

Acoustic Associates Sussex Ltd

Retrospective Planning Application Noise Assessment

Site: **Hayling Island Log Company, Stoke Farm .P011 0PZ**
Client: **Graham North**

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Project: J2581

Issue 1



**Acoustic Associates
Sussex Ltd.**



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1 Introduction

Acoustic Associates Sussex Ltd have been appointed to undertake an acoustic assessment to support a retrospective planning application to regularise the firewood processing activities carried out at Stoke Farm, Northwood Lane, Hayling Island.

Standards and guidance referenced for this assessment include:

- World Health Organisation (WHO) - Guidelines for Community Noise 1999
- BS8233 (Sound insulation and noise reduction for buildings) 2014
- ISO9613 (Attenuation of sound during propagation outdoors) 1996
- National Planning Policy Framework (NPPF) 2018
- NPPG-Noise (2014)
- BS4142:2014 – Methods for rating and assessing industrial and commercial sound

An unattended sound survey was carried out at the site's Eastern boundary as close as possible to the nearest residential receptor between the 9th November 2018 and the 15th November 2018. The survey used a class one sound level meter to understand the ambient and background sound levels associated with both the active farm and the firewood processing business. A co-located weather station was also installed in line with good practice and to satisfy the requirements of BS4142:2014 showing that the dataset has been recorded in suitable meteorological conditions.

Attended measurements were also made on site to identify the elements of the firewood processing business.

The unattended survey position identified that the representative background sound levels for the business hours for the firewood processing business were 46dB $L_{A90, 15 \text{ minute}}$ for both Monday to Friday 09:00-17:00 hours and additionally, Saturday 10:00-13:00 hours.

The firewood processing machinery has been measured and is predicted to be 1.1 dB(A) below measured background sound levels at the nearest residential receptor. When considering a BS4142:2014 assessment, it is critical that the result must be considered in line with the context of the site and the business, and it is important to reflect that the processing of firewood does not happen all of the time, nor every day and remains a seasonal operation on what is an operational farm. Recommendations have been made with regards to positions where the future firewood processing may occur which is undercover and would result in a lower predicted noise level to the residential dwelling adjacent.

The Environmental Health Officers comments as a specialist consultee were considered and have been met in the production of the acoustic report. In considering the retrospective regularisation of the firewood business, conditions have been listed in Section 9 which allow the operation of the business to the satisfaction of the local planning authority.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

The planning application (APP/18/00669) currently with Havant Borough Council seeks to retrospectively regularise the firewood processing activities which have been carried out on the farm premises for the last 7 years.

It is critical to understand that the planning application, which was requested by the local planning authority seeks only to regularise the firewood processing and not activities associated with agricultural processes related to the active farm premises.

As part of the planning application process, an objection has been received and Environmental Health comments to the local planning authority suggest that a scheme and conditions may be secured via a condition, but must be specified by an independent noise consultant.

2.2 Firewood Processing

To process firewood, the farm tractor is connected to a piece of farm equipment called Hakki Pilke 38 Pro, but which will be referred to as “The Firewood Processor” via a power take off, which is a spinning shaft located to the rear of the tractor. The power to the unit enables 3m length logs to be placed into a conveyor belt on the left-hand side of the machine and fed through to a saw blade and splitter.

In being fed through the relatively enclosed unit, a single chainsaw arm moves to cut the log into smaller longitudinal sections. The sawn log section then drops a short distance to a smaller area below, where it is forced through a blade which splits the log into 4 pieces. The firewood size logs then travel up and along the conveyor belt and drop onto the floor where the logs are manually stored. Individual firewood pieces are then manually bagged to produce the finished product or are kept loose and loaded into the delivery tipper truck.

Deliveries of 3m length logs (raw materials) are made approximately once a fortnight to site and average 24 deliveries a year.



Figure 1. Firewood Processor connected to Tractor

It is noted that deliveries are made of the finished product via the client's Ford Transit Tipper vehicle.

2.3 Hours of Operation for Firewood Processing Business

The hours of use for the firewood processing business are between 09:00 to 17:00 hours Monday to Friday and 09:00 hours to 13:00 hours on Saturdays.

Deliveries of logs to be processed into firewood also occur within the same working hours and similarly, the delivery of processed firewood to customers also occurs within business hours.

2.4 Relevant Context for Firewood Processing

Part of any assessment and in particular a BS4142:2104 assessment, must consider context of the operation in question. The following items are relevant:

- The firewood processing has been carried out for the past 7 years on the same site
- The firewood processing operation is not a new process or activity.
- It is relevant to note that the firewood processing element is carried out by a single individual so specific elements may only occur at one point in time. For example, deliveries of firewood will not occur at the same time as the processing/splitting of wood.
- The operation only occurs between 09:00 to 17:00 hours Monday to Friday and 09:00 – 13:00 hours Saturdays
- The firewood processing and the farming operation operate in tandem with both operations supporting one another.
- The firewood processing is seasonal with greater demand occurring in the winter months.
- Given the single operator, running the farm and the firewood processing, operations are likely to be intermittent and dynamic with no two days the same.
- Firewood processing is not carried out in the rain as it is presently done in the open.
- During the winter months firewood processing is likely to be carried out for 4-5 hours a day. During the summer, it is common to have days without any firewood processing and then 3-4 hours during a single day.
- In the past 7 years, a full day of firewood processing has never been carried out.
- The growth of the firewood processing element is restricted by storage of the finished product stored undercover in the 3 sided farm building.

2.5 Deliveries of Logs (raw materials to site)

As discussed, logs are delivered to the site approximately twice a month and average 24 times a year. The process lasts approximately 30 minutes with a crane.

2.6 Deliveries of Logs to Customers

Processed and bagged logs are also delivered to customers and the frequency of the vehicle leaving the farm will depend on the season and the demand for logs. For example, a review of the client's diary identified that in May 2017, no more than 6 deliveries were made.

However, in contrast, a busy winter Saturday morning saw 6 deliveries made. For the purposes of a robust assessment, six Saturday morning deliveries will be assessed as six separate trips leaving the yard.

2.7 Location of Site

The processing of firewood is carried out on an active farm which includes cattle. A livery is also apparent on the site with space for a number of horses. Both the physical location of the farm and the farm layout can be seen in Figures 2 and 3 below.

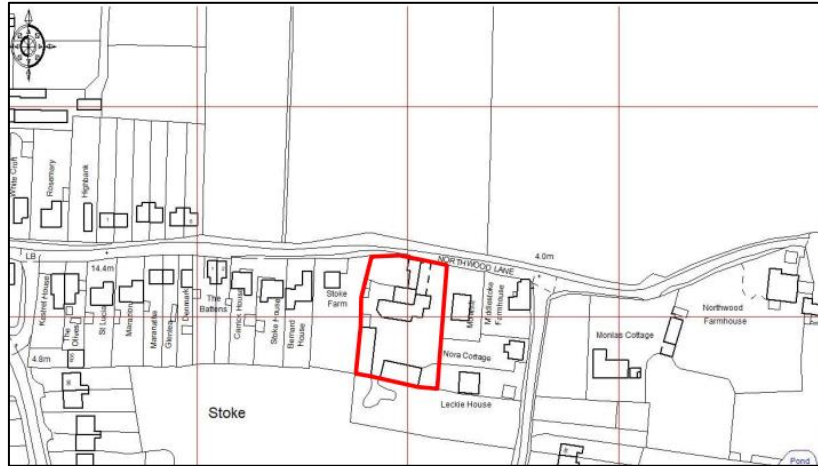


Figure 2. Location Plan of Stoke Farm



Figure 3. Approximate Layout of Firewood Processing Area on the farm

2.8 Soundscape

The soundscape of the farm consists of noise from the animals, the tractor, deliveries being made, barley processing as part of the farm agriculture and passing traffic. It was also noted that faster road traffic noise was audible from the South West of the site which was constant during my visits to set up and decommission the survey equipment. A goose was also noted to roam the farm yard and be noisy, again typical of farming and agriculture operations.

Aviation noise from military helicopters was also noted whilst present on the site.

2.9 Havant Borough Council Comments

The online planning website for Havant Borough Council shows two sets of comments from the Environmental Health Officer, to the planning officer. These are as follows:

2.9.1 Comments dated 23/8/2018

“As there has been no noise survey / assessment done at this time, I am unable to establish whether NOAEL (No Observable Adverse Effect Level) or even LOAEL (Lowest Observable Adverse Effect Level) in terms of BS4142:2014, will be achieved during the firewood processing operations, or whether acoustic mitigation measures are required to ensure NOAEL. It should be noted that when operational, the time period can range from a short period of time to a number of hours of continuous operation. There is also the potential to increase the output of firewood from this site, which could also lead to longer operating periods and alternative machinery being employed.”

Whilst NOEL and LOAELS have been referenced, it should be noted that these terms originate in the NPPG:Noise (2014) and the Noise Policy Statement England (2010), and not BS4142:2014 which discusses impact of new plant and processes and assesses whether or not there is an adverse or significant adverse impact with regards to how high the rating level is above background sound levels. It is also relevant to note that there can be acceptable or satisfactory levels above LOAEL's.

It is relevant to note that the EHO concludes their comments by adding that if the local planning authority is minded to approve the application, that conditions set by an acoustic consultant could form part of a scheme to be agreed.

2.9.2 Comments dated 5/11/2018

The EHO comments that any acoustic assessment must make reference to the delivery of logs and the use of the tractor in stacking and processing of the logs and that if an acoustic report is not forthcoming, they would consider an objection to the application.

Comments were also specifically made about logs as a finished product leaving the site as well as an increase or intensification of use of the firewood business.

2.10 National Planning Policy Framework 2018

The National Planning Policy Framework (July 2018) defines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so.

The following paragraphs are relevant within NPPF Section 15 (Conserving and enhancing the natural environment) states the following:

Paragraph 170(e) - 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.

Paragraph 180-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 impacts 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

Paragraph 182 - Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

2.11 Noise Policy Statement for England (NPSE,2010)

2.11.1 NPSE Mission Statement

The document "Noise Policy Statement for England" sets out the following vision for on- going noise policy:

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

This vision should be achieved through the following Noise Policy 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; and where possible, contribute to the improvement of health and quality of life".

2.11.2 NPSE Noise "Effect Levels"

To achieve these objectives the Noise Policy Statement sets out three noise levels to be defined by the assessor:

- NOEL - No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level there is no detectable effect on health and quality of life due to the noise.

- LOAEL - Lowest Observed Adverse Effect Level

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

- SOAEL - Significant Observed Adverse Effect Level

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

The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable.

Where the assessed noise levels fall between the LOAEL and the SOAEL noise levels, the Policy Statement requires that:

"all reasonable steps should be taken to mitigate and minimize adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development... .. This does not mean that such adverse effects cannot occur."

Where noise levels are below the LOAEL it is considered there will be no adverse effect. Once noise levels are below the NOEL there will be no observable change.

2.11.3 Guidance Documents

For guidance as to a numerical definition of LOAEL, while this is not provided specifically, it is helpful to refer to the following Standards.

- BS8233: 2014: Guidance on Sound insulation and noise reduction for buildings
- World Health Organization (WHO) - Guidelines for Community Noise 1999
- BS4142: 2014: Method for rating and assessing industrial and commercial sound

2.12 BS4142: 2014: Methods for rating and assessing industrial and commercial sound

This document provides a means of assessing the impact of industrial or commercial sound upon nearby noise-sensitive receptors, including residential properties.

It does this by comparing the Rating Level of the noise from the industrial or commercial source with the pre-existent L_{90} background noise level affecting the same noise-sensitive premises. The Standard provides guidance that:

- a) Typically, the greater the difference, the greater the magnitude of the 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 noise level, this is an indication of the specific sound source having a low impact, depending on the context.

2.13 WHO Internal Noise Criteria

The target internal levels are based on guidelines laid out by the World Health Organisation (WHO) and are as follows:

Room Type	Target Maximum Internal Level - Leq dB (A)
Living rooms	35 (Daytime only)
Bedrooms	30 (Night)

The target maximum internal noise level for a bedroom during the night time corresponds to the threshold of sleep disturbance. WHO state that the noise level outside a bedroom window would be less than 45dB(A) this assumes that an open window provides 15dB attenuation.

2.14 WHO External Noise Criteria

With regard to outdoor amenity areas WHO states the following:

To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB(A) on balconies, terraces and in outdoor living areas.

To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 50dB(A) on balconies, terraces and in outdoor living areas.

2.15 BS8233 Noise Criteria

Table 4 of BS8233 provides the following guideline values:

Activity	Location	Time period of day	
		07:00-23:00	23:00-07:00
Resting	Living Rooms	35dB L _{Aeq,16hour}	-
Dining	Dining Room/Area	40dB L _{Aeq,16hour}	-
Sleeping (daytime resting)	Bedroom	35dB L _{Aeq,16hour}	30dB L _{Aeq,8hour}

Table 1: BS8233 Criteria

3 Environmental Sound Survey

3.1 Unattended Survey Methodology

An unattended sound survey was carried out from 9th November 2018 to 15th November 2018 capturing a weekend to ensure any variability in the soundscape was understood.

A Type 1 sound level meter was used which was placed as close as possible to the nearest residential property attached to the telegraph pole to measure both background and ambient sound levels. The sound level meter was set to Fast and A weighting filters and was calibrated to 94dB(A) whilst setting up and decommissioning the survey equipment. No drift was noted. Data was recorded for both 5 and 15 minute intervals. In line with good practice, a Maplins easyweather weather station was also set up on site and co-located in line the requirements of BS4142:2014.

Property Boundary– Affixed to Telegraph pole	
Survey(s) carried out by	Scott Castle BSc (Hons) Env Health, MCIEH CEnvH PGDip Acoustics MIOA
Equipment Used	Svantek Castle Mirus - Type 1 Sound Level Meter
Equipment Used	Castle Group Acoustic Calibrator – GA607-Serial.041173
Location of Microphone	SU72202/02407
Duration of Survey	09:00 9/11/2018 to 11.25 15/11/2018
Height	2.0 m above ground level

Table 2. Equipment used



Figure 4. Survey Location

The survey location can also be seen below in the plan in Figure 5.

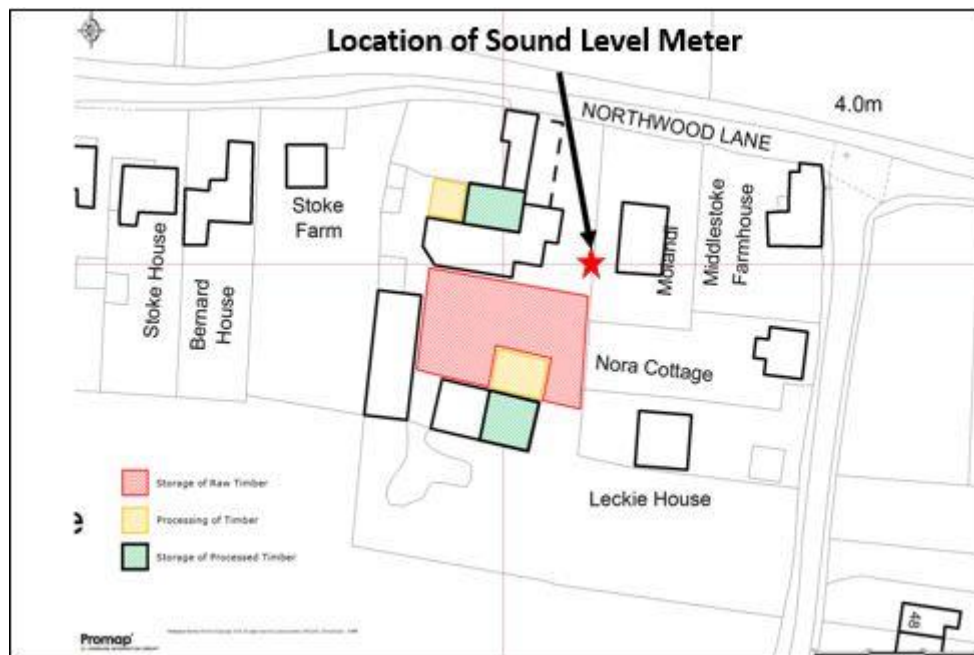


Figure 5. Location of sound level meter

3.2 Attended Measurements

Nearfield attended measurements were also made of the tractor running both at idle and increased engine speeds to rotate the crankshaft and additionally, the operation of the firewood processor. Measurements were made at 3m away from the mobile plant and additionally, at the telegraph pole to indicate the nearest accessible boundary location where measurements could practically be recorded.

It was also proposed to measure the logs being delivered, as this occurs relatively infrequently and was specifically referenced within the Environmental Health Officers comments, however, the delivery was delayed on the day in question. The initial visit had deliberately targeted the log delivery as no further deliveries were proposed until after Christmas 2018.

The delivery of logs whilst late, did occur during day one of the unattended monitoring being set up and operational. Accordingly, the client was requested to make a note of the start and finish of the delivery process, in order that the dataset can be examined and the impact of the log delivery assessed, albeit only occurring an average of once a fortnight.

Attended measurements were also made at the revisit to collect the survey equipment of the company van leaving the site, in order to be able to determine the associated sound exposure level (SEL) created by the vehicle pass.

3.3 Weather Conditions

In line with good practice, a co-located weather station was installed in close proximity to the unattended survey location. As the survey information for windspeed in Figure 6 shows, data for the majority of the period was below 5m/s. Whilst occasional gusts were evident, review of the data shows that these were limited to below 15-minute intervals.

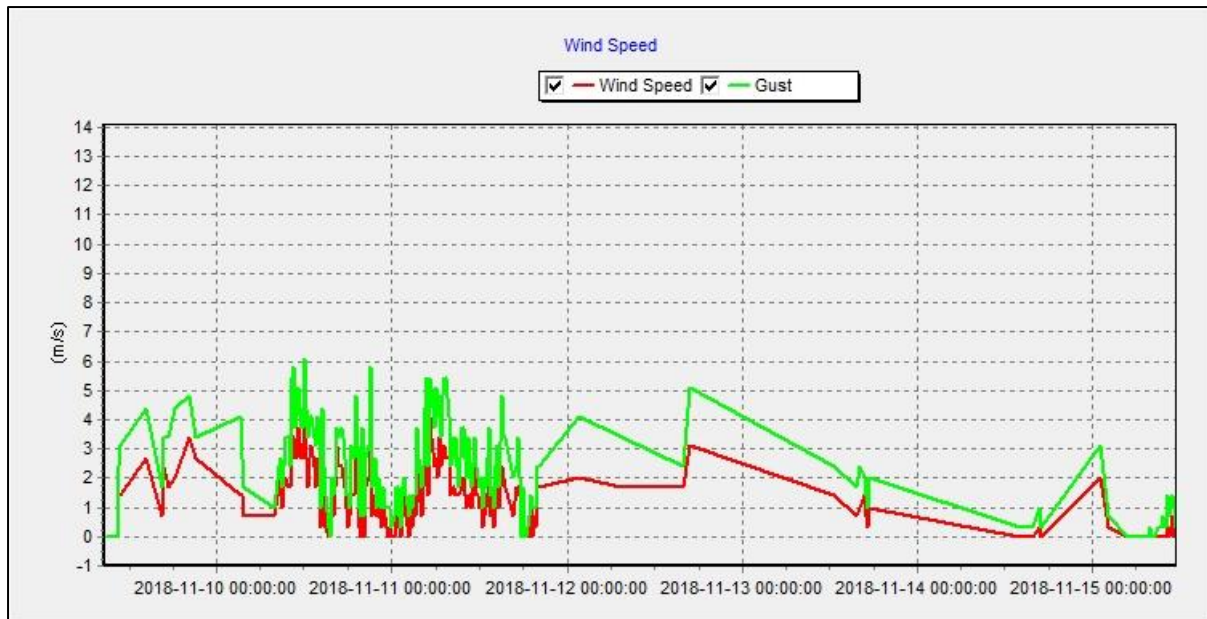


Figure 6. Wind speed conditions on site

4 Methodology and Assessment Standards

4.1 Applicable Assessment Standards

In line with the comments of the Environmental Health Officer of Havant Borough Council, a BS4142:2014 assessment is being carried out to assess the impact of the firewood processing plant. With attended measurements made of the firewood processing plant and unattended monitoring data to show the soundscape at the site, noise modelling software may be used to determine the impact on the nearest noise sensitive dwelling.

The movements of the company van were also considered using a Sound Exposure Level or SEL as a drive past. Two vehicle drive pasts were carried out to determine a suitable average which was used with a worst-case number of log deliveries. The Calculation or Railway Noise (CRN,1995) methodology will be used to determine the daytime impact of the vehicle drive pasts. Given that the SEL methodology uses exact seconds, there is no on-time correction required. Additionally, given that the deliveries are only made during the business hours, there is no need to consider night time operations.

The measured SEL and the information regarding the number of vehicle movements can be used to predict the day (07:00-23:00hrs) and night (23:00-07:00hrs) time noise level ($L_{Aeq,day/night}$):

$$L_{Aeq, day/night} = SEL - 10\log T + 10\log N$$

- N = no. of events in period (Based on information from Councils Highway Consultant)
- Day = 07:00-23:00hrs & Night = 23:00-07:00hrs
- T = no. of seconds in period (57600 seconds for the day and 28800 for the night)

The predicted day and night time noise levels can be seen below:

4.2 Nearest Noise Sensitive Receptor

For the purposes of the report, the nearest noise sensitive receptor is considered to be Molandi located to the East of the farm premises.

5 Results of the Unattended Sound Survey

The client was requested to keep a diary of when firewood processing was carried out in order that the dataset can be examined to determine both background and ambient sound readings. The representative background levels are presented below in Figures 7 and 8.

The permissible operating hours for the firewood processing are 09:00-17:00 hours, therefore, it is these hours which have been examined from the dataset. For completeness and to ensure a robust approach, the hours have been cross referenced against the weather data to ensure that the conditions were collected in meteorological conditions suitable for environmental monitoring. The dataset also included a weekend for two reasons, to ensure that Saturday operations were captured, and additionally, to include a Sunday when no firewood processing occurs.

The data to produce the modal background sound levels has excluded the firewood processing times, but will include the farm yard activities, the livery yard and agricultural processes. Figure 7 below shows that the representative background sound level is 46 dB $L_{A90,15\text{minutes}}$.

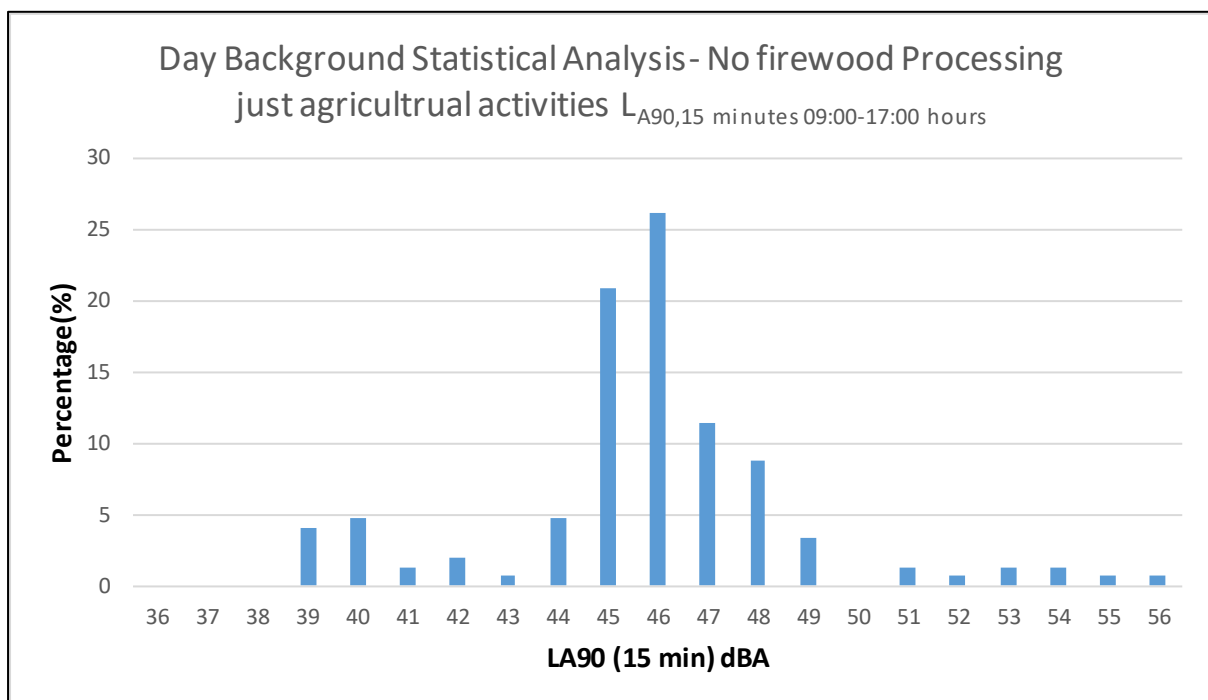


Figure 7. Representative Background Sound Levels $L_{A90,15\text{ minutes}}$ – whole period

Background sound levels were also examined for the Saturday morning period from 10:00 hours to 13:00 hours. Whilst the intended business hours would be 09:00-13:00 hours on a Saturday, firewood activities were carried out from 09:00-10:00 hours, hence the rationale for removing these from background activities. As Figure 8 below shows, the representative background sound level for a Saturday is also 46 dB $L_{A90,15\text{ minutes}}$.

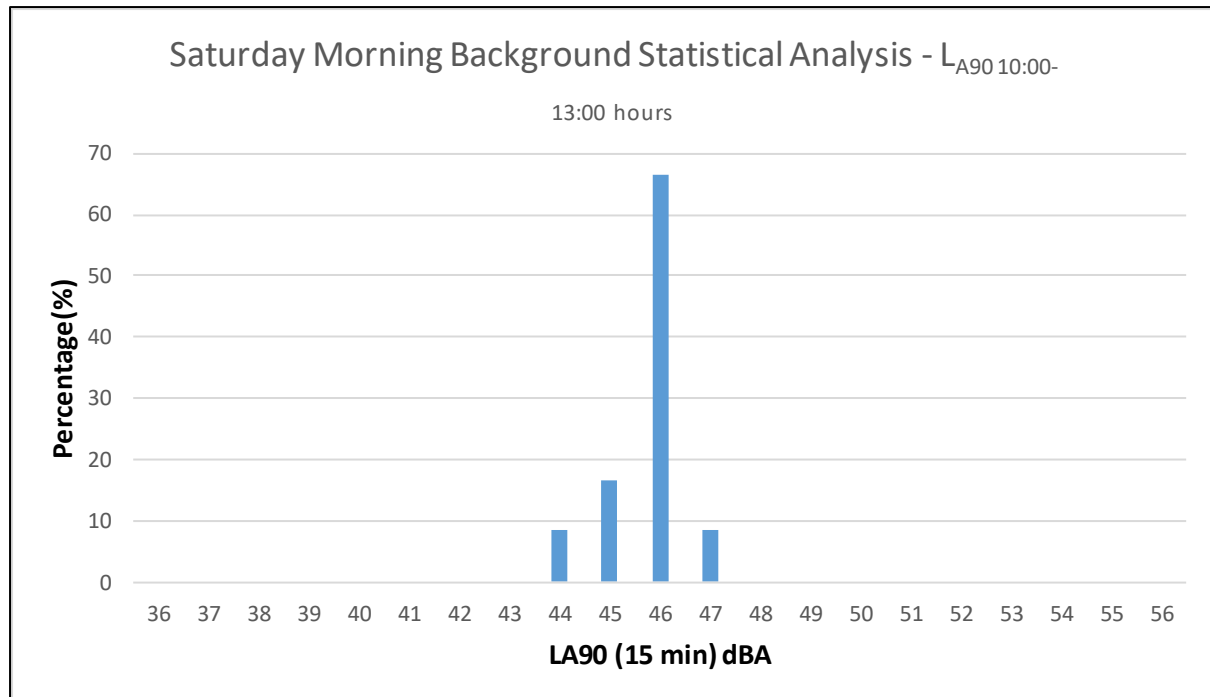


Figure 8. Saturday Morning Background Sound Levels ($L_{A90,15 \text{ minutes}}$)

5.1 Results of the Attended Measurements (9/11/2018 and 15/11/2018)

Attended measurements were made with a class one sound level meter to understand various items of machinery likely to be used in the processing of firewood. These included measuring the SEL of two ford transit tipper vehicle passes, the firewood processor itself and the chainsaw. The measurements were recorded on a tripod at 1.5m in height and above a concrete yard at the distances stated.

5.1.1 Ford Transit Tipper

As the name suggests, the Haying Island Log Company has a dedicated ford open back tipper truck, in which loose logs are delivered to customers on the island. Two drive past events were measured which included both the opening and closing of the door, the ignition of the engine and manoeuvring in reverse and forward gears to drive out of the farm yard site.

The events were recorded as SEL's and these measured 80.3 dB(A) and 80.9 dB(A) respectively. A logarithmic average was taken to produce 80.6. Using the methodology as stated in 4.1, SEL's may be used to calculate the likely 4-hour average sound level for a worst case Saturday morning.

5.1.2 Chainsaw

The chain saw which is occasionally used to cut larger logs was measured at 3m and took 25 seconds to cleanly cut through a sizeable log. The $L_{Aeq,(25 \text{ seconds})}$ was 91.9 dB(A). The sound power level to be used with any modelling software would be 109 dB L_{WA} . The client conforms that in a typical hour, the chainsaw may be used for 25 minutes. Assuming a cut is made every 90 seconds due to repositioning, it is reasonable to assume 17 cuts of 25 seconds duration within the 25 minute period. The on-time correction value is therefore calculated as $10 \log(425/3600)$ and provides an minus 9.3 dB.

It was referenced that the chainsaw is kept sharp and maintained and serviced to ensure an efficient cutting operation.

5.1.3 Firewood Processor

As discussed above, a tractor unit provides the power to the firewood processor. The processor was measured at approximately 2.5 metres to the front of the operating unit and measured 83dB $L_{Aeq,1minute}$. As a sound power level to use in any noise modelling software will be 98.9 dB L_{WA} . This is consistent with the manufacturers information suggesting a sound power level of 98 dB(A).

It should be noted that the recorded duration for an entire 3-metre length log to be pulled through the processor and be cut into smaller sections and split was 28 seconds. The 98 dB(A) sound power level is therefore without any time correction and will require an ontime correction when being considered in line with BS4142:2014.

5.2 Havant Borough Council Requirements for External/Mobile Plant

In reviewing the Environmental Health Officer's comments dated 23/8/2018 and 5/11/2018, whilst reference is made to BS4142:2014, no discussion or comments have been referenced about the local authority's accepted standard in respect of the British Standard. Therefore, the requirements of BS4142:2014 will be applied accordingly, in that to achieve a low or no impact, the rating level should match background sound levels.

6 IMMI Noise Modelling Software (Wolfel, 2015)

To determine the propagation of sound on the application site, noise modelling software was used and an acoustic model constructed.

The model inputs reflected the heights of the buildings and positioning of the activities. The advantage of using such modelling, is that predictions may be made of differing scenarios with the firewood processing happening in different positions.

6.1 Current Practice

A noise model has been constructed on the basis of current site conditions where logs (raw materials) are stored against the Eastern property boundary and level with the neighbouring hedge height. The sound levels predicted at the unattended monitoring position are relatively consistent with those levels apparent from the survey when firewood processing was occurring.

The modelling indicates that the predicted level at the ground floor reception point at Molandi would be 49.9 dB(A), which is 4dB(A) above the measured background and does not yet include any penalties or on-time corrections as required in BS4142:2014.

6.2 Future Proposals

Presently, the processing of firewood may only be carried out during dry weather conditions and it is proposed to have the processor under cover where it remains safe and dry. An extension to the southernmost open sided barn is proposed which would see an additional

20m of barn extending South into the field, with the intention that the processing of firewood can happen inside the barn with minimal impact to the residents to the North East (Molandi).

It is also proposed to retain a stack of green unseasoned 3m logs in situ and maintained at a particular height, level with the neighbour's hedge-line. This was measured on site as 3.3m. In circumstances where the green wood is to be processed, and the effective barrier height is to be diminished, processing of fire wood will only occur at the West of the bungalow property belonging to the client at the Northern end of the site.

7 BS4142:2014 Assessment

BS4142:2014 is an assessment of activities or plant and the results of the assessment may be used to determine the impact on noise sensitive receptors. From the site layout, it is known that Molandi to the East will be considered as the nearest noise sensitive receptor.

7.1 Penalties

BS4142:2014 includes a sliding scale of penalties for how sound is perceived at the receptor location and includes three categories in terms of tonality, onset noise and intermittency. Whilst stood at the telegraph pole, within the application premises, with wood being cut within the firewood processor, subjectively, the sound was similar to that of a distant power drill being used.

Having used a spreadsheet to check for tonality in the frequencies listed below (taken from Annex C of BS4142:2014), within the application premises, the received sound energy profile at the boundary position was not identified to be tonal. It is therefore unlikely to be tonal the other side of a hedgerow and fence-line at the receptor location.

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 the middle-frequency one-third-octave bands (160 Hz to 400 Hz);
and
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

However, it would be appropriate to apply a 3dB(A) penalty for intermittent operations for the firewood processor.

7.2 On Time Correction

As stated in 5.1.3 above, the measurement of the firewood processor included only the processing of a single log (28 seconds). The time taken for the operator to stop activating the console controls at the front of the machine and to load a new log into position is likely to account for 1 log every 3 minutes which would equate to 20 logs in an hour, with an hour being the relevant daytime reference period (3600 seconds) in BS4142:2014.

The on-time correction would therefore be $10\log(560/3600) = -8.08$, rounded to -8dB

7.3 Background Sound Level

The background sound level to be applied, as per section 5 above is 46 dB $L_{A90, 15\text{minutes}}$ which is the most representative sound level as required in BS4142:2014 and is applicable for the proposed working daytime hours of 09:00 to 17:00 hours as well as 09:00-13:00 hours on Saturdays.

7.4 Correction of Specific Noise Level of Firewood Processor

BS4142:2014 requires that the specific noise level be corrected for background. The Specific Noise level recorded in front of the firewood processor is therefore $10\log(10^{8.3} - 10^{4.6})$ which is 82.99 dB(A). This is commensurate with the process outlined in BS4142:2014 below. The specific noise level therefore remains as 83 dB $L_{Aeq, 1\text{minute}}$.

7.3.3 Correct for the effect of the residual sound by using the following formula:

$$L_s = 10\lg(10^{L_r/10} - 10^{L_a/10}) \quad (2)$$

where:

L_s is the specific sound level;

L_a is the ambient sound level; and

L_r is the residual sound level.

7.5 Assessment of Firewood Processor

The firewood processing is currently carried out in the lower of the two yellow hatched areas shown in Figure 9 below.

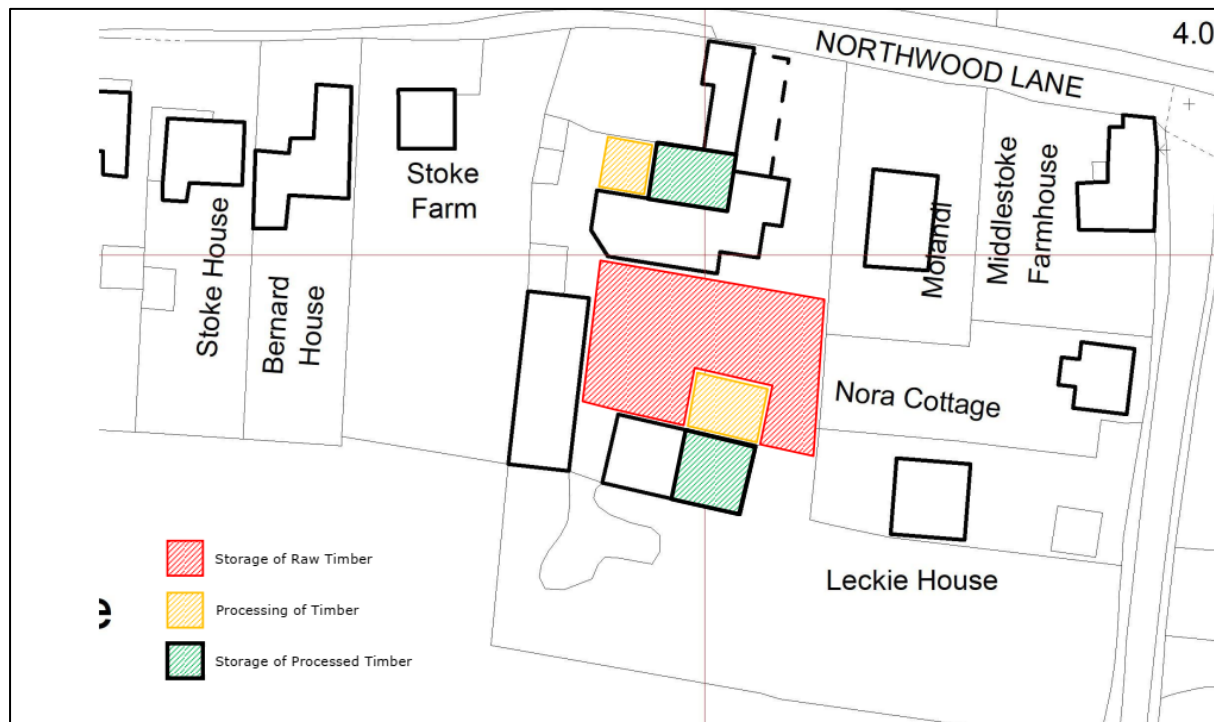


Figure 9. Site layout and firewood processing in Yellow area

The IMMI noise modelling software suggests that at the ground floor reception point (1.5m in height) placed on Molandi's South facing façade indicates 49.9 dB(A) as a specific noise level.

Daytime			
Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	L _{Aeq(T)}	49.9	7.3.4
On time corrected value	Minus 8	41.9	
Acoustic feature correction	intermittent	3	9.2
Rating level		44.9	9.2
Background sound level	L _{A90(T)}	46	8
Excess of rating level over background sound level		-1.1	11
Assessment indicates a	Low/No Impact		11
Uncertainty of the assessment	Discussed		10

Table 3. BS4142:2014 Assessment of Firewood Processor

Section 11 of BS4142:2014 describes that where the rating level does not exceed the background sound level, the specific sound source is likely to have a low impact. As per table 3 above, with the firewood processor being 1.1 dB(A) below measured background sound levels and with the context below, it is argued that the operation of the fire wood processor should not have any impact at the receptor location.

When carrying out a BS4142:2014 assessment it is critical that the results are reported, depending on the context. Section 2.4 which defined the context has been replicated below for ease of reference.

- The firewood processing has been carried out for the past 7 years on the same site
- The firewood processing operation is not a new process or activity.
- It is relevant to note that the firewood processing element is carried out by a single individual so specific elements may only occur at one point in time. For example, deliveries of firewood will not occur at the same time as the processing/splitting of wood.
- The operation only occurs between 09:00 to 17:00 hours Monday to Friday and 09:00 – 13:00 hours Saturdays
- The firewood processing and the farming operation operate in tandem with both operations supporting one another.
- The firewood processing is seasonal with greater demand occurring in the winter months.
- Given the single operator, running the farm and the firewood processing, operations are likely to be intermittent and dynamic with no two days the same.
- Firewood processing is not carried out in the rain as it is presently done in the open.
- During the winter months firewood processing is likely to be carried out for 4-5 hours a day. During the summer, it is common to have days without any firewood processing and then 3-4 hours during a single day.
- In the past 7 years, a full day of firewood processing has never been carried out.
- The growth of the firewood processing element is restricted by storage of the finished product stored undercover in the 3 sided farm building.

7.6 Future Proposals- Working Undercover

The proposal to work under cover in the newly constructed barn is likely to reduce the noise impact to Molandi further still. It should be noted that the new barn construction will have a concrete 4m barrier along the Eastern boundary to prevent sound energy propagating through the underside of the structure and travelling further North.

The noise modelling software was used to predict the relocated firewood processor as follows in Table 4.

Daytime			
Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	$L_{Aeq(T)}$	36.3	7.3.4
On time corrected value	Minus 8	28.3	
Acoustic feature correction	Intermittent	3	9.2
Rating level		31.3	9.2
Background sound level	$L_{A90(T)}$	46	8
Excess of rating level over background sound level		-14.7	11
Assessment indicates a	Low/No Impact		11
Uncertainty of the assessment	Discussed		10

Table 4. BS4142:2014 Assessment of Molandi with relocated Firewood Processor to Southern barn

With the firewood processing occurring at 12dB below background, it is not likely to cause any localised impact to the identified receptor.

Whilst the noise source has been moved further away from Molandi, the specific sound source has also been assessed with regards to the nearest residential property to the South, 78B Havant Road. It is estimated that a point in the centre of the garden, the predicted rating level ($L_{Ar,Tr}$) will be 43dB(A) measured at 1.5m in height and at the building façade, 41.9 dB(A). This does not take account of soft ground reduction and any boundary treatments which are likely to make the rating level lower still.

7.7 Future Proposals for Using the Firewood Processor at the North of the site.

As discussed above in section 6.2, it is proposed to retain a 3.3m high log store of raw materials adjacent to the Eastern premise's boundary. The log pile acts as a barrier encouraging absorption and scattering of the incident sound energy. Where the log store is needed to be processed, and the barrier height is in effect reduced, the firewood processing activities will be carried out to the North of the site, as shown by the red arrow in Figure 10 below.



Figure 10. Northern Firewood Processing Point

The BS4142:2014 assessment as detailed in Table 5 below for the processing of firewood at the location in Figure 10 above shows sound levels well below measured background noise levels at the application site.

Daytime			
Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	$L_{Aeq(T)}$	34.6	7.3.4
On time corrected value	Minus 8	26.6	
Acoustic feature correction	Intermittent	3	9.2
Rating level		29.6	9.2
Background sound level	$L_{A90(T)}$	46	8
Excess of rating level over background sound level		-16.4	11
Assessment indicates a	Low/No Impact		11
Uncertainty of the assessment	Discussed		10

Table 5. Assessment of Firewood Processing at North of application site

7.8 Assessment of the Chainsaw Activities

As discussed above in 5.1.2, the chainsaw was measured for the L_{Aeq} for the time it took to cut through an oversized log which was 25 seconds. However, it is relevant to reflect on the fact that the chainsaw is not continually used and it would be normal to cut a batch of logs into smaller more workable sizes in one period. As per 5.1.2 above, a BS4142:2014 assessment is made accordingly for the same ground floor receptor at Molandi. Using the sound power level of 109 dB(A) in the noise modelling software produces a specific noise level of 56.8 dB(A) at the ground floor Molandi property.

The measurement made at 3m also included third octave spectral information which was run through a tonality indicator and no tones were identified. However, a penalty would be applicable for intermittent operations.

Daytime			
Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	L _{Aeq(T)}	56.8	7.3.4
On time corrected value	Minus 9.3	47.5	
Acoustic feature correction	Intermittent	3	9.2
Rating level		50.5	9.2
Background sound level	L _{A90(T)}	46	8
Excess of rating level over background sound level		4.5	11
Assessment indicates a	Adverse?		11
Uncertainty of the assessment	Discussed		10

Table 6. Assessment of chainsaw operations

In line with the result in Table 6 above, it could be argued that the chainsaw is audible over measured background sound levels at the adjacent residential property and that it may be appropriate to consider the use of the chainsaw elsewhere on the site. It is however recognised that the chainsaw is only likely to be used for a 25-minute period in a worst case single hour and is not used all of the time.

In considering the use of the chainsaw at the North of the property, it is seen that the impact is significantly reduced and the resulting operating levels are below the measured background sound levels.

Daytime			
Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	L _{Aeq(T)}	45.5	7.3.4
On time corrected value	Minus 9.3	36.2	
Acoustic feature correction	Intermittent	3	9.2
Rating level		39.2	9.2
Background sound level	L _{A90(T)}	46	8
Excess of rating level over background sound level		-6.8	11
Assessment indicates a	Low/No Impact		11
Uncertainty of the assessment	Discussed		10

Table 7. Chainsaw use at Northern end of Application Site

It is also relevant to consider the use of the chainsaw within the same extended barn which is in the process of construction, where the firewood processor is intended to be used. Table 8 shows that the rating level of the chainsaw is predicted to be almost 6dB(A) below measured background sound levels at the Molandi measurement point.

Daytime			
Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	L _{Aeq(T)}	46.7	7.3.4
On time corrected value	Minus 9.3	37.4	
Acoustic feature correction	Intermittent	3	9.2
Rating level		40.4	9.2
Background sound level	L _{A90(T)}	46	8
Excess of rating level over background sound level		-5.6	11
Assessment indicates a	Low/No Impact		11
Uncertainty of the assessment	Discussed		10

Table 8. Chainsaw use in Southern extended barn

7.9 Assessment of Logs being delivered

As discussed above, a subjective assessment of the 3metre logs being delivered was not possible on the day of the visit, due the delivery being delayed. However, the unattended survey matched the diary entries from the client and shows an increased sound level for the 30-minute period concerned.

It is however noted that the process of logs being delivered is only 30-minute duration and may occur once a fortnight in theory, however discussion with the client suggests that in reality 6-7 weeks may occur without a delivery occurring. In terms of context, deliveries will only be made during the daytime working hours of the business, and do not include any reversing alarms or the opening of gates, or unnecessary idling and/or waiting.

It is also noted that the delivery vehicle was likely to have been immediately adjacent the unattended survey position when the logs were delivered, so this is not a true reflection of what is encountered on the other side of a boundary fence in terms of impact at the residential receptor location.

Figure 11 below shows a 5-minute time history graph for the first day of monitoring with the delivery times highlighted in a red box. Whilst elevated at the point of measurement/recording, an on-time correction would likely see a further 3dB(A) reduction due to the activity happening for only 30 minutes in a one-hour assessment period, as per the requirements of BS4142:2014.

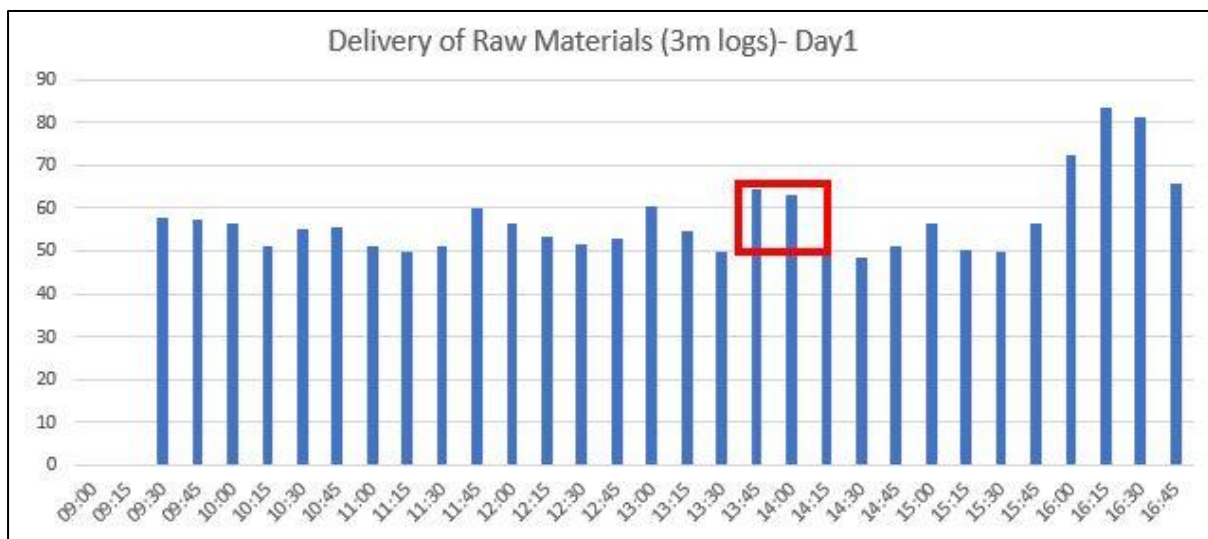


Figure 11. Raw materials being delivered

By creating a point noise source adjacent to the unattended survey position of such a sound power that the survey position recorded 63dB(A), the resulting specific sound level at the Molandi ground floor assessment position is only 40.7dB. With an on-time correction for 30 minutes in any one hour, a 3dB(A) reduction is calculated to 37.7dB. A penalty for the intermittent character of the log delivery of 3dB(A) creates a rating level or $L_{Ar,Tr}$ of 40.7, which is still 5.3dB(A) below measured background sound levels.

7.10 Assessment of delivery vehicle (Ford Transit Tipper Truck) leaving site

As stated above, as part of the Hayling Island Log Company, deliveries are made from the farm yard to the customer locations in a Ford Transit Tipper Truck.

As referenced above in 2.6 and 5.1.1, a worst-case scenario would be 6 deliveries made in a Saturday morning. Using the SEL formula as in 5.11 the L_{Aeq} for a Saturday morning (4 hours) can be calculated as follows:

$$L_{Aeq} \text{ (Saturday 09:00-13:00)} = 80.6 - 10\log(14400) + 10\log(6) = 46.7$$

The line source drawn onto the acoustic model, representing the transit route of the vehicle is then calibrated with sound power levels, which when run in a propagation calculation match those recorded in the sum above at the attended survey position. The model can then be run to determine what the 4-hour period will be at both a ground floor window and the rear garden area, both calibrated at 1.5m in height.

The IMMI noise modelling software shows that the specific sound level generated from the 6 Saturday morning trips would be 27.6 dB $L_{Aeq, 4 \text{ hour}}$ at the façade building and 30.5 $L_{Aeq, 4 \text{ hour}}$ in the garden. A penalty of 3 dB for intermittent operation is also applied for the intermittent nature of deliveries. The combined rating level or $L_{A_{r,Tr}}$ is therefore is 34dB. This is 12dB(A) below measured background sound levels. BS4142:2014 comments that where background is matched there should be low/no impact. Being 12dB(A) below background should not present any sound issues to the occupants of Molandi.

When considering the reduction of sound pressure levels from outside to inside, in line with a 15dB(A) reduction, as advocated by BS8233:2014, this is likely to result in 15.6 dB inside, which is significantly below the sound levels identified in Table 4 of BS8233:2014.

7.11 Operation of the Tractor

The tractor is used as part of the regular farm machinery, but as stated in 2.2 above, it is also used to run the firewood processor. The firewood processor measurements taken include the tractor noise also. The tractor is also used with the pallet attachment to remove logs from their respective piles for processing accordingly.

The tractor was measured both at idle and at an increased power output to run the power take off which drives the firewood processor. Both nearfield and distance measurements were taken of the tractor at idle and increased power. Table 9 below shows the measured results with the engine noted at the front of the tractor unit accounting for a distinct difference between the front and rear of the tractor at idle.

Tractor Measurements – $L_{Aeq, 1 \text{ minute}}$		
Position	Idling ($L_{Aeq, 1 \text{ minute}}$)	Increased Power ($L_{Aeq, 1 \text{ minute}}$)
Front	79 dB(A)	80 dB(A)
Rear	69 dB(A)	77 dB(A)
Left	74 dB(A)	78 dB(A)
Right	78 dB(A)	82 dB(A)
Log Average (Sound Pressure-Lp)	76.4 dB(A)	79.7 dB(A)
Log Average (Sound Power-LWA)	93.9 dB(A)	97.2 dB(A)
Measured at Boundary – Telegraph Pole	53 dB(A)	60 dB(A)

Table 9. Tractor Measurements

Based on the fact that increased engine revs will be necessary to manoeuvre the tractor and raise the pallet attachment/forks, the specific noise level impact on the residential property will be 46.3 dB(A) when considering the tractor taking logs from the lower pile (1.5m) and 53.8 from the higher pile located adjacent to the Eastern fence-line. The latter is higher due to the fact that the tractor engine as the dominant noise source is closer to the property boundary.

The operation will require an on-time correction as the client confirms that no more than 10 minutes in a day would be moving logs. The on-time correction is therefore determined by considering the ten minutes within the worst case hour $10\log(10/60) = \text{minus } 8\text{dB(A)}$. It is also relevant to consider that whilst the tractor engine would be adjacent to the fence line when removing logs from the higher stock pile, the logs would be tipped further away inside the farm yard processing area.

Revised sound levels at the same reception point at the residential property would therefore be $46.3 - 8 = 38.3$ and respectively $53.8 - 8 = 45.8$ dB, both of which would be below the measured background sound levels.

