additionally, the two permitted CHP biogas engines will be replaced with a single natural gas CHP engine, powered by upgraded gas directly from the plant before it enters the National Grid.

1.1.4 A review and update to the site's environmental risk assessment is provided below, including additional control measures to minimise risk of environmental harm.

2 SITE SETTING

2.1.1 The site is surrounded by agricultural land, the nearest human receptors being based at Melverley Farm, 340m to the west and occupiers of the Barnes Farmhouse and Barnes Farm Cottages themselves. There are no SSSIs or European Sites within 10km of the site boundary.

2.1.2 Table 1.1 below identifies the receptors within 1km of the facility their distance.

Table 1.1 Receptors within 1km of the Anaerobic Digestion Facility

Receptor	Type of receptor	Approximate distance from facility
Barnes Cottages	Residential	75m
Barnes Farm House	Residential	390m
Stone House	Residential	425m
Melverley Farm and campsite	Residential	340m
Rowton	Residential	730m
Waters Upton	Residential	850m

2.1.3 The site is not in a source protection zone but the site is on superficial deposits of Devensian Till, which is underlain by sandstone bedrock which forms a Principal Aquifer. There is a private water supply provided by a borehole at the adjacent farm.

3 ENVIRONMENTAL RISK ASSESSMENT

Table 3:1 Risk Assessment for Thornfield 001, Barnes Farm Anaerobic Digestion Facility

Risk	Nature of risk	Severity	Likelihood Without Mitigation	Mitigation Measures (Design and Operational)	Actual Risk With Mitigation Measures
Emissions of toxic compounds to air	Emissions from CHP engines. Impact on air quality and possible impact on health Potential for acid deposition.	Medium	Medium	The change from bio-gas to natural gas will see a reduction in emissions due to use of a cleaner fuel. Previous higher levels of emissions were assessed as acceptable and permitted (see ST16938 AQ-001 Air Quality Assessment, 2019)	Very low
Pollution of surface waters	Spillages and leaks from pipes, tanks and other containment. Leaks during loading and unloading. Loss of containment from oils and other polluting fluids from containers and storage.	Medium	Medium	An impermeable sealed surface is provided that does not allow transmission of fluids. All waste delivery/offloading areas at the site are provided with this surfacing and kerbing to contain spills. There are shut-off and non-return valves at offloading points. All deliveries are supervised, and levels in the liquid feed tank are checked prior to off-loading to ensure that there is adequate capacity. Staff are trained on the actions to take in the event of a spill. All tanks, vessels and tankers are constructed from materials that are chemically resistant to corrosion from wastes they contain and are located in a suitably sized bund. Oil and other polluting fluids are contained in suitable containers within a bund or drip tray.	Very low
Pollution of ground waters	Spillages, leaks and loss of liquids and wastes to the ground.	Medium	Medium	An impermeable sealed surface is provided that does not allow transmission of fluids. All waste delivery/offloading areas at the site are provided with this surfacing and kerbing to contain spills. There are shut-off and non-return valves at offloading points.	Very low

Table 3:1 Risk Assessment for Thornfield 001, Barnes Farm Anaerobic Digestion Facility					
Risk	**Nature of risk**	**Severity**	**Likelihood Without Mitigation**	**Mitigation Measures (Design and Operational)**	**Actual Risk With Mitigation Measures**
				All deliveries are supervised, and levels in the liquid feed tank are checked prior to off-loading to ensure that there is adequate capacity. Staff are trained on the actions to take in the event of a spill. All tanks and vessels are constructed from materials that are chemically resistant to corrosion from wastes they contain and are located in a suitably sized bund constructed from reinforced concrete with sealed joints. Oil and other polluting fluids are contained in suitable containers within a bund or drip tray.	
Containment failure - polluting wastes released	Catastrophic failure of tanks and vessels from gas build up, overpressure or other failure of containment. Failure of oil or fluid containers causing spills and resulting in pollution. Spillage of liquid waste deliveries or pipe failure.	Medium	Low	There are overpressure and non-return valves on all tanks. Tanks have contents and fill gauges and deliveries are supervised. Biogas production is carefully monitored from the dedicated control room. There is an emergency flare at the site, should biogas pressure build up the flare will burn off excess gas. The digestion process is carefully monitored to minimise foam or other issues. Tanks are subject to regular inspection and will be repaired/ replaced as required. Bunding is provided around all tanks. The bund is capable of holding 110% of the contents of the largest tank and is constructed from impermeable reinforced concrete with sealed joints. This is inspected	Very low

Table 3:1 Risk Assessment for Thornfield 001, Barnes Farm Anaerobic Digestion Facility					
Risk	**Nature of risk**	**Severity**	**Likelihood Without Mitigation**	**Mitigation Measures (Design and Operational)**	**Actual Risk With Mitigation Measures**
				and maintained. The bund conforms to the guidance given in CIRIA 736.	
Odour	Release of odour from wastes reception, storage, pre-treatment and processing. Release of odour from other activities at the site including flare and gas clean-up.	Medium	Low	All aspects of the waste delivery, storage and treatment are within sealed, appropriately constructed tanks and vessels. All operations take place in sealed pipes and vessels to ensure wastes are never directly open to the air. All emissions to air from tanks, oil separator and treatment plants are emitted via a carbon filter to remove odorous compounds. Regular checks by trained site staff are carried out to ensure there are no emissions. Biogas is managed effectively to minimise the risk of pressure relief valves opening. Should gas build up a flare will be provided at the site and this will combust the gas at a minimum of 1,000°C for 3 seconds, which will destroy odorous compounds.	Very low
Noise	Noise nuisance for site neighbours and environment	Medium	Low	The main risk of noise is from waste deliveries, waste treatment and the use of pumps on site. All pumps are maintained in accordance with the manufacturer's instructions to ensure they do not present an unacceptable noise risk. A noise assessment is provided as Appendix 1, demonstrating that the addition of the oil separator is unlikely to very low risk of noise.	Very low
Dust and particulates	Effects to neighbours of the site from dusty emissions covering property. Effects on	Medium	Very low	Waste types are inherently non-dust producing, comprising wet food wastes and similar materials delivered by an enclosed tanker.	Very low

Table 3:1 Risk Assessment for Thornfield 001, Barnes Farm Anaerobic Digestion Facility					
Risk	**Nature of risk**	**Severity**	**Likelihood Without Mitigation**	**Mitigation Measures (Design and Operational)**	**Actual Risk With Mitigation Measures**
	wildlife and health from dusty emissions			During process, waste is not allowed to dry out and is contained within the digestion process throughout. All areas of the site are subject to good housekeeping and cleansing as necessary.	
Pests/vermin	Attraction of vermin, flies and birds from the use of waste on the site.	Medium	Low	Wastes is delivered directly to and treated in sealed tanks and vessels, which will prevent access by any pests and vermin on-site. Housekeeping measures, including inspections for pests and vermin are carried out and a local pest control contractor will be brought to site if there is evidence of a pest problem.	Very low

4 POSITIVE IMPACTS AND CONCLUSIONS

4.1.1 The risk assessment demonstrates that the new activities are considered to be adequately controlled, effectively preventing or minimising emissions.

4.1.2 Environmental control measures in place include adequate bunding and odour abatement using activated carbon filters on breathing vents for the bio-oil tank and centrifuge. An update to the Odour Management Plan has been included with the application for completeness, however changes are limited to reference to the new plant, which utilises existing odour control measures and principles.

4.1.3 A noise assessment is provided in Appendix 1, demonstrating that noise from the new oil separator is likely to be inaudible against existing background sound levels, therefore very unlikely to cause noise pollution.

4.1.4 The new natural gas CHP unit will replace the currently permitted CHP units and will use a cleaner fuel resulting in lower emissions from energy generation on site.

4.1.5 As far as possible natural gas will be sourced from after the gas to grid unit. This fuel is of biological origin, operating within the short carbon cycle. That is the CHP units will not use fossil fuels.

4.1.6 The changes to the permit are therefore demonstrated to be acceptable.

APPENDIX 1

Noise Assessment Report

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NOISE ASSESSMENT REPORT

NOVEMBER 2022

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THORNFIELD 001 LIMITED

THORNFIELD ENERGY

NOISE ASSESSMENT REPORT

NOVEMBER 2022

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EXECUTIVE SUMMARY

Wardell Armstrong LLP has carried out a noise assessment to accompany a planning application for the proposed installation of a combined heat and power biogas engine (CHP) and oil separator at the existing Thornfield 001 Energy site (Barnes Farm) in Rowton, Telford.

A baseline sound survey was undertaken in October 2022, at existing residential dwellings near to the existing anaerobic digestion (AD) plant, during the day and night-time periods. The noise survey data was used to assess the potential noise impact of the development upon nearby receptors.

Noise modelling was undertaken to predict the potential noise impact from the Proposed Development at the nearest existing sensitive receptors.

The results of the noise modelling predictions demonstrate that any noise associated with the Proposed Development is likely to be below the background sound levels at the nearest sensitive receptors. On this basis, no mitigation measures are proposed, and existing sensitive receptors would not experience any adverse effect due to noise relating to the proposed new plant items at Thornfield Energy.

When considering the proposals in accordance with national planning guidance, the predicted noise impact is below the Lowest Observed Adverse Effect Level (LOAEL), and is therefore, not a significant consideration when determining the planning application.

1 INTRODUCTION

1.1.1 Wardell Armstrong LLP (WA) was commissioned to undertake a noise impact assessment to accompany a planning application for the proposed installation of a new gas fired CHP and an oil separation plant at the existing Thornfield 001 Energy site (Barnes Farm) in Rowton, Telford.

