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Noise Impact Assessment:

Development of a Warehouse Facility

At

Kronospan Manufacturing Facility
Off Holyhead Road
Chirk
Wrexham

for

Axis
Acting on behalf of
Kronospan Ltd

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

Report No.: R21.0502/DRK
Date: 7th May 2021

Undertaken by:

Noise & Vibration Consultants Ltd

Member of Institute of Acoustics
Member of Association of Noise Consultants
Member of Academy of Experts

Report undertaken & checked by:
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Date: 7th May 2021

Summary

1. This noise assessment is prepared for Kronospan Ltd in support of a planning application made by Kronospan Limited (hereafter referred to as Kronospan) for the development of a Warehouse Facility (referred to as the Proposed Development) at the Kronospan Works site off Holyhead Road, Chirk, Wrexham.

2. The assessment establishes any potential noise impