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Noise Impact Assessment:

For Proposed

Biomass Boiler and Associated Infrastructure
Intertissue Site
Baglan Energy Park
Near Port Talbot
South Wales

For

Axis

Report No.: R15.1004/DRK
Report Date: 15th October 2015

Consultant: D.R. Kettlewell MSc MAE MIOA I.Eng

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Report prepared by:

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On behalf of:

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Report No.: R15.1004/DRK

Report undertaken & checked by:
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Date: 15th October 2015

Summary

1. Intertissue Ltd is submitting a planning application to construct and operate a biomass boiler and ancillary infrastructure at the existing Intertissue paper manufacturing and processing plant located at Plot 5 on the Baglan Energy Park, near Port Talbot in South Wales.

2. This assessment has been commissioned by Axis acting on behalf of Intertissue Ltd to determine the noise and vibration impact at the nearest existing residential properties in relation to the proposed development.

3. Noise and vibration levels have been considered and assessed during the construction and operational phases of the proposed development. Relevant and appropriate noise guidance and standards have been used to determine the noise impact and where appropriate amelioration measures provided to mitigate noise sources to acceptable and reasonable levels.

4. To determine any likely impact from noise it was necessary to establish typical baseline sound levels in the vicinity of the nearest residential property boundaries. This information has helped determine any likely noise impact on nearest receptors to the site during the operation of the proposed development.

   The results of the investigation into the existing noise climate have established the following:
   Representative background sound levels during a Sunday period were shown to be between 42dB LA90 and 57dB LA90 at agreed monitoring positions during daytime periods. For the Sunday night-time period background sound levels were recorded to vary between 39dB LA90 and 54dB LA90.

5. Pre-application dialogue has been undertaken with Public Protection Officers at the Environmental Health Department at Neath Port Talbot CBC to discuss the proposal and agree the assessment methodology and noise criteria, which is reflected in this assessment. The Officer's advised that the assessment should consider BS4142: 2014 in terms of noise criteria at the nearest residential

properties and BS8233: 2014 in relation to nearest commercial receptors to the site. Consideration of vibration is also to be assessed during construction and operational periods.

6. The impact of site activity noise at the nearest residential properties to the north, east and south directions from site has been assessed.

7. The report predicts the impact of noise from the proposed development that would be operated on site within buildings and external positions during site operational and construction work activities. The noise assessment concludes the following:
   - Noise levels from site operations have been undertaken using a noise prediction calculation model, internationally recognised calculation standard with appropriate input settings and plant noise limit data from the technology provider.
   - The highest predicted noise levels from site operations would be well below the lowest measured background sound levels measured during a Sunday period.
   - The highest predicted noise levels from site operations would not increase existing residual sound levels measured in terms of LAeq.
   - According to BS4142, the assessment of highest likely site operational noise levels would indicate that impact is low.
   - Site noise levels would be within all relevant guidance and standards for noise (i.e. would be below night-time noise level according to WHO guidance, below recommended internal noise levels according to BS8233: 2014 and sleep disturbance criteria in terms of LAeq.
   - Noise levels predicted at nearest offices is shown to be well within a reasonable design range for an office environment according to BS8233: 2014.
   - The impact of site operational noise or the proposed and existing Intertissue Ltd plant have been assessed and would not exceed lowest measured background sound levels and not increase existing residual LAeq levels and therefore there is no significant cumulative impact.

- Best practice would be applied in relation to the plant operation and site noise management.
- Assessment of construction noise indicates that there would not be any significant impacts and residual sound levels are unlikely to increase.
- No significant impacts are likely to occur as a result of additional vehicle movements as a result of the development as these would be negligible in context with the existing baseline traffic flows on the local road network.
- No significant impacts are predicted in relation to construction vibration or operational vibration and levels at nearest commercial premises are not expected to reach perceptible levels.

8. An example of noise amelioration measures to control site operational noise have been proposed to meet the requirements of best available techniques (BAT).

CONTENTS

1.0 INTRODUCTION

1.1 Intertissue Ltd is submitting a planning application to construct and operate a biomass boiler and ancillary infrastructure at the existing Intertissue paper manufacturing and processing plant located at Plot 5 on the Baglan Energy Park, near Port Talbot in South Wales. This assessment considers the impact of the proposed development with regard to noise and vibration.

1.2 This assessment has been commissioned by Axis acting on behalf of Intertissue to determine the noise and vibration impact at the nearest existing residential properties in relation to the proposed development.

1.3 Noise and vibration levels have been considered and assessed during the construction and operational phases of the proposed development. Relevant and appropriate noise guidance and standards have been used to determine the noise impact and where appropriate amelioration measures provided to mitigate noise sources to acceptable and reasonable levels.

1.4 To determine any likely impact from noise it was necessary to establish typical baseline sound levels in the vicinity of the nearest residential property boundaries. This information has helped determine any likely noise impact on nearest receptors to the site during the operation of the proposed development.

Assessment Aims and Objectives

1.5 The aim of this assessment is to provide information in support of a planning application in relation to the impact of noise from the proposal on sensitive receptors. This includes the provision of the following:

- Information on typical existing site sound climate;
- Information and predictions on noise and vibration impacts from site construction activities;
- Information and predictions on noise or vibration impacts during site operations; and
- Noise mitigation measures, which would be necessary to comply with

existing noise conditions and current noise standards to meet `best available techniques' (BAT).

1.6 The potential noise impacts from the proposed development are considered in the context of the existing ambient noise at the site, which is influenced by road traffic movements and existing industrial activities.

1.7 Appendix 1 provides details of technical terms within the chapter, for ease of reference. There is also a chart showing typical everyday noise levels to assist in understanding the subjective level of noise in terms of decibels.

1.8 It is intended that the plant would operate 24 hours per day and 7 days per week.

1.9 Information used in this assessment has been obtained from the following sources:

- Ordnance Survey maps of the local area;
- general layout and building elevations of the proposed development;
- British Standards BS 4142: 2014, BS8233: 2014 & BS 7445: 2003
- Technical Guidance Note IPPC H3;
- Guidelines for Community Noise – WHO: April 1999;
- ISO9613-2 Attenuation of sound during propagation outdoors – Part 2: General Method of Calculation: 1996;
- Calculation of Road Traffic Noise (CRTN): 1988; and
- BS5228-1: 2009 Code of practice for noise and vibration control on construction and open sites.

1.10 The noise prediction software used to assess the noise contribution from the site is CadnaA which utilises ISO9613-2.

1.11 The proposal includes fuel storage and boiler plant buildings and plant relevant to the operations at the site. These elements are illustrated on Figure 2.

2.0 SITE DESCRIPTION

2.1 Introduction

2.1.1 The application site is located at Plot 5 on the Baglan Energy Park, near Port Talbot in South Wales.

2.1.2 The paper mill occupies circa 32ha of land in total and it is fully operational. It comprises of a series of large interlinked buildings together with a separate office block and association infrastructure including weighbridges, car parking, a trailer park, internal roadways and circulation areas. As illustrated on Figure 2 the biomass boiler is proposed to be located within an area of the site which is surrounded on three sides by buildings. This part of the site is covered in hard standing and is currently used as external circulation space.

2.1.3 The proposed biomass boiler and associated fuel storage are anticipated to occupy circa 0.3ha of land within this area.

2.1.4 Access to the paper mull is achieved from a roundabout off Brunel Way which in turn provides a connection to the A48/A474 roundabout and ultimately the M4.

2.1.5 The site is relatively detached from sizable areas of residential development. The nearest residential properties are located to the south and west of the site off Old Road and Handel Avenue at a distance of approximately 1.1km and 1.5km respectively.

2.1.6 The main source of existing noise affecting nearest property positions relates to the movement of vehicles on the local roads (road traffic).

2.2 Nearest Sensitive Receptors

2.2.1 The nearest residential properties are located to the west south and northern directions from the site. The agreed nearest sensitive receptor positions with the Public Protection Officer included the following:

(A) Tor-y-Myndol
(B) Handel Avenue
(C) Fenbroke Close
(D) Burrows Road
(E) Travellers Caravan Park

2.2.2 Further consideration is made in respect of the office buildings on adjacent plots (i.e. Plots 6 and 8) during daytime periods.

2.2.3 Other potential receptors which have been included relate to permitted development, which may have not been implemented to date but include:

a) Local new development - we have found P2013/1047 which is Land North of Handel Avenue (Phase 7a Baglan Bay) Baglan Neath, Port Talbot which is approx. 1.2km south of the site across the brown field site and power station area. The noise report provides information on the LA90 levels measured at this position in May 2013, which can be referenced.
b) Commercial development P2014/0749- Plot 7B Brunel Way Data Centre with ancillary servicing centre and supporting office accommodation (Outline with all matters reserved)This is north of the Intertissue site on the plot of land to the side of the Council Offices and Depot.
c) Health Centre (including pharmacy within a two storey building) and offices (within two separate, two storey buildings). Planning reference P2014/0314 which was granted in September 2014 and is located on Plot 6B.

2.2.4 Figure 1 attached, shows the site position relative to the nearest residential properties and noise monitoring positions.

2.3 Development Elements

2.3.1 In summary, the proposed development comprises the following key elements, each of which are subsequently described in further detail:

- Biomass storage facilities including fuel storage and handling system;
- Boiler House including the combustion unit, boiler and other process plant, electrical room, control room; and

- Associated infrastructure including silos for storage of biomass, vehicular and pedestrian access, and external hardstanding for vehicle manoeuvring (fuel deliveries would be segregated from the other working areas by clearly defined routes).

3.0 NOISE & VIBRATION GUIDANCE AND STANDARDS

3.1 Planning Policy & Guidance

3.1.1 The following section outlines the key planning policy and guidance that relates to the assessment of residential amenity and protection of residents from general environmental and industrial noise sources.

3.1.2 Within the introduction of Planning Guidance (Wales) Technical Advice Note (TAN) 11, Noise – October 1997, it states: *"This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business.*

3.1.3 The guidance introduces the concept of Noise Exposure Categories (NEC), which has been derived to assist local planning authorities in their consideration of planning applications for residential development near transport related noise sources. The NEC procedure is only applicable for the introduction of a new residential development into an area with an existing noise source. At Annex B guidance is given for various types of noise sources, which include, for example, commercial developments, road traffic, construction sites, aircraft and railways. Whilst this guidance is not directly relevant to the proposed development, it nonetheless provides information on what absolute noise levels are deemed to be acceptable for new residential development affected by transportation noise and as such provides a useful indication of noise levels considered acceptable at residential receptors.

3.1.4 The day time noise level at the boundary of NEC A and NEC B is based on guidance provided by the World Health Organisation health criteria that: *"General daytime outdoor noise levels of less than 55dB(A) Leq are desirable to prevent any significant community annoyance."*

3.1.5 The night-time noise level at the boundary of NEC A and NEC B is also based on the World Health Organisation health criteria, which states that: *"based on limited*

data available, a level of less than 35dB(A) is recommended to preserve the restorative process of sleep."

3.1.6 Table 3.1 provides an interpretation of the NEC categories in terms of granting planning permission.

Table 3.1: NEC Category description in terms of planning issues

NEC Category	Description	Noise Range LAeq,T dB
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.	<55dB(A) daytime (16hr) <45dB(A) night-time (8hr) Road, rail and mixed sources
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.	55-63dB(A) daytime (16hr) 45-59dB(A) night-time (8hr) Road, rail and mixed sources

3.1.7 For noisy industrial development the TAN11 refers to BS4142 Method for rating industrial noise affecting mixed residential and industrial areas. It gives the comment that *"the likelihood of complaints about noise from industrial development can be assessed, where the Standard is appropriate, using guidance in BS4142: 1990"* (note: the standard was updated in 1997 & recently in 2014).

3.1.8 Further comment is made in respect of noise levels within buildings in that *"in addition, general guidance on acceptable noise levels within buildings can be found in BS8233: 1987"* (note: the standard was updated in 1999 and recently in 2014).

BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'

3.1.9 BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound' is based on the measurement of background sound using L_{A90} noise measurements, compared to source noise levels measured in L_{Aeq} units. The

differential between the two measurements; once any corrections have been applied for source noise tonality, distinct impulses etc. (i.e. the 'rating' level); determines the likelihood of complaints.

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

3.1.10 In terms of establishing the rating level, corrections for the noise character has to be taken into consideration. These include the following factors:

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.

Other sound characteristics

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

NOTE 2 Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. 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.

3.1.11 The assessment of noise from the site is based on previous monitoring (by NVC) and from other studies of similar facilities at similar distances to the sensitive receptors in this instance. The findings of this assessment work is provided below:

a) Frequency analysis of this type of plant from previous experience does not typically produce any tonal characteristics and considering the separation distance between the plant and receptors tonal noise is not anticipated to be perceptible at the nearest receptor and there would be no requirement to apply a correction. If mobile plant are to be utilised on site these would only operate occasionally during the daytime and would be fitted with broadband type noise reversing alarms. The relative noise contribution compared with the residual noise is also likely to be more than 10dB below ambient noise levels at nearest receptors.

b) In terms of impulsivity considering the mechanical operation of the plant and design of the site (i.e. using automated feeding systems and enclosing the plant within a building) there is no significant impulse noise expected during normal plant operations (i.e. significant impacts or air release other than in an exceptional event during a safety steam vent release). Consequently it is

not expected that impulsive noise from the proposed operations would be generated.

c) In terms of intermittency whilst there would occasional delivery of fuel there is no specific intermittent character that is likely to be distinctive when considering the separation distance and the noise contribution relative to ambient noise.

3.1.12 In conclusion, in view of the predicted noise contribution, separation distance from site to receptor, NVC's experience in dealing with this type of site and noise control measures proposed (i.e. plant enclosure and steam vents and plant noise limited) it is advised that a noise character penalty is not deemed to be necessary.

BS8233:2014 – Guidance on sound insulation and noise reduction for buildings

3.1.13 The British Standard BS8233 provides additional guidance on noise levels within buildings. These are based on the WHO recommendations and the criteria given in BS8233 for unoccupied spaces within residential properties.

3.1.14 The guidance provided in Section 7.7 of BS8233 provides recommended internal ambient noise levels for resting, dining and sleeping within residential dwellings. Table 4.2 provides detail of the levels given in the standard.

Table 3.2: BS8233: 2014 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hours}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hours}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hours}$	30 dB $L_{Aeq,8hours}$

World Health Organisation (WHO) Guidelines for Community Noise: April 1999

3.1.15 This document provides further updated information on noise and its effects on the community. Within the document for noise 'In Dwellings' it states that *"the effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30dB LAeq for continuous noise and 45dB LAmax for single sound events. Lower noise levels may be disturbing depending upon the nature of the noise source."*

World Health Organisation (2009) – Night noise guidelines for Europe

3.1.16 The WHO regional office for Europe set up a working group of experts to provide scientific advice to the Member States for the development of future legislation and policy action in the area of assessment and control of night noise exposure. Considering the scientific evidence on the thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the Environmental Noise Directive (2002/49/EC), an $L_{night,outside}$ of 40dB should be the target of the night noise guidance (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ value of 55dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach.

H3 Horizontal Guidance Note for Noise Part 2: Noise Assessment and Control

3.1.17 Natural Resources Wales' assessment of noise includes guidance found within the H3 Horizontal Guidance Note for Noise, which includes the application of Best Available Techniques' (BAT) to control noise associated with the proposed Facility.

3.1.18 In summary, the aim of BAT should be to achieve the following:

- Underpinning of good practice, a basic level of which the operator should employ for the control of noise including adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise. For example, this would include bearings, air handling plant, the building fabric as well as specific noise attenuation measures associated with plant, equipment or machinery.
- Noise levels should not be loud enough to give reasonable cause for annoyance for persons in the vicinity, which is a more appropriate environmental standard than that of Statutory Nuisance and is normally the aim of most planning or other conditions applied by Local Authorities.
- Prevention of *"creeping background"*, which is the gradual increase in background sound levels as industry expands and areas develop.

Construction Noise

3.1.19 For residents of the existing houses that would be exposed to construction noise, BS5228 is considered to be the appropriate standard. This standard does not prescribe limits, but requires `best practicable means' (BPM) to be employed to control noise generation. The criterion therefore is that BPM should be employed and conditions implemented for example to restrict construction noise to non-sensitive hours.

3.1.20 The construction impact semantic scale is based on the ABC method of assessment, which sets out threshold values depending upon the ambient noise at receptors, which have been defined from the baseline sound survey.

Table 3.3: Impact Magnitude Category – Construction Noise

Threshold Value LAeq dB	Time of Day	Change in total noise level above threshold dB(A) [i.e. ambient + construction noise]	Impact Magnitude
65 55 45	Daytime (0700-1900) Evening (1900-2300) or weekend Night-time (2300-0700)	0 or lower	No significant impact (negligible)
65 55 45	Daytime (0700-1900) Evening (1900-2300) or weekend Night-time (2300-0700)	+0.1 to +3.0	Slight
65 55 45	Daytime (0700-1900) Evening (1900-2300) or weekend Night-time (2300-0700)	+3.1 to +9.9	Moderate
65 55 45	Daytime (0700-1900) Evening (1900-2300) or weekend Night-time (2300-0700)	+10.0 or more	Substantial

Guidance on Ground Vibration

3.1.21 BS 5228- 2:2009 Annex B gives guidance on the effects of vibration levels, which is summarised below in Table 3.4.

Table 3.4: Guidance on Effects of Vibration Levels

Vibration Level $mm.s^{-1}$	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

3.1.22 In terms of response limits of buildings BS 5228-2: 2009 (Annex B, Table B.2) refers to BS 7385-1 and BS 7385-2 and sets out guide values for transient

vibration for cosmetic damage, which gives a low frequency limit of 15mm/s (4Hz) increasing to 20mm/s at 15Hz for residential or light commercial buildings. For reinforced or framed structures the limit is 50mm/s at 4Hz and above.

3.1.23 The impact magnitude categories applied to the assessment of ground vibration are described in Table 3.5.

Table 3.5: Impact Significance Category – Ground Vibration

Vibration Level ($mm.s^{-1}$)	Subjective Response (Residential)	Impact Magnitude	Significance Level
0.14 to 0.29	Imperceptible to Barely perceptible	Negligible	Neutral
0.3 to 0.99	Just perceptible	Minor	Slight
1.0 to 4.99	Noticeable	Moderate	Moderate
5 to 14.99	Potential cosmetic damage (continuous vibration)	Major	Large
15 or more	Potential structural damage (continuous vibration) Potential cosmetic damage (transient vibration)	Substantial	Very Large

Vibration

Vibration - Nuisance

3.1.24 The fact that the human body is very sensitive to vibration can result in subjective concern being expressed at energy levels well below the threshold of damage.

3.1.25 Guidance on the human response to vibration in buildings can be found in British Standard BS 6472-1: 2008 ‘Guide to Evaluation of human exposure in buildings (1Hz to 80Hz)’. Weighting curves related to human response to vibration of buildings are presented within this document. Estimates are given on the probability of adverse comment, which might be expected, from human beings experiencing vibration in buildings. This is based on a vibration dose value (VDV), assessed from frequency weighted vibration measurements and based on a 16-hour day and 8 hour night period.

4.0 BASELINE NOISE CONDITIONS

4.1 In terms of previous noise monitoring positions and receptor locations, the survey carried out in 2007 by Gregory Environmental indicates that 2 monitoring positions were agreed with the EA which included the following positions:

- North of the factory outside the caravan park (designated NCS01); and
- At the junction of Old Road and Crawford Road (designated NCS02).

4.2 The baseline sound monitoring positions as agreed with the Public Protection Officer at Neath Port Talbot CBC are indicated on Figure 2 and include the following:

1. North of the factory outside the caravan park (designated NCS01);
2. At the junction of Old Road and Crawford Road (designated NCS02); and
3. Handel Avenue (south of the site).

4.3 The noise monitoring positions are representative of the sound climate in the vicinity of the proposed development. Details of the instrumentation used for the survey are detailed in Appendix 2.

4.4 Monitoring was undertaken on a Sunday period during morning, afternoon, evening and night-time periods (4 x 15 minutes sequential measurements at each location) on a spot roaming rotation basis. Monitoring of LAeq, LAmax, LA90 and one-third octave band frequency measurements for each monitoring period to determine typical ‘representative' background sound levels in accordance with BS4142: 2014.

4.5 The baseline sound survey was undertaken on Sunday 15th through to Monday 16th February 2015 at three spot roaming measurement locations adjacent to nearest residential receptor locations and is therefore a good indication of the representative baseline sound levels. Monitoring was undertaken during low wind speeds and dry conditions.

4.6 The background sound survey was carried out in accordance with BS 4142: 2014 and advice given in BS 7445:2003.

4.7 Although ambient noise levels can vary depending on weather conditions, the purpose of the baseline survey is to monitor sound levels under suitable weather conditions. This then provides a typical and representative indication of ambient conditions. The effect of wind on noise levels can be significant, as an example, BS 8233: 2014 (Paragraph 6.8) states: *"Whether noise levels are measured or predicted, wind gradients, temperature gradients and turbulence affect the level of received sound and audibility over short periods. The magnitude of these effects, i.e. variations in noise level and audibility, increases with increasing distance between source and receptor. The effects are asymmetrical and, for distances of 500m to 1000 m, typically range from increasing the level by typically 2 dB downwind to reducing it by typically 10 dB upwind. It is not usually practicable to use these factors in design, but the prevailing wind direction should be considered when planning building orientation. Noise from wind and precipitation, including the wind-generated noise from trees, can also affect noise measurements."*

4.8 For the purpose of this assessment, it is assumed that monitoring and assessment of operational noise from the proposed development is undertaken under appropriate weather conditions and therefore any positive or negative vector from wind direction is not representative. The effect of wind speed and direction can also increase background noise levels thereby masking any potential increase in site-specific noise levels. For this reason it is assumed that typical weather conditions apply and no increase or decrease for the wind vector is required.

Site Baseline Noise Survey Results

4.9 The results of measurements taken at the fixed monitoring positions are presented in Tables 4.1 to 4.2 and detailed measurements are provided in Appendix 3.

Table 4.1: Baseline sound levels at monitoring positions (daytime)

Position (refer to Figure 2)	Time Period	LAeq dB (range)	LA10 dB	LA90 dB (range)	LAmax dB
1.Caravan Park(NCS01)	Daytime	57 (53-60)	56	52 (48-57)	65-81
2.Old Road/Crawford Road (NCS02)	Daytime	61 (59-63)	61	53 (51-56)	74-83
3.Handel Avenue	Daytime	56 (53-59)	55	44 (42-47)	70-80

Table 4.2: Baseline sound levels at monitoring positions (night-time)

Position (refer to Figure 2)	Time Period	LAeq dB (range)	LA10 dB	LA90 dB (range)	LAmax dB
1.Caravan Park (NCS01)	Night-time	55 (47-58)	55	48 (42-54)	60-65
2.Old Road/Crawford Road (NCS02)	Night-time	57 (49-60)	52	40 (39-41)	62-85
3.Handel Avenue	Night-time	47 (45-49)	48	43 (42-45)	53-60

4.10 The results of baseline sound measurements taken at the monitoring positions would indicate that representative background sound levels during the daytime period (0700-2300 hours) are typically between 44dB and 53dB L_{A90} with the higher daytime background sound levels occurring closer to the local road network and during the night-time period (i.e. between 2300-0700 hours) is shown to be between 40-50dB L_{A90} at the monitoring positions.

5.0 NOISE LEVEL PREDICTIONS

5.1 Introduction

5.1.1 Noise has been defined as sound, which is undesired by the recipient. The effects of noise on the neighbourhood are varied and complicated, including such things as interference with speech communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals would be more sensitive to noise than others.

5.1.2 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or L_{Aeq} parameter.

5.1.3 In general, the level of noise in the local environs that arises from a development site would depend on a number of factors. The more significant of which are:

(a) The sound power levels of the plant or equipment used on site.
(b) The periods of operation of the plant on site.
(c) The distance between the source noise and the receiving position.
(d) The presence or absence of screening effects due to barriers, or ground absorption.
(e) Any reflection effects due to the facades of buildings etc.

5.2 Prediction Methodology

Site Operational Noise

5.2.1 For site operational noise this assessment has used ISO9613-2 prediction modelling and CadnaA software for producing noise maps of the highest likely generated noise.

5.2.2 The methodology takes into account source position, distance and duration of activity. Any local screening from existing buildings on the intervening ground in relation to the nearest sensitive receptors has been taken into account. The

noise modelling assumes that all significant plant is operating. The prediction calculations therefore provide an indication of the highest likely noise level.

5.2.3 Predictions for HGV movements have also been based on the calculation methodology provided under ISO9613-2. The assessment has used CadnaA software prediction modelling for the calculations (refer to Appendix 6 for noise maps).

5.3 Plant Complement

5.3.1 The assumed plant noise levels from which the noise predictions were made are provided in paragraph 8.4. The plant complement is based on information provided by the applicant.

5.4 Results of Noise Predictions

5.4.1 This assessment has used empirical data of the fixed plant and any vehicle movements likely to be used for the calculations at the nearest property boundary locations during site operations. Refer to the appendices for further information on plant noise levels.

5.4.2 Prediction calculations have been undertaken using CadnaA noise prediction modelling software in accordance with ISO9613-2 calculation methodology with the following settings.
Ground Absorption (G) = 0.5
Temperature = 10degC
Relative humidity = 70%
Maximum order of reflection = 3
No ground absorption over barrier
Octave band frequency data used.

Receptor height for daytime or night-time operations = 4m above ground except at caravan site which is assumed to be 1.5m above ground.

5.4.3 The above represents reasonable input settings for calculation which have been shown to provide an accurate prediction of likely noise contribution (albeit slightly erring on the pessimistic side) based on many years of experience and shown following compliance monitoring on other sites in the UK. Results of noise mapping are provided in Appendix 5.

5.4.4 The noise model has included local screening from the existing Intertissue buildings.

Site Plant Noise Assessment:

General Activities

5.4.5 Table 5.1 provides the output results from the noise prediction model from the Biomass building plant which assumes that building doors in the fuel feed building are in the open position during daytime and closed during night-time. The Biomass plant building doors are assumed to be closed during daytime and night-time periods.

Table 5.1: Predicted Noise Contribution from Fixed & Mobile Plant Operating within the Building (Daytime)

Receptor Position	Noise from Site LAeq dB Ref. noise model map 1 (Appendix 6)	Existing Background Sound Levels LA90 dB [LAeq]
1.Caravan Park (NCS01)	29	52 (range 48-57) [57]
2.Old Rd/Crawford Rd (NCS02)	31	53 (range 51-56) [61]
3.Handel Avenue	31	44 (range 42-47) [56]
4. Fenbroke Close	29	52 (range 48-57)* [57]
5. Burrows Road	30	53 (range 51-56)*** [61]
6.Residential Development (permitted) P2014 1047	32	44 (range 42-47)** [56]
7.Commercial Data Centre P2012 0749	34	52 (range 48-57)* [57]
8.Health Centre Plot 6B	34	44 (range 42-47)** [56]

*Background sound levels assumed to be similar to position 1 due to relative position of M4 Motorway.
**Background sound levels assumed to be similar to position 3 due to relative position to M4 Motorway.
***Background sound levels assumed to be similar to position 2 due to relative position to M4 Motorway.

Table 5.2: Predicted Noise Contribution from Fixed & Mobile Plant Operating within the Biomass Building (Night-time)

Receptor Position	Noise from Site LAeq dB Ref. noise model map 1 (Appendix 5)	Existing Background Sound Levels LA90 dB [LAeq]
1.Caravan Park (NCS01)	24	48 (range 42-54) [55]
2.Old Road/Crawford Road (NCS02)	24	40 (range 39-41) [57]
3.Handel Avenue	28	43 (range 42-45) [47]
4. Fenbroke Close	26	48 (range 42-54)* [55]
5. Burrows Road	26	40 (range 39-41)** [57]
6.Residential Development (permitted) P2014 1047	30	43 (range 42-45) [47]
7.Commercial Data Centre P2012 0749	28	48 (range 42-54)* [55]
8.Health Centre Plot 6B	30	43 (range 42-45) [47]

*Background sound levels assumed to be similar to position 1 due to relative position of M4 Motorway.
**Background sound levels assumed to be similar to position 2 due to relative position to M4 Motorway.

BS4142: 2014 Assessment

5.4.6 Tables 5.3 to 5.6 provided below show a summary assessment using BS4142: 2014, further detailed analysis of noise at the nearest sensitive receptor is provided in Appendix 5 attached.

Table 5.3: BS4142 Assessment from Biomass Plant (Daytime)

Receptor:	1.Caravan Park	2.Old Road	3.Handel Avenue
Calculated Noise Level	29dB LAeq	31dB LAeq	31dB LAeq
Noise Character Penalty	0	0	0
Rating level	29dB	31dB	31dB
Background noise	48dB LA90*	51dB LA90*	42dB LA90*
Rating above background noise	-19	-20	-11
Conclusion	**Low Impact**	**Low Impact**	**Low Impact**

Table 5.4: BS4142 Assessment from Biomass Plant (Daytime)

Receptor:	4. Fenbroke	5.Burrows Road	6.Permitted residential dev.
Calculated Noise Level	29dB LAeq	30dB LAeq	32dB LAeq
Noise Character Penalty	0	0	0
Rating level	29dB	30dB	32dB
Background noise	48dB LA90	51dB LA90	42dB LA90
Rating above background noise	-19	-21	-10
Conclusion	**Low Impact**	**Low Impact**	**Low Impact**

Table 5.5: BS4142 Assessment from Biomass Plant (Night-time)

Receptor:	1.Caravan Park	2.Old Road	3.Handel Avenue
Calculated Noise Level	24dB LAeq	24dB LAeq	28dB LAeq
Noise Character Penalty	0	0	0
Rating level	24dB	24dB	28dB
Background noise	42dB LA90*	39dB LA90*	42dB LA90*
Rating above background noise	-18	-15	-14
Conclusion	**Low Impact**	**Low Impact**	**Low Impact**

Table 5.6: BS4142 Assessment from Biomass Plant (Night-time)

Receptor:	4. Fenbroke	5.Burrows Road	6.Permitted residential dev.
Calculated Noise Level	26dB LAeq	26dB LAeq	30dB LAeq
Noise Character Penalty	0	0	0
Rating level	26dB	26dB	30dB
Background noise	42dB LA90	39dB LA90	42dB LA90
Rating above background noise	-16	-13	-12
Conclusion	**Low Impact**	**Low Impact**	**Low Impact**

5.4.7 The above tables show the highest predicted noise levels from site operations which are likely to occur during the daytime and night-time operating periods. This is based on noise levels advised by the technology provider and plant working simultaneously and is therefore the highest likely noise to be generated by the site.

5.4.8 The above would indicate that with the proposed recommendations on noise control, the levels at residential receptors would indicate that impact is likely to be low and would result in an internal noise levels within living rooms that would comply with design guidance according to BS8233: 2014 (allowing for an open window attenuation of 10-15dB).

5.5 Noise levels at adjacent Offices

5.5.1 To meet design guidance for internal noise levels (for residential receptors) BS8233: 2014 during daytime periods would indicate that an external level of around 45dB(A) to 50dB(A) Leq_{1hr} would be reasonable. For noise levels at office windows reference to BS8233: 2014 is referenced where external noise levels of 55-65dB(A) Leq_{1hr} would be appropriate (assuming single or double glazed windows are installed).

5.5.2 The resultant noise contribution at nearest commercial offices has been considered below.

5.5.3 The predicted noise levels with the proposed mitigation measures at the nearest commercial unit offices are provided below in Table 5.7.

Table 5.7: Predicted noise levels at adjacent offices

Position	Noise from Proposed Development Daytime $LAeq_{1hr}$ dB	Reasonable external noise level to Offices (closed window) according to BS8233:2014 LAeq dB
7.Commercial Data Centre (ref.P2012 0749)	34	55-65
8.Health Centre Plot 6B	34	55-65

5.5.4 The above predicted levels within adjacent offices is within reasonable external design noise levels. Note that modern office type developments would normally have windows closed due to air conditioning systems operating.

Cumulative Impacts

5.5.5 The cumulative impact of the proposed development with the existing Intertissue site is considered below. Reference is made to the Arup Acoustics report (Ref. AAc/112021-72/R04) dated January 2005 which was undertaken as part of the Pre-operational IPPC Noise Conditions and provides predicted noise contribution from the Intertissue Ltd site at the nearest receptors to the site. The table of results from this report is provided below for ease of reference.

Table 5.8: Ove Arup Acoustics Noise Predictions for the Intertissue Ltd Site

Receiver	Distance to Building B	Distance to Building D	Noise Level at Receptor Leq dB(A)
Tor-y-Myndol	1150	950	32
Handel Avenue	1450	1430	29
Fenbroke Close	1600	1600	31
Burrows Road	1450	1250	30
Travellers Caravan Park	900	800	34

5.5.6 Based on the above predicted noise contribution from the Intertissue Ltd Site and the proposed development the following resultant noise levels at receptors would occur.

Table 5.9: Predicted Cumulative Noise Contribution from Intertissue Ltd Site including the Biomass Plant (Daytime)

Receptor Position	Noise from Existing Site LAeq dB Daytime	Noise from Proposed Biomass LAeq dB Daytime	Cumulative noise level (both operating) LAeq dB
1.Caravan Park (NCS01)	34	29	35
2.Old Rd/Crawford Rd (NCS02)	32	31	35
3.Handel Avenue	29	31	33
4. Fenbroke Close	31	29	33
5. Burrows Road	30	30	33
6. Permitted Residential Development	30*	32	34

*Predicted based on distance propagation attenuation.

Table 5.10: Predicted Cumulative Noise Contribution from Intertissue Ltd Site including the Biomass Plant (Night-time)

Receptor Position	Noise from Existing Site LAeq dB Night-time	Noise from Proposed Biomass LAeq dB Night-time	Cumulative noise level (both operating) LAeq dB
1.Caravan Park (NCS01)	34	24	34
2.Old Rd/Crawford Rd (NCS02)	32	24	33
3.Handel Avenue	29	28	32
4. Fenbroke Close	31	26	32
5. Burrows Road	30	26	31
6. Permitted Residential Development	30	30	33

5.5.7 The revised BS4142 assessment tables for the cumulative effect are presented below.

Table 5.11: BS4142 Assessment from Biomass Plant (Daytime)

Receptor:	1.Caravan Park	2.Old Road	3.Handel Avenue
Calculated Noise Level	35dB LAeq	35dB LAeq	33dB LAeq
Noise Character Penalty	0	0	0
Rating level	35dB	35dB	33dB
Background noise	48dB LA90*	51dB LA90*	42dB LA90*
Rating above background noise	-13	-16	-9
Conclusion	**Low Impact**	**Low Impact**	**Low Impact**

Table 5.12: BS4142 Assessment from Biomass Plant (Daytime)

Receptor:	4. Fenbroke	5.Burrows Road	6.Permitted residential dev.
Calculated Noise Level	33dB LAeq	33dB LAeq	34dB LAeq
Noise Character Penalty	0	0	0
Rating level	33dB	33dB	34dB
Background noise	48dB LA90	51dB LA90	42dB LA90
Rating above background noise	-15	-18	-8
Conclusion	**Low Impact**	**Low Impact**	**Low Impact**

Table 5.13: BS4142 Assessment from Biomass Plant (Night-time)

Receptor:	**1.Caravan Park**	**2.Old Road**	**3.Handel Avenue**
Calculated Noise Level	24dB LAeq	24dB LAeq	28dB LAeq
Noise Character Penalty	0	0	0
Rating level	24dB	24dB	28dB
Background noise	42dB LA90*	39dB LA90*	42dB LA90*
Rating above background noise	-18	-15	-14
Conclusion	**Low Impact**	**Low Impact**	**Low Impact**

Table 5.14: BS4142 Assessment from Biomass Plant (Night-time)

Receptor:	**4. Fenbroke**	**5.Burrows Road**	**6.Permitted residential dev.**
Calculated Noise Level	26dB LAeq	26dB LAeq	30dB LAeq
Noise Character Penalty	0	0	0
Rating level	26dB	26dB	30dB
Background noise	42dB LA90	39dB LA90	42dB LA90
Rating above background noise	-16	-13	-12
Conclusion	**Low Impact**	**Low Impact**	**Low Impact**

5.5.8 The above results show no change in the impact conclusions relative to BS4142: 2014.

Road Traffic Impacts

5.5.9 According to the Transport Assessment provided by Axis shows that when taking into account a sensitivity test trip generation (i.e. worst case) scenario the number of two way movements to and from site would only result in 16 HGV movements and 4 staff which would result in a **negligible** impact onto the local road network and therefore would not present any significant impacts.

5.5.10 The noise model for daytime allows for the HGV movements on site based on the sensitivity test.

6.0 CONSTRUCTION NOISE & VIBRATION

Construction Noise

6.1 In general, the level of noise in the local environs arising from the construction of a development site would depend on a number of factors. The most significant of which are as follows:

- The sound power levels (SWL's) or sound pressure levels (SPL's) of the plant or equipment used on site;
- The periods of operation of the plant on site;
- The distance between the source noise and the receiving position;
- The presence or absence of screening effects due to barriers, or ground absorption; and,
- Any reflection effects due to the facades of buildings etc.

Calculation Methodology

6.2 The calculation method used in this study for construction noise is based upon theoretical noise propagation theory, which takes into account source position, distance, direction and frequency content in relation to the nearest residential property boundary positions. British Standard BS5228 methodology has been used to estimate construction noise levels at the nearest existing dwellings including source noise levels for construction plant.

6.3 Noise levels emanating from the Site due to construction works associated with the proposed development would vary from day to day. In order to give an indication of the probable noise levels generated by the works, a worst-case scenario has been considered for several construction activities, namely soil movement, piling and building construction. See Appendix 5 for further information.

Predicted Noise Levels: Construction

6.4 The highest likely noise levels for the proposed development in terms of construction noise are provided below. This is based on calculations for soil

movement work and general site activities at the closest approach to existing dwellings.

6.5 It is difficult to estimate how long this type of activity would last but typically in areas close to the site boundary (i.e. noisiest construction period assessed) this is normally completed in weeks rather than months.

6.6 The results of calculations for piling, soil movement, general site activities and building construction are summarised below in Table 6.1.

Table 6.1: Noise Predictions for Highest Likely Construction Noise at Nearest Receptors

Receptor Position	Distance to receptor (m)	Activity	Noise Level, dB $LAeq_{1\ hr}$	Typical Residual Noise $LAeq_{1hr}$ dB	Total noise (residual + construction) $LAeq_{1hr}$ dB	BS5228 Threshold Value LAeq dB (daytime)
1.Caravan Park (NCS01)	1000	Piling	33	57	57	65
		Soil Movement	34	57	57	
		General site activities	29	57	57	
		Infrastructure	27	57	57	
		Building construction	34	57	57	
2.Old Road/ Crawford Road (NCS02)	1200	Piling	31	61	61	65
		Soil Movement	32	61	61	
		General site activities	27	61	61	
		Infrastructure	30	61	61	
		Building Construction	31	61	61	
3. & 6.Handel Avenue (or permitted residential dev)	1450	Piling	29	56	56	65
		Soil Movement	34	56	56	
		General site activities	30	56	56	
		Infrastructure	28	56	56	
		Building Construction	34	56	56	
4. Fenbroke Close	1640	Piling	28	57	57	65
		Soil Movement	33	57	57	
		General site activities	29	57	57	
		Infrastructure	27	57	57	
		Building Construction	33	57	57	

8. Health Centre	350	Piling	44	56*	56	65
		Soil Movement	43	56*	56	
		General site activities	39	56*	56	
		Infrastructure	36	56*	56	
		Building Construction	42	56*	56	

Note: Construction noise prediction levels given above do not allow for any site screening other than at position 8 from the existing Intertissue Ltd buildings and highest level predicted assumes that the plant equipment is at its closest approach.*Assumed ambient noise level based on readings taken in the general area.

6.7 The highest construction noise levels are likely to be created during the soil movements and the construction of buildings. This would however, be well within the level of noise normally found to be acceptable for an activity of this type and duration. The results show that for the construction period the noise level from construction activities at the existing properties would not exceed reasonable daytime absolute noise levels and existing residual noise levels would not change.

6.8 For the construction period noise generated by site activities would be below reasonable absolute noise criteria (i.e. below 65dB(A) Leq). The results show that the threshold proposed by BS5228 would not be exceeded and therefore a **negligible** impact magnitude and **neutral** impact significance.

Construction Vibration

Typical Vibration Levels

6.9 The highest levels of vibration generated by plant are likely to arise from the following:

- Piling Rigs;
- Vibratory rollers and compactors;
- Material offloading onto hard surfaces; and
- Concrete vibratory plant.

6.10 Typical field measurements taken at sites in the UK where piling or vibratory rollers have been used (on clay-based ground, which is likely to be the highest generated vibration) would indicate that at a distance of around 20 metres the peak particle

velocity is around 14-17 mm/s reducing to 1.5 to 2 mm/s at 30 metres distance and <1mm/s at 50 metres. For vibro piling measured levels of vibration are shown to be between 1mm/s and 3mm/s at a distance of between 20 to 30 metres (ref. BS5228-2: 2009 Table D4).

BS 5228: 2009 Part 2: Vibration

6.11 Part 2 of the Standard deals with vibration from construction and open sites and provides information on the effects of the levels of vibration, human and structural response, response limits of structures and practical measures to reduce vibration.

6.12 The distance from nearest residential receptors to any likely use of piling rigs (i.e. building foundation construction) and vibratory compaction (i.e. during road construction) is likely to exceed a distance of 1km based on the nearest existing residential receptors. The distance to any existing commercial or industrial buildings would also be in excess of 300 metres.

Conclusion

6.13 Based upon the above information, it is clear that even at the closest approach to existing residential properties, the likely levels of ground-borne vibration would be well below the limiting value for continuous vibration of 5.0 mm/s for cosmetic damage and also below perceptible levels of vibration (i.e. 0.3mm/s) at all receptors. The levels of vibration at the closest approach to existing industrial/commercial buildings would be greater than 300 metres with maximum potential ground vibration being less than 0.3mm/s when vibration source is at closest approach. It is predicted therefore that vibration would not be perceptible at the nearest commercial buildings and well below threshold levels where cosmetic or structural damage occurs. The results of empirical measurements of vibration from vibratory plant at distances greater than 30 metres according to BS 6472: 2008 would indicate that the vibration levels are unlikely to give rise to any ‘adverse comment’ from a nuisance aspect.

6.14 Construction vibration would be approached on a `best practice' basis in accordance with BS5228: 2009 Part 2.

7.0 OPERATIONAL VIBRATION

Ground Vibration Monitoring – Fixed & Mobile Plant

7.1 Measurements of ground borne vibration from empirical data obtained from measurements at a waste, construction and a Biomass site have been referred to for an indication of typical ground borne vibration levels from HGVs, mobile plant and fixed plant. Definitions of all vibration measurement parameters noted during the survey are presented in Appendix 7.

7.2 During the survey at the construction site, the seismograph transducer did not trigger at the measurement distance of 3-5 metres from mobile plant, indicating that the level of vibration was below the transducer sensitive threshold of 0.3mm/s. The only trigger recorded during the survey was during measurements of a passing HGV at a distance of 1 metre, which recorded a level of 0.635mm/s.

7.3 At the site, the seismograph was placed at 10 metres from the kerbside of the access road to the site. The seismograph transducer did not trigger when the HGVs were travelling along the access road prior to reaching the speed hump (which was opposite the monitoring position). The seismograph did however trigger during HGV movements when certain vehicles were travelling over the speed 'hump'. The maximum levels of vibration recorded ranged between 0.45mm/s to 0.83mm/s at the 10-metre position. This level of vibration is still relatively low and according to BS6472: 2008, even when properties are at this distance, there is normally a `low probability of adverse comment' over the operating period indicating that nuisance conditions are unlikely.

7.4 For the monitoring of night-time operations at the proposed development, the seismograph transducer did not trigger at the measurement distance of 50 metres from the plant, indicating that the level of vibration was below the transducer sensitive threshold of 0.3mm/s.

7.5 The above findings indicate that vibration levels from similar site operations at the proposed development are likely to be **negligible** at nearest private

residential receptors (in all cases separation distances exceed 50m) and are likely to be imperceptible at nearest receptors. In terms of BS6472 vibration levels would be well below a ‘low probability of adverse comment’ and therefore nuisance conditions are highly unlikely to occur. Vibration levels at the nearest commercial receptor are also unlikely to be perceptible.

8.0 MITIGATION MEASURES

Mitigation of Construction Period Effects

8.1 In accordance with BS5228, best available techniques would be employed to control the noise generation (e.g. using equipment that is regularly maintained and fitted with silencers or acoustic hoods where practicable, maximising distance between noisy plant and receptors, avoiding un-necessary plant operation or revving of engines and use of broadband reverse alarms for mobile plant etc.).

Mitigation of Operation Period Effects

8.2 Neath Port Talbot CBC is able to apply conditions to any forthcoming planning permission to ensure that noise limits for daytime and night-time operations is achieved.

8.3 The predicted noise levels from the site have been calculated with the noise mitigation measures in position, site layout and operations to ensure that the resultant noise levels are within appropriate guidance and standards.

Noise Mitigation Measures

8.4 The following inherent noise mitigation measures are assumed to be in place to achieve the noise criteria.

(i) Mobile plant used on site should be fitted with broadband noise type reverse alarms (e.g. Brigade Electronics ‘smart alarms’) or visual alarms used instead (subject to health and safety risk assessment).

(ii) Plant noise levels would not exceed a noise level of 85dB(A) Leq_{15mins} at 1m under normal plant operation. This includes the noise level at the end of the ventilation stack.

(iii) The Boiler House Building would have a minimum Rw value of 24dB.

(iv) Doors into the building to be closed during night-time periods.

(v) Mobile plant not operated external to buildings during night-time periods.

8.5 The design of the proposed Intertissue Ltd Boiler Plant has been assessed on the basis of applying (BAT).

9.0 CONCLUSIONS

9.1 This assessment has been commissioned by Axis acting on behalf of Intertissue Ltd to determine the noise and vibration impact at the nearest existing residential properties in relation to the proposed development.

9.2 Noise and vibration levels have been considered and assessed during the construction and operational phases of the proposed development. Relevant and appropriate noise guidance and standards have been used to determine the noise impact and where appropriate amelioration measures provided to mitigate noise sources to acceptable and reasonable levels.

9.3 To determine any likely impact from noise it was necessary to establish typical baseline sound levels in the vicinity of the nearest residential property boundaries. This information has helped determine any likely noise impact on nearest receptors to the site during the operation of the proposed development.

9.4 The results of the investigation into the existing noise climate have established the following:
Representative background sound levels during a Sunday period were shown to be between 42dB LA90 and 57dB LA90 at agreed monitoring positions during daytime periods. For the Sunday night-time period background sound levels were recorded to vary between 39dB LA90 and 54dB LA90.

9.5 Pre-application dialogue has been undertaken with Public Protection Officers at the Environmental Health Department at Neath Port Talbot CBC to discuss the proposal and agree the assessment methodology and noise criteria, which is reflected in this assessment. The Officer's advised that the assessment should consider BS4142: 2014 in terms of noise criteria at the nearest residential properties and BS8233: 2014 in relation to nearest commercial receptors to the site. Consideration of vibration is also to be assessed during construction and operational periods.

9.6 The report predicts the impact of noise from plant that would be operated on site

within buildings and external positions during site operational and construction work activities. The noise assessment concludes the following:

- Noise levels from site operations have been undertaken using a noise prediction calculation model, internationally recognised calculation standard with appropriate input settings and plant noise limit data from the technology provider.
- The highest predicted noise levels from site operations would be well below the lowest measured background sound levels measured during a Sunday period.
- The highest predicted noise levels from site operations would not increase existing residual sound levels measured in terms of LAeq.
- According to BS4142, the assessment of highest likely site operational noise levels would indicate that impact is low.
- Site noise levels would be within all relevant guidance and standards for noise (i.e. would be below night-time noise level according to WHO guidance, below recommended internal noise levels according to BS8233: 2014 and sleep disturbance criteria in terms of LAeq.
- Noise levels predicted at nearest offices is shown to be well within a reasonable design range for an office environment according to BS8233: 2014.
- The impact of site operational noise or the proposed and existing Intertissue Ltd plant have been assessed and would not exceed lowest measured background sound levels and not increase existing residual LAeq levels and therefore there is no significant cumulative impact.
- Best practice would be applied in relation to the plant operation and site noise management.
- Assessment of construction noise indicates that there would not be any significant impacts and residual sound levels are unlikely to increase.
- No significant impacts are likely to occur as a result of additional vehicle movements as a result of the development as these would be negligible in context with the existing baseline traffic flows on the local road network.

- No significant impacts are predicted in relation to construction vibration or operational vibration and levels at nearest commercial premises are not expected to reach perceptible levels.

REFERENCES

1. Technical Advice Note TAN11 ‘Noise’: 1997
2. Guidelines for Community Noise – World Health Organisation: April 1999
3. Community Noise – World Health Organisation: 1995
4. BS 7445: 2003, Description and measurement of environmental noise.
5. BS 5228: 2009 Part 1 `Code of practice for noise and vibration control on construction and open sites’.
6. BS8233: 2014 `Guidance on sound insulation and noise reduction for buildings’
7. BS4142: ‘Methods for rating and assessing industrial and commercial sound’
8. ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors: General method of calculation
9. IPPC - Technical Guidance Note IPPC H3 Part 2 – Noise Assessment & Control

FIGURES

Figure 1: Baseline Measurements & Receptor Positions

Figure 2: Site Location on Intertissue Ltd Site

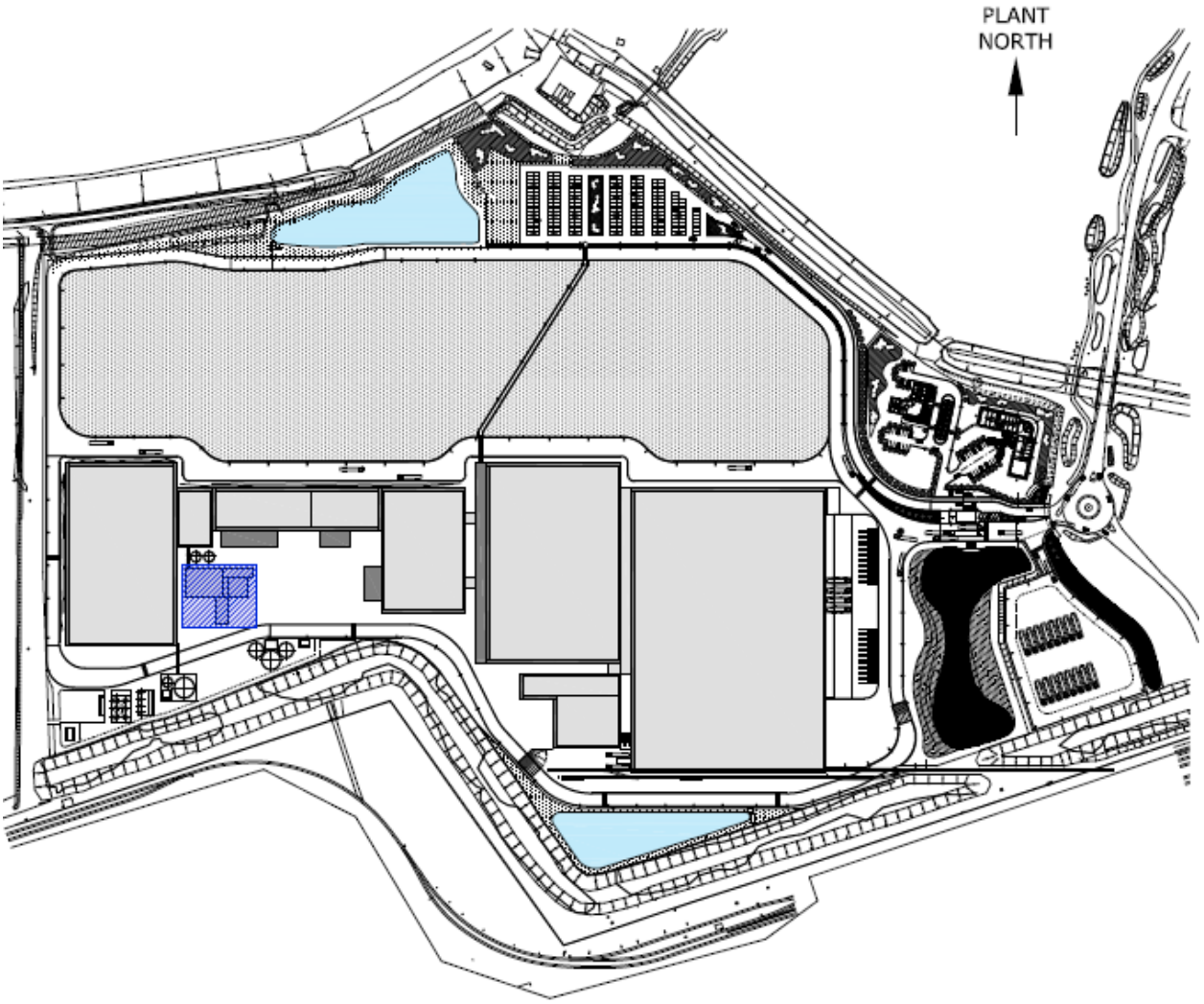
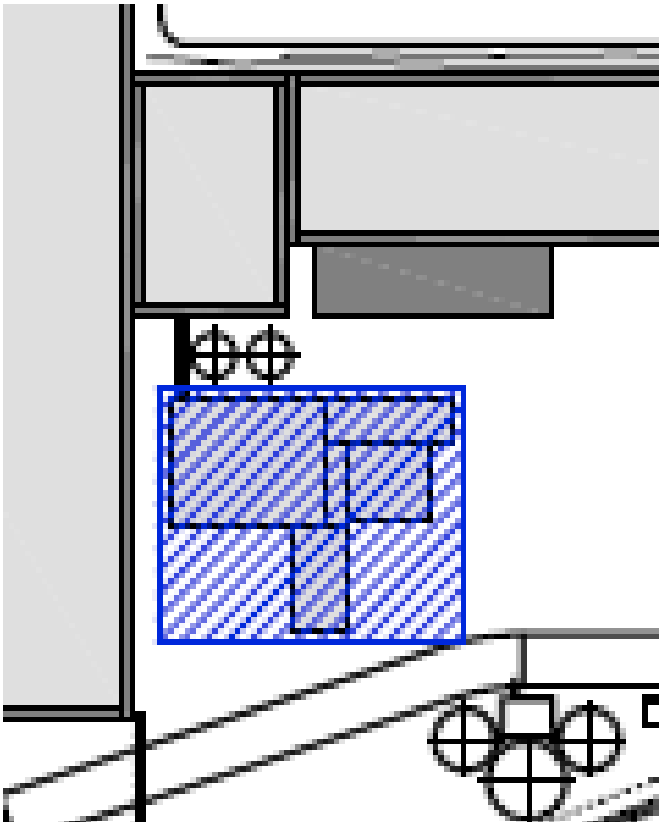
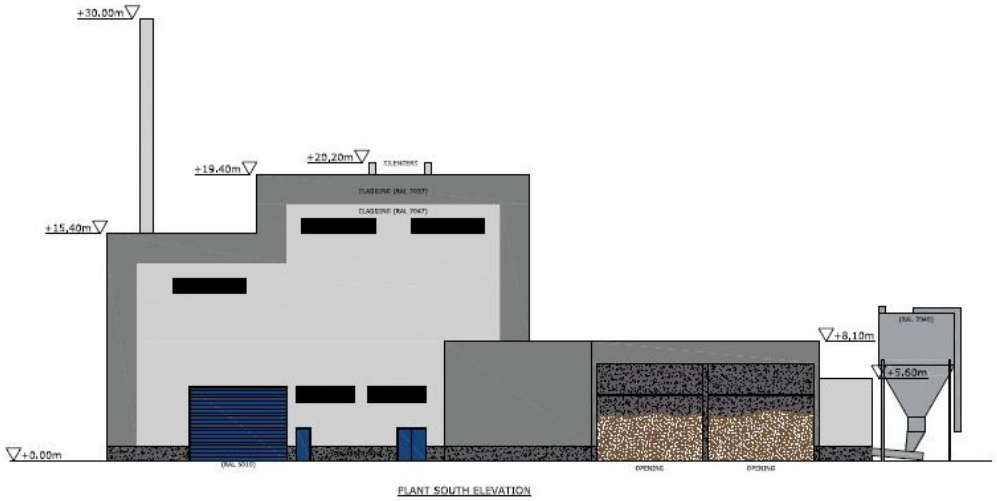


Figure 3: General Layout of Biomass Plant Building





APPENDICES

APPENDIX 1

BASIC ACOUSTIC TERMINOLOGY

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure level. It is because of this wide range that a noise level scale based on logarithms is used in noise measurement. This is the decibel or dB scale.

Audibility of sound covers a range of about 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level. The ability to recognise a particular sound is dependent on the pitch or frequencies present in the source. Sound pressure measurements taken with a microphone cannot differentiate in the same way as the ear, consequently a correction is applied by the noise measuring instrument in order to correspond more closely to the frequency response of the ear which responds to sounds from 20 Hz to 20000 Hz. This is known as 'A weighting' and written as dB(A).

The use of this unit is internationally accepted and correlates well with subjective annoyance to noise.

The logarithmic basis of noise measurements means that when considering more than one noise source their addition must be undertaken in terms of logarithmic arithmetic. Thus, two noise sources each of 40 dB(A) acting together would not give rise to 40 + 40 = 80 dB(A) but rather 40 + 40 = 43 dB(A). This 3 dB(A) increase represents a doubling in sound energy but would be only just perceptible to a human ear.

The attached chart gives typical noise levels in terms of dB(A) for common situations.

Noise levels can vary with time according to source activity and indices have been developed in order to be able to assign a value to represent a period of noise level variations and to correspond with subjective response.

The definition in layman's terms is given below for terminology used in the measurement and results obtained during the survey work.

A-weighting: Normal hearing covers the frequency (pitch) range from about 20Hz to 20,000 Hz but sensitivity of the ear is greatest between about 500Hz and 5000Hz. The "A-weighting" is an electrical circuit built into noise meters to mimic this characteristic of the human ear.

Ambient noise: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Attenuation: Noise reduction

Background noise: The general quiet periods of ambient noise when the noise source under investigation is not there.

Decibel (dB): The unit of measurement for sound based on a logarithmic scale. 0dB is the threshold of normal hearing; 140dB is the threshold of pain. A change of 1dB is only detectable under controlled laboratory conditions.

dB(A) [decibel A weighted]: Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) serves to distinguish sounds of different frequency (or pitch) in a similar way to how the human ear responds. Measurements in dB(A) broadly agrees with an individual's assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal everyday conditions, and a change of 10dB(A) corresponds roughly to doubling or halving the loudness of sound.

dB(C): [decibel C weighted]: Frequency weighting which does not alter low frequency octave band levels by very much compared to `A' weighting. Similar to linear reading (i.e. linear does not alter frequency spectra at all)

Frequency (Hz): The number of sound waves to pass a point in one second.

LAeq: This is a noise index used to describe the "average" level of a noise that varies with time (T). It allows for the different sensitivities of the human ear to different frequencies (pitch), and averages fluctuating noise levels in a manner, which correlates well with human perceptions of loudness.

$L_{A10,T}$: This noise index gives an indication of the upper limit or peak levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 10 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A10} reading was say 60dB, then this means that for 1 hour out of 10 the level went above 60dB.

$L_{A90,T}$: This noise index gives an indication of the lower limit or levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 90 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A90} reading was say 50dB, then this means that for 9 hours out of 10 the level went above 50dB.

L_{Amax}: This is the highest A weighted noise level recorded during a noise measurement period.

$L_{night,outside}$: This is the A-weighted long-term average sound level measured outside as defined in ISO 1996-2: 1987, determined over all the night periods of a year.

Residual noise: The ambient noise remaining at a given position in a given situation when the noise source under investigation is not there.

Specific noise: The noise source under investigation for assessing the likelihood of complaints

Examples of typical noise levels

Source/Activity	**Indicative noise level [dB(A)]**
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Busy road at 5km	35-45
Car at 65km/h at 100m	55
Busy general office	60
Conversation	60
Truck at 50km/h at 100m	65
City Traffic at 5m	75-85
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

APPENDIX 2

NOISE SURVEY DETAILS

Instrumentation

Manufacturer	***Description***	***Type***	***Calibration Due date***	***Serial No.***
Norsonic	Real Time Analyser	118	June 2015	31992
Cirrus	Electronic Calibrator	CR: 513A	June 2015	031523

The following set-up parameters were used on the sound level meters during noise measurement:

Static Noise Monitoring:

Time Weighting: Fast
Frequency Weighting: `A'
Measurement Period: 15mins

Calibration

Calibration setting: 94dB

The noise meter was calibrated with the electronic calibrator prior to commencement and on completion of the survey. No significant drift in calibration was observed.

Survey Dates and Personnel

Baseline Survey

Spot roaming noise measurements were undertaken at positions as shown on Figure 1 to represent typical background sound levels at nearest sensitive receptors.
See Appendix 3 for detailed information.

Mr D.R. Kettlewell of Noise & Vibration Consultants Limited undertook these measurements Sunday 15th February 2015. Monitoring included the night-time (Sunday) period.

Data logging of L_{Aeq}, L_{A10}, L_{A90} and L_{Amax} were recorded at 15-minute intervals at the monitoring positions for information on typical baseline sound levels.

The noise meters were mounted on a tripod at a height of between 1.2 to 1.5 metres above ground level and fitted with a wind and rain shield.

Meteorological Conditions

Weather details were recorded by the NVC Consultant during the period of the surveys, and appear below:

Sunday 15th to Monday 16th February 2015

The weather during Sunday daytime period remained dry, variable cloud cover and a light variable wind (1-3m/s) with temperature around 2-8degC.

During the evening monitoring period the weather conditions were dry, overcast and light variable winds (1-2m/s) and temperature varying between 6-7degC.

During the night-time monitoring period was dry, cloud cover variable, winds light south to south easterly (1-2m/s) and temperature 6-7degC.

The above climatic conditions were suitable for monitoring environmental noise levels in accordance with advice given in BS 7445:2003 `Description and measurement of environmental noise'.

APPENDIX 3

BASELINE SOUND SURVEY RESULTS

Noise Survey Results

Date: Sunday 15th to Monday 16th February 2015 **TABLE 1**

Location: Baglan Bay, Neath, Near Port Talbot

Client: Intertissue

Project: Biomass Boiler Plant

Data: **Background Sound Survey: Position 1 - Caravan Park (Brunel Way)**

Instrumentation: Norsonic 118 Real Time Analyser (31992) Calibration due June 2016

Weather Conditions: Dry, variable cloud, light variable winds (1-3m/s), temp. 2-8degC

Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
08:28	15:00	59.6	59.8	57.1	65.5	Noise from road traffic
08:43	15:00	58.8	58.5	54.5	73.9	Noise from road traffic
08:58	15:00	57.2	57.7	54.9	66.2	Noise from road traffic
09:13	15:00	59.3	59.1	55.0	79.5	Noise from road traffic
14:07	15:00	58.6	55.0	50.8	80.4	Noise from road traffic
14:22	15:00	57.8	54.4	51.6	79.2	Noise from road traffic
14:37	15:00	57.3	55.6	52.5	76.3	Noise from road traffic
14:52	15:00	56.6	54.1	50.6	74.9	Noise from road traffic
19:35	15:00	55.8	54.8	48.9	80.8	Noise from road traffic
19:50	15:00	54.3	55.2	48.4	64.6	Noise from road traffic
20:05	15:00	53.4	53.6	51.2	65.4	Noise from road traffic
20:20	15:00	54.1	55.6	50.3	64.5	Noise from road traffic
Average		**57.3**	**56.1**	**52.2**	**65-81**	
Range		**53-60**		**48-57**		
23:08	15:00	57.9	59.3	51.2	64.7	Noise from road traffic
23:23	15:00	56.9	58.2	51.0	63.5	Noise from road traffic
00:38	15:00	54.1	55.8	48.7	60.1	Noise from road traffic
00:53	15:00	47.0	45.8	42.1	65.2	Noise from road traffic
Average		**55.4**	**54.8**	**48.3**	**60-65**	
Range		**47-58**		**42-54**		

Noise Survey Results

Date: Sunday 15th to Monday 16th February 2015 **TABLE 2**

Location: Baglan Bay, Neath, Near Port Talbot

Client: Intertissue

Project: Biomass Boiler Plant

Data: **Background Sound Survey: Position 2 - Old Road/Crawford Road**

Instrumentation: Norsonic 118 Real Time Analyser (31992) Calibration due June 2016

Weather Conditions: Dry, variable cloud, light variable winds (1-3m/s), temp. 2-8degC

Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
09:40	15:00	60.3	60.4	52.3	76.6	Road traffic noise
09:55	15:00	63.2	60.8	51.5	83.2	Road traffic noise
10:10	15:00	62.1	60.4	52.1	83.2	Road traffic noise
10:25	15:00	60.3	59.8	51.1	74.9	Road traffic noise
15:16	15:00	62.9	65.1	54.5	74.4	Road traffic noise
15:31	15:00	60.2	60.9	53.9	74.3	Road traffic noise
15:46	15:00	60.3	59.6	53.0	74.3	Road traffic noise
16:01	15:00	62.5	63.8	53.7	75.6	Road traffic noise
20:46	15:00	59.4	59.6	55.6	75.6	Road traffic noise
21:01	15:00	59.2	59.8	54.7	73.7	Road traffic noise
21:16	15:00	59.1	59.0	53.1	75.1	Road traffic noise
21:31	15:00	59.5	59.5	53.7	74.1	Road traffic noise
Average		**61.0**	**60.7**	**53.3**	**74-83**	
Range		**59-63**		**51-56**		
02:22	15:00	49.4	51.4	41.2	61.7	No local road traffic
02:37	15:00	52.0	51.9	40.2	71.6	No local road traffic
02:52	15:00	60.2	53.3	39.0	84.6	No local road traffic
03:07	15:00	58.9	51.6	39.2	81.4	No local road traffic
Average		**57.1**	**52.1**	**39.9**	**62-85**	
Range		**49-60**		**39-41**		

Noise Survey Results

Date: Sunday 15th to Monday 16th February 2015 **TABLE 3**

Location: Baglan Bay, Neath, Near Port Talbot

Client: Intertissue

Project: Biomass Boiler Plant

Data: **Background Sound Survey: Position 3 - Handel Avenue**

Instrumentation: Norsonic 118 Real Time Analyser (31992) Calibration due June 2016

Weather Conditions: Dry, variable cloud, light variable winds (1-3m/s), temp. 2-8degC

Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
07:05	15:00	56.3	56.4	46.7	75.3	Distant road traffic noise
07:20	15:00	53.7	50.8	43.1	70.1	Distant road traffic noise
07:35	15:00	52.6	52.3	42.0	70.7	Distant road traffic noise
07:50	15:00	58.2	57.1	42.3	75.0	Distant road traffic noise
13:00	15:00	56.3	53.9	42.0	76.5	Distant road traffic noise
13:15	15:00	59.0	55.5	42.5	80.2	Distant road traffic noise
13:30	15:00	56.8	52.7	42.2	77.0	Distant road traffic noise
13:45	15:00	54.2	55.9	42.4	70.2	Distant road traffic noise
18:00	15:00	55.9	56.8	45.6	80.2	Distant road traffic noise
18:15	15:00	56.3	56.1	44.8	75.4	Distant road traffic noise
18:30	15:00	55.5	55.8	46.8	72.8	Distant road traffic noise
18:45	15:00	53.9	54.2	46	69.9	Distant road traffic noise
Average		**56.0**	**54.8**	**43.9**	**70-80**	
Range		**53-59**		**42-47**		
01:15	15:00	46.3	47.3	42.7	60.1	Distant road traffic noise
01:30	15:00	45.2	46.4	42.0	52.6	Distant road traffic noise
01:45	15:00	45.4	46.0	42.1	59.0	Distant road traffic noise
02:00	15:00	49.3	50.9	45.2	54.8	Distant road traffic noise
Average		**46.8**	**47.7**	**43.0**	**53-60**	
Range		**45-49**		**42-45**		

APPENDIX 4

BS4142: 2014 ASSESSMENT (DETAILED EXAMPLE)

POSITION 3: BS4142: ASSESSMENT (DAYTIME)

Results		Relevant clause	Commentary
Calculated Specific sound level	$L_{Aeq(15\ min)}$ = 33dB	7.3.6	Specific sound source calculated using ISO9613-2
Background sound level	$L_{A90(15\ min)}$ = 42dB	**8.1.3** **8.2**	Measured over Sunday period deemed to be representative of the background sound on the quietest day of the week.
Assessment during the daytime, so reference time interval is 1 hour		**7.2**	
Acoustic feature correction	0dB	**9.2**	No acoustic feature expected. The specific sound is not expected to be tonal, impulsive or its intermittency distinct above the residual acoustic environment.
Rating level	(33 + 0) dB = 33dB	**9.2**	No significant perceptible noise character predicted
Background sound level	L_{A90} = 42dB	**8**	Lowest value used of background sound period to cover worst case
Excess of rating over background sound level	(33 − 42) dB = -9dB	**11**	
Assessment indicates low impact		**11**	
Uncertainty of the assessment	Not significant	**10**	The excess of the rating level over the background sound level is negative. Residual levels are significantly higher and the uncertainty of the measurement does not have any significance to the outcome of the assessment. Appropriate standards used for the calculation and baseline sound survey undertaken covering the quietest likely time period. All instruments used Type 1, calibrated and in calibration limits.

APPENDIX 5

CONSTRUCTION PLANT INVENTORY

Construction Plant Inventory

Piling Activities:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Piling Rig	116	100	1.0
Lorry	103	20	1.0
Truck Mixer	107	100	1.0
Concrete Pump	110	100	1.0

Soil Movements:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Excavatator/Loader	106	100	1.0
Lorry	106	100	0.8
8 Wheel Tipper	107	100	0.8
Dozer	108	100	0.8
Dump Truck	107	100	0.8

General Site Noisy Activities:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Excavator	104	100	1.0
Dumper	104	100	0.8
Lorry	99	20	0.8
Compressor	95	100	1.0
Generator	103	100	1.0
Telehandler	105	100	0.8
Mobile Crane	94	100	1.0

Infrastructure Construction:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Asphalt Melter	103	100	0.8
Asphalt Spreader	110	100	0.8
Road Roller	102	100	0.8
Lorry	103	10	0.8

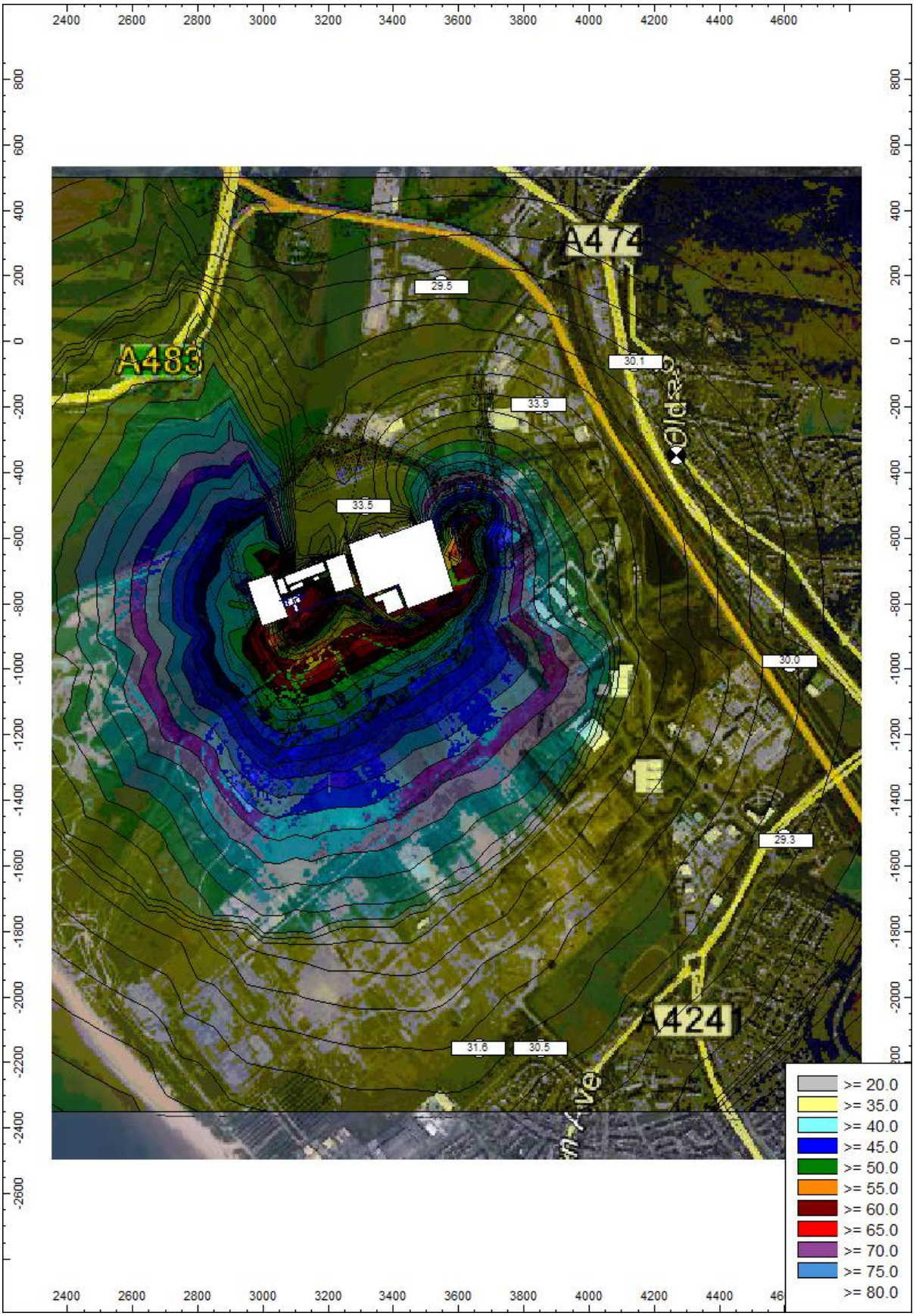
Building Construction:

Plant Type	Sound Power Level	% Operating Time	Distance Ratio
Steelwork Erection	108	100	1.0
Concrete Pump	103	100	1.0
HGV	103	20	0.8
Cutting/Grinding	107	100	1.0
Concrete vibrators	106	100	1.0
Hydraulic Pump	106	100	1.0

