Noise Impact Assessment of a Plant-Based Protein Extraction Factory

Client Name:	Naylor Farms
Client Address:	Roman Bank, Moulton Seas End, Lincolnshire, PE12 6LG
Site Address:	Land South of Rangell Gate (B1165) and East of A16, Spalding, Lincolnshire
Date:	10/09/2021



Authorisation and Version Control	
Report Prepared By	Mr M Caley, MSc, MIOA
Report Checked By	Mr J Barratt Gibson, MSc, MIOA, MIET
Report Approved By	Mr. A T Martin, MSc, MIOA, MCIEH, MIET, MInstSCE
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Executive Summary

An environmental noise survey and noise impact assessment have been undertaken on land adjacent to Rangell Gate, Spalding, Lincolnshire to assess the potential increase in noise levels from the erection of a plant-based protein extraction factory on the surrounding Noise Sensitive Receptors. The measured background sound levels have allowed a BS4142:2014 noise assessment to be carried out.

The BS4142:2014 assessment indicates that provided the proposed development is implemented and operated as specified within this report, the Rating Noise Level should be a minimum of 2 dB below the prevailing background sound level at the most affected NSRs. This indicates 'Low Impact' in accordance with BS4142:2014 and 'No Observed Effect Level' (NOEL) when assessed with the NPSE and NPPF.

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

1. Introduction

Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a plant-based protein extraction factory (the Proposed Development') on land south of Rangell Gate (B1165) and east of A16, Spalding, Lincolnshire ('the Site').

The applicant is preparing a planning application ('the Application') to be submitted to South Holland District Council.

The following technical noise assessment has been prepared to support the planning application to South Holland District Council. This report details the existing background sound climate at the nearest receptors, 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.

Scope & Objectives

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

- Baseline sound monitoring survey to evaluate the prevailing background sound levels at the nearest Noise Sensitive Receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with; ISO9613 – 1 ISO 9613-2 - Attenuation of sound during propagation outdoors 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 Policy Framework (2021), Noise Policy Statement for England (2010) and British Standard BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'. Further information on the legislation can be found in Appendix B.

2. Environmental Noise Survey

Measurement Methodology

In order to characterise the sound profile of the area at the closest Noise Sensitive Receptor (NSR), an environmental sound survey was carried out from 11/08/21 to 12/08/21. For the long-term monitoring, a sound level meter was attached to a lamppost with the microphone positioned approximately 3.5m from the ground. The monitoring position was chosen in order to collect representative sound levels at the NSR during the typical operational periods of the proposed development. The monitoring location is shown in Figure 1.0 below.

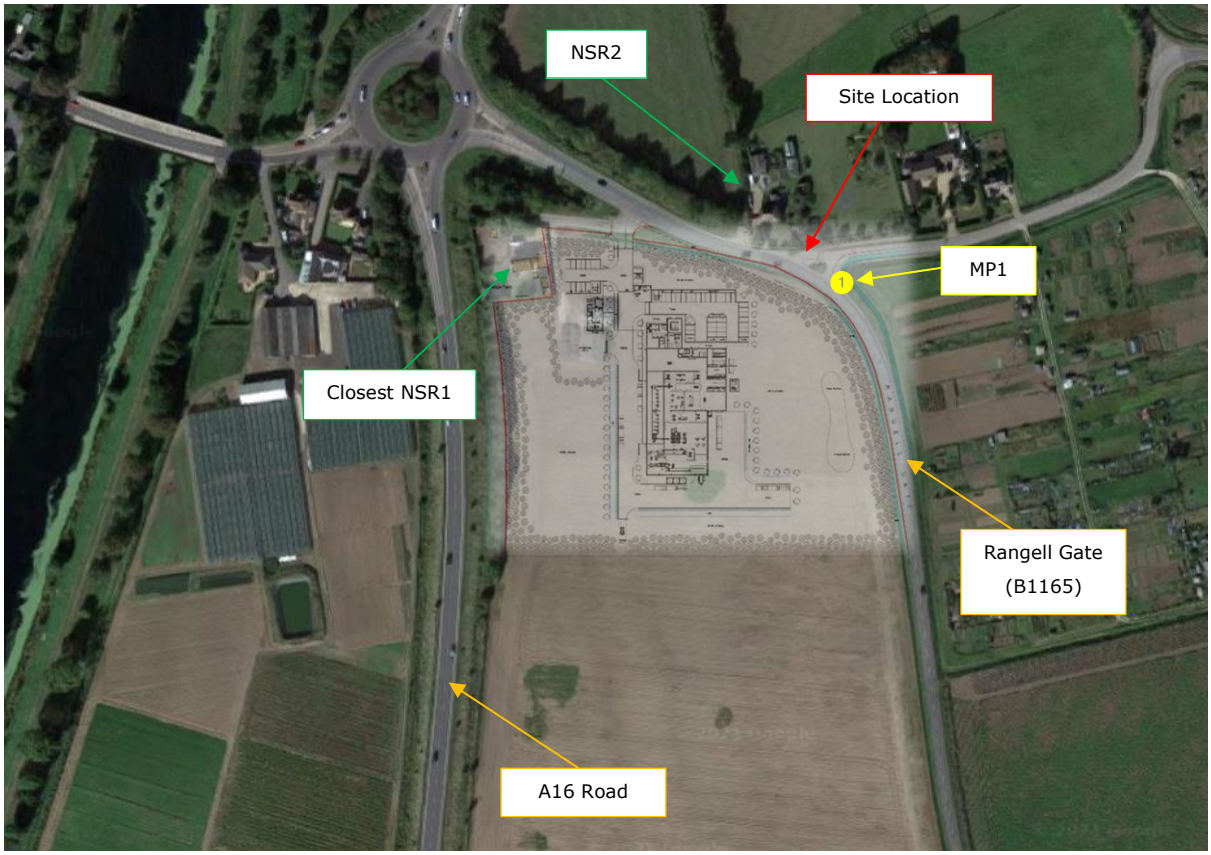


Figure 1.0 – Indicative Site Layout

Context & Subjective Impression

The area surrounding the site is mixed in nature with both residential dwellings and commercial/industrial properties. The noise profile of the area is dominated by traffic noise emissions from the surrounding road networks and the acoustic environment at the NSRs is considered to be of a moderate level.

Background

The proposed development is for the demolition of existing buildings and construction of a new plant-based protein extraction factory and ancillary office space together with landscaping, SuDs features, car park and associated infrastructure.

The client has specified that the facility is to operate 24 hours per day, however HGV and tractor movements will be limited to between the hours of 06:00 and 18:00. During this period there are expected to be up to 4no. HGV movements and 8no. tractor movements. During a worst-case 15-minute assessment period, it is thought there could be 1no. HGV and 1no. tractor entering and exiting the site.

The main internal sources of noise include:

- Cutters chopping the goods,
- Washing of raw product,
- Boilers creating steam for driers and sterilizing,
- Drying of product,
- Forklifts moving materials,
- Workshop with spare parts etc.,
- Packaging of goods.

Environmental Noise Survey Results

The table below outlines the background sound levels measured during the proposed operational periods of the business that will be used as the baseline for the noise assessment. Further summary results for the entire measurement period can be found in Appendix D.

Measurement Position MP1				
Measurement Period ('t')	**$L_{A90,15min}$**	***SMR $L_{A90,15min}$**	**Min. $L_{A90,15min}$**	**Max. $L_{A90,15min}$**
11/08/21 – 23:00 – 07:00	58.0	**43.0**	39.0	60.0
12/08/21 – 06:00 – 07:00	58.0	**59.0**	55.0	60.0

Table 1.0 – Background Sound Level Summary Results

**Statistically Most Repeated*

As can be seen in the table above, the statistically most repeated $L_{A90,15min}$ values are 43.0 dB and 59.0 dB for the two periods respectively. These values are both deemed to be 'typical' for the environment and will be used in subsequent assessments.

3. BS4142:2014 Noise Assessment

In the following section of the report, the noise generated from the site is compared with the background sound levels of the area to calculate the potential for noise impact.

Specific Noise Levels

The following noise levels will be used in the predictive noise model:

Internal Noise Breakout

Noise data for the equipment that will be used on site has been provided by the client. This is shown in the table below.

Description	$L_{Aeq,t}$ at 1m (dB)
Cutter	75.0 – 80.0
2no. Filter press	75.0
Belt Dryer	85.0
Compressors and Blowers	100.0
Milling	80.0
Sedicanter	80.0 – 85.0
Ultra-Filtration	50.0
Drum Dryer	70.0

Table 2.0 – Internal Noise Levels

As can be seen in the table above, the internal noise levels are unlikely to exceed 85 dB in the majority of rooms within the facility. This is in line with the 'Upper Exposure Action Value' specified in the Noise at Work Regulations, and as such is thought to present a robust internal noise level to use within the breakout assessment. The exception to this is the room containing the compressors and blowers, which can reach levels of 100 dB (L_{Aeq}). According to the plans, this room will be located on the 1st floor level above the workshop/MCC area.

The noise breakout from the structure has been calculated assuming the following criteria:

- The structure will be a steel portal frame building with an outer skin constructed from 0.6mm steel.
- All rooms inside the facility will be constructed from composite panelling providing a minimum sound reduction of 26 dB R_w.
- The internal rooms and the outer skin will provide a combined minimum sound reduction of 36 dB R_w. This has been predicted using INSUL 9.0 software.
- Any doors leading in from the external area into the factory will also provide a sound reduction of 36 dB R_w.

- The main roller shutter doors are assumed to be constructed from 0.6mm sheet steel, providing a minimum sound reduction of 18 dB R_w.
- It is assumed that during delivery periods the main roller shutter door could remain open for a full 15-minute assessment period. As such, only an internal to external noise level correction will be applied (-6 dB) to account for reverberant to non-reverberant conditions.
- The facades and roof of the structure are thought to behave as area noise sources. This is calculated within the SoundPlan model assuming +10log(S).

The table below shows the calculated external noise levels at the facades and roof of the structure.

Description	Room Type	Internal $L_{Aeq,t}$ (dB)	Façade Sound Reduction (R_w, dB)	External Façade Noise Level (Internal – Rw – 6) (dB)
Façades and Roof	Compressors and Blowers	100.0	36.0	58.0
Façades and Roof	All Other Rooms	85.0	36.0	43.0
Roller Shutter Door (Closed)		85.0	18.0	61.0
Roller Shutter Door (Open During Deliveries)		85.0	0.0	79.0

Table 3.0 – Breakout Calculations

HGV Movement Noise Level

The HGV movement noise that will be used in the noise model has also been taken from BS5228:2009. This has been time corrected to show the noise levels averaged over a 15-minute period considering a 2-minute movement time, which allows for an HGV to enter and exit the site with a 10 mph site speed limit. This is shown in the table below.

Description	L_{WA} (dB)	On-Time Correction	L_{WA} (dB)
HGV Movement Noise Level	98.0	2 mins/15 mins	89.0

Table 4.0 – HGV Movement Noise Levels

Tractor Movement Noise Level

The noise levels for the tractor movements have been taken from a previous assessment compiled by NOVA Acoustics in which a tractor was measured towing a large effluent trailer (report ref: 5881RR). Again, this has been time corrected to show the noise levels averaged over a 15-minute period considering a 2-minute movement time.

Description	L_{WA} (dB)	On Time Correction	L_{WA} (dB)
Tractor Movement Noise Level	98.0	2 mins/15 mins	89.0

Table 5.0 – Tractor Movement Noise Levels

Delivery/Loading Noise Level

The plans show that raw product is loaded into the building at the southern façade. The predicted noise level for this activity has been taken from BS5228:2009 and is shown in the table below.

Description	L_{WA} (dB)
Raw Product Delivery	103.0

Table 6.0 – Raw Product Delivery Noise Levels

Predictive Noise Modelling

The specific sound level at the NSRs has been calculated using SoundPlan 8.2, which undertakes its calculations 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 is a mix of acoustically 'soft' and 'hard' surfaces.
- The building heights have been taken from the plans provided by the client (shown in Appendix C).
- The HGV movement noise has been modelled at a height of 1.5m (approximate engine height).
- The sound power levels of the building elements have been calculated within the SoundPlan software using the formula: $L_w = L_p + 10log(s)$.
- The raw product delivery noise has been modelled at a height of 1.5m.
- The sound map below is shown at a grid height of 1.5m, however, the specific sound levels at the NSRs are taken from the most affected area of the façade, which could be any floor of the building.

The sound maps showing the specific sound level emissions from the Proposed Development can be seen in the figures below.

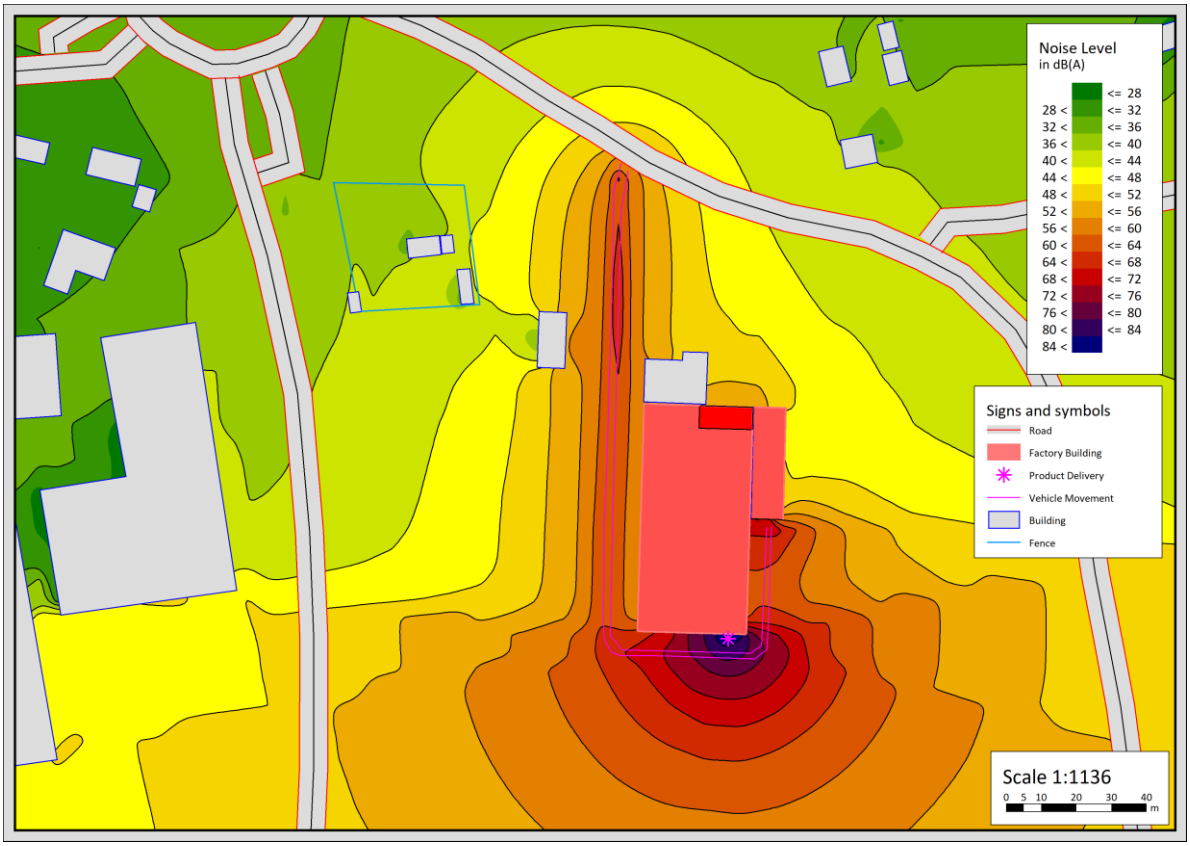


Figure 2.0 – Specific Sound Level Map – 06:00 to 18:00

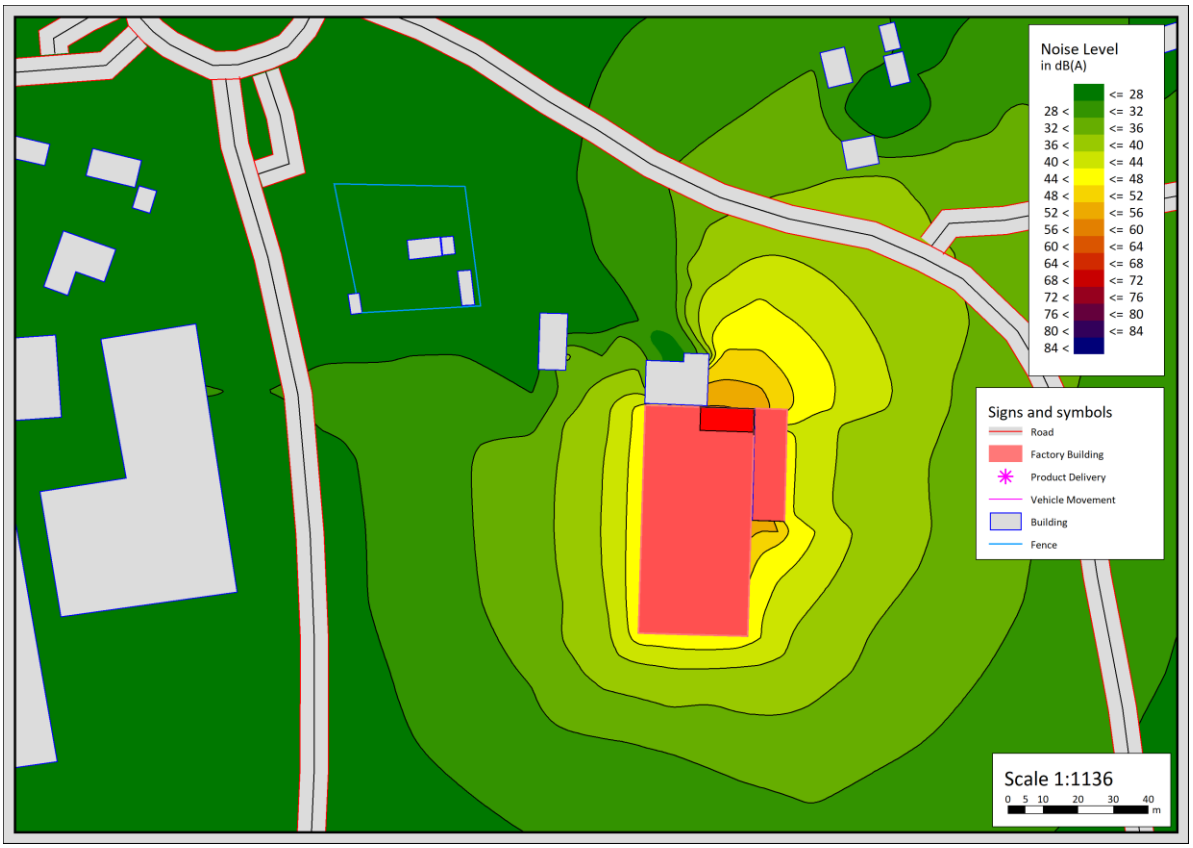


Figure 3.0 – Specific Sound Level Map – 23:00 to 06:00

A summary of the specific sound levels at the most affected Noise Sensitive Receptors can be seen in the following table.

Most Exposed NSR	Specific Sound Level, 06:00 to 18:00 (dBA)	Specific Sound Level, 23:00 to 06:00 (dBA)
1	43.0	27.0
2	42.0	36.0

Table 7.0 – Specific Sound Level at NSR Summary

Rating Penalty Assessment

In the following section, a rating penalty is defined and applied to the predicted specific noise levels.

Rating Noise Levels			
Assessment Period	**Specific Noise Level at the Most Exposed NSR (dBA)**	**Acoustic Correction (dB)**	**Rating Sound Level (dBA)**
06:00 to 18:00	43.0	Tonality +2 Impulsivity +3	48.0
23:00 to 06:00	36.0	Tonality +2 Impulsivity +3	41.0

Table 8.0 – Rating Noise Level at NSRs

**The penalties are applied to account for audible tonal and impulsive components of the noise emissions.*

BS4142:2014 – Noise Impact Assessment

The BS4142 assessment of the proposed development can be seen in the table below.

BS4142 Assessment		
Results	**06:00 – 18:00 (dBA)**	**23:00 – 06:00 (dBA)**
Rating Sound Level	48.0	41.0
Background Sound Level	59.0	43.0
Excess of Rating over Background Sound Level	-11.0	-2.0

Table 9.0 – BS4142:2014 Noise Impact Assessment

Discussion

The assessment above indicates that the rating level is below the background sound level at the most affected Noise Sensitive Receptors by a minimum of 2 dB. This is classed as 'Low Impact' when

assessed with BS4142:2014 and 'No Observed Effect Level' (NOEL) when assessed with the NPPF and NPSE.

Given the outcome of the assessment, no further mitigation measures are required.

4. Plant Noise Limit Level

At this stage, it is unknown if external fixed plant units will be required for the proposed development. As such, in the following section, a plant noise limit level is defined that must not be exceeded at the most affected NSRs if plant units are to be installed. It is assumed that any fixed plant could operate at any time during the day or night, and as such, the limit level has been calculated based on the night time background sound levels.

The cumulative noise level from all externally mounted ancillary plant equipment associated with the development must not exceed the limit level shown in the table below. The limit level is inclusive of any penalties that should be applied to account for audible characteristics of the sound deemed to cause increased annoyance, such as tonality or intermittency, in line with BS4142:2014.

Description	Operational Period (dBA)
Statistically Most Repeated Background Sound Level	43.0
Maximum cumulative **Rating** Level of external plant equipment at the Façade of the Closest NSR	33.0
Exceedance background sound level	-10.0

Table 10.0 – Plant Noise Level Limit Summary

Once the plant has been specified the design should be approved by a suitably qualified acoustic consultant to ensure the plant limit level is achieved.

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.

B.1 – National Planning Policy Framework (2021)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2019. 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.*

B.2 – 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.

B.3 – British Standard BS 4142:2014+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:

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."

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:

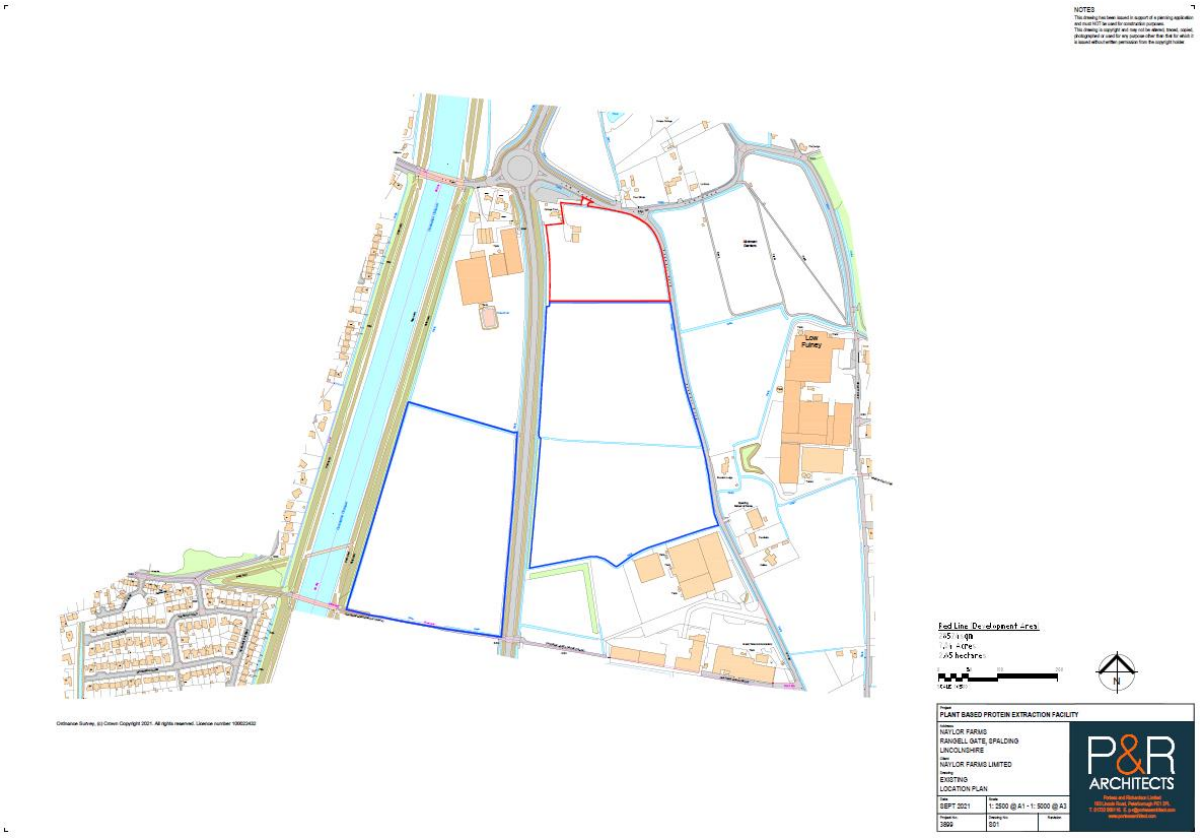
- "Typically, the greater this difference, the greater the magnitude of the impact."
- "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."
- "A difference of around +5dB is likely to be an indication of an adverse impact, depending 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."

