STOCKING PELHAM – ENERGY DEVELOPMENT SITES

Acoustic Appraisal

Reference: 12622.RP01.ENS.1
Prepared: 27 November 2023
Revision Number: 1

Jo Van Riemsdijk

Acoustic Appraisal

STOCKING PELHAM – ENERGY DEVELOPMENT SITES

Reference: 12622.RP01.ENS.1
Prepared: 27 November 2023

Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	19 May 2023	James Stokes	Andrew Heath
1	Comments regarding additional report	27 November 2023	James Stokes	Andrew Heath

Terms of contract:

RBA Acoustics Ltd has prepared this report in accordance with our Scope of Work 12622.SW01.0 dated 16 March 2023. RBA Acoustics Ltd shall not be responsible for any use of the report or its contents for any purpose other than that for which it was provided. Should the Client require the distribution of the report to other parties for information, the full report should be copied. No professional liability or warranty shall be extended to other parties by RBA Acoustics Ltd without written agreement from RBA Acoustics Ltd.

The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

RBA ACOUSTICS

LONDON
44 Borough Road
London SE1 0AJ
T. +44 (0) 20 7620 1950

MANCHESTER
Bloc, 17 Marble Street
Manchester, M2 3AW
T. +44 (0) 161 661 4504

Contents

1.0 INTRODUCTION

RBA Acoustics have been appointed to undertake a benchmarking noise survey and a review of previous and existing/outstanding Planning documentation in relation to a number of energy storage and generation developments which have been either approved or proposed (pending decision) in the vicinity of Stocking Pelham, a small village located on the border between East Hertfordshire and Uttlesford Districts.

Although there are a greater number of approved and/or proposed developments in the wider area, this report and analysis focusses on the nearest and most acoustically relevant developments, detailed below in Section 2. The location of these developments are shown in the attached Figure 1.

Details of the acoustic benchmarking survey undertaken by RBA Acoustics are provided in Section 3.

A review of the previous relevant Planning Documentation is given in Section 5, followed by relevant discussion and conclusions in Sections 6 & 7.

2.0 PLANNING APPLICATIONS

RBA Acoustics have undertaken an acoustic review of documentation relating to the following Planning Applications. Although the sites are adjacent to one another, they are located either side of the boundary between two boroughs. In each case, the relevant Planning Authority is listed:

2.1 Land North of Pelham Substation and South of Berden Road

Local Authority: Uttlesford District Council (UDC)
(ref: UTT/16/2316/FUL)

This Planning Application related to the proposal to build an Energy Reserve Enhanced Frequency Response Facility (ERF) on an area of land to the north of the National Grid substation site in Stocking Pelham. This site has already been approved and built in 2018, however this application is relevant to the subsequent applications due to the associated noise emissions from this site having an ongoing impact on a number of local residents, as well as the associated noise being present in subsequent "background noise" analyses taken near to the site, potentially resulting in less onerous noise restrictions for future nearby developments.

Note that for brevity, at times we will refer to this application as the 'Pelham Substation' site throughout this report. For clarity, we will refer to the larger substation as the 'National Grid Substation'.

2.2 Land Off Crabbs Lane And Pelham Substation Stocking Pelham

Local Authority: East Hertfordshire District Council (EHDC)
(ref: 3/22/0806/FUL)

This Planning Application relates to the proposed Battery Energy Storage System (BESS) on land at the Crabbs Green Farm, located to the south-east of Stocking Pelham; to the west of the Pelham Substation; and to the north of the National Grid Substation. The development consists of a number of plant items, of which there are inverters and transformers proposed.

Note that for brevity, at times we will refer to this application as the 'Crabbs Lane' site throughout this report.

2.3 Land At Berden Hall Farm, Dewes Green Road, Berden

Local Authority: Uttlesford District Council (UDC)
(ref: UTT/22/2046/PINS)

This Planning Application relates to the proposed solar farm development on land to the north-east of both Pelham Substation and the National Grid substation. The development consists of a number of plant items, of which there are inverters and transformers proposed.

Note that for brevity, at times we will refer to this application as the 'Berden Hall' site throughout this report.

3.0 BRITISH STANDARD 4142

Given the relevance of this standard to the assessment of previous and existing Planning proposals, a summary of this document has been included, for reference.

BS4142 *Methods for rating and assessing industrial and commercial sound* describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- sound from industrial and manufacturing processes
- sound from fixed installations which comprise mechanical and electrical plant and equipment
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises
- 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 methods described within BS4142:2014+A1:2019 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. The standard is also applicable to determine rating levels for sound of an industrial or commercial nature at proposed new dwellings or premises used for residential premises. The standard is only appropriate for the assessment of external sound levels. The assessment method described in BS4142:2014+A1:2019 is based on the continuous sound pressure level produced by a specific source ($L_{Aeq,Tr}$) at the assessment location. Appropriate corrections allowing for any tonality, impulsivity, other characteristics or intermittency of the specific sound source are then applied to derive the rating level ($L_{Ar,Tr}$). The rating level is then compared to the background sound level ($L_{A90,T}$) to produce the relative difference, or excess of rating level over background sound level. BS4142:2014+A1:2019 quantifies the estimated impact from the excess as:

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

3.1 Rating Level Corrections

Section 9.0 of BS4142:2014+A1:2019 relates to the calculation of the rating level from the source's specific noise level. Section 9.1 ('General') of BS4142:2014+A1:2019 states the following:

> *"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.*
>
> *NOTE 1: Sound with prominent impulses has been shown to be more annoying than continuous types of sound (without impulses or tones) with the same equivalent sound pressure level.*
> *NOTE 2: The rating level is equal to the specific sound level if there are no such features present or expected to be present"*

The following subsections, go on to clarify the difference between the (a) subjective and (b) objective assessment methods.

3.1.1 Subjective Method

Section 9.2 ('Subjective Method') provides additional detail relating to the calculation of the rating level using character correction, providing the following information:

> *"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 characteristic occurs, or is expected to be present for new or modified sound sources.*
>
> *NOTE 1: The prominence of tonal or impulsive sound from a source can be masked by residual sound. In many cases the amount of masking varies as the residual sound changes in level and possibly character. The source's tonal and/or impulsive characteristics could also vary with time.*
>
> *Consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention.*
>
> *COMMENTARY ON 9.2*
>
> ***Tonality***
>
> *For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.*

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

> *NOTE 2: If characteristics likely to affect perception and response are present in the specific sound, within the same reference period, then the applicable corrections ought normally to be added arithmetically. However, if any single feature is dominant to the exclusion of the others then it might be appropriate to apply a reduced or even zero correction for the minor characteristics.*

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Other sound characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent,
though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

3.2 Objective Method for Tonality

As can be seen from the above extract from Section 9.2 of BS4142:2014+A1:2019, a character correction could reasonably be applied to the specific plant noise levels to give a rating level where tonality is noted. Section 9.3.1 states:

> *" If the subjective method is not sufficient for assessing the audibility of tones in sound … use the one-third octave method in 9.3.2*

Section 9.3.2 then states:

> *"Identify tones using the method given in Annex C, then add a correction of 6 dB if a tone is present"*

Annex C of BS4142:2014+A1:2019 then states the following:

> *"Annex C (informative)*
> ***Objective method for assessing the audibility of tones in sound: One-third octave method***
>
> *The test for the presence of a prominent, discrete-frequency spectral component (tone) typically compares the ($L_{Zeq,T}$) sound pressure level averaged over the time when the tone is present in a one-third-octave band with the time-average linear sound pressure levels in the adjacent one-third-octave bands. For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference.*
>
> *The level differences between adjacent one-third-octave bands that identify a tone are:*
>
> *• 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);*
> *• 8 dB in middle-frequency one-third-octave bands (160 Hz to 400 Hz);*
> *• 5 dB in high-frequency one-third-octave bands (500 Hz to 10 000 Hz)."*

4.0 ENVIRONMENTAL NOISE SURVEY

4.1 General

Monitoring of the current noise levels was undertaken over the following period:

- 12:00 on Thursday 6th April 2023 to
- 10:30 on Wednesday 12th April 2023

As the survey was unattended it is not possible to comment with certainty regarding meteorological conditions throughout the entire survey period, however the weather was generally considered satisfactory it being predominantly dry with little wind.

Measurements were made of the L_{A90} and L_{Aeq} noise levels over sample periods of 15 minutes duration.

4.2 Measurement Positions

Measurements were undertaken in the following 4no. locations:

- ***MP1 – Rear Façade First Floor window of Berways***

The microphone was located at a distance of 1m outside the window of a rear bedroom, at a height of around 5m from ground level. The position overlooked the rear garden, to the south of which is Pelham Substation and the National Grid Substation. This position is located at a distance of 495m from the nearest corner of the Pelham substation and 625m from the nearest part of the National Grid Substation. The main noise sources in this position during survey setup and collection were noted to be distant road and air traffic and natural sounds (e.g.: birdsong).

- ***MP2 – Rear boundary of Berways garden***

The microphone was located at a height of around 3m from ground level on a pole attached to the rear fence of the Berways garden. This position is located at a distance of 405m from the nearest corner of the Pelham substation and 555m from the nearest part of the National Grid Substation. The main noise sources at this position during survey setup and collection were noted to be distant road and air traffic and natural sounds (e.g.: birdsong).

- *MP3 – Rear Façade First Floor window of the residential annex building at 2 Pelham Close*

The microphone was located at a distance of 1m outside the rear façade, of an annex building at 2 Pelham Close, where a bedroom is located, at a height of around 5m from ground level. The position overlooked the rear garden of the property, to the south-east of which is Pelham Substation and the National Grid Substation. This position is located at a distance of 545m from the nearest corner of the Pelham substation and 595m from the nearest part of the National Grid Substation. A garden water fountain, located in an adjacent garden at a distance of 65m away, was noted to be audible at the time of installation and this will have provided a dominant contribution to the measured high frequency levels, when in operation. Other than the fountain, the main noise sources in this position during survey setup and collection were noted to be distant road and air traffic and natural sounds (e.g.: birdsong).

- *MP4 – Boundary gate at rear of Cockswood land*

The microphone was fixed to a gate at a height of around 2.5m from ground level in a location representative of the boundary of the land associated with the house Cockswood. The position overlooked an adjacent field, which is directly to the west of the proposed Crabbs Lane development, and with Pelham Substation and the National Grid Substation located further to the south-east. This position is located at a distance of 455m from the nearest corner of the Pelham substation and 480m from the nearest part of the National Grid Substation. The main noise sources in this position during survey setup and collection were noted to be distant road and air traffic and natural sounds (e.g.: birdsong) as well as some audibility of the existing substations.

The measurement positions are marked on the Site Plan in Figure 1 and photos of the installed positions are shown in the attached Figures 6-9.

4.3 Instrumentation

Details of the instrumentation used to undertake the survey are provided in Appendix B.