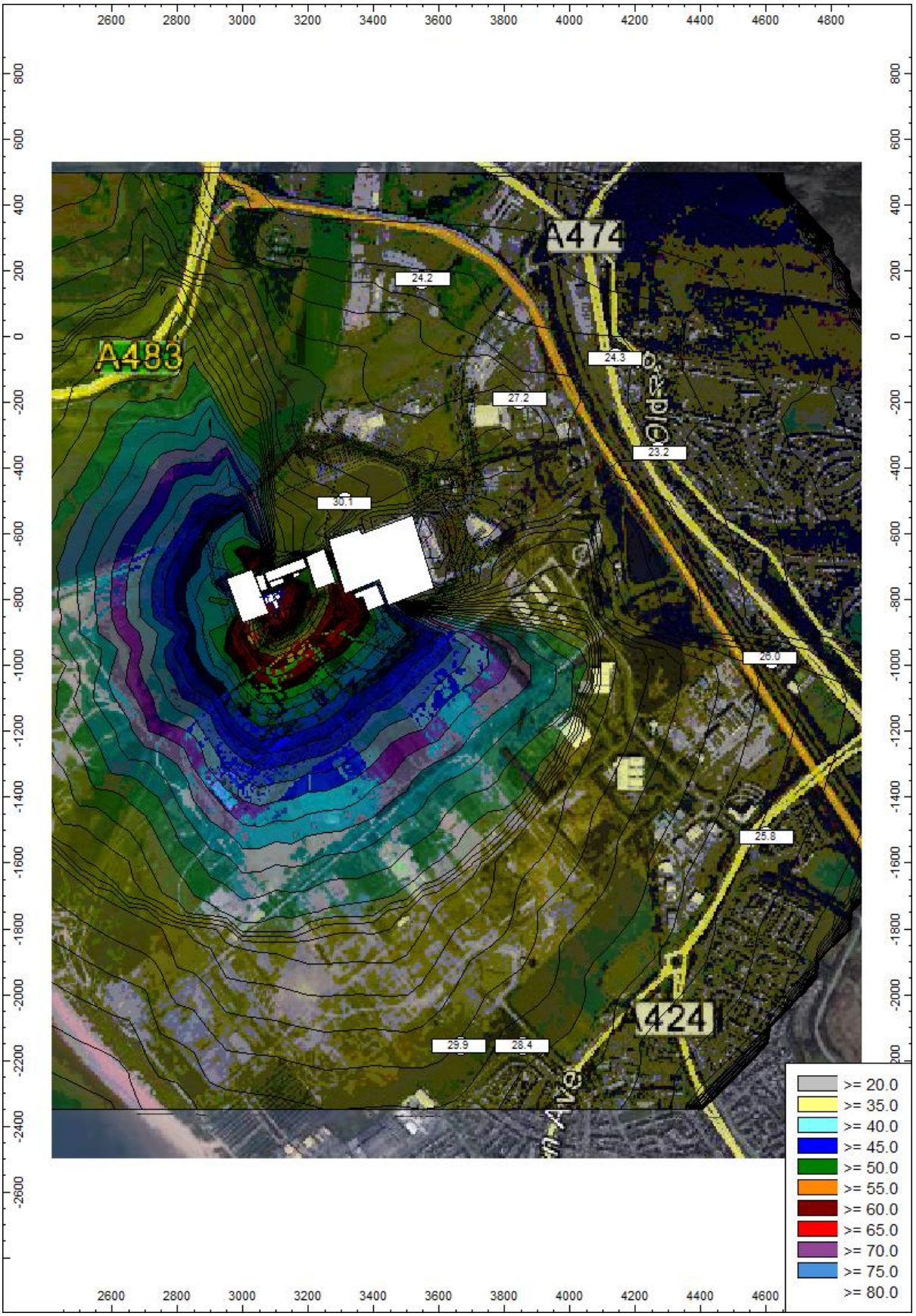
APPENDIX 6

NOISE MAPPING

NOISE MAP 1: NOISE CONTOURS OF SITE OPERATIONS (INCLUDING NOISE MITIGATION) – DAYTIME OPERATIONS



NOISE MAP 2: NOISE CONTOURS OF SITE OPERATIONS (INCLUDING NOISE MITIGATION) - NIGHT-TIME OPERATIONS



APPENDIX 7

VIBRATION TERMINOLOGY

Ground Borne Vibrations

For any source of vibration on or near the surface of the ground, energy propagates away from the source via:

a) Elastic body (or compression) waves – which radiate energy into the ground in all directions

b) Surface (or shear) waves – which carry energy along the ground surface, caused when body waves are reflected back into the ground at the ground-surface interface

Thus, at any point away from that source, the ground motion is the sum of all the wave motions at that point. When wave motion has been generated, the waves will be attenuated as they travel away from the source. The two main mechanisms for attenuation are:

a) Enlargement of the wave front as the distance from the source increases, and

b) Internal damping of the transmitting medium (the ground)

Ground borne vibration is therefore made up of a combination of different waves, travelling in different directions, at different speeds and at different frequencies. The frequency component of the vibration will affect the rate at which attenuation occurs since the internal damping of the ground is frequency dependent.

Since vibration enters buildings through the foundations, the hard structure of the building is normally affected to a greater degree than by air borne vibration. Often ground borne vibrations are more noticeable when standing or sitting near the middle of suspended wooden floors.

Ground Borne Vibration Measurement Units

Ground borne vibration is caused when the individual particles making up the strata are caused to oscillate by the passage of a pressure wave. The resulting vibration can be summarized in terms of 4 main parameters:

a) **Velocity** – how fast the particles move when they are oscillating. Since the velocity of these particles continually change as the pressure wave passes the most useful value that is often reported is the maximum or peak particle velocity (PPV). PPVs are usually expressed in terms of ms^{-1} or mms^{-1}.

b) **Acceleration** – is the rate at which the particle velocity changes during oscillation. It is usually measured in ms^{-2} mms^{-2} or "g's". 1g is that acceleration imparted to an object by the earth's gravitational pull and is approximately 9.81 ms^{-2}.

c) **Displacement** – is the distance moved by oscillating particles. This is usually very small and measured in mm or even µm.

d) **Frequency** – is the number of oscillations per second which a particle undergoes due to the passage of a vibration wave. It is measured in cycles per second or Hertz (Hz).

The movement of particles induced to oscillate by vibration waves are usually measured in three mutually perpendicular directions to fully describe the vibration intensity, as particles will be oscillating in three dimensions. These are:

a) **Longitudinal** – back and forth particle movement in the same direction that the vibration wave is travelling.
b) **Vertical** – up and down movement perpendicular to the direction the vibration wave is travelling.
c) **Transverse** – left and right particle movement perpendicular to the direction the vibration wave is travelling.

APPENDIX 8

Example of Vibration Surveys

Vibration Monitoring Details – Biomass Site at 50m distance

Vibration measurements were made, in the three mutually perpendicular axes at a distance of approximately 50 metres from the nearest building, with the plant operating under normal conditions.

Instrumentation

The following instrumentation was used for all vibration measurements:

Manufacturer	Description	Type	Serial No.
Nomis	Portable Field Seismograph	Mini-Supergraph	10708

The following set-up parameters were used on the Seismographs during vibration measurement:
Mode: Continuous (PPV)
Range: Up to 2mm/sec
Scan Time: 10 seconds (trigger: 0.3mm/sec)

Survey Dates and Personnel

Vibration levels were measured over a two hour period on Thursday 31st May 2007. The survey was conducted by Mr D.R. Kettlewell of Noise & Vibration Consultants Limited.

Meteorological Conditions

Weather conditions were noted during the survey period.
Dry, overcast with a light westerly wind (0-1m/s). Temperature 10-12deg C.

Summary of Vibration Monitoring in Continuous Mode

Position	Vibration Source	Resultant Maximum PPV (mm/sec)	Peak Frequency (Hz)
Access road (100m) (kerbside)	Biomass Plant	No trigger (0.3mm/sec background level)	-
50m boundary of site	Biomass Plant	No trigger (0.3mm/sec background level)	-

Vibration Monitoring Details – Construction Site

Vibration measurements were made, in the three mutually perpendicular axes, during periods when the HGVs and mobile plant were travelling along construction site roads. The Nomis seismograph was set to the `continuous' setting (at a trigger level of 0.5mm/sec) and was placed at the kerbside position, approximately 2 to 5 metres from the travelling vehicle.

The seismograph has monitored the ground borne vibration in terms of Peak Particle Velocity (PPV).

5th July 2007

The monitoring of PPV vibration was carried out at the kerbside of construction roads at the existing housing development in Lincolnshire.

Instrumentation

The following instrumentation was used for all vibration measurements:

Manufacturer	Description	Type	Serial No.
Nomis	Portable Field Seismograph	Mini-Supergraph	10000

The following set-up parameters were used on the Seismographs during vibration measurement:

	PPV
Mode:	Continuous
Range:	Up to 20mm/sec
Scan Time:	10 seconds (trigger: 0.5mm/sec)

Survey Dates and Personnel

Vibration levels were measured between the hours of 0830 and 0930 hours on Thursday 5th July 2007. The survey was conducted by Mr D.R. Kettlewell of Noise & Vibration Consultants Limited.

Meteorological Conditions

Weather conditions were noted during the survey period.

Thursday 5th July 2007

Dry conditions, sunny periods, variable cloud cover (20%-50%) and a light westerly wind (1-2m/sec). Temperature ranging from 13-19deg C.

The results of the vibration monitoring with the seismograph in continuous mode are shown below:

Vibration Monitoring in Continuous Mode

The results show that for nearly all the monitoring events, the level of vibration was too low to trigger the transducer. It is also apparent that all vibration magnitudes measured at close position to construction traffic are well within the limiting criterion of 5.0mms^{-1} PPV for continuous vibration and 10mms^{-1} for intermittent vibration. Indeed, as a maximum, vibration levels measured were generally below the level of perceptibility. We can therefore conclude that the occurrence of either cosmetic or structural damage due to plant-induced vibration

Construction Site Vibration Monitoring Results

Position	Distance to plant	Type of Construction Plant	Resultant Maximum PPV (mm/sec)	Peak Frequency (Hz)
Kerbside	3m	HGV	No trigger (0.5 background level)	-
Kerbside	1m	HGV	0.635	2.9Hz
Kerbside	5m	PT6000 Truck	No trigger (0.5 background level)	-
Kerbside	5m	TFL35 Loadall JCB	No trigger (0.5 background level)	-
Kerbside	5m	Excavator LCN 130	No trigger (0.5 background level)	-
Kerbside	5m	JCB Loader	No trigger (0.5 background level)	-
Kerbside	5m	Mobile Crane	No trigger (0.5 background level)	-