1.1.2 Planning permission was granted for the development in September 2016 (Planning Reference: TWC/2016/0315) for the erection of an on-farm anaerobic digestion (AD) plant, for the processing of agricultural manures, crop and crop residues, together with earthworks, bunding, weighbridge, improved site access and landscaping.

1.1.3 The site now currently operates an AD Plant and a Gas to Grid Plant. The AD Plant treats organic waste and a large proportion of the biogas which is produced from the AD process is currently fed into the Gas to Grid plant to be upgraded for export into the National Gas Grid network.

1.1.4 The assessment detailed in this report considers the potential noise impact from the new equipment to be installed at the Site, at the nearest existing sensitive receptors which are located to the north and to the west.

1.1.5 The report assesses the results of baseline noise monitoring and noise modelling carried out in accordance with current guidance and considers any need for noise mitigation if and where appropriate to comply with national planning policy and British Standards.

2 ASSESSMENT METHODOLOGY

2.1.1 The noise assessment has considered the following standards and guidance:

- National Planning Policy Framework, 2021 (NPPF).
- Noise Policy Statement for England (2010) (NPSE)
- Planning Practice Guidance – Noise (2019).
- British Standard BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS4142).
- British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings (BS8233:2014).

2.1.2 Further details of these documents are included in **Appendix A.**

2.2 Proposed Development

2.2.1 We understand that the intention is to install a CHP and oil separator at the existing Barnes Farm site. The arrangement of the proposed plant items is shown in drawing 'Oil- 08082022-001' which is attached to this report.

2.3 Scope of Assessment

2.3.1 This report details the following:

- The baseline sound survey carried out to determine the background sound levels at the nearest existing sensitive receptors (ESRs), to inform the noise assessment.
- Specific sound measurements of an operational oil separator at an alternative AD site in Hemswell, to obtain representative data to be used in the assessment.
- A computer noise model to predict the emissions from the proposed CHP and oil separator, and resultant noise levels at ESRs.
- A full BS4142 assessment of the likely impacts at the nearest ESRs to the proposed oil separator and CHP, quantifying the additional noise impact.

2.4 Existing Sensitive Receptors

2.4.1 The receptors detailed in Table 1 below have been considered as part of this assessment.

2.4.2 Other receptors beyond those identified may be impacted by the development proposals, however the impact is expected to be equal to or less than the receptors listed, based upon distance to the site.

2.4.3 The locations of the ESRs are shown on Figure 1.

Table 1: Existing Sensitive Receptors for Consideration in the Noise Assessment

Receptor	Receptor Location	Grid Reference		Bearing from Site
		North	West	
ESR1	Property North of Barns Farm, Telford TF6 6QX	52°46'27.6"N	2°33'35.2"W	North, 365m
ESR2	Melverley Farm, Telford TF6 6QX	52°46'14.7"N	2°34'04.9"W	West, 370m

3 NOISE SURVEY

3.1 Introduction

3.1.1 On Monday 10th and Tuesday 11th October 2022, WA carried out a noise survey to measure existing ambient and background sound levels at ESRs in the vicinity of the existing Thornfield Energy site.

3.1.2 Unattended measurements were taken at two Monitoring Locations (ML1 and ML2) to capture the background sound levels. The monitoring location is shown on Figure 1.

3.1.3 Table shows the monitoring periods, together with associated observations which were undertaken during the installation and decommissioning of the sound level meters.

Table 2: Noise Monitoring Periods

Monitoring Location	Start Date and Time	Finish Date and Time
ML1 – Representative of Existing Dwellings to the north of the existing Thornfield Energy site.	10/10/2022 15:30:00 PM	11/10/2022 16:00:00 PM
ML2 – Representative of dwelling at Melverley Farm to the west.	10/10/2022 14:30:00 PM	11/10/2022 15:30:00 PM

3.1.4 During the monitoring periods, distant road traffic noise from the A442 to the east was dominant. Agricultural activity noise from S V Taylor & Partners Dairy Farm (adjacent to Thornfield Energy) was also audible during the daytime. The activity included tractor and truck movements to and from the farm sheds.

3.1.5 Very low-level plant noise was occasionally audible from existing operations at Thornfield Energy at both monitoring locations. Other noise sources noted during the survey were occasional vehicles passing on the local country lanes.

3.1.6 The noise measurements were made using two Class 1, integrating sound level meters. The microphones were mounted on tripods 1.5m above the ground and more than 3.5 metres from any other reflecting surfaces. The sound level meters were calibrated to a reference level of 94dB at 1kHz both before and on completion of the noise survey. No significant drift in the calibration during the survey was noted.

3.1.7 A-weighted[1] L_{eqs}[2], maximum sound pressure levels, A-weighted L_{90s}[3], A-weighted L_{10s}[4] were measured and are presented in full in Appendix B.

3.2 Meteorological Conditions

3.2.1 The weather conditions were obtained on site during the noise survey. On the 10th and 11th October 2022, the weather conditions were as follows:

- Temperatures between 3 and 11°C.
- NW winds with speeds up to 9m/s until 1800 hours on 10th October. This reduced after 1800 hours on 10th October and for the remainder of the survey, wind speeds ranged between 0.4 and 5m/s (NW and SE).
- Dry and overcast.

3.2.2 Noise levels recorded prior to 1800 hours on 10th October have been excluded from the overall noise levels used for the assessment because windspeeds were above the acceptable limit.

3.3 Existing Background Noise Levels

3.3.1 The noise measurements obtained at ML1 and ML2 have been analysed to establish representative background sound levels for the daytime and night-time periods as required by BS4142.

3.3.2 Section 8 of BS4142 provides guidance on the selection of the background sound to be used in the assessment. BS4142 states that the background sound levels used for the assessment should be representative of the period being assessed (i.e., daytime, or night-time periods), and that there is no "single" background sound level.

3.3.3 Therefore, an assessment of the measured background sound levels is required to select the most appropriate and representative background sound level. An assessment has been carried out based upon the measured sound levels during the daytime and night-time.

3.3.4 Further analysis of the background sound levels for the assessment is shown in Charts B1 – B4 of Appendix B.

[1] A' Weighting — An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.
[2] L_{eqs} — Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.
[3] L_{90} — The noise level which is exceeded for 90% of the measurement period.
[4] L_{10} — The noise level which is exceeded for 10% of the measurement period.

3.3.5 Table 3 below presents the representative background sound levels measured at each monitoring location, alongside average ambient noise levels and maximum noise levels for additional context of the baseline sound environment. The maximum noise levels presented are the 10th highest recorded in accordance with ProPG: Planning and Noise.

Table 3: Summary of Measured Noise Levels

Monitoring Location	Daytime			Night-time		
	Background Noise Level (dB L_{A90})	Ambient Noise Level (dB L_{Aeq})	Maximum Noise Level (dB $L_{AF,Max}$)	Background Noise Level (dB L_{A90})	Ambient Noise Level (dB L_{Aeq})	Maximum Noise Level (dB $L_{AF,Max}$)
ML1	35	53	82	34	44	61
ML2	32	46	69	29	39	50

4 ASSUMPTIONS, LIMITATIONS AND UNCERTAINTY

4.1 Introduction

4.1.1 This assessment makes the following assumptions and limitations.

4.2 Assumptions

4.2.1 The following assumptions have been made:

- Noise emissions are predicted at a height of 1.5 m above ground level during the daytime period, and 4.5m during the night-time, to represent the typical usage of a dwelling.
- The assessment assumes the site operates 100% of the time, day and night, therefore the proposed oil separator will be operational 100% of the time. This presents a worst-case scenario.
- The proposed installation location of the CHP and oil separator has been determined from the scale drawings prepared by BioteCH_4 Ltd (drawing reference 'Oil- 08082022-001').
- A window open at 20% provides around 13 dB of noise attenuation.[5]

4.3 Limitations

4.3.1 The noise model has been created using SoundPLAN version 8.2, which uses the noise prediction methodology set out in *ISO 9613-2:1996 'Attenuation of sound during propagation outdoors*' which accounts for downwind propagation.

4.3.2 SoundPLAN takes into account the effects of ground attenuation, in which the total area to be calculated is assigned a coefficient based upon the ratio of soft to hard surfaces. For this model, the coefficient 0.75 has been assigned (where 1 = soft and 0 = hard), as the surrounding area to the site is predominantly soft ground.

4.3.3 Care has been taken when setting up the noise model to ensure its accuracy, and that it represents the proposed site layout and the local environment local area (i.e., topography and existing buildings), however, some assumptions have had to be made which might limit the accuracy of the output of the model to a small degree. Assumptions used to inform the computer noise model have been stated above.

[5] Acoustics, Ventilation and Overheating – Residential Design Guide, January 2020

4.4 Uncertainty

4.4.1 To reduce measurement uncertainty the following steps have been taken:

- The background sound measurement locations were selected to be representative of the background sound levels at the closest receptors to the site. In accordance with guidance, the sound level meters were mounted vertically on tripods 1.5m above the ground. The monitoring locations were also more than 3.5 metres from any other reflecting surfaces.
- The background sound measurement data is from suitable weather conditions only.
- The baseline sound monitoring was undertaken over approximately 24 continuous hours, and then analysed to establish the most representative background sound level of a typical 1-hour period for the daytime and 15-minute period for the night-time, where periods of unsuitable weather conditions have been excluded from the overall results.
- The results of each measurement period are reported to the nearest 0.1dB; and;
- Noise measurements were made using Class 1, integrating sound level meters.

5 INDUSTRIAL NOISE MODEL

5.1 Modelling Assumptions

5.1.1 The following plant items are proposed as part of the development:

- A natural gas fired CHP (1 engine, with 1.2MW electrical output), which will run on gas from the gas to grid plant;
- Installation of an oil separator to remove vegetable oil after the pasteurisation unit, for recycling into biofuel or similar use.

5.1.2 The plant items listed above have been modelled using the modelling software SoundPLAN 8.2.

5.1.3 Details of how each proposed plant item have been modelled are described below.

5.2 Oil Separator Measurements

5.2.1 On Tuesday 19th October 2022, Wardell Armstrong carried out a site visit to a similar existing operational AD energy site in Hemswell, where the proposed oil separator plant is currently undergoing a trial operational period.

5.2.2 The oil separator is approximately 1.5m high and runs uniformly 100% of the time in which the Site is operational. The main source of noise from the oil separator is a motor situated approximately 0.5m above ground level.

5.2.3 Specific sound measurements were obtained of the oil separator with the microphone positioned 1m from the motor. The data collected was used to convert the sound pressure level of the plant into an overall sound power level.

5.2.4 Table 4 below details the linear sound power levels (dB) of the oil separator per octave band, and the overall a-weighted sound power level (dBA).

Table 4: Measured Oil Separator Sound Power Levels

Plant Item	Sound Power Level (dB) per Octave Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	Overall L_w (dBA)
Oil Separator	103	92	88	86	80	82	72	63	89

5.2.5 The noise emissions of the oil separator, as shown in Table 4, have been input into the modelling software SoundPLAN 8.2 and used to calculate the noise level of the proposed plant as it would be experienced at the nearest ESRs, located to the north and to the west.

5.2.6 The oil separator has been modelled as a point source at a height of 1m.

5.3 CHP

5.3.1 During the site visit to Hemswell on Tuesday 19th October, WA also carried out specific sound measurements of three simultaneously running CHPs. The measurement was conducted at a distance of 10m from the three CHPs. Table 5 below details the calculated, distance corrected linear sound power levels (dB) of the three CHPs measured per octave band, and the overall a-weighted sound power level (dBA).

Table 5: CHP Sound Power Levels

Plant Item	Sound Power Level (dB) per Octave Frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	Overall Lw (dBA)
CHP	102	104	98	94	91	88	86	78	97

5.3.2 The approximate sound power level of one CHP unit has been calculated using the data above. The resulting sound power level representative of one CHP is 92.5 dBA $L_{w,}$ which has been used in the noise model, where the CHP has been input as a point source, at a height of 7m as a worst-case scenario, to account for the flare stack.

5.3.3 The results of the noise model are detailed in the following section.

6 BS4142 ASSESSMENT

6.1 Modelling of the Specific Industrial Sound

6.1.1 The specific sound levels from the proposed oil separator have been predicted at each of the ESRs. In accordance with BS4142, the specific sound levels for the daytime and night-time have been presented for 1-hour (daytime) and 15-minute (night-time) periods respectively. The predicted specific sound levels, rounded to the nearest dB, are presented in Table 6.

6.1.2 Note that the daytime receptors have been modelled at a hight of 1.5m to represent a typical person standing in their garden. The night-time receptors have been modelled at 4m high to represent a typical scenario in which case people would most likely be in their bedrooms on the first floor above ground floor level. This difference in receptor height accounts for the difference between the daytime and night-time specific noise levels, despite the plant operating the same during both time periods.

Table 6: Predicted Specific Sound Levels

Description	Daytime $L_{Aeq,\ 1\text{-}hour}$ (dB)		Night-time $L_{Aeq,\ 15min}$ (dB)	
	ESR1	ESR2	ESR1	ESR2
Specific Noise Level (dB)	29	26	31	28

6.2 Selection of the Background Sound

6.2.1 The baseline sound level data discussed in Section 3 above shows the representative background sound levels as summarised in Table 7.

Table 7: Representative Background Sound Levels

Monitoring Location	Daytime Background Sound Level (dB $L_{A90,1hour}$)	Night-time Background Sound Level (dB $L_{A90,15min}$)
ML1	35	34
ML2	32	29

6.3 Rating level

6.3.1 BS4142 includes guidance on the application of an additional weighting which should be applied to the specific sound level should the industrial noise be tonal, impulsive, intermittent or have any other characteristics that are readily distinctive against the residual acoustic environment, as experienced at receptors.

6.3.2 The specific noise levels from the CHP and oil separator are below the background sound levels measured, however based on observations noted during the survey, it is

possible that low level noise from the new plant items may be just perceptible at both receptors, during the quietest periods.

6.3.3 Therefore, a +3 dB penalty has been added to the specific sound at both receptors for the daytime period, due to the potential for the additional plant noise being perceptible when occupants of the properties are outdoors in their gardens.

6.3.4 The penalty has not been applied for the night-time period, as the occupants are most likely to be indoors during this time, and considering the attenuation provided by a 20% open window being 13dB, the resulting specific sound levels from the proposed plant items would be significantly lower than the measured night-time background sound levels.

6.4 Comparison of the Background and Rating Levels

6.4.1 In accordance with BS4142, the predicted rating levels of operations from the proposed commercial park, at two existing sensitive receptors (which are nearest to the proposed development), have been compared with the representative background sound levels, this is shown in Table 8 below.

Table 8: Comparison of Rating Levels and Background Sound Levels

Description	Daytime		Night-time	
	ESR 1	ESR 2	ESR 1	ESR 2
Specific Noise Level, L_{Aeq} (dB)	29	26	31	28
Acoustic Character Corrections	+3	+3	0	0
Calculated Rating Level (dB)	32	29	31	28
Measured Background Sound Level L_{A90} (dB)	35	32	34	29
Excess of the rating level over the Background sound level	-3	-3	-3	-1

6.4.2 As shown in Table 8, the predicted rating levels at ESR1 and ESR2 are below the background sound level during the daytime and night-time.

6.4.3 This is an indication of a low impact, the lowest category set out in BS4142, depending on context of the environment in which the sound resides.

6.5 BS4142 Context Assessment

6.5.1 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

sources exceeds the background sound level and the context in which the sound occurs".

6.5.2 The first requirement of this statement has been determined within the noise impact assessment section above. To determine the context in which the industrial sound will reside, three factors must be considered, these are;

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and;
- The sensitivity of the receptor.

Absolute Level of Sound

6.5.3 In accordance with BS4142, it is necessary to determine whether the residual and background sound levels are high or low. Section 11 of BS4142 states:

> *"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.*
>
> *Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse."*

6.5.4 The level of the background sound level is low at ESR2 and moderate at ESR1, and the rating levels are very low at both receptors. Therefore, the absolute sound would not change the outcome of the assessment in this case.

Character and Level of Residual Sound Compared with the Specific Sound

6.5.5 The character of the specific sound is similar to engine noise which is broadband in nature. The residual sound at both receptor locations contains a range of sources, but predominantly consists of distant HGV and tractor movements alongside occasional road traffic noise on the local country lanes. These noise sources can all also be considered broadband in nature. Therefore, the character of the specific sound is in keeping with the existing ambient sound environment at the receptors.

6.5.6 The residual sound level at ESR1 is 53 dB $L_{Aeq,16h}$ during the daytime and 44 dB $L_{Aeq,8h}$ during the night-time. At ESR2 the daytime residual sound level is 46 dB $L_{Aeq,16h}$, and during the night-time is 39 dB $L_{Aeq,8h}$.

6.5.7 The specific sound levels at both receptors are lower than the residual and background sound levels, and therefore, are likely to be inaudible. This is a positive indication that the noise impact from the proposed additional plant would be low due to the existing ambient sound environment being significantly higher than the expected noise contribution from the proposed plant item.

Sensitivity of Receptor

6.5.8 With regard to pertinent factors to be taken into consideration, Section 11 of BS4142 states;

> *"The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*
>
> *i) facade insulation treatment;*
>
> *ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
>
> *iii) acoustic screening."*

6.5.9 Sensitive external areas at ESR1 and ESR2 will have high sensitivity given their residential nature. The noise model does not take into account any attenuation from the receptor's garden fences, therefore the actual specific noise level in gardens during any given time period is likely to be lower than what has been predicted.

6.5.10 Furthermore, considering that a partially open window provides 13 dB attenuation, the specific sound from the proposed CHP and oil separator is likely to be inaudible over the residual sound inside habitable rooms of the dwellings.

6.5.11 Therefore, the sensitivity of the receptor would not alter the outcome of the quantitative assessment in Table 8.

6.6 Summary of the BS4142 Assessment

6.6.1 The assessment in Table 8 shows that the rating levels of activities associated with proposed development would be lower than the background sound levels during the daytime and night-time at ESR1 and ESR2 and have no more than a low impact, which the lowest category set out in BS4142.

6.6.2 In accordance with BS4142, the context in which the sound resides must be considered as part of the assessment. As demonstrated in this assessment, and when considering context, the noise from the CHP and oil separator will not likely be audible. Therefore, the BS4142 assessment indicates that the noise associated with the proposed development will have a low impact at all ESRs.

6.6.3 Based on the results of this assessment, no mitigation has been proposed, and it is considered that the installation of the oil separator at the Thornfield Energy site would have no more than a low impact at ESRs nearest to the site.

7 CONCLUSIONS

7.1.1 Wardell Armstrong LLP (WA) has carried out a noise impact assessment to accompany a planning application for the proposed installation of an oil separation plant at the existing Thornfield Energy Ltd site in Rowton, Telford.

7.1.2 An assessment of noise impact in accordance with BS4142 was undertaken and shows that noise from the proposed plant items is likely to be between 1 and 3 dB below existing background sound levels and is likely, therefore, to be inaudible. When considered in context, the proposed plant will result in no more than a low impact at the nearest ESRs, which is the lowest category set out in BS4142.