The sound level meters were calibrated both prior to and on completion of the survey with no significant calibration drifts observed at the time of collection. However, during later analysis of the survey data, it was noted that the equipment at MP1 ceased recording from 11:00 on Monday 10th April 2023, and therefore data from this period has been excluded from our analyses for this position.

4.4 Results

The noise levels measured are shown as time-histories on the attached Graphs 1 in Appendix C.

Measured noise levels for the relevant assessment periods are given below. Note that the period 05:00-07:00 has been included as this is relevant to the Berden Hall Solar Farm assessment (where noise levels are anticipated to be significantly lower outside of daylight hours). Note also that the night-time period includes these early-morning hours. The time-averaged L_{Aeq} are given for each period, while the 10th percentile of the $L_{A90,15min}$ are given to represent a typical worst-case, without selecting the absolute quietest value, which is deemed to be overly pessimistic and unrepresentative.

Table 1 – Measured Background Noise Levels during RBA survey

Meas. Position	Typical Lowest (10th percentile) Background Noise Level, $L_{A90,15min}$ (dB)			Time-Averaged Noise Level, L_{Aeq} (dB)		
	Daytime (07:00-23:00)	Night-time (23:00-07:00)	Early Morning (05:00-07:00)	Daytime (07:00-23:00)	Night-time (23:00-07:00)	Early Morning (05:00-07:00)
MP1	28	25	30	49	45	51
MP2	31	26	30	51	51	57
MP3	36	33	39	52	48	51
MP4	33	28	32	53	49	54

4.5 Substation Noise

To determine the presence of any potentially tonal components to the resulting noise measured at the 4no. survey receptors, additional spot measurements were taken close to the existing National Grid substation and Pelham Substation at around 10:00 on Thursday 6th April 2023. Noise from these two sources was noted to be constant and containing a noticeable tonal buzz / hum, as it typical of electrical substation transformers. The following noise levels were measured:

- 45dB, L_{Aeq} at 25m from the nearest fence of the National Grid Substation electrical compound
- 55dB, L_{Aeq} at 1m from the nearest fence of the Pelham Substation electrical compound (and approximately 10m from the loudest plant item which was notably the substation transformer)

Given that the UK national grid operates with alternating current (AC) at a frequency of 50Hz, the expansion and contraction of electrical elements (known as magnetostriction) within transformers occurs at double the AC frequency, therefore most UK transformers will have a dominant tonal peak at 100Hz, and typically a notable peak at the first harmonic which occurs at double the frequency (200Hz). From analysis of the spectral noise levels measured (shown in the attached Graph 2 in Appendix C), there were clear peaks at 100Hz and 200Hz.

In order to determine if the tonal element of the substation noise was audible/noticeable at the 4no. measurement positions, analysis was therefore undertaken of the noise levels at 100Hz and 200Hz throughout the survey. It was also understood that disturbance to local resident's was most commonly noted during the night-time, when background noise levels were quieter (as well as other potential variations, such as the operating duty of the substations and meteorological conditions). Reviewing noise levels in this way, it was noted that the most prominent period during which these frequencies were elevated consistently was between the hours of 02:00-03:00 in the early hours of Sunday 9th April 2023. The logarithmic average of the $L_{90,15min}$ noise levels during this worst-case hour period are shown in the attached Graph 2 in Appendix C.

From analysis of Graph 2 we can make the following observations:

- Both of the source noise levels near to National Grid and Pelham Substations contain notable peaks / tones at 100Hz and 200Hz. The 200Hz peak close to the Pelham substation has a level difference of 13dB and 17dB to adjacent 1/3 octave-band levels, which indicates a strong degree of tonality at the source. Of course, the presence of tonality at source does not necessarily result in audible tonality at the receptor.

- In the worst-case resulting noise levels at receptors MP1-MP4, peaks /tones are notable at 100Hz and 200Hz, however the degree of prominence of each peak varies at different receptors. The most notable is a significant peak at 100Hz for MP4 which has a level-differences of 18dB and 19dB to adjacent 1/3 octave-band levels. Receptors MP2 and MP4 have more prominent peaks at 100Hz but smaller peaks at 200Hz, whereas receptors MP1 and MP3 have 100Hz and 200Hz peaks which are more proportionate to one another, which may indicate the same noise source. Given the accounts of the local residents stating that substation noise is often audible (and claiming that this is due to the Pelham Substation), this appears to tie in with the measured data, where the presence of peaks at these key frequencies is a strong indication of audibility and therefore the need to include some form of tonality correction in prediction assessments, to account for such worst-case scenarios.

- Above around 1250Hz, noise levels were below the noise floor of meters MP1, MP2 and MP4, which is shown as the lines plateauing at 10dB. For meter MP3, the presence of consistently louder high frequency is understood to be caused by a nearby garden water fountain which was audible at the measurement location.

5.0 ACOUSTIC REVIEW OF PREVIOUS PLANNING DOCUMENTATION

RBA Acoustics have reviewed previous Planning-related documentation and reports, relating to the following 3no. Planning Applications, described above in Section 2:

- Pelham Substation (ref: UTT/16/2316/FUL)
- Crabbs Lane (ref: 3/22/0806/FUL)
- Berden Hall (ref: UTT/22/2046/PINS)

5.1 Documents relating to Pelham Substation (ref: UTT/16/2316/FUL)

The following documents have been reviewed in relation the above application:

- Acoustic Report (ref: UTT_16_2316_FUL-NOISE_ASSESSMENT-2447409, dated 15/09/16)

5.1.1 Pelham Substation Acoustic Report

RBA Acoustics has reviewed the above document (ref: UTT_16_2316_FUL-NOISE_ASSESSMENT-2447409, dated 15/09/16) and comment as follows:

- The report was produced by RPS (RPS report ref: 9081e_Pelham_Report_rev0_20160915)

- In Section 1 ('Introduction'), the report provides the following description of the proposals:

"The proposed development is for an ERF comprising of welfare facilities, containerised battery units, transformers, inverters and associated cooling plant. There are two main purposes of the facility: the first will be to provide frequency response in order to maintain the correct operational frequency in the national grid network (49.9 to 50.1 Hz), this requires the batteries to reach 100% power output to respond to a frequency deviation within 1 second; and the second purpose is to provide fast response generation of power. This is similar to the purpose of conventional peaking plant but can meet peak energy demand faster than conventional gas and diesel facilities.

Due to these two purposes, along with the need for charging of the batteries, the site may be required to operate at any time; however, it is unlikely to operate for long periods of time"

This provides some insight into the potential for the units to ramp up intermittently at very short notice, however RBA site observations noted a constant buzzing tone from the Pelham substation.

- Section 3.29 states that a consultation with an EHO from UDC (Janet O'Boyle, on 1/9/16) resulted in agreement that a BS 4142:2014 assessment would be undertaken and that the rating level would not exceed the background level, or where the background level is very low, an absolute rating level of 35dB, $L_{Ar,Tr}$ would not be exceeded, in line with Clause 11 of BS 4142:2014.

- The assessment has only considered the receptor at Crabbs Green Farm, on the basis that the nearest other receptors to the north in Stocking Pelham are over 400m away.

A baseline noise survey was undertaken from Friday 26th August to Wednesday 31st August 2016 at a monitoring location at Crabbs Green Farm. The extracted figure showing the proposed plant and monitoring location is shown in the attached Figure 2 in Appendix C of this report. Based on a low standard deviation in the measured background levels, the arithmetic average of the levels for day (07:00-19:00), evening (19:00-23:00) and night (23:00-07:00) are used in their assessment, which equate

to values of 33dB, 29dB and 27dB respectively. Despite different survey positions background levels measured during the RBA survey generally align with these levels; although different survey positions were used, the background noise during the typical quieter periods is likely to be similar at nearby locations. That being said, the existing tonal character of the background noise at Crabbs Green Farm is likely to have been greater due to the significantly closer proximity to the National Grid substation.

- In section 5.1, the report states:

"The only significant noise generating plant on the ERF is the Medium Voltage Power Station (MVPS). Manufacturer's data for the SMA 2000SC MVPS has been used for the assessment"

This appears to be a significant oversight, given that site observations indicated that the loudest item of plant associated with this development was the transformer.

- The assessment's modelling has been undertaken using SoundPLAN v7.4 modelling software and has considered light down-wind conditions, atmospheric absorption, ground effects, screening and directivity in line with ISO 9613-2:1996. Each MVPS has been modelled as a 'industrial building' with the total sound power equalling the sound power data supplied by the manufacturer.

- It is notable that the presence of the existing farm buildings and kennels provide significant acoustic screening to the residential receptors used in this assessment, and that there are no obvious large barriers between the proposed site and other units in Stocking Pelham (such as Berways).

- Section 7.1 of the report states the following in relation to Tonality corrections:

"Although there is a peak in the sound power levels at 3.15 kHz, the high frequency levels are attenuated more over distance than low frequency, and therefore there are no prominent tones at the receptor locations modelled. Therefore, it is expected that the sound would not contain any acoustic features and no acoustic feature correction has been added to the specific sound level to derive the rating level."

Although it is true that higher frequencies are more readily attenuated in air, given that the distances involved in this assessment are relatively small (around 180m), the difference in attenuation at different frequencies in unlikely to be so significant that the above statement is justification alone for discounting the potential for tonality. Further to this, tonality of the resulting octave band levels could be determined through octave-band analysis, using the Objective Method described in BS4142:2014 (and summarised above in Section 3.2 of this report).

Furthermore, we also know that the purpose of the proposed ERF technology is to provide a short burst of operation to help balance the frequency response of the National Grid, therefore in addition to a potential character correction for tonality, there may also have been a need to include a correction for intermittency / impulsivity.

- Section 7.4 confirms that the assessment does indicate rating levels which exceed the background levels for each respective assessment period (by up to 8dB in the worst-case night-time period) and confirms that this is an indication of adverse impact. However, the report continues, to argue that the absolute noise levels are suitable when assessed as single-figure noise levels, against the single-figure criteria given in the World Health Organisation's document 'WHO Guidelines For Community Noise'. Although numerically the numbers are correct, this could potentially be underestimating the significance of the potentially disturbing character of the resulting plant noise, given that such analysis is frequency independent.

- Further analyses are undertaken, comparing ambient noise levels with/without the proposed plant noise, however, again, this is undertaken using single-figure values, which potentially discounts the significance of frequency-dependant components of the resulting noise.

- The report concludes that it is the daytime and evening periods when residents are most likely to be disturbed by any potential noise from the proposed Pelham substation (on the basis that residents "*will tend to be indoors or asleep during the night*"), however this seems to discount the potential disturbance of residents at night-time once awake, which can clearly have a profound impact on the quality of life of residents. Now that this development has been built, it is in fact during the night-time that resident's have noted the greatest degree of disturbance and audibility from the Pelham Substation. Therefore this oversight, which is critical in the report's conclusion, appears to unduly disregard arguably the most important period, acoustically.

- The report states that the rating level target of 35dB, $L_{Ar,Tr}$ is achieved, as agreed with the EHO at UDC.

- Section 7.16 states that "*Noise from site has been mitigated and minimised to as low as practicable*". This statement doesn't appear to be accurate, given that no acoustic shroud/screening appears to have been used around the development to further limit external noise emissions from the substation. This would be a relatively simple and low-cost form of mitigation which would significantly improve the degree of noise reduction from the development (depending on the specific treatment). Having been to site, the fence surrounding the development is an open metal grille which is acoustically transparent and there are very small bunds (around 2m high) located near to the road, but which would not be expected to provide any significant noise reduction to any receptors.

5.2 Documents relating to Crabbs Lane (ref: 3/22/0806/FUL)

The following documents have been reviewed in relation the above application:

- Acoustic Report (ref: 3_22_0806_FUL-NOISE_ASSESSMENT-1805164, dated 06/04/22)
- EHO Internal Memo (ref: 3_22_0806_FUL-ENV_HEALTH_NOISE_8.11.22-1890678, dated 08/11/22)
- Acoustic report NJD23-0082-003R dated October 2023

5.2.1 Crabbs Lane Acoustic Report

RBA Acoustics has reviewed the above document (ref: 3_22_0806_FUL-NOISE_ASSESSMENT-1805164, dated 06/04/22) and comment as follows:

- The report was produced by ion Acoustics (Ion report ref: Acoustics Report A1690 R01B)

- In Section 1, the report states:

"The battery units are not normally considered noisy however various associated electrical components, such as inverters and transformers, can emit low levels of noise. As such, an assessment (this report) has been carried out to determine operational noise levels at the nearest residential receptors."

- A baseline noise survey was undertaken to determine the background noise levels used in the assessment. However, the measurement locations were at the boundary of the proposed BESS site, rather than in a location more representative of the individual receptors.

- In Section 2.2, the report states that the development is to include the following items of plant:

- 96 No. Battery Energy Storage units;
- 192 Heating, Ventilation & Air Conditioning (HVAC) units, equating to 2no. per battery
- 12 No. Transformer/ inverters units; and,
- A single Distribution Network Operator (DNO) transformer station.

It also states that there would be a 3m acoustic fence surrounding the battery units and an acoustic barn enclosing the inverter/transformer units.

- The report refers to a previous EHDC Planning Application (EHDC application ref: 3/21/0969/FUL) in which there is a plant noise proposal resulting in a rating level at a receptor of 35dB, where the background level used in the assessment is 19dB. The EHO states that achievement of a rating level of 30dB would be *"more defendable in the circumstances in the event that complaints did arise"*. Ion Acoustics have used this precedent to assume that a rating level of 30dB would also be suitable for this proposed site, stating:

"... it is considered appropriate to apply the 30dB rating noise level limit proposed by the Council in instances of low background sound levels."

In Section 3.6, the report makes the further argument:

"In instances of low background and rating noise levels, BS4142 indicates that assessment in line with absolute noise limits might be as, or more, appropriate than a relative assessment. In this instance, a rating noise limit of 30dB is proposed in accordance with the Council's consultation response detailed in section 3.3 above"

Through analysis of the measured background levels, the assessment considers typical background levels of L_{A90} 35dB (daytime) and L_{A90} 27/28dB (night-time). This results in targeting the following rating levels: L_{Ar} 35dB (daytime) on the basis of being no greater than the measured background level; and L_{Ar} 30dB (night-time) on the basis of the measured background noise levels being considered *"very low in absolute terms".* It is notable, however, that the use of this argument previously, was for a background level of L_{A90} 19dB, whereas the proposed L_{A90} 27/28dB is 8-9dB higher than this. Note that using the night-time 30dB limit rather than the measured background levels results in the BS4142 assessment being 2-3dB less onerous.

- The following receptors have been considered in this assessment, which are shown in the attached Figure 3 of this report:

- AL01 – Crabbs Green Farm
- AL02 – White Hart Farm
- AL03 – Berways
- AL04 – Bennils
- AL05 – Dellows
- AL06 – Crabbs Green

- Acoustic modelling has considered wind direction, ground absorption, ambient air temperatures and barrier/screening. Although consideration of these factors is welcomed, the assessment does not appear to consider any changes in the electrical load/duty of the units, which may result in a significant difference in noise levels and tonal character. Without understanding the potential change in electrical duty and associated change in noise levels, this is a significant uncertainty in the assessment methodology.

- It is notable that no specific plant noise data has been used in the assessment, with the report stating:

"The exact equipment for use on the site has not yet been identified, therefore example noise data for typical equipment used on other projects has been used here as a representative evidence-based assessment."

It is notable that this represents a significant source for potential uncertainty, given that the actual plant proposals could be significantly louder than those used in the assessment. It is therefore recommended that the Local Authority require submission of an updated acoustic assessment, representative of the final plant proposals.

- It is not clear whether any noise contribution from the proposed DNO transformer has been included in the assessment.

- A character correction of only 2dB has been applied to the predicted cumulative Specific Noise levels on the basis of the HVAC fans having a *" 'just perceptible' tone as a worst-case assumption".* This section refers mainly to the HVAC fans, however it isn't clear what (if any) dominant contribution is coming from the acoustic barn/batteries. Given that the HVAC fans are likely to operate intermittently, depending on the required load, it would be reasonable to include a +3dB for 'intermittency'. Furthermore, it is not clear from the assessment whether the resulting noise levels at receptors will contain any audible tonality. Depending on the resulting spectral levels the tonality correction could be up to 6dB, where tonality is 'highly perceptible'.

Based on the report's predictions, the rating level at all receptors is at least 3dB below the target for daytime periods. For night-time periods, resulting rating levels are generally below the target, with the exception of the nearest receptor (AL01 - Crabbs Green Farm), where the rating level is predicted to be

+2dB above the rating level target. It is worth noting that resulting rating levels exceed the background level in 4 out of 6 of the receptor locations.

BS4142 states that, when comparing the resulting rating level to the background noise level:

> *"c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *d) 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."*

As such, the above result would suggest that there is a low, but non-negligible risk of adverse impact to the nearest residents in relation to noise, based on the assessment's assumptions.

5.2.2 Crabbs Lane EHO Internal Memo

RBA Acoustics has reviewed the above document (ref: 3_22_0806_FUL-ENV_HEALTH_NOISE_8.11.22-1890678, dated 08/11/22) and comment as follows:

- This document details feedback from EHDC EHO, Claire Spendley, in relation to the above acoustic report. The document recommends that Planning Permission be refused, giving numerous reasons.

- The EHO comments that the background noise levels measured by ion during their noise survey would have been higher than they otherwise would have been, had suitable acoustic mitigation measures been implemented on the existing Pelham Substation site (relating to Planning ref: UTT/16/2316/FUL). It is agreed that the proposed mitigation measures (which we understand were not implemented in full or enforced by UDC) would likely reduce the noise contribution from the Pelham Substation.

- Background noise levels measured at RBA survey position MP1 (Rear façade of 'Berways' house) were L_{A90} 25dB, which is 2-3dB below the background noise level used in the acoustic report and 5dB below the rating level target used in the assessment. Furthermore, given that Crabbs Green Farm is understood to be an active farm, it is possible that background noise levels could also be further elevated in this location due to other industrial and mechanical noise sources. Further still is the noise contribution from the larger Stocking Pelham substation, whose noise contribution would be louder at the Crabbs Lane measurement positions than at the majority of other receptors, due to the greater distance loss.

- The EHO comments that insufficient spectral noise level are provided. We agree with this point, in particular, given the inherently tonal character of substation/transformer noise.

- The EHO comments that 'grid demand' may impact the associated plant noise levels. We agree with this point and would suggest that the assessment should demonstrate what (if any) variation would be expected from a change in electrical duty/load.

- The EHO comments that 'low frequency noise' is the major concern, referring to the tonal hum emitted by electrical substation/transformers. It is agreed that special consideration should be given to this tonal element of the proposed electrical plant, given it's potential to produce audible tonality at receptors. Given that tonal transformer noise from the existing Pelham Substation has already caused disturbance to residents of Stocking Pelham, and that the proposed Crabbs Lane development site is around twice as close to a number of units, it is anticipated that, without suitable

acoustic mitigation, the resulting plant noise from the Crabbs Lane facility is likely to be louder and therefore a greater level and regularity of disturbance to the worst-affected residents.

- The EHO comments that mitigation measures should be provided alongside proposals for post-development commissioning testing. It is also recommended that, given the issues with enforcing the implementation of mitigation measures at the nearby Pelham Substation (under the jurisdiction of UDC), that the EHDC provides a clear commitment to enforcing the implementation of the proposed mitigation measures, to ensure the protection of the amenity of the surrounding noise-sensitive receptors.

5.2.3 Land at Crabbs Green Farm Report

RBA Acoustics has reviewed the document ref: NJD23-0082-003R dated October 2023 produced by NJD Environmental Acoustics and comment as follows:

- Further noise monitoring has been undertaken in the vicinity, one position on the southern boundary of the development to the south of Stocking Pelham and a second to the north east of the village of Berden some 1.7 km from the proposed site.

- Background noise levels have been taken from the second measurement location (Berden Village) as agreed with Environmental Health at EHDC such that *is not influenced by operational noise from the existing BESS*. These measurements were indeed quieter than the Stocking Pelham data and a background noise level of 19 dBA have been established.

- Surrogate noise data rather than the actual plant selections have been used to assess the noise impact at the site as the final manufacturer of the plant has not been finalised.

- A noise assessment using the CadnaA acoustic calculation software has been undertaken, the calculation method and assumptions used look reasonable.

- Noise sensitive receptors are shown on the noise model predictions on Crabbs Lane and Ginns Road but specific addresses are not included. Other potentially affected receptors, for example Berways and 2 Pelham Close have not been identified.

- Significant noise control measures are proposed to limit noise break-out e.g. 3m and 5m high barriers and a series of acoustic louvres.

- The BS4142 assessment suggests a rating noise level or +9dB at night which would typically represent an adverse impact though goes on to say that as the predicted levels are very low this is unlikely to be perceptible through a partially open window.

- The alternative targets they have used are generally suitable and are typically what we would refer to in a low noise environment when assessing low frequency noise (NANR45 and NR20) though given the very quiet nature of the site this still may not be appropriate.

5.3 Documents relating to Berden Hall (ref: UTT/22/2046/PINS)

The following documents have been reviewed in relation the above application:

- Acoustic Report (ref: JAJ02800-REPT01-R0_Redacted, dated 23/05/22)
- EHDC EHO comments (ref: EHDC_Environmental_Health_Redacted, dated 01/02/23)
- UDC EHO Comments (ref: EHO comments - UDC_Environmental_Health, dated 03/02/23)

5.3.1 Berden Hall Acoustic Report

RBA Acoustics has reviewed the above document (ref: JAJ02800-REPT01-R0_Redacted, dated 23/05/22) and would comment as follows:

- The report was produced by RPS (RPS report ref: JAJ02800-REPT01-R0)

- Section 2.32 of the report details the requirements contained within UDC's Noise Assessment Technical Guidance (NATG) document. This document states:

"The development should be designed so as to achieve a rating level of 5 dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location"

"Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics."

"Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location"

- The report identifies the following receptors within the report:

- NRS A1 Ginns Road
- NSR A2 Benskin Close
- NSR B1 High Fields
- NSR B2 51°56'14.3"N 0°07'45.1"E
- NSR B3 51°56'14.4"N 0°07'44.3"E
- NSR C1 Barn Cottage
- NSR C2 Berden Hall
- NSR C3 Durwards
- NSR C4 Vicarage
- NSR D1 Crabbs Lane
- NSR D2 Crabbs Lane

Receptors are grouped by approximate location and the following units are considered in the assessment:

- NRS A Ginns Road
- NSR B 51°56'14.3"N 0°07'45.1"E
- NSR C Barn Cottage
- NSR D Crabbs Lane

It is highly notable that multiple receptors in Stocking Pelham (which were identified within the Crabbs Lane Acoustic Report (see Section 4.1.1 and the attached Figure 2 of this report) were not even identified as potential receptors in this assessment. This is deemed to be a significant oversight within this assessment, given that many of these receptors are located closer to both the proposed Inverters and Transformer, as

well as the existing Pelham Substation, which may also increase in noise levels due to the increased electrical load/duty provided by the solar farm.

- An unattended baseline noise survey was undertaken from Monday 31st January 2022 to Monday 7th February 2022. Two long-term monitoring positions were used; LT1 was considered representative of receptors NSR A and NSR C (units to the north-east of site) and LT2 was considered representative of receptors NSR B and NSR D (units to the south and west of site). It is notable that measurement position LT2 was located relatively close to the existing Pelham Substation and the larger Stocking Pelham Substation, both of which would be significantly louder at LT2 than would be measured at other nearby receptors in Stocking Pelham that weren't considered in the RPS assessment.

- The report states that the 50th percentile of the background noise levels was selected to be used as a representative value for the assessment which we note is less onerous than the 10th percentile used in our assessment of the histograms.

- The assessment's modelling has been undertaken using SoundPLAN v8.2 modelling software and has considered light down-wind conditions, atmospheric absorption, ground effects, screening and directivity in line with ISO 9613-2:1996. Section 4.11 also refers to the modelling giving consideration to topographical Ordnance Survey data.

- In Section 4, the report states that the assessment is to assume the following for the proposed items of plant:

- 11 No. Standalone Solar PV Inverters (maximum sound power level 91dBA, L_w for the 07:00-23:00 daytime period and 76dBA, L_w for the 05:00-07:00 early morning period and not operational during the 23:00-07:00 night-time period)
- 1no. New Substation (maximum sound power level 87dBA, L_w operating at all times)

A footnote in Table 4.1 of the report states, in relation to the assessment noise level data: *"SWL based on data for large substation transformer as previously assessed by RPS"*. It is therefore acknowledged that the noise levels used in this assessment are not specific to the final acoustic proposals and that the Local Authority should ensure that any future specific proposals are assessed, using accurate laboratory data and with assessment parameters (e.g.: duty/operating times) that are specific to this proposed site.

Further to this point, the same noise level spectrum has been used for all plant in this assessment.

Justification for the reduced inverter noise level duty for the 05:00-07:00 period is given in Section 4.6 of the report, as shown in their Figure 4.1, repeated in Figure 5 of Appendix C of this report.

- It is notable that a +3dB character correction is applied to all receptors to account for tonality, however no correction is suggested for intermittency on the basis that "*the intermittency is not expected to be readily distinctive against the residual acoustic environment*".

- Modelling has been undertaken for the three assessment periods (day, night and early morning) and has assessed resulting rating levels with and without a contribution from the existing Pelham Substation, using noise levels measured during a commissioning survey, with information provided in Appendix B of their report. It not clear, however, whether the presence of a large solar farm would change the operating duty/load on the existing Pelham Substation thereby potentially affecting it's typical and worst-case noise levels, which may be different from those measured during the commissioning survey.

- It is notable that the predicted specific noise level (when including the existing Pelham substation which appears to be the dominant noise at the receptor) at NSR D (Crabbs Lane) appears to align

closely with the predictions made by RPS in the Pelham Substation acoustic report, despite RPS's report not modelling noise contributions from the transformers. The resulting worst-case night-time rating level exceeds the assessment background noise level by 3dB, which ordinarily would suggest that there is a low, but non-negligible risk of adverse impact to the nearest residents in relation to noise, based on the assessment's assumptions.

- Based on a review of the predicted rating levels being well below the existing background noise levels, the report concludes that there is a low risk of adverse impact on receptors. Furthermore, it concludes that for receptors NSR A, B & C, which are located in the Uttlesford District, they achieve the requirement for rating levels to be at least 5dB below the measured background levels as per the NATG requirement.

- The report also concludes that there would be no change to the absolute ambient noise levels due to the proposed development. As stated previously, such an analysis could potentially underestimate the frequency component of the noise.

- Appendix B of this report includes the appended substation commissioning report undertaken by RPS at the site on 27th November 2017. It is initially noted that: *"Due to the ambient air temperature at the time of the measurements the condenser fans which form part of the battery storage air cooling units were likely operating on a very low duty. It is possible that the inverter cooling systems were also operating on a low duty."* This statement suggest that measured noise levels are not worst case; these levels are subsequently referenced and used in the Berden Hall acoustic report, although it is not clear if any correction has been applied to account for the 'very low duty' scenario that they were measured in.

- Section 1.10 of Appendix B of the report confirms that the worst-case specific noise level prediction (based on the 'low duty' measurements) at the Crabbs Green Farm receptor would be 35dBA with no acoustic mitigation and 34dBA with proposed acoustic fences. Therefore, assuming any character correction of ≥2dB (which is likely to be the case, given the tonal nature of the noise) the resulting noise levels would not be compliant with the rating level criterion of 35dB. Further predictions of E-House condenser fans suggest specific noise levels at the Crabbs Green Farm receptor of 39dBA with no acoustic mitigation and 38dBA with proposed acoustic fences. This provides further prediction that the proposed development is non-compliant with the criteria and that further acoustic mitigation would be required, providing even greater levels of attenuation that the proposed acoustic fences would provide. This non-compliance is clarified in section 1.15 of their Appendix B, which states:

  "The results of the modelling indicate that it is likely that, during periods of high demand that coincide with periods of elevated ambient air temperatures, the condition 3 criterion could be exceeded. Notwithstanding the point above regarding uncertainties associated with likely sound levels from the cooling plant under different loads, the exceedances above the condition 3 criterion could be in the order of around 5 dB. Depending on the magnitude of the rating penalty which would be appropriate in such situations, worst case exceedances of the condition 3 criterion could be up to around 10 dB, if a high rating penalty can be appropriately justified. However the likelihood of this occurring depends on many factors, and worst case exceedances could perhaps only occur for 1 hour a year or less, or may never occur at all."

It is not clear where this final sentence relating to regularity has come from. The uncertainty surrounding this regularity is concerning, as the robustness of any BS4142:2014-type assessment would need to understand the context and regularity of an occurrence, to determine whether it is acoustically acceptable or not.

- Section 1.13 of Appendix B states: *"A worst case level from the invertors has not been predicted as it is considered that the E-House condenser fans represent a more significant risk as they are located at high level, whilst sound from the inverters may be more easily attenuated by acoustic fencing, as the inverters are closer to ground level."* We would question why this vague statement has been included to replace an robust objective technical assessment of the inverter levels, given that ground absorption and screening and both able to be included in acoustic modelling.

- Section 1.16 of Appendix B states:

  "Though the stated reason for condition 3 is to safeguard amenity it is considered that small exceedances of the criterion would be unlikely to result in significant impacts to residential amenity. Even worst-case exceedances of the criterion may not result in significant impacts to residential amenity and on this basis it is considered unlikely that the operation of the facility would attract noise complaints and subsequent action by the local authority."

This statement is misleading, as it does not recognise the fact that the initial usage of a 35dB rating level criterion was itself a derogation from the typical BS4142:2014 approach (comparing rating levels against background noise levels) and has been used based on the precedent of a previous project. It is therefore not reasonable to suggest that relaxations on an already relaxed criterion are acceptable.

- Section 1.17 of Appendix B provides details of mitigation proposals:

  "However, if sound from the facility exceeded the condition 3 criterion, and the exceedances were identified, then mitigation measures could be specified to reduce sound levels at the boundary of Crabb's Green Farm. The mitigation measures would likely consist of:
  - *E-House Condenser Fans: selection of quieter plant, or provision of engineering noise control options such as attenuators and acoustic cladding; and*
  - *The specification and installation of acoustic fencing, with the planning design as an initial design on which the detailed design would be based."*

Despite this being highlighted at pre-Planning stage for the Pelham Substation, it is our understanding that nothing has been implemented and UDC have not enforced any mitigation measures to be implemented, over 5 years after the production of the above report.

5.3.2 Berden Hall EHDC EHO comments

RBA Acoustics has reviewed the above document (ref: EHDC_Environmental_Health_Redacted, dated 01/02/23) and would comment as follows:

- The EHO representing EHDC recommend refusal of the proposed development. One of the reasons cited is that the application *"lacks sufficient information to satisfy the local authority that the proposal adequately assesses or mitigates against the noise impact of the development".* We would agree that it is not clear whether worst-case conditions have been assessed. Furthermore, the assessment acknowledges that noise levels used are from another project and final plant details may be different. It would be advisable that measurements are taken at an existing site with the same model of equipment, or laboratory tested manufacturers data is provided, such that specific noise data for the proposed units can be used and the assessment could provide greater clarity on the potential variation in noise levels during operation.

- There is a general concern from the EHO that there is a risk of noise creep in the local area, if baseline background noise levels used in the assessments include contributions from previous/newly built schemes which themselves may not be suitably controlled or include adequate mitigation to avoid disturbance to nearby residents. A measurement undertaken at a nearby resident's window strongly indicates the presence of peaks at 100Hz and 200Hz due to noise from

the existing Pelham Substation. As such, the implication is that this substation should first be suitably mitigated, then that any future proposals are assessed against background noise levels representative of the noise climate prior to the Pelham Substation being built.

- The EHO also comments that assessment to Crabbs Green Farm, which was undertaken for the Pelham Substation included a significant degree of screening from the existing farm buildings, and suggests that noise transfer to other receptors in Stocking Pelham which don't benefit from significant building screening, may in fact be higher or have more of an impact on residents.

- The EHO requests that further analyses are undertaken for the site to predict 'full frequency' (which we understand to mean 1/3 octave-band) noise transfer to other receptors in Stocking Pelham which have not currently been considered in the assessment. It further requests that, suitable acoustic mitigation measures are proposed.

5.3.3 Berden Hall UDC EHO comments

RBA Acoustics has reviewed the above document (ref: EHO comments - UDC_Environmental_Health, dated 03/02/23) and would comment as follows:

- Concerns are raised by the EHO that, following numerous complaints from residents in and around Stocking Pelham due to noise from the Pelham Substation, that the proposed solar farm could further increase the low-frequency tonal noise experienced at numerous residential receptors.

- We agree with the EHO's statement that the assessment should be updated to align with the actual plant proposals and proposed plant noise data, rather than generic/typical noise data.

The EHO states: *"The use of BS4142 should be applied but its overall robustness in determining noise impacts in this case is limited due to the potential Low Frequency (LF) sound generated by the plant."* We would agree with the essence of this comment, however would suggest that BS4142 can still be capable of providing a representative assessment result, providing the assumptions are correction for the application of character corrections, and when assessed against the actual background noise levels, rather than the relaxed rating level criterion of 35dB.

- The EHO questions the validity of the RPS assessment for Berden Hall, on the basis that commissioning testing of the installed Pelham Substation demonstrated a significant difference between the assessed and commissioned noise levels from the facility. It is also noted that, during the Pelham Substation commissioning survey, there was a 'low duty cycle' on the transformers. It is however unclear whether the data used in the Berden Hall assessment, has included a correction for normal operation of the inverters and transformers.

6.0 DISCUSSION & CONCLUSION

Based on analysis of the measured survey data and the previous Planning documentation listed above, the following key areas of concern have been identified relating to the Pelham Substation:

Pelham Substation	
1	The use of a rating level target of 35dB results in the BS4142 assessment is not deemed appropriate as this represents a significant relaxation from the typical approach of assessing rating levels against background noise levels given that background noise levels have been measured as low as 25dB, L_{A90}
2	The assessment has only assessed to Crabbs Green Farm and has not assessed any noise transfer to other receptors in Stocking Pelham. Although these receptors are further from site, they do not benefit from significant building screening (as is experienced at Crabbs Green Farm) and will have a different background noise character, being located further from the existing National Grid substation
3	The report indicates that only the Medium Voltage Power Stations (MVPS) have been used for the assessment, which fails to include any contribution from the associated transformer and other cooling plant. Therefore the assessment does not seem to have been representative of all noise sources
4	The acoustic report concludes that the worst-case noise transfer exceeds the night-time background levels by +8dB which is an indication of adverse impact. The initial acoustic report does not include any character corrections for tonality, which is deemed to be an oversight
5	The acoustic report states that site noise has been minimised to as low as practicable, however this is patently untrue, given that in this report, there is no proposal to include further mitigation such as screens, enclosures and/or quieter plant units
6	Since the construction of Pelham Substation, multiple residents in Stocking Pelham have noted audibility of tonal noise at the residences and experienced disturbance due to the resulting noise. The presence of tonal peaks that are characteristic of transformer noise have been confirmed in noise levels measured by both RBA Acoustics and an EHO, suggesting that the RPS assessment failed to robustly categorise risk of impact to residential receptors from the development site
7	Subsequent commissioning testing and further review of BS4142 assessment indicates that even with the inclusion of 'acoustic fences' (the details of which are not clear) that resulting rating levels would exceed the 35dB target. Commissioning was undertaken during 'very low duty', so assuming a correction for normal operation, and with the inclusion of character corrections for tonality and intermittency, the exceedance over the rating level target is anticipated to be in the region of 5-10dB which is highly significant. Note this would be an exceedance of around 15-20dB over the actual measured background levels which BS4142 suggests having a significant adverse impact
8	The site appears to have been granted Approval despite EHOs from both adjacent local authorities recommending refusal and providing robust and comprehensive evidence for doing so. We have not seen evidence of any adequate response or action following the raising of these concerns

The following key areas of concern have been identified relating to the Crabbs Lane development:

Crabbs Lane - NOISE_ASSESSMENT-1805164, dated 06/04/22 & EHO Memo	
1	The use of a rating level target of 30dB results in the BS4142 assessment is not deemed appropriate as this represents a significant relaxation from the typical approach of assessing rating levels against background noise levels given that background noise levels have been measured as low as 25dB, L_{A90}
2	Example noise data for 'typical equipment' has been used for all plant items in the assessment, therefore the assessment is not representative of the actual potential risk of impact to receptors. The assessment should be completed with representative noise data, taking into consideration specific frequency components of the plant noise
3	It is not clear whether any noise contribution from the DNO transformer has been included in the assessment
4	A character correction of only 2dB has been applied (for tonality), whereas we feel the tonality correction could be as high as +6dB and there may be grounds for an intermittency correction of +3dB (due to the intermittent operation of HVAC fans). These corrections would also have a significant impact on the outcome of the assessment
5	The acoustic report concludes that resulting rating levels exceed background levels in 4 out of 6 of the assessed receptors, including the receptor at Crabbs Green Farm where the rating level target is exceeded by +2dB. BS4142 suggest this is likely to be an indication of adverse impact
6	In line with EHO concerns, given that there is already an issue of noise disturbance from the Pelham Substation, there is a significant risk that such noise issues could be increased by the Crabbs Lane development, if noise is not adequately mitigated
7	Given the issues with enforcing the implementation of mitigation measures at the nearby Pelham Substation (under the jurisdiction of UDC), if the site is approved, the EHDC should provide a clear commitment to enforcing the implementation of the proposed mitigation measures, to ensure the protection of the amenity of the surrounding noise-sensitive receptors.
8	EHDC EHO has recommended refusal and provided robust and comprehensive evidence for doing so

Crabbs Lane – Report NJD23-0082-003R dated October 2023 produced by NJD Environmental Acoustics	
1	Example noise data for 'typical equipment' has been used for all plant items in the assessment, therefore the assessment is not representative of the actual potential risk of impact to receptors. The assessment should be completed with representative noise data, taking into consideration specific frequency components of the plant noise
2	Noise sensitive receptors are shown on the noise model predictions on Crabbs Lane and Ginns Road but specific addresses are not included. Other potentially affected receptors, for example Berways and 2 Pelham Close have not been identified.
3	The BS4142 assessment suggests a rating noise level or +9dB at night which would typically represent an adverse impact though arguments for context are provided
4	The alternative targets they have used are generally suitable and are typically what we would refer to in a low noise environment when assessing low frequency noise (NANR45 and NR20) though given the very quiet nature of the site this still may not be appropriate
5	Significant noise control measures are proposed to limit noise break-out e.g. 3m and 5m high barriers and a series of acoustic louvres. How will the effectiveness of these measures be ensured and verified during construction and operation?

The following key areas of concern have been identified relating to the Berden Hall development:

Berden Hall	
1	The assessment has failed to include a number of key receptors in Stocking Pelham, located to the north-west of site (see receptors AL02 – AL05 in the attached Figure 3 in Appendix C); these receptors are located closer to the proposed noisy plant items (e.g. inverters/transformers) than some other receptors which *were* included in the assessment. This is a significant oversight, and we would recommend that further analyses are undertaken to these receptors
2	Noise levels used in this assessment are not specific to the proposed plant items and therefore further analyses should be undertaken with plant-specific noise data to ensure predictions are representative of future proposals
3	The resulting worst-case night-time rating level (to Crabbs Green Farm) represents a +3dB exceedance over the background level, indicating a low but non-negligible risk of adverse impact

This report has outlined that there are a number of issues with the assessments and the enforcement of acoustic mitigation measures such that resulting noise from the now-approved and constructed Pelham Substation is causing disturbance to some residents in Stocking Pelham.

It is recommended that, the issue of noise disturbance is only likely to get worse with future applications, unless serious consideration is given to the concerns raised by the relevant EHOs and those listed in the above tables.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g L_{A10}, L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

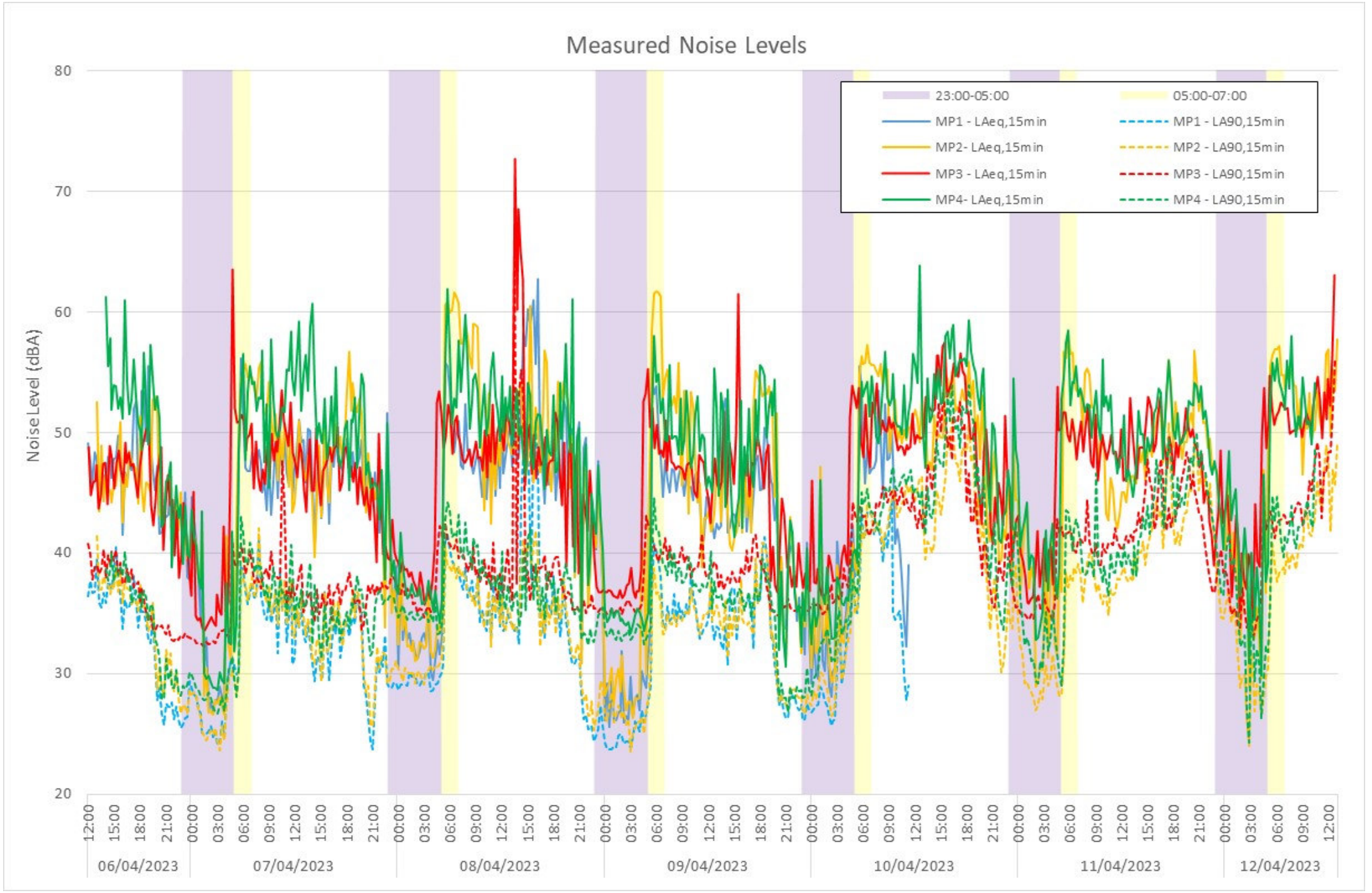
Appendix B - Instrumentation

The following equipment was used for the measurements:

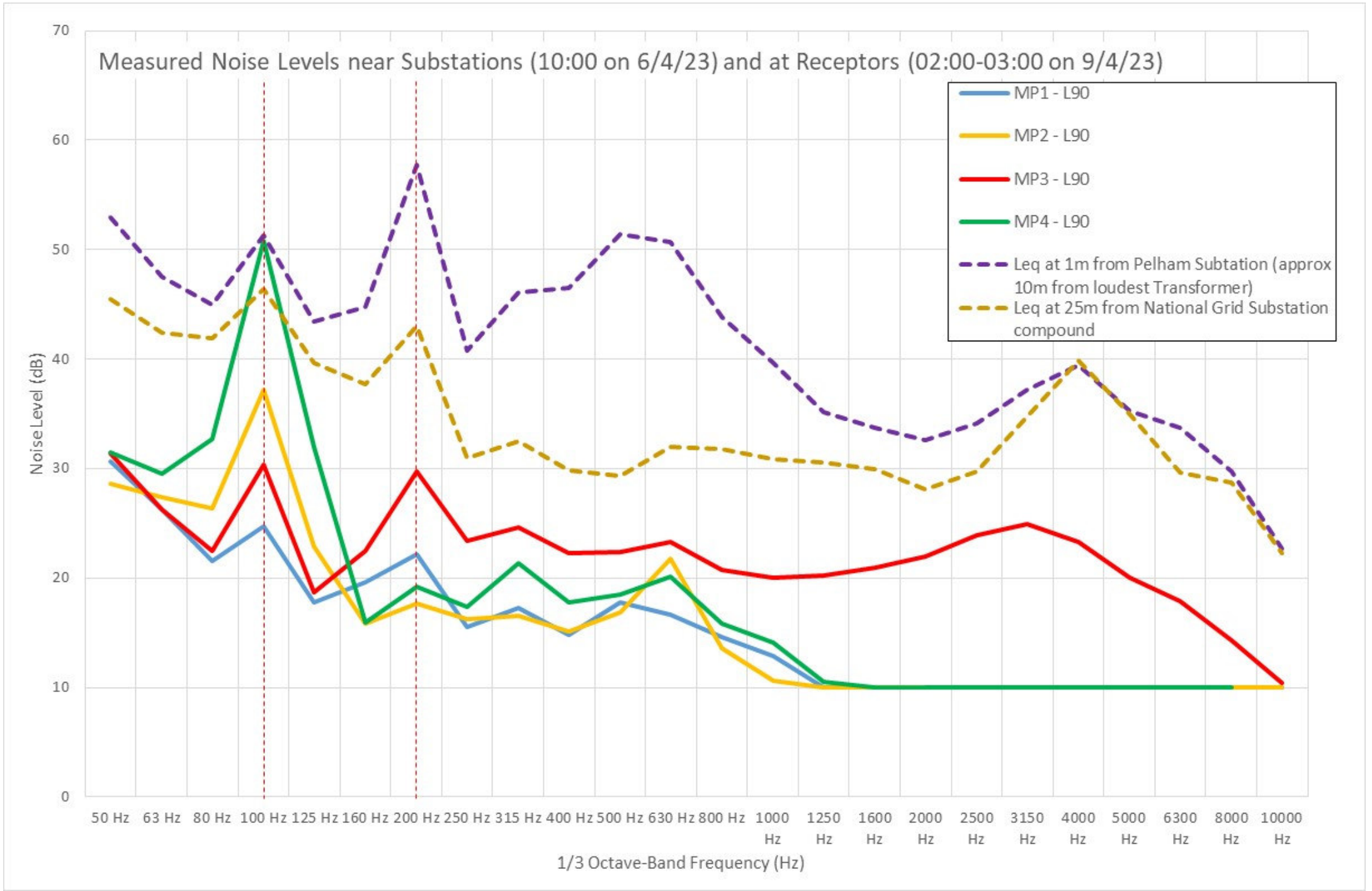
Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
Norsonic Type 1 Sound Level Meter	Nor140	1406971	U38866	2 September 2023
Norsonic Pre Amplifier	1209	21571		
GRAS ½" Microphone	40AF	207393	38865	2 September 2023
Norsonic Sound Calibrator	1251	35016	U38864	1 September 2023
Norsonic Type 1 Sound Level Meter	Nor140	1403226	U42991	18 January 2025
Norsonic Pre Amplifier	1209A	12066		
Norsonic ½" Microphone	1225	168180	42990	18 January 2025
Norsonic Sound Calibrator	1251	31988	U42989	18 January 2025
Norsonic Type 1 Sound Level Meter	Nor140	1407477	U39227	19 October 2023
Norsonic Pre Amplifier	1209	22341		
Norsonic ½" Microphone	1225	358196	39226	
Norsonic Sound Calibrator	1255	125525259	U39225	19 October 2023
Norsonic Type 1 Sound Level Meter	Nor140	1407793	4712338926	9 December 2023
Norsonic Pre Amplifier	1209	23228		
Norsonic ½" Microphone	1225	468954		3 December 2023
Norsonic Sound Calibrator	1255	125525796	Cal 022-2021-14779	8 December 2023
Norsonic Type 1 Sound Level Meter	Nor140	1407794	4712332270	9 December 2023
Norsonic Pre Amplifier	1209	23229		
Norsonic ½" Microphone	1225	468970		3 December 2023
Norsonic Sound Calibrator	1255	125525795	Cal 022-2021-14778	8 December 2023

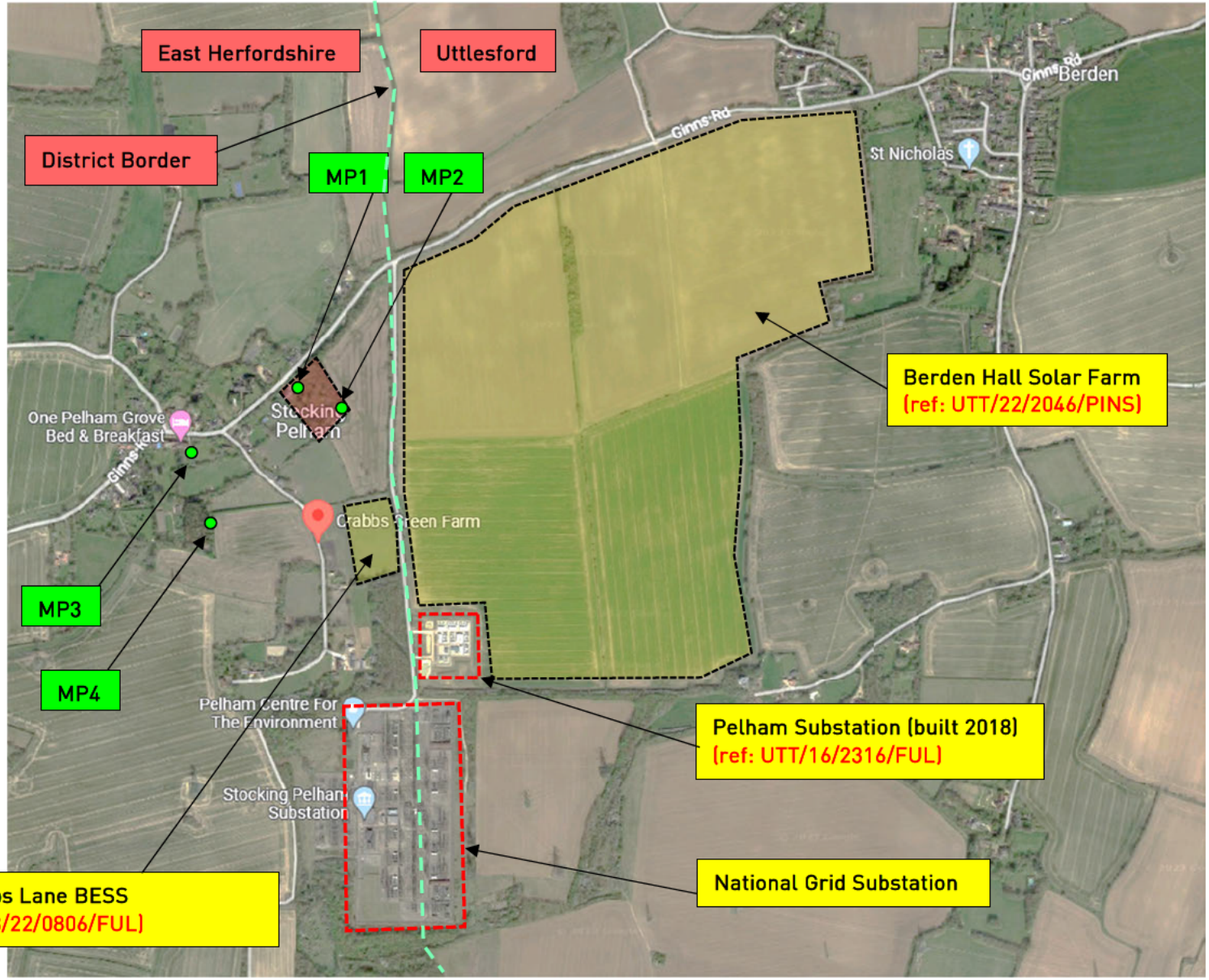
Appendix C – Graphs and Site Plans

Graph 1 – RBA Baseline Noise Survey



Graph 2 – Comparison of source noise levels near existing substations and worst-case resulting background levels at RBA survey receptors