The BS4142:2014 assessments of the tractor moving logs would therefore be as follows:

Daytime			
Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	$L_{Aeq(T)}$	38.3	7.3.4
On time corrected value	Minus 3	35.3	
Acoustic feature correction	None	0	9.2
Rating level		35.3	9.2
Background sound level	$L_{A90(T)}$	46	8
Excess of rating level over background sound level		-10.7	11
Assessment indicates a	Low/No Impact		11
Uncertainty of the assessment	Discussed		10

Table 10. Operation of tractor at lower log pile

Daytime			
Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	$L_{Aeq(T)}$	45.8	7.3.4
On time corrected value	Minus 3	42.8	
Acoustic feature correction	None	0	9.2
Rating level		42.8	9.2
Background sound level	$L_{A90(T)}$	46	8
Excess of rating level over background sound level		-3.2	11
Assessment indicates a	Low/No Impact		11
Uncertainty of the assessment	Discussed		10

Table 11. Operation of tractor at higher log pile adjacent to fence-line

Tables 10 and 11 indicate that the tractor operations should not present a problem with both predicted rating levels below measured background sound levels.

7.12 Summary of BS4142:2014 Assessments

Whilst Table 12 below provides a summary of the BS4142:2014 assessments carried out, it lacks the context which has previously been described as being associated with the individual pieces of plant and processes.

The reader is therefore directed to the sections above to ensure that any results of the BS4142L2014 assessments are correctly read and interpreted in connection with suitable site context.

Summary Table		
Plant	Location	Impact in relation to measured background (L _{A90}) sound levels
Firewood Processor	Current Position	1.1 dB (A) below background
	Under cover in new barn	14.7 dB (A) below background
	North of Application Site	16.4 dB(A) below background
Chainsaw	Current Position	4.5 dB (A) above background
	Under cover in new barn	5.6 dB (A) below background
	North of Application Site	6.8 dB (A) below background
Delivery of customers Logs	Transit van route out of site	12dB (A) below background
Delivery of raw materials	Delivered to Stoke Farm	5.3 dB(A) below background
Tractor Operation	Adjacent to lower log pile	7.7 dB (A) below background
Tractor Operation	Adjacent to fence and higher log pile	0.2 dB (A) below background

Table 12. Summary of BS4142:2014 Assessment results

The only operation which has been assessed at the neighbouring property as being above measured background sound levels is that of the chainsaw being operated.

8 Mitigation Measures and Recommendations

The assessment demonstrates that in the current location, the processing of firewood is 1.1 dB(A) below measured background sound levels (L_{A90,15 minutes}) at the residential receptor's property. As stated above, the results of any assessment must be considered in line with the relevant context. The firewood processor is not a continual or daily process, and the site remains an active farm premises with numerous noisy activities.

As stated above, where it proposed to remove unseasoned or green logs from the log pile which diminish the 3.3m high pile, consideration should be given to carrying out the firewood processing at the North of the site, where the farm buildings create greater barrier effects.

Presently, the operation of the firewood processor is conducted outside and is subject to dry weather conditions to operate. With this in mind, it is proposed to develop the southern barn further South to extend an additional 20 metre enclosed shed/structure and to run a continuous concrete blockwork barrier along the Eastern boundary of the shed to prevent the escape of sound energy to the North and East. The concrete barrier will meet the roofline to prevent sound escaping through any gaps.

Working inside the barn structure will reduce sound levels to the nearest residential receptor at Molandi.

9 Potential Conditions

In their consultee response, the Environmental Health Officer suggests that conditions may be suggested to the local planning authority with a view to providing a scheme to allow the site use to be regularised and the application approved. The following conditions have been considered in line with the six planning tests outlined in the 2018 NPPF as relevant and appropriate for the site:

1. The activities carried out at Stoke Farm in line with the Hayling Island Log Company business shall only be carried out between the hours of 09:00 to 17:00 hours Monday to Friday and 09:00 to 13:00 hours on Saturdays. No firewood processing activities shall be carried out on either Sundays, bank or public holidays.
2. Deliveries to or from the site, in connection with the firewood business shall only be received or made during the hours listed in condition 1 above.
3. The Hakki Pilke 38 Pro, chainsaw and tractor shall be subject to a regular maintenance and servicing regime to ensure that the plant remains in optimal working conditions and contains all of the relevant manufacturers fittings and fixtures.
4. All mobile plant, including the chainsaw, the Hakki Pilke 38 Pro and the tractor, shall not be left idling and will be switched off when not in operation.
5. The plant listed in condition 4 shall only be operated by trained operatives
6. The height of the log pile at the Eastern boundary shall be retained at 3.3 metres and where the log pile is reduced for whatever reason, the processing of firewood is only to be carried out within the yellow hatched area shown in plan SC/North/02 dated June 2018 amended block plan submitted with the application.

10 Uncertainty

In line with professional guidance, steps have been taken to report and reduce uncertainty in the report writing and data collection process. These are as follows :

- To ensure robust data capture for the background sound levels, an unattended sound level meter was positioned on a telegraph pole at the site boundary in close proximity to the nearest residential dwelling.
- The durations and exposure for the survey period deliberately included a weekend to capture any variation in the soundscape and time periods when firewood processing was not carried out.
- The sound level meters used in both attended and unattended operations were calibrated before and after the survey in situ, without any drift having occurred, to ensure that the information and data being obtained was representative and that the sound level meters were operating correctly.
- Weather conditions were also considered to be ideal for environmental monitoring and the wind speeds presented have not required any monitoring data being removed from the data set.
- In assessing background sound levels, the operating hours of the business have been used from both Monday to Friday and Saturday operations, the latter of which have included reduced hours of operations. By concentrating on the proposed hours of use, this ensures that the chosen measured background sound levels are robust and are

not likely to be influenced by lower values potentially measured into the latter part of the day up to 23:00 hours which is still considered to be daytime.

- When considering items such as the customer delivery of logs, a worst-case scenario (ie six separate trips occurring on a Saturday morning) has been presented to ensure a robust assessment.
- With any calculations made, including the determination of background sound levels, there has not been any additional rounding of numbers to prevent double handling, this has only occurred once at the final part of the sum and is presented to the reader with an easy to understand reference level or single figure.
- Rather than making assumptions which may be incorrect or inappropriate, where there have been questions relating to the report, the client has been the initial point of contact to ensure that the process has been properly understood.
- Manufacturers information has not been relied on and mobile plant has been measured to ensure an accurate representation within the assessment and report writing process.
- Whilst the Molandi property is closest, by moving the noisy operations further South and under cover, attention has also been paid to the residents further West to ensure that they are not inadvertently impacted by sound propagating from the site.
- Context is critical in understanding the assessment of impact and where for reasons of brevity, the context has not been detailed, the readers attention has been signposted to the relevant sections.

11 Conclusion

An unattended sound survey was carried out at the site's Eastern boundary as close as possible to the nearest residential receptor between the 9th November 2018 and the 15th November 2018. The survey used a class one sound level meter to understand the ambient and background sound levels associated with both the active farm and the firewood processing business. A co-located weather station was also installed in line with good practice and to satisfy the requirements of BS4142:2014 showing that the dataset has been recorded in suitable meteorological conditions.

Attended measurements were also made on site to identify the elements of the firewood processing business.

The unattended survey position identified that the representative background sound levels for the business hours for the firewood processing business were 46dB $L_{A90, 15 \text{ minute}}$ for both Monday to Friday 09:00-17:00 hours and additionally, Saturday 10:00-13:00 hours.

The firewood processing machinery has been measured and is predicted to be 1.1 dB(A) below measured background sound levels at the nearest residential receptor. When considering a BS4142:2014 assessment, it is critical that the result must be considered in line with the context of the site and the business, and it is important to reflect that the processing of firewood does not happen all of the time, nor every day and remains a seasonal operation on what is an operational farm. Recommendations have been made with regards to positions where the future firewood processing may occur which is undercover and would result in a lower predicted noise level to the residential dwelling adjacent.

The Environmental Health Officers comments as a specialist consultee were considered and have been met in the production of the acoustic report. In considering the retrospective regularisation of the firewood business, conditions have been listed in Section 9 which allow the operation of the business to the satisfaction of the local planning authority.