7.1.3 When considering the proposed development in accordance with national planning guidance, the predicted noise impact is below the Lowest Observed Adverse Effect Level (LOAEL), and should therefore, not be a significant consideration when determining the planning application.

APPENDICES

APPENDICES

Appendix A

Policy, Standards and Guidance

National Planning Policy Framework

In July 2021 the 'National Planning Policy Framework' (NPPF) was amended as the current planning policy guidance within England.

Paragraph 185 of the NPPF states:

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

a. Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development - and avoid noise giving rise to significant adverse impact 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'…

Paragraph 187 of the NPPF states:

'Planning policies and decisions should ensure that new development can be integrated with existing business and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.'

Noise Policy Statement for England

With regard to 'significant adverse impacts on health and the quality of life' the NPPF refers to the 'Noise Policy Statement for England' (NPSE).

The Noise Policy Statement for England refers to the World Health Organisation when discussing noise impacts and introduces observed effect levels which are based on

established concepts from toxicology that are applied to noise impacts by WHO.

Three levels are defined as follows:

'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.

LOAEL – Lowest Observed Adverse Effect Level

- This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

- This is the level above which significant adverse effects on health and quality of life occur'.

The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided. The second aim refers to the situation where the impact lies somewhere between LOAEL and SOAEL, and it requires that all reasonable steps are taken to mitigate and minimise the adverse effects of noise. However, this does not mean that such adverse effects cannot occur.

Planning Practice Guidance – Noise

The Planning Practice Guidance (PPG) provides further detail about how the effect levels can be recognised. Above the NOEL noise becomes noticeable, however it has no adverse effect as it does not cause any change in behaviour or attitude. Once noise crosses the LOAEL threshold it begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. Increasing noise exposure further might cause the SOAEL threshold to be crossed. If the exposure is above this level the planning process should be used to avoid the effect occurring by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused. At the highest extreme the situation should be prevented from occurring regardless of the benefits which might arise. Table 1 summarises the noise exposure hierarchy.

Table A1 - National Planning Practice Guidance noise exposure hierarchy			
Perception	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
No Observed Effect Level			
Not noticeable	No Effect	No Observed 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
Lowest Observed Adverse Effect Level			
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 non-awakening 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			
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 Adverse 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

The PPG summarises the approach to be taken when assessing noise. It accepts that noise can override other planning concerns, but states:

> "Neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separate from the economic, social and other environmental dimensions of proposed development"

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

British Standard 8233 "Guidance on sound insulation and noise reduction for buildings" 2014, suggests the following guideline noise levels and states that they are based on guidelines issued by the World Health Organisation;

- 35 dB $L_{Aeq\ (16\ hour)}$ during the day time in noise sensitive rooms
- 30 dB $L_{Aeq\ (8\ hour)}$ during the night time in bedrooms
- 45 dB $L_{Amax,F}$ during the night time in bedrooms
- 50 dB $L_{Aeq\ (16\ hour)}$ desirable external noise levels for amenity space such as gardens and patios
- 55 dB $L_{Aeq\ (16\ hour)}$ upper guideline value which would be acceptable in noisier environments.

In addition, for internal noise levels it states;

> "Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

Furthermore, with regard to external noise, the Standard states;

> "However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited".

British Standard 4142:2014 + A1 2019 Methods for rating and assessing industrial and commercial sound (BS4142):

BS4142 is used to rate and assess sound of an industrial and/or commercial nature including:

- 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 premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The standard is applicable to the determination of the following levels at outdoor locations:

- rating levels for sources of sound of an industrial and/or commercial nature; and
- ambient, background and residual sound levels, for the purposes of:

1) Investigating complaints;

2) Assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and

3) Assessing sound at proposed new dwellings or premises used for residential purposes.

The purpose of the BS4142 assessment procedure is to assess the significance of sound of an industrial and/or commercial nature.

BS4142 refers to noise from the industrial source as the 'specific noise' and this is the term used in this report to refer to noise which is predicted to occur due to activities associated with industrial noise.

BS4142 assesses the significance of impacts by comparing the specific noise level to the background noise level (L_{A90}).

Certain acoustic features can increase the significance of impacts over that expected from a simple comparison between the specific noise level and the background noise level. In particular, BS4142 identifies that the absolute level of sound, the character, and the residual sound and the sensitivity of receptor should all be taken into consideration. BS4142 includes allowances for a rating penalty to be added if it is found that the specific noise source contains

a tone, impulse and/or other characteristic, or is expected to be present. The specific noise level along with any applicable correction is referred to as the 'rating level'.

The greater the increase between the rating level over the background noise level, the greater the magnitude of the impact. The assessment criteria given by BS4142 are as follows:

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

During the daytime, BS4142 requires that noise levels are assessed over 1-hour periods. However, during the night-time, noise levels are required to be assessed over 15-minute periods.

Where the initial estimate of the impact needs to be modified due to context, BS4142 states that all pertinent factors should be taken into consideration, including:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and,
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

Appendix B – Noise Monitoring Results

The results displayed in red text in all tables below have been excluded from the overall assessment due to poor weather conditions, i.e., wind speeds exceeding 5m/s.

Table B1: Daytime Measured Noise Levels at ML1 - Properties to the North of Thornfield Energy					
Period start	Measured Noise Levels (dB)				
	$L_{Aeq,15min}$	$L_{Amin,15min}$	$L_{Amax,15min}$	$L_{A90,15min}$	$L_{A10,15min}$
10/10/2022 15:30	54.1	37.7	81.3	40.1	54.6
10/10/2022 15:45	53.2	38.1	75.2	42	50.3
10/10/2022 16:00	57.4	36.6	84.1	39.5	50.6
10/10/2022 16:15	44.7	35.3	60.6	38.2	47.7
10/10/2022 16:30	55.7	36.2	80.5	37.7	50.3
10/10/2022 16:45	53.8	36.5	75.5	39.2	48.5
10/10/2022 17:00	55.8	32.2	79	33.8	49.8
10/10/2022 17:15	53.2	35.5	74.9	37.9	48
10/10/2022 17:30	52.7	32.6	77.5	34.5	41.9
10/10/2022 17:45	50.7	33.1	76.2	33.8	41.1
10/10/2022 18:00	51.5	32	71.9	33.4	44
10/10/2022 18:15	52.4	31	75.9	32.3	44.9
10/10/2022 18:30	44.5	32.4	70.6	33.6	37.6
10/10/2022 18:45	50	30	71	31.2	43.7
10/10/2022 19:00	43.7	29.6	70.8	31.1	36.9
10/10/2022 19:15	48.4	28.5	73.8	29.9	34.9
10/10/2022 19:30	32.2	29.5	45.5	30.3	33.5
10/10/2022 19:45	50.6	29.9	77.7	30.9	35.2
10/10/2022 20:00	35.8	30.1	53.3	32.3	37.7
10/10/2022 20:15	48.6	35.6	72.3	36.3	41.2
10/10/2022 20:30	38.1	34.5	43.2	35.7	39.9
10/10/2022 20:45	58.3	31.7	86.3	33.4	40.7
10/10/2022 21:00	57.8	30.8	86.9	32.1	39.1
10/10/2022 21:15	33.8	30.9	40.9	31.9	35.2
10/10/2022 21:30	33.5	30.4	46.8	31.5	34.6
10/10/2022 21:45	42.7	29.8	69.6	31.2	34.7
10/10/2022 22:00	44.2	29	72	30.7	35.1
10/10/2022 22:15	33.6	30.6	41.9	31.5	35
10/10/2022 22:30	36.1	32.7	40.4	34.1	37.6
10/10/2022 22:45	37.2	34.8	44.6	35.2	38.6
11/10/2022 07:00	49.4	39.4	72.8	40.8	48.1
11/10/2022 07:15	53.3	44.8	78.3	45.1	49.4
11/10/2022 07:30	56.5	40.9	79.4	42.2	51.9
11/10/2022 07:45	59.1	43.8	81.9	44.2	53.6
11/10/2022 08:00	51.8	44.7	73.9	46.2	51.9
11/10/2022 08:15	54.4	41.5	75.5	42.8	49.4
11/10/2022 08:30	58.4	41.9	83.8	42.7	49.4
11/10/2022 08:45	54.2	41.5	77.6	42	51.1

11/10/2022 09:00	52.7	40.9	74.5	42	49.3
11/10/2022 09:15	52.6	42.1	74.1	42.9	49.2
11/10/2022 09:30	60.4	40.8	81.4	41.7	54.7
11/10/2022 09:45	54.9	38.1	79.1	39.3	49.3
11/10/2022 10:00	53.9	36.6	75.3	37.6	46.4
11/10/2022 10:15	57.3	35.9	80.2	37.2	49.8
11/10/2022 10:30	49.5	36.1	71.2	36.7	49.5
11/10/2022 10:45	57.9	35.8	82.4	37.2	51.4
11/10/2022 11:00	50.3	35.6	74.7	36.6	49.5
11/10/2022 11:15	56.6	33.2	82.9	35.1	44.7
11/10/2022 11:30	54.7	35	78.6	36	49.2
11/10/2022 11:45	47	34.2	71.5	35.3	40.1
11/10/2022 12:00	45.4	34.2	66.7	35.2	40.1
11/10/2022 12:15	57.3	34.9	80.4	36.1	55
11/10/2022 12:30	58.2	34.3	84.1	36.4	46.4
11/10/2022 12:45	57.2	34	84.2	35	44.7
11/10/2022 13:00	52.1	34	79.1	35.6	43.1
11/10/2022 13:15	55.9	33.7	81.7	35.6	43.7
11/10/2022 13:30	59.3	32.7	84.6	35	44.4
11/10/2022 13:45	54.1	32.5	80.1	34.6	48.1
11/10/2022 14:00	44.5	34.4	69.5	35.8	43.9
11/10/2022 14:15	50.8	35.3	71.4	37.2	48.5
11/10/2022 14:30	50.2	32.2	73.2	34.9	44.7
11/10/2022 14:45	50.5	32.8	76.3	33.4	42.1
11/10/2022 15:00	54	32	79	33.3	43.9
11/10/2022 15:15	52.6	33.6	73.2	35.3	49.6
11/10/2022 15:30	49.5	34.1	74.5	35.8	43.5
11/10/2022 15:45	53.6	33.5	78.4	34.3	47
Overall	**53.2**	**28.5**	**81.9**	**36.0**	**44.8**