Stocking Pelham – Energy Development sites

Site Plan & RBA survey positions

Project 12622

Figure 1

27 November 2023

Not to Scale

RBA ACOUSTICS

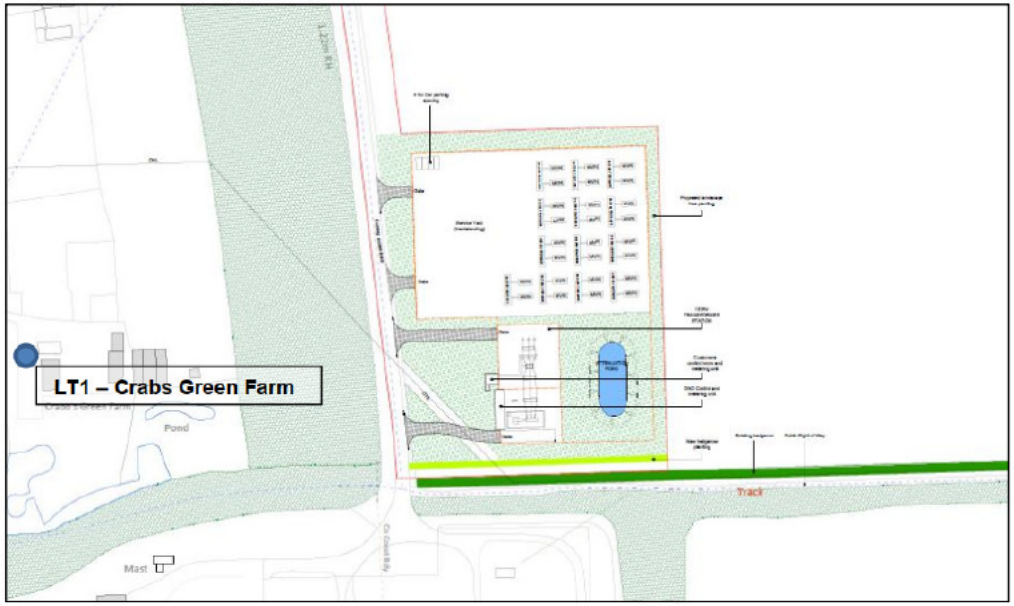
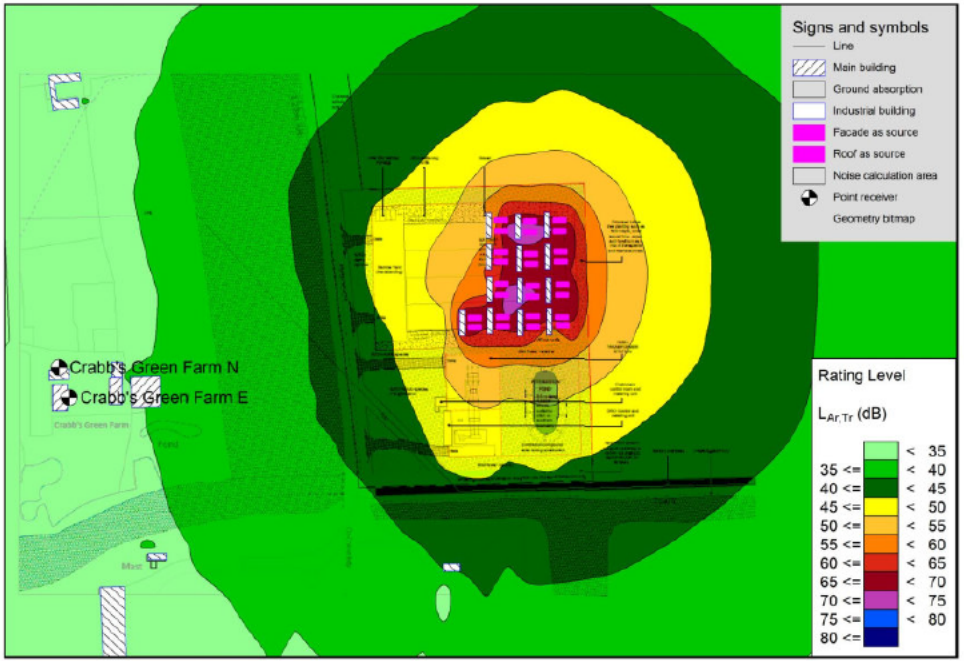


Figure 4.1 within Pelham Substation Acoustic Report showing survey position (LT1)



Appendix B within Pelham Substation Acoustic Report showing noise level predictions

Stocking Pelham – Energy Development sites

Relevant extracts from RPS's Acoustic Report for Pelham Substation (see Section 5.1.1)

Project 12622

Figure 2

27 November 2023

Not to Scale

RBA ACOUSTICS

Figure 1 within Crabbs Lane Acoustic Report showing survey positions

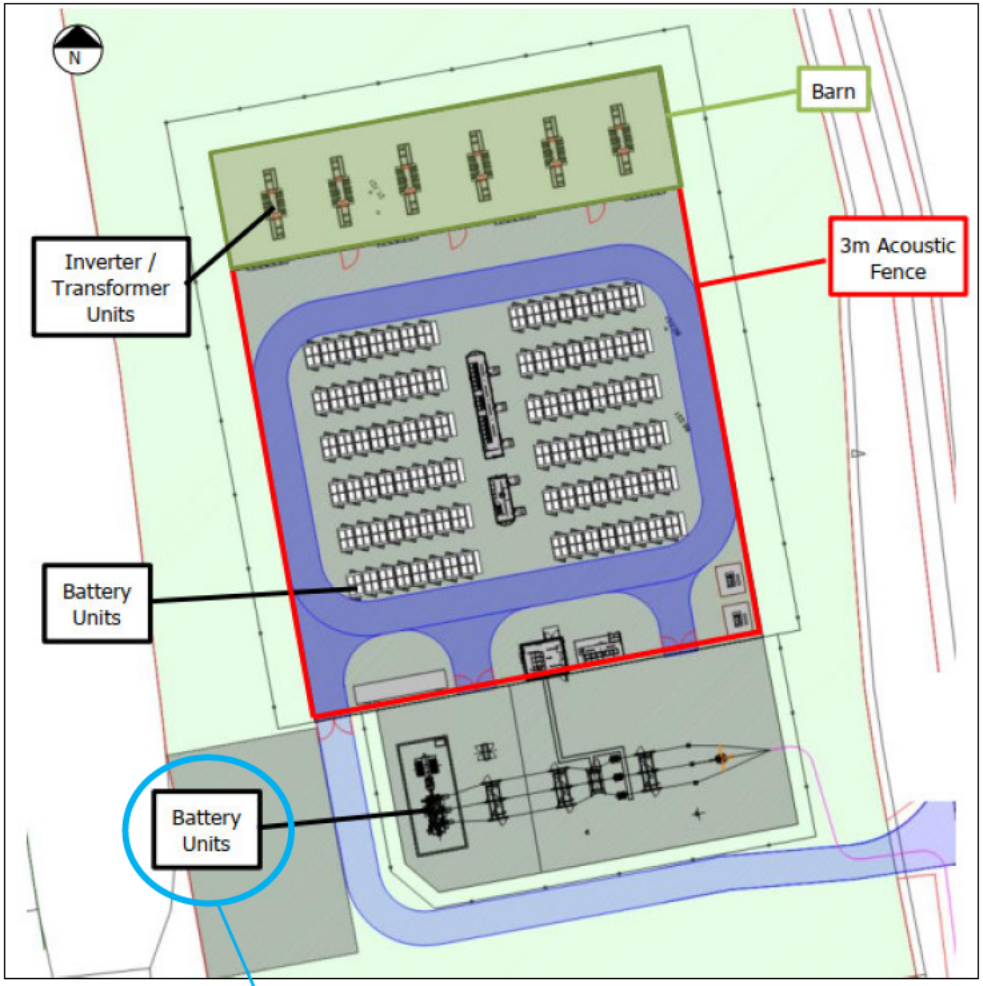


Figure 2 within Crabbs Lane Acoustic Report showing proposed plant items

We believe this is a typo and should be labelled as 'Distribution Network Operator (DNO)

Stocking Pelham – Energy Development sites

Relevant extracts from ion Acoustics' Acoustic Report for Crabbs Lane (see Section 5.2.1)

Project 12622

Figure 3

27 November 2023

Not to Scale

RBA ACOUSTICS

Figure 3.1 within Berden Hall Acoustic Report showing assessment receptors

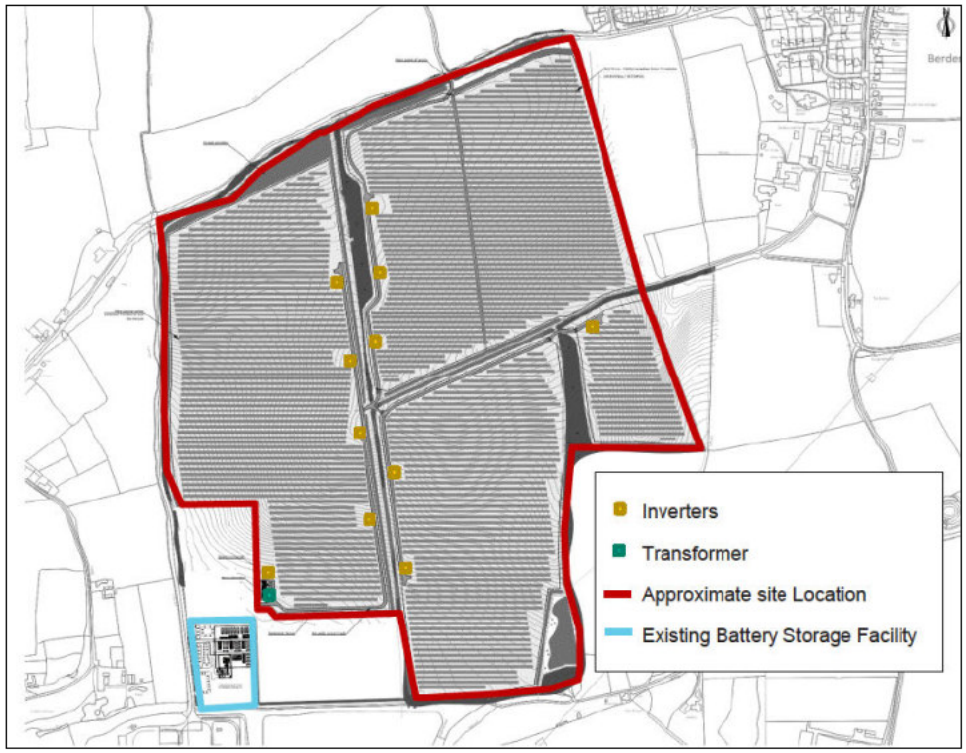


Figure 3.2 within Berden Hall Acoustic Report showing proposed plant items

Stocking Pelham – Energy Development sites

Relevant extracts from RPS Acoustic Report for Berden Hall Solar Farm (see Section 5.3.1)