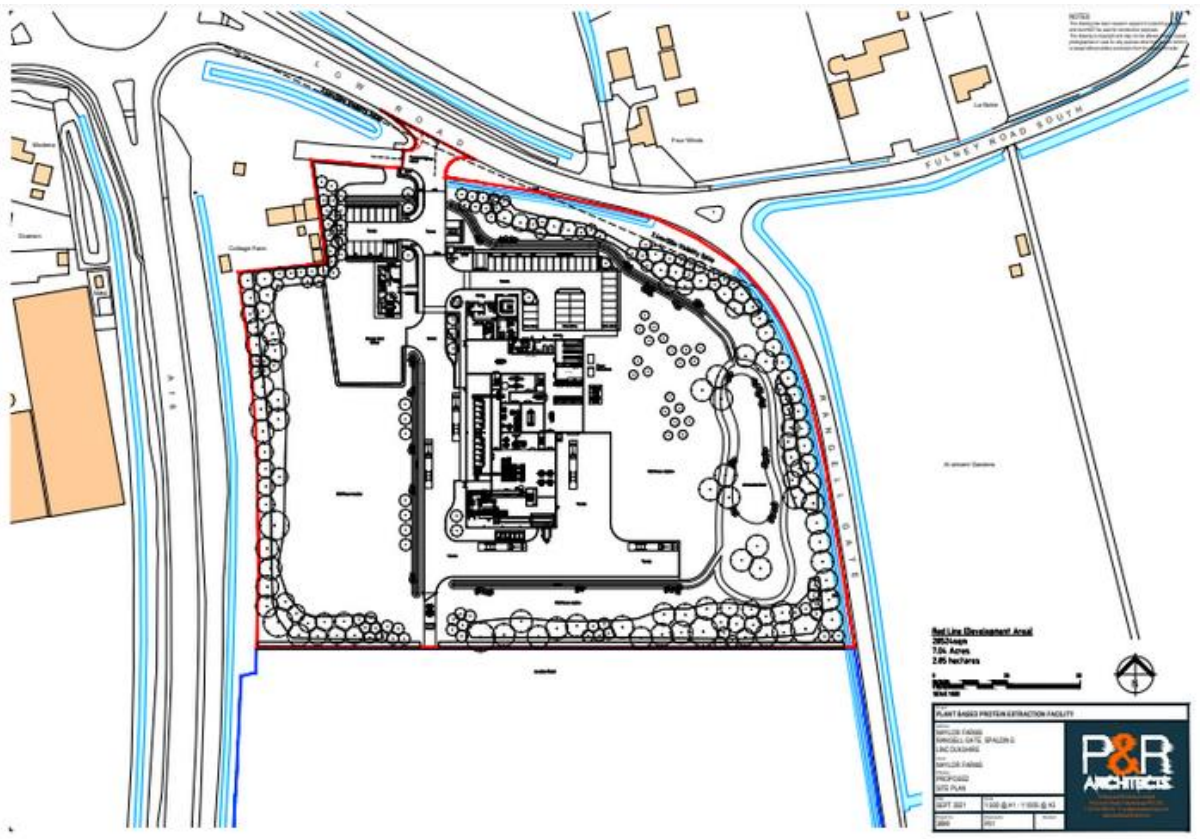
Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- 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 a No Observed Adverse Effect Level.

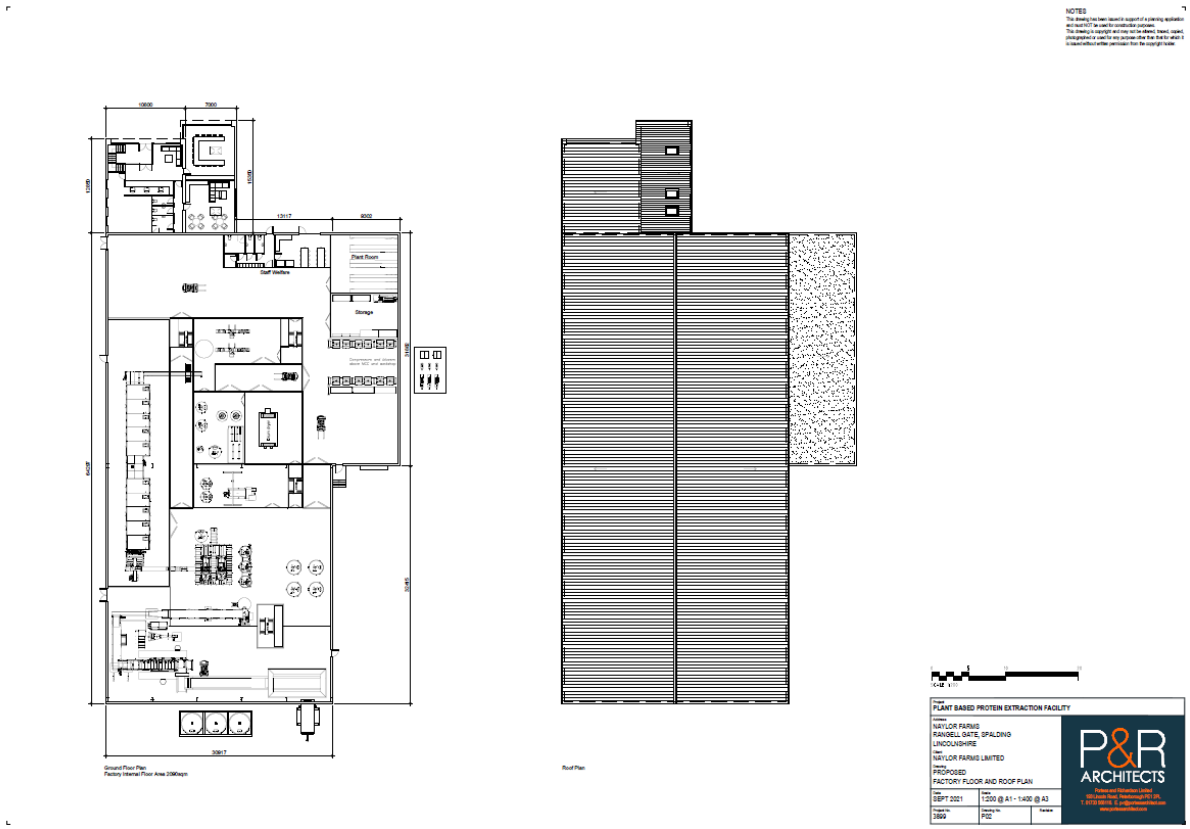
During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

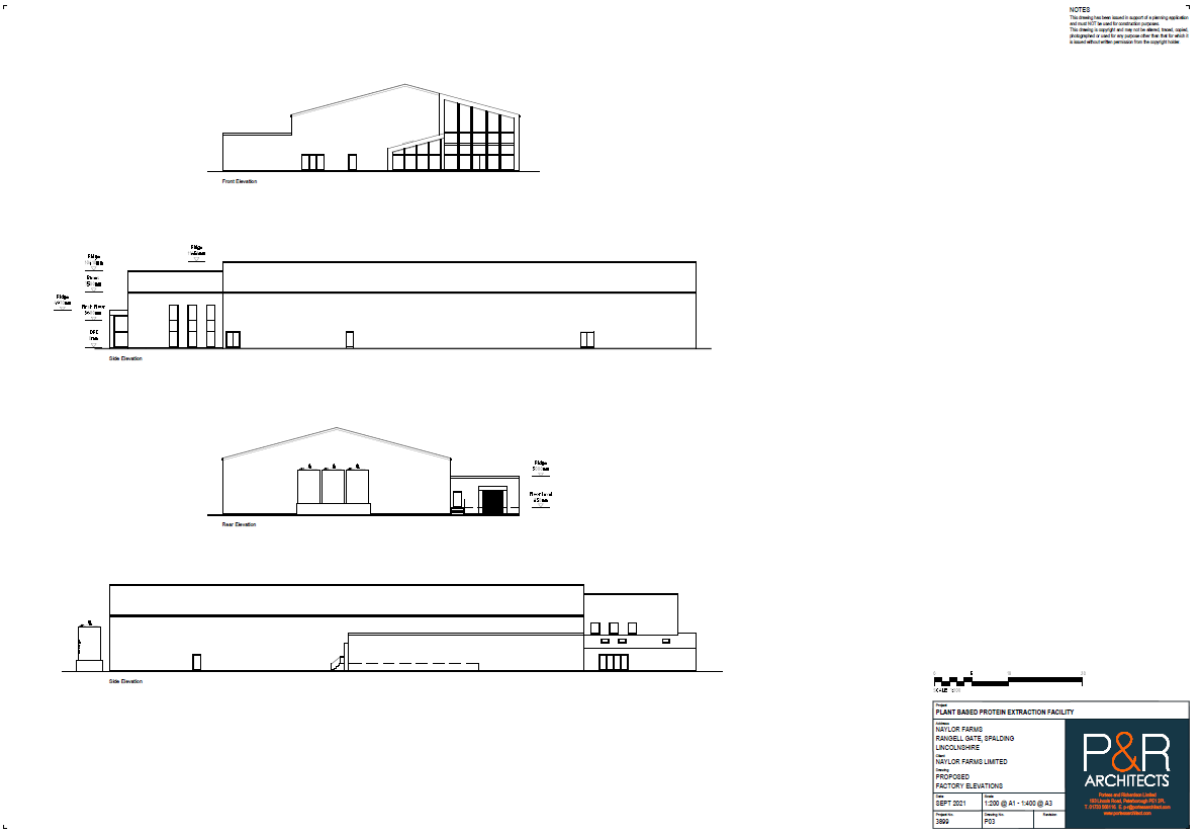
Appendix C – Location and Site Plans

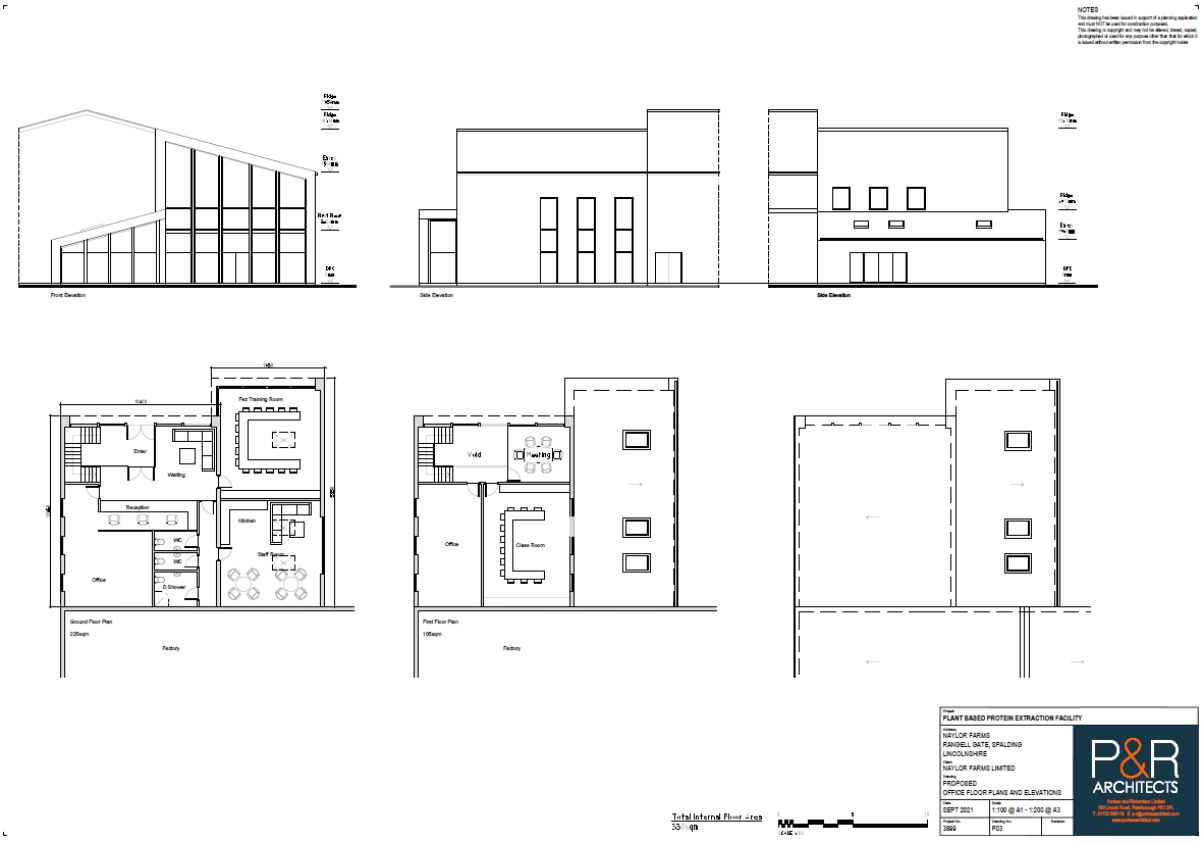





LOW ROAD
FULNEY ROAD SOUTH
RANDELL GATE
NAYLOR FARMS
PLANT BASED PROTEIN EXTRACTION FACILITY
P&R ARCHITECTS


NOTES
PLANT BASED PROTEIN EXTRACTION FACILITY
P&R ARCHITECTS


NOTES
PLANT BASED PROTEIN EXTRACTION FACILITY
NAYLOR FARMS
RANGELL GATE, SPALDING
LINCOLNSHIRE
NAYLOR FARMS LIMITED
PROPOSED
FACTORY ELEVATIONS
SEPT 2021
1:200 @ A1 - 1:400 @ A3
3899
P03
P&R
ARCHITECTS


NOTES
PLANT BASED PROTEIN EXTRACTION FACILITY
NAYLOR FARMS
RANGELL GATE, SPALDING
LINCOLNSHIRE
NAYLOR FARMS LIMITED
PROPOSED
OFFICE FLOOR PLANS AND ELEVATIONS
SEPT 2021
1:100 @ A1 - 1:200 @ A3
3899
P03
P&R
ARCHITECTS

Appendix D – Environmental Survey

D.1 – Tabulated Summary Noise Data

Measurement Position MP1				
Measurement Time Period ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
11/08/21 – 12:00 – 23:00	68.0	98.0	67.0	70.0
11/08/21 – 23:00 – 07:00	63.0	90.0	58.0	66.0
12/08/21 – 07:00 – 11:55	69.0	86.0	68.0	69.0