Table B2: Night-time Measured Noise Levels at ML1 - Properties to the North of Thornfield Energy					
Period start	**Measured Noise Levels (dB)**				
	$L_{Aeq,5min}$	$L_{Aeq,5min}$	$L_{Aeq,5min}$	$L_{Aeq,5min}$	$L_{Aeq,5min}$
10/10/2022 23:00	36.9	34.4	41.3	34.9	38.4
10/10/2022 23:05	36	33.1	39.5	34.2	37.5
10/10/2022 23:10	36.9	32.9	41.3	34.3	39
10/10/2022 23:15	37.9	34.2	41.8	35.4	39.5
10/10/2022 23:20	38.3	35.5	42.8	36.2	39.9
10/10/2022 23:25	37.6	34.5	41.7	35.7	39.2
10/10/2022 23:30	36.9	34.2	41	35	38.5
10/10/2022 23:35	37.9	34.6	44.2	35.6	39.5
10/10/2022 23:40	36.2	33.5	40.6	34.4	37.6
10/10/2022 23:45	36.5	33.7	40.1	34.5	37.9
10/10/2022 23:50	36.2	33.3	41.4	34.3	37.6
10/10/2022 23:55	35.4	31.1	39.7	32.9	37.1

11/10/2022 00:00	36	32.5	41.1	33.5	37.6
11/10/2022 00:05	36.1	32.9	44.4	33.8	37.8
11/10/2022 00:10	35.7	32.5	41.4	33.3	37.3
11/10/2022 00:15	36.2	33.3	42.4	34	37.7
11/10/2022 00:20	35.6	32.9	42.4	33.3	37.3
11/10/2022 00:25	35	32.5	39.5	33.1	36.4
11/10/2022 00:30	36.1	32.6	46.6	33.8	37.6
11/10/2022 00:35	37.2	34.2	42.1	35.4	38.4
11/10/2022 00:40	37.4	34.2	42.6	35.3	38.8
11/10/2022 00:45	37.6	33.7	41.5	35.1	39.2
11/10/2022 00:50	38.4	34.9	42.9	36	40.2
11/10/2022 00:55	38.2	34.1	42.3	35.4	40.2
11/10/2022 01:00	36.9	34	42.7	34.7	38.3
11/10/2022 01:05	36	32.2	40.4	34.3	37.3
11/10/2022 01:10	35.1	32.9	41.4	33.2	36.7
11/10/2022 01:15	34.8	32.1	40.8	33.1	36.1
11/10/2022 01:20	36.1	33.3	40	33.9	37.6
11/10/2022 01:25	36.9	33.3	48.3	34.7	38.5
11/10/2022 01:30	36	33.4	41.7	33.9	37.6
11/10/2022 01:35	34.5	32.4	38.2	32.9	35.8
11/10/2022 01:40	35.6	33	40.5	33.6	36.9
11/10/2022 01:45	35.2	31.9	39	33.3	36.5
11/10/2022 01:50	36.6	33.6	41.3	34.6	38.1
11/10/2022 01:55	35.5	32.5	38.8	33.6	36.9
11/10/2022 02:00	36.6	33.2	45.8	34.1	37.6
11/10/2022 02:05	36.4	32.5	40.7	33.8	38.1
11/10/2022 02:10	36.5	33.2	40.9	34	38.2
11/10/2022 02:15	34.9	32.5	38.1	33	36.2
11/10/2022 02:20	35.4	31.9	54.1	33.2	36.6
11/10/2022 02:25	36.5	34.1	40	34.4	38.1
11/10/2022 02:30	36.7	33.1	41	34.6	38
11/10/2022 02:35	36.9	34.6	40.7	35.2	38.1
11/10/2022 02:40	37.2	35.1	40.8	35.9	38.3
11/10/2022 02:45	34.8	32.5	39.6	32.7	36.4
11/10/2022 02:50	51.6	34.6	74.9	34.8	39.9
11/10/2022 02:55	36.1	33.4	40.2	34.1	37.4
11/10/2022 03:00	36.5	33.6	41.2	34.1	38.4
11/10/2022 03:05	37	33.5	43.9	34.7	38.3
11/10/2022 03:10	38	35.9	41.7	36.4	39.3
11/10/2022 03:15	50.5	33.3	72.9	34.5	39.7
11/10/2022 03:20	36.2	33.9	40.2	34.4	37.2
11/10/2022 03:25	38.5	34.6	43.3	35	41.2
11/10/2022 03:30	39.5	34	43.6	35.5	41.8
11/10/2022 03:35	37.2	33.4	40.6	34.9	38.8
11/10/2022 03:40	37.6	35.2	41.9	36.1	38.5
11/10/2022 03:45	37.7	34.3	43.6	35.2	39.6

11/10/2022 03:50	36	32.7	39.9	33.7	37.6
11/10/2022 03:55	37.4	33.7	42.1	35.1	39.2
11/10/2022 04:00	36.9	34.3	40.9	35	38.3
11/10/2022 04:05	36.6	32.4	45.5	34	38
11/10/2022 04:10	38.3	34.9	46.1	35.6	39.8
11/10/2022 04:15	38.7	35.2	45.7	36.1	40.5
11/10/2022 04:20	35.8	32.6	40.8	33.7	37.3
11/10/2022 04:25	37.4	33.8	43.1	34.7	39.1
11/10/2022 04:30	37	33.6	41.9	34.1	39.2
11/10/2022 04:35	35.8	31.9	41.4	33.5	37.6
11/10/2022 04:40	38.7	31.5	45	32.9	41.5
11/10/2022 04:45	39.5	36.8	45.3	37.5	41
11/10/2022 04:50	51.7	36.5	75	37.1	44.3
11/10/2022 04:55	38	34	41.7	35.6	39.5
11/10/2022 05:00	38.4	35	43.2	36.5	39.8
11/10/2022 05:05	41.4	38.2	46.7	39.5	42.7
11/10/2022 05:10	40.7	36.6	58	37.9	42.4
11/10/2022 05:15	38.3	35	47.8	35.7	40.3
11/10/2022 05:20	52.3	35.3	74.7	36.4	44.8
11/10/2022 05:25	50.6	36.6	72.1	39.2	46.8
11/10/2022 05:30	52.9	36.1	73.9	36.7	45.3
11/10/2022 05:35	40.2	37.8	46.1	38.3	41.5
11/10/2022 05:40	39.2	36	54.5	36.6	40.7
11/10/2022 05:45	37.3	34.8	53	35.8	38
11/10/2022 05:50	38.5	34.7	46.8	35.9	40.5
11/10/2022 05:55	39.3	36.9	46.6	37.2	40.8
11/10/2022 06:00	39.7	36.5	44.5	37.5	41.7
11/10/2022 06:05	37.7	34.6	44.4	35.6	39
11/10/2022 06:10	39.7	36.1	47.2	36.7	42.2
11/10/2022 06:15	37.7	35.2	48.9	35.8	39.1
11/10/2022 06:20	41.5	37.6	56.6	38.4	43.8
11/10/2022 06:25	40.8	37.5	57.3	37.9	42
11/10/2022 06:30	52.1	39.9	76	40	45.3
11/10/2022 06:35	58.9	37.8	82	38.6	48.3
11/10/2022 06:40	43.2	39.6	60.1	40.6	44.5
11/10/2022 06:45	42.3	38.9	55.2	39.7	43.7
11/10/2022 06:50	43.3	38.7	61.3	39	44.1
11/10/2022 06:55	50.9	39.9	70.7	40.2	44.9
Overall	**44.1**	**31.1**	**61.3**	**35.3**	**39.5**

Table B3: Daytime Measured Noise Levels at ML1 - Properties to the West, Melverley Farm					
Period Start	Measured Noise Levels (dB)				
	$L_{Aeq,15min}$	$L_{Amin,15min}$	$L_{Amax,15min}$	$L_{A90,15min}$	$L_{A10,15min}$
10/10/2022 14:30	48.7	37	68.8	38.6	46.5
10/10/2022 14:45	43.2	38	60.8	39.4	45.2
10/10/2022 15:00	42.4	35.3	65.2	37.3	43.5
10/10/2022 15:15	54	34.6	76	36.8	45.8
10/10/2022 15:30	46.4	33.9	65.7	35.1	42.8
10/10/2022 15:45	41.5	34.9	54.9	36.4	44.3
10/10/2022 16:00	38.9	33.8	53.8	35	42
10/10/2022 16:15	40.5	35.3	57.1	36.4	42.1
10/10/2022 16:30	40.1	35	56.3	36	42.4
10/10/2022 16:45	39.4	34.1	56.1	35.1	41.8
10/10/2022 17:00	39.9	32.1	58.2	33.1	42.2
10/10/2022 17:15	39	33.1	62.6	34.8	40.7
10/10/2022 17:30	36.9	31.7	53.5	32.9	39.2
10/10/2022 17:45	36.5	31	52.4	31.9	38.7
10/10/2022 18:00	45.6	31.8	71.2	32.9	42.9
10/10/2022 18:15	40.1	31.2	63.7	32.9	41
10/10/2022 18:30	38.7	32.3	59.3	33.3	41
10/10/2022 18:45	43.4	33.1	71	34.3	44.1
10/10/2022 19:00	36.1	32.3	48.5	33.3	37.3
10/10/2022 19:15	34	31.8	42.7	32.4	35.3
10/10/2022 19:30	34.8	31.2	47.9	32.2	36.1
10/10/2022 19:45	36.8	30.2	52	31.4	37.3
10/10/2022 20:00	34.6	32	42.2	32.8	35.8
10/10/2022 20:15	34.7	30	45.7	31.2	36.3
10/10/2022 20:30	29.9	27.5	39.4	28.4	31.2
10/10/2022 20:45	39.2	27.3	59.9	28.4	37
10/10/2022 21:00	39.7	26.6	62.2	27	34.2
10/10/2022 21:15	28.2	25.6	41.2	26.3	29.6
10/10/2022 21:30	30.2	26.7	47.3	27.5	31
10/10/2022 21:45	33	28.4	44.2	29.7	34.8
10/10/2022 22:00	31.7	26.6	44.3	28.1	34.2
10/10/2022 22:15	27.6	25	41.9	25.5	29.7
10/10/2022 22:30	30.4	27.4	36.5	28.3	32.2
10/10/2022 22:45	31.8	29.2	49.1	30.1	33
10/10/2022 23:00	32.2	28.1	37.7	29.1	34
10/10/2022 23:15	31.4	27.4	36.8	28.8	33.2
10/10/2022 23:30	30.6	27.3	34.9	28.5	32.1
10/10/2022 23:45	30.2	26.2	36.6	27.8	31.8
11/10/2022 07:00	47.5	42.1	66.7	43.8	49
11/10/2022 07:15	49.4	46.3	59	47.1	51.2
11/10/2022 07:30	49.3	41.5	63.4	43.7	52

11/10/2022 07:45	49.6	46.3	62.3	47.7	51.1
11/10/2022 08:00	47.4	44.1	63.9	44.6	49.1
11/10/2022 08:15	44.8	42.2	63.2	43.1	45.8
11/10/2022 08:30	47.2	43.5	65.4	43.8	48.6
11/10/2022 08:45	50.1	42.7	77.1	43.1	50.1
11/10/2022 09:00	45.4	41.9	62.4	42.3	47.8
11/10/2022 09:15	45.1	40.6	57.2	41.6	47.5
11/10/2022 09:30	44.4	36.7	70.5	37.9	45.4
11/10/2022 09:45	40	34.8	55.6	36.1	42.3
11/10/2022 10:00	40.7	35.1	58.7	35.4	44.3
11/10/2022 10:15	39.8	32	59.6	32.8	42.2
11/10/2022 10:30	48.7	31.9	79.3	32.9	44.1
11/10/2022 10:45	60.8	32.2	92.4	34.1	41.5
11/10/2022 11:00	47.6	30.1	66.6	32	47.1
11/10/2022 11:15	39.7	30.1	61.2	31.7	42.9
11/10/2022 11:30	40.3	30.6	54.9	32.1	43.5
11/10/2022 11:45	35.9	30.8	50.7	31.9	38.4
11/10/2022 12:00	38.9	30.6	66.5	31.8	38.5
11/10/2022 12:15	51.9	32	73.5	32.7	49.3
11/10/2022 12:30	37.7	30.3	51	31.9	40.2
11/10/2022 12:45	35	29.8	51.9	30.9	37.1
11/10/2022 13:00	35.9	27.9	50.7	31.3	39
11/10/2022 13:15	35.8	28.1	55.5	29.4	36.7
11/10/2022 13:30	39.8	29.2	65.7	30.4	39.8
11/10/2022 13:45	45.6	30.2	67.8	30.8	41.9
11/10/2022 14:00	37.7	31.6	53.1	32.2	40.5
11/10/2022 14:15	44.9	30.5	63.2	32.3	43.5
11/10/2022 14:30	42.1	28.8	60.8	30.4	41.6
11/10/2022 14:45	36.2	30.4	61.9	31.1	37.4
11/10/2022 15:00	46.2	30	68.1	31.5	37.7
11/10/2022 15:15	46	30.2	76.6	30.7	40.8
11/10/2022 15:30	48.2	32.9	66.6	33.3	51.4
Overall	**45.5**	**25.0**	**68.8**	**33.4**	**40.8**

Table B2: Night-time Measured Noise Levels at ML1 - Properties to the West, Melverley Farm

Period start	Measured Noise Levels (dB)				
	$L_{Aeq,5min}$	$L_{Aeq,5min}$	$L_{Aeq,5min}$	$L_{Aeq,5min}$	$L_{Aeq,5min}$
10/10/2022 23:00	30.7	28.2	35.3	28.6	32.7
10/10/2022 23:05	31.8	28.1	37.5	29.3	34
10/10/2022 23:10	33.5	31.2	37.7	32.1	34.4
10/10/2022 23:15	31.9	28.7	36.3	29.6	33.3
10/10/2022 23:20	31.3	27.7	35.9	29.1	33.1
10/10/2022 23:25	30.9	27.4	36.8	27.4	33.1
10/10/2022 23:30	31.4	29	34.5	29.8	32.4

10/10/2022 23:35	29.7	27.3	34.9	27.9	31.7
10/10/2022 23:40	30.6	28.7	34	29.3	31.7
10/10/2022 23:45	30.2	28.5	36.6	28.5	31.7
10/10/2022 23:50	31.1	28.8	34.2	29.6	32.5
10/10/2022 23:55	29	26.2	34.9	26.9	30.8
11/10/2022 00:00	29.5	26.4	37.2	26.9	31.5
11/10/2022 00:05	29.4	26.9	43.2	27.1	31.2
11/10/2022 00:10	29.3	27.4	41.4	27.7	29.9
11/10/2022 00:15	31.5	27.4	36.1	28.6	33.2
11/10/2022 00:20	31.7	29.1	38.6	29.5	33.3
11/10/2022 00:25	31.3	28.7	35.4	29.2	33.2
11/10/2022 00:30	30.7	28.8	34.4	29.2	31.9
11/10/2022 00:35	32.1	28.9	37.7	29.9	33.5
11/10/2022 00:40	32.6	31.2	40.6	31.3	33.5
11/10/2022 00:45	30.8	28.4	37.3	28.8	32.1
11/10/2022 00:50	31.4	29.5	39	30	32
11/10/2022 00:55	29.8	27	37.6	27.7	31.3
11/10/2022 01:00	28.3	25.3	34.8	25.8	30.1
11/10/2022 01:05	30.7	29.3	36.6	29.4	31.9
11/10/2022 01:10	35	31.7	39	33	36.6
11/10/2022 01:15	32.2	29.6	40.6	30	34
11/10/2022 01:20	31.8	30.2	34.8	30.4	32.7
11/10/2022 01:25	31.4	27.5	51.1	28.3	32.3
11/10/2022 01:30	31.5	28	36.7	28.6	33.4
11/10/2022 01:35	32.4	30.1	39	30.4	33.7
11/10/2022 01:40	32.7	30.6	35.9	31.2	33.9
11/10/2022 01:45	32.7	30.3	36.6	31.3	33.7
11/10/2022 01:50	32.6	31	35.8	31.4	33.7
11/10/2022 01:55	31.3	28.9	34.5	29.2	33
11/10/2022 02:00	33.1	30.5	41.1	31	34.3
11/10/2022 02:05	33.7	32.2	37.2	32.4	34.9
11/10/2022 02:10	33.1	31.8	51.3	31.8	33.7
11/10/2022 02:15	33.5	32.4	35.8	32.2	34.2
11/10/2022 02:20	33.8	32.9	44.3	32.7	34.9
11/10/2022 02:25	33.5	31.2	39.2	31.8	35
11/10/2022 02:30	33	31.6	36.1	32	33.5
11/10/2022 02:35	35	33.1	39.2	33.1	36.3
11/10/2022 02:40	37.1	35.1	39.5	35.5	38
11/10/2022 02:45	34	31.7	40	31.8	35.3
11/10/2022 02:50	33.8	32.1	36.7	32.4	34.5
11/10/2022 02:55	36.9	35	40.3	35.6	37.7
11/10/2022 03:00	36.1	33.5	40.2	33.7	37.5
11/10/2022 03:05	37.5	35.5	42.6	35.7	39.3
11/10/2022 03:10	38.1	36.4	41.7	36.6	39
11/10/2022 03:15	37.9	35.4	42.4	35.6	39.3
11/10/2022 03:20	37.8	34.4	44	35.4	39.2

11/10/2022 03:25	39.5	37.5	43.7	38.1	40.3
11/10/2022 03:30	39	37.7	42.9	37.6	40.2
11/10/2022 03:35	38.4	36.3	43.4	36.7	39.2
11/10/2022 03:40	40	36.7	43.3	37.4	41.4
11/10/2022 03:45	41.6	37.1	45.5	38.1	43.4
11/10/2022 03:50	37	34.4	40.5	35.3	38.1
11/10/2022 03:55	36.2	33.5	43.5	34.3	37.6
11/10/2022 04:00	36.3	34.7	39.7	35.2	37.3
11/10/2022 04:05	36.5	35	38.9	35.3	37.4
11/10/2022 04:10	36.4	34.1	46.2	34.6	37.5
11/10/2022 04:15	39.3	36.9	43	37.4	40.5
11/10/2022 04:20	35.1	33.4	43.9	33.4	36.3
11/10/2022 04:25	35.3	32.5	41.5	32.5	37.4
11/10/2022 04:30	37.5	34	41.7	34.5	39.6
11/10/2022 04:35	39.3	36.8	44	37.5	40.6
11/10/2022 04:40	38.8	37.4	41.3	37.4	39.6
11/10/2022 04:45	39.8	38.2	42.3	38.7	40.7
11/10/2022 04:50	39.3	38.3	42	38.2	40.1
11/10/2022 04:55	40	37.7	43.2	38.3	41.3
11/10/2022 05:00	38.4	36.7	40.7	37.2	39.3
11/10/2022 05:05	40.2	38.3	43.3	38.7	41.1
11/10/2022 05:10	39.5	38	43.1	38	40.5
11/10/2022 05:15	40.1	38.2	49.3	38.6	41
11/10/2022 05:20	41.6	39	46.7	39.4	43.3
11/10/2022 05:25	41.6	40.4	48.5	40.4	42.3
11/10/2022 05:30	41.5	39.7	48.1	39.8	42.3
11/10/2022 05:35	41.5	40	46.2	40.3	42.3
11/10/2022 05:40	41.9	39.5	50.6	39.6	43.1
11/10/2022 05:45	42.4	40.5	45.2	40.8	43.5
11/10/2022 05:50	39	37	43.3	37.7	40
11/10/2022 05:55	39.5	37.3	42.9	37.3	41.3
11/10/2022 06:00	42.8	37.4	45.9	39.9	44.4
11/10/2022 06:05	40.2	37.9	45.8	38.4	41.4
11/10/2022 06:10	43.9	41.4	48.3	42.1	45.7
11/10/2022 06:15	44.6	41.6	50.3	42.4	45.9
11/10/2022 06:20	43.1	40.8	53.1	41.7	44
11/10/2022 06:25	41.7	40	47.8	40.2	42.9
11/10/2022 06:30	43.3	41.7	46.1	42	44.1
11/10/2022 06:35	45.4	41.6	54.3	42.3	46.8
11/10/2022 06:40	48.8	42.8	65.4	43.6	52.7
11/10/2022 06:45	46.2	43.7	59.5	43.8	47.5
11/10/2022 06:50	47	43.9	63.2	44.5	48.7
11/10/2022 06:55	48.3	44.1	67.4	44.5	49
Overall	**39.2**	**25.3**	**50.3**	**34.2**	**37.5**