Project 12622

Figure 4

27 November 2023

Not to Scale

RBA ACOUSTICS

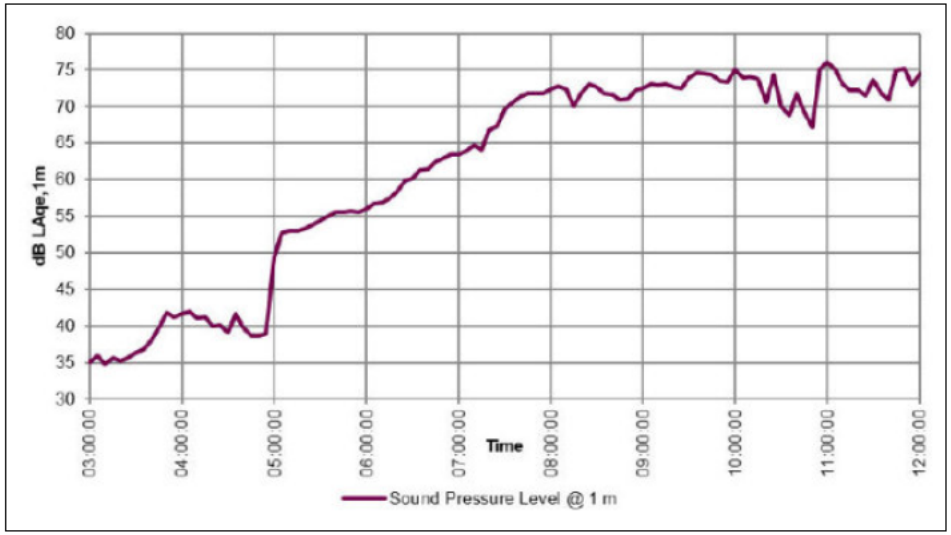


Figure 4.1 within Berden Hall Acoustic Report showing typical 'ramping-up' of sound pressure level of a solar inverter during early hours of the morning

Plant Item & Operating Conditions			Overall Sound Power, Lw, dBA	Linear Sound Power Level, dB, per Third Octave Band, Hz																								
Equipment	Item	Op Condition		50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
Inverter	Air inlet	FFR mode (25% fixed power)	46		62	65	58	55	49	39	39		35		21	29	27	19										
Inverter	Air outlet	FFR mode (25% fixed power)	60						45	43	18									27	51	54	35	44	56	46	41
Inverter	Air outlet duct	FFR mode (25% fixed power)	55	41			41	25	41	40	33	37	29		23	23	25	22	26	26	43	45	31	41	54	39	33
Inverter	Enclosure	FFR mode (25% fixed power)	65	62	62	59	56	50	51	41	46	48	50	39	36	41	35	49	40	43	51	53	47	52	63	53	53
Inverter switchgear	Enclosure	FFR mode (25% fixed power)	57							63	45	54	47	53	45		43	39	33	31	35	47	35		46	38	41
Inverter transformer	Enclosure	FFR mode (25% fixed power)	60			50	51			52	45	60		44	44	46	47	41			46	52	34	45	53	50	51
Main site transformer	Transformer	FFR mode (25% fixed power)	88	79	76	79	85	77	75	92	74	87	81	82	86	74	87	82	46		45	51			43		33
Inverter	Air inlet	FFR mode (10-30% variable)	47	57	53	55	50	55	48		42	36															
Inverter	Air outlet	FFR mode (10-30% variable)	61						45	43		31	28							26	49	55	34	45	57	38	39
Inverter	Air outlet duct	FFR mode (10-30% variable)	50	45			46	44	42	42	29	40	38	36	34	34	31	31	32	29	38	37	35	37	47	32	28
Inverter	Enclosure	FFR mode (10-30% variable)	63	65	64	66	57	56	57	54	54	47	47	51	24	44	42	40	42	40	45	49	41	55	61	51	52
Inverter switchgear	Enclosure	FFR mode (10-30% variable)	56						49	55	52	54	50	53	50	43	42	36			44	31		24	44		34
Inverter transformer	Enclosure	FFR mode (10-30% variable)	61			57	56	53	45	54	46	60	54	58	52	47	49	41	37	36	47	49	33	39	49		
Main site transformer	Transformer	FFR mode (10-30% variable)	86	83	72	77	85	79	71	89	75	87	89	81	84	73	83	81									
Inverter	Air inlet	Discharging 50 MW (100% power)	76	73	80	81	83	79	75	75	72	73	65	65	61	64	63	61	63	62	59	57	54	52		59	50
Inverter	Air outlet	Discharging 50 MW (100% power)	72	67	67	67	68	66	62	57	66	66	67	65	63	61	60	59	58	58	59	61	52	54	64	58	60
Inverter	Air outlet duct	Discharging 50 MW (100% power)	69	71	78	79	85	71	72	69	63	61	60	57	54	53	52	50	49	48	50	53	39	46	56	40	41
Inverter	Enclosure	Discharging 50 MW (100% power)	78	80	80	80	80	74	73	77	75	76	69	67	65	66	67	64	61	58	62	64	55	60	69	60	60
Inverter switchgear	Enclosure	Discharging 50 MW (100% power)	60		71		69	63		68		69	54	53	53	47	47	43	47	38	44	45	34				
Inverter transformer	Enclosure	Discharging 50 MW (100% power)	82				73		65	58	51	60	57	55	42	52	48	47	43			45		33	51		38
Main site transformer	Transformer	Discharging 50 MW (100% power)	84	90	74		90	82	75	89	71	86	79	78	78	70	67	60	54	50	55	60	46	46	51	41	41
Inverter	Air inlet	Discharging 48.5 MW (97% power)	72	74	80	80	73	76	73	73	74	69	63	60	60	60	60	59	61	60	55	48	50			42	
Inverter	Air outlet	Discharging 48.5 MW (97% power)	72	60	69	69	61	69	64	63	66	66	66	64	61	60	60	59	58	57	59	63	63	54	64	58	60
Inverter	Air outlet duct	Discharging 48.5 MW (97% power)	66	73	76	76	73	68	70	67	60	60	59	56	53	51	50	48	47	46	50	49	47	48	53	43	44
Inverter	Enclosure	Discharging 48.5 MW (97% power)	76	77	76	79	78	73	70	74	71	73	69	67	64	65	65	64	60	58	59	60	50	58	68	56	57
Inverter switchgear	Enclosure	Discharging 48.5 MW (97% power)	62				76	64		66	50	57	54	51		47	48	48	47	44	47	49	38	45	53	35	37
Inverter transformer	Enclosure	Discharging 48.5 MW (97% power)	63				72		68	62	54		57	54		54	52	48	48	44	48	50	40	44	56	40	44
Main site transformer	Transformer	Discharging 48.5 MW (97% power)	86	84			87		66	89	74	88	77	78	83	71	83	58	52	47	52	58		41	53		
Battery storage	Condenser fan	Charging 50 MW (100% power) - fan on very low power	46			31			48	44	46	42	43	39	38	33	27	33	28	23	28	27	27	21	24	20	17
Battery storage		Charging 50 MW (100% power)	79	58						63		53	57	57	60	60	58	58	61	65	68	70	71	72	71	69	67
Inverter	Air inlet	Charging 50 MW (100% power)	72	73	80	79	75	76	72	71	74	69	62	60	58	61	59	59	60	60	55	49	50			39	
Inverter	Air outlet	Charging 50 MW (100% power)	73	76	78	78	76	75	76	73	64	66	66	64	60	60	59	58	57	56	59	63	52	55	67	50	51
Inverter	Air outlet duct	Charging 50 MW (100% power)	66	74	76	74	73	68	70	67	61	60	59	55	53	51	49	46	47	46	52	52	41	45	58	43	46
Inverter	Enclosure	Charging 50 MW (100% power)	75	78	77	77	77	72	71	72	67	68	66	64	65	64	62	58	56	58	60	60	50	59	71	57	58
Inverter switchgear	Enclosure	Charging 50 MW (100% power)	62		63			64		67	46	60	53	51	40	46	47	48	47	46	49	49	38	40	50	39	42
Inverter transformer	Enclosure	Charging 50 MW (100% power)	65				71		62	55	55	58	58	54	51	55	53	52	45	45	48	50	40	45	50	45	48
Main site transformer	Transformer	Charging 50 MW (100% power)	82	87	72		85		66	88	67	74	78	71	78	71		68				56					
Inverter	Air inlet	Charging 20 MW (40% power)	45	52	56	62	58	55	49	43	36																
Inverter	Air outlet	Charging 20 MW (40% power)	63						45	43		28	20	16					17	31	54	58	39	46	59	42	43
Inverter	Air outlet duct	Charging 20 MW (40% power)	55	45		37	52	40	49	37			31			42		34	36	39	47	46	31	37	53	33	35
Inverter	Enclosure	Charging 20 MW (40% power)	67	53	59	58	59	54	59	50	44	46	41	43	44	44	43	39	36	34	49	54	38	53	66	53	54
Inverter switchgear	Enclosure	Charging 20 MW (40% power)	54						32	56	37	50	43	45	41	38	38	39	36	34	28	43	36	37	49	36	35
Inverter transformer	Enclosure	Charging 20 MW (40% power)	60				59	64	61	66	30	59		47		43	41	41	34	37	43	47	31	46	57	46	46
Main site transformer	Transformer	Charging 20 MW (40% power)	86	79	69	67	84	68	72	91	73	83	76	73	84	74	67	57	45			60					

Appendix A within Appendix B within Berden Hall Acoustic Report showing Pelham Substation commissioning measurements with missing data

Stocking Pelham – Energy Development sites

Relevant extracts from RPS Acoustic Report for Berden Hall (see Section 5.3.1)

Project 12622

Figure 5

27 November 2023

Not to Scale

RBA ACOUSTICS

Stocking Pelham – Energy Development sites

Photo of RBA Survey Positions – MP1 – Level 1 Rear Window of Berways

Project 12622

Figure 6

27 November 2023

Not to Scale

RBA ACOUSTICS

Stocking Pelham – Energy Development sites

Photo of RBA Survey Positions – MP2 – Rear Garden boundary of Berways

Project 12622

Figure 7

27 November 2023

Not to Scale

RBA ACOUSTICS

Stocking Pelham – Energy Development sites

Photo of RBA Survey Positions – MP3 – Rear façade of annex building at 2 Pelham Grove

Project 12622

Figure 8

27 November 2023

Not to Scale

RBA ACOUSTICS

Stocking Pelham – Energy Development sites

Photo of RBA Survey Positions – MP4 – Boundary gate at rear of Cockswood land

Project 12622

Figure 9

27 November 2023

Not to Scale

RBA ACOUSTICS

Transformers
(Noted to be subjectively loudest item of plant)

Medium Voltage Power Stations (MVPS)

Stocking Pelham – Energy Development sites

Photo of front of Pelham Substation

Project 12622

Figure 10

27 November 2023

Not to Scale

RBA ACOUSTICS

Stocking Pelham – Energy Development sites

Photo in front of Pelham Substation

Project 12622

Figure 11

27 November 2023

Not to Scale

RBA ACOUSTICS

Stocking Pelham – Energy Development sites

Photo of National Grid Substation

Project 12622

Figure 12

27 November 2023

Not to Scale

RBA ACOUSTICS

RBA ACOUSTICS
W. [redacted]
E. info@rba-acoustics.co.uk

London:
44 Borough Road
London SE1 0AJ
T. +44 (0) 20 7620 1950

Manchester:
Bloc, 17 Marble Street
Manchester M2 3AW
T. +44 (0) 16 1661 4504