L_{A90} Analysis – Operation Hours				
Measurement Period ('t')	**$L_{A90,t}$**	**SMR $L_{A90,t}$**	**Min. $L_{A90,t}$**	**Max. $L_{A90,t}$**
11/08/21 – 12:00 – 23:00	63.0	63.0	60.0	65.0
11/08/21 – 23:00 – 06:00	48.0	43.0	39.0	57.0
12/08/21 – 06:00 – 07:00	58.0	59.0	55.0	60.0
12/08/21 – 07:00 – 11:55	63.0	62.0	61.0	65.0
Noise Survey Time History				

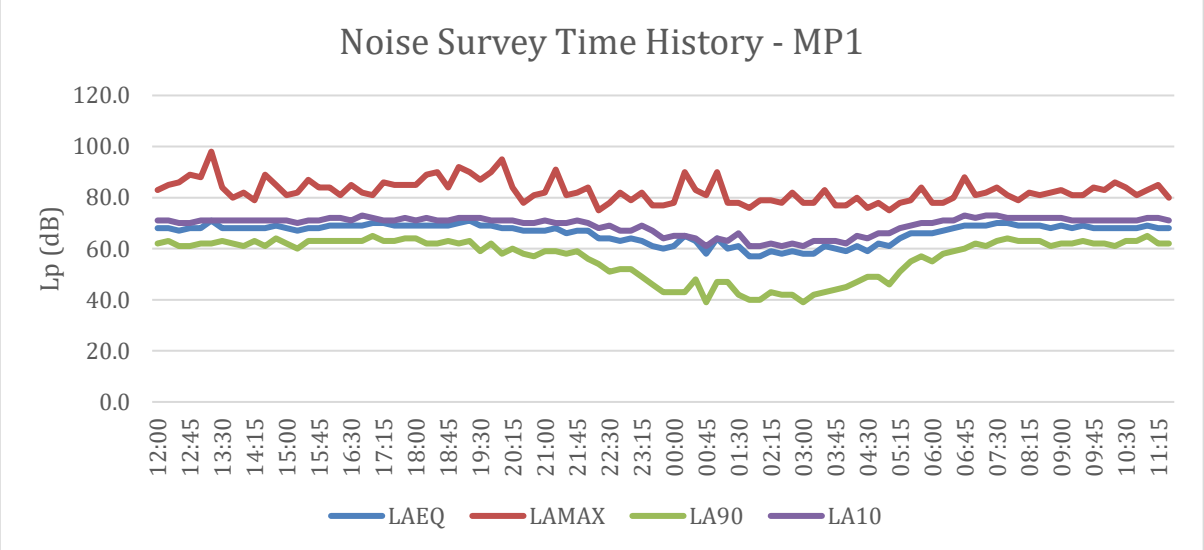


Table 11.0 – Sound Survey Summary Results

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
CESVA SC420 Class 1 Sound Level Meter	T250681	≤0.5
CESVA CB006 Class 1 Calibrator	902442	

Table 12.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a 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 windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Spalding – 1km West of Site				
Time Period	**Air Temp (^{0}C)**	**Rainfall (mm/h)**	**Prevailing Wind Direction**	**Wind Speed (m/s)**
11/08/21 – 00:00 – 23:59	14.7 – 24.4	0.0	SSW	0.0 – 2.6
12/08/21 – 00:00 – 23:59	14.7 – 24.3	0.0	SSW	0.0 – 2.6

Table 13.0 – Weather Summary