Chart B1: Histogram for the Selection of Daytime Background Sound at ML1

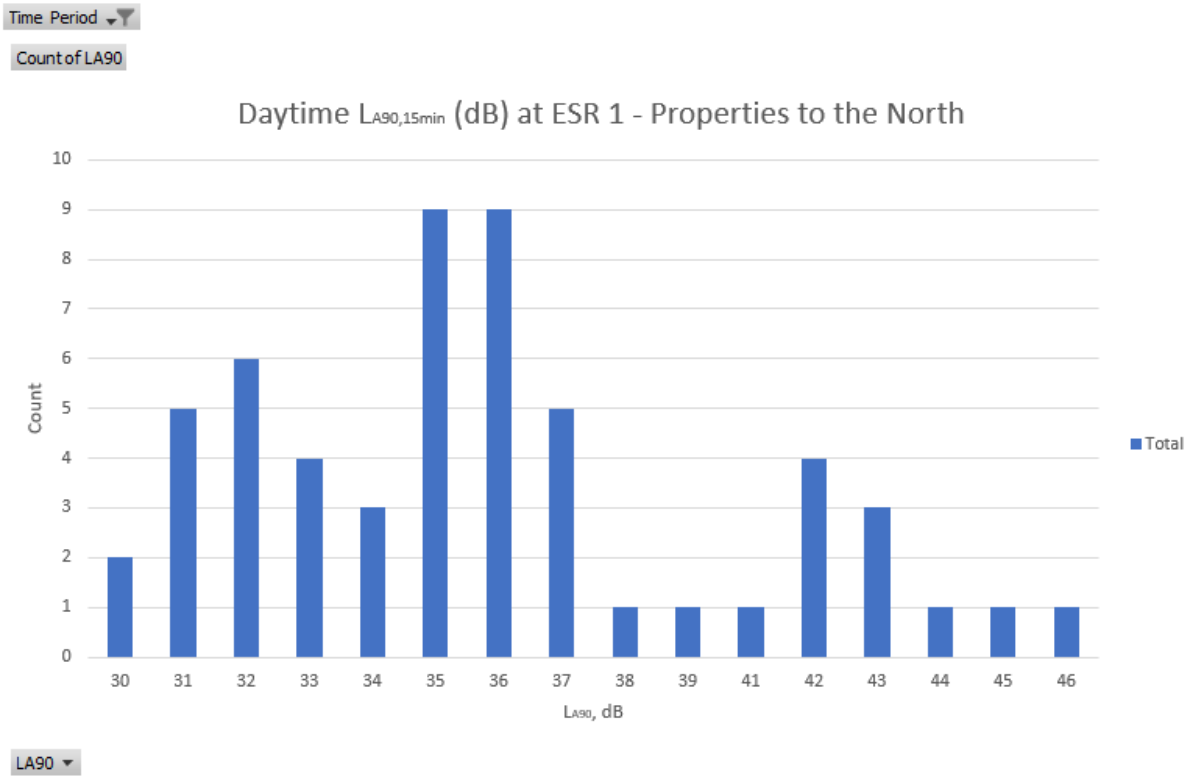


Chart B2: Selection of Night-time Background Sound at ML1

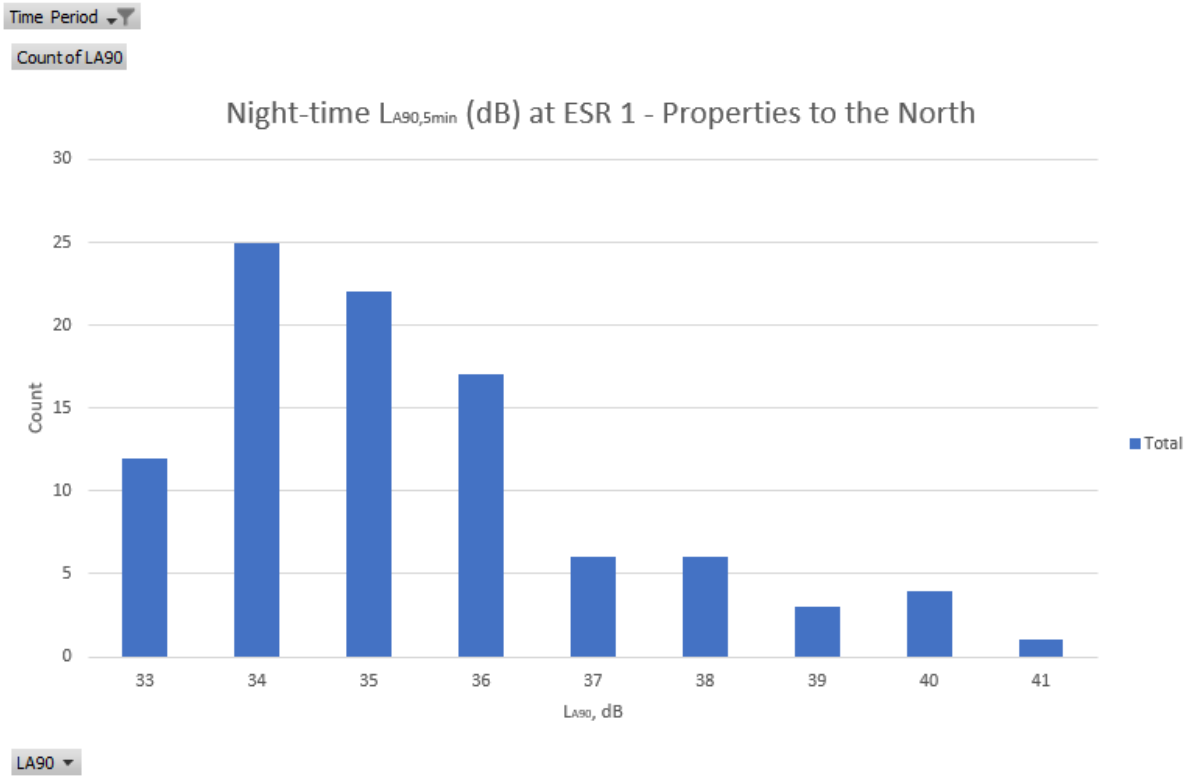


Chart B3: Histogram for the Selection of Daytime Background Sound at ML2

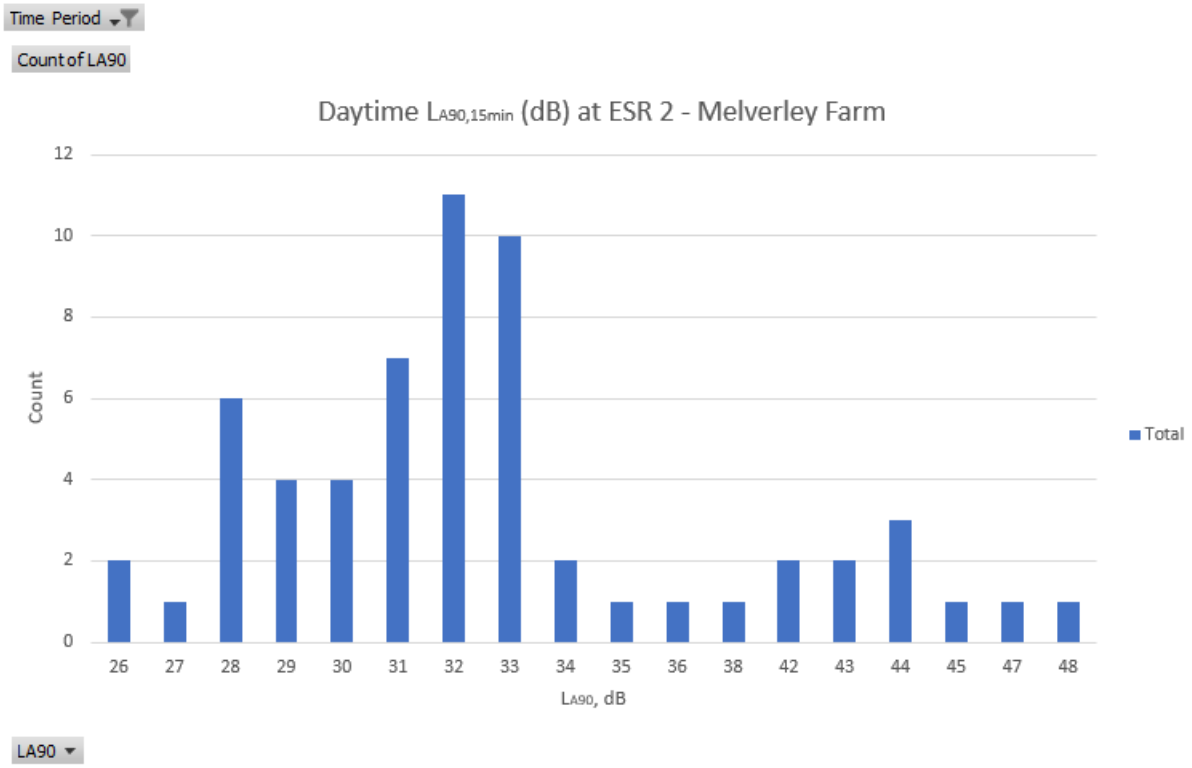
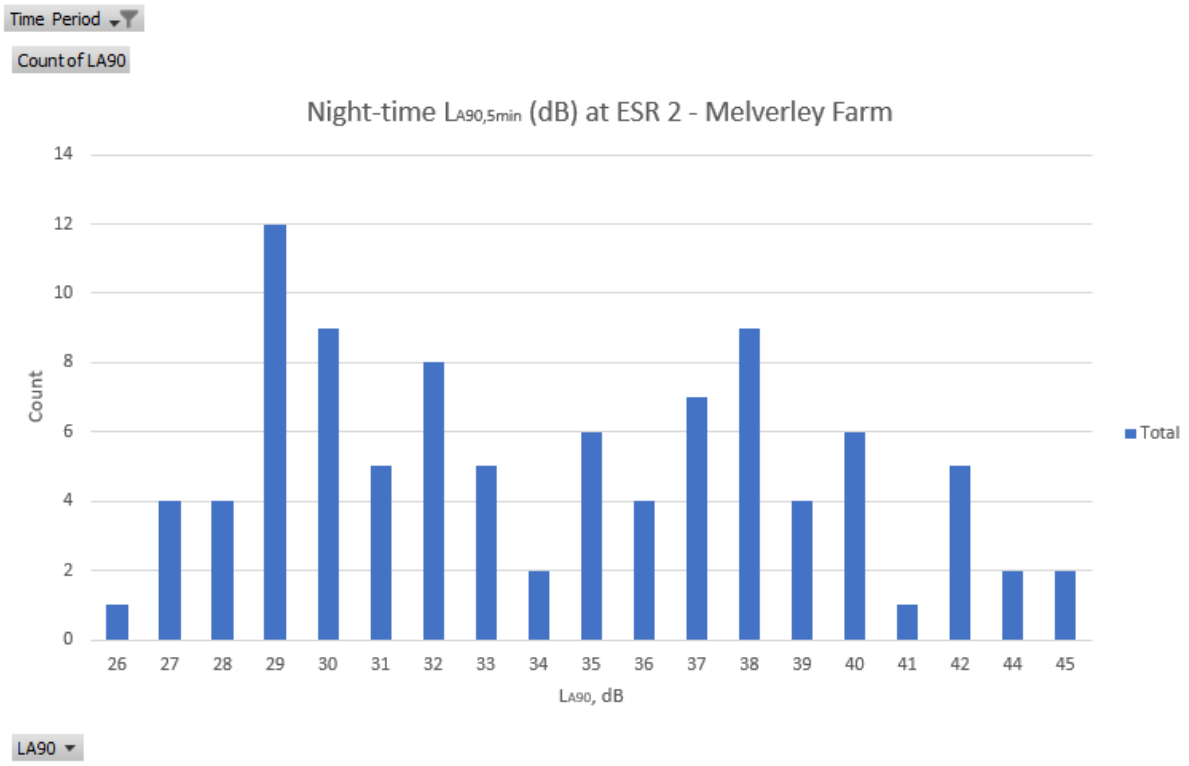


Chart B4: Selection of Night-time Background Sound at ML2



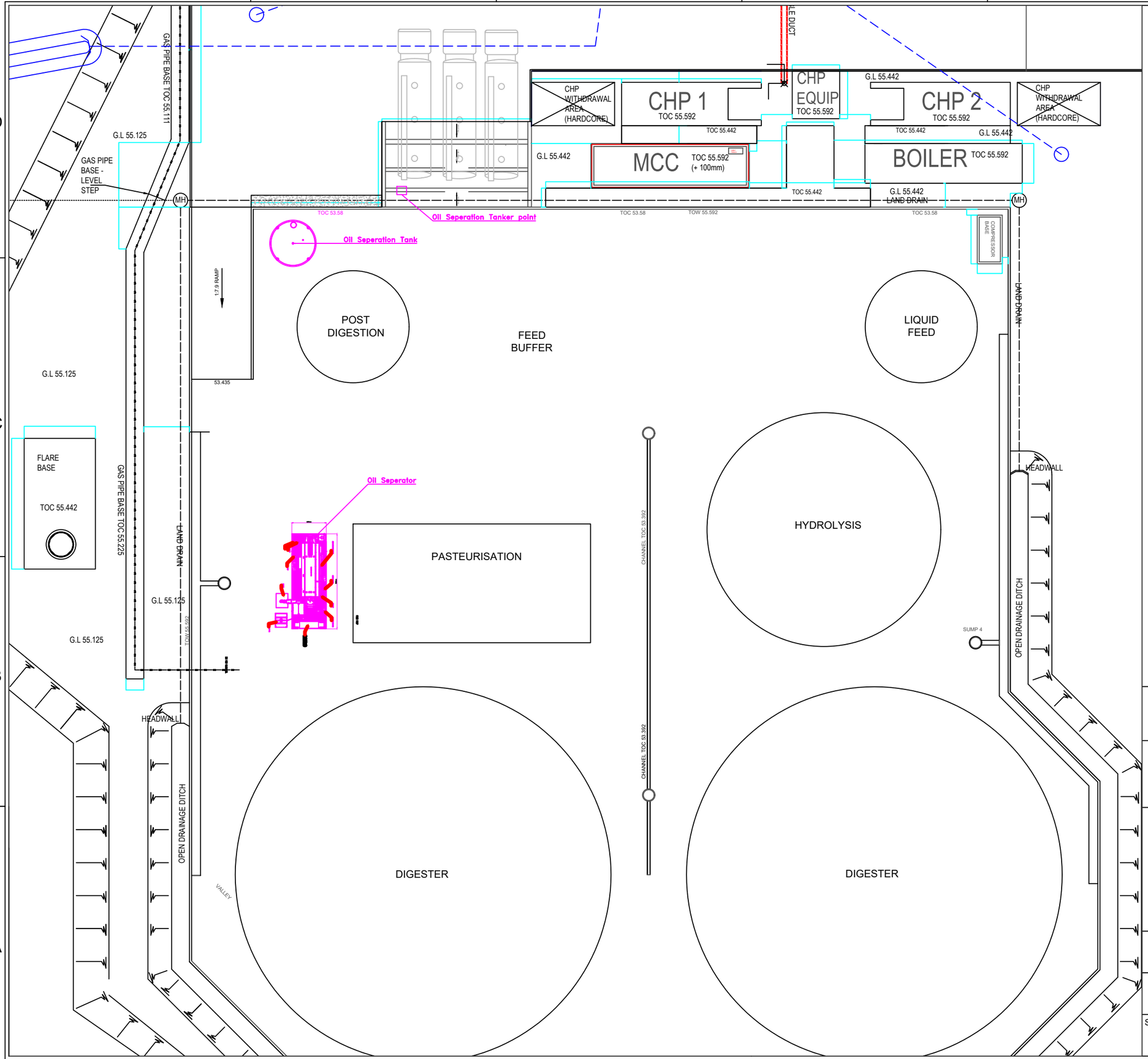
CLIENT:
Thornfield 001 Limited

PROJECT:
Thornfield Energy

TITLE:
Figure 1 - Site Location, Monitoring Locations & Existing Senstivite Receptros

DRG NO:		REV:
ST19738/001		A
DRG SIZE: A3	SCALE: 1:2400	DATE: 10/11/2022
DRAWN BY: BG	CHECKED BY: MW	APPROVED BY: SU

wardell armstrong



LEGEND:

BioteCH$_4$

DRAWING TITLE: Thornfield 001 Ltd Site GA
Oil Seperation

NOTES:

PROJECT: Oil Seperation

DRAWING No: Oil-08082022-001

DATE: 08/08/2022

SCALE: A3

DRAWN BY: A Carter

REV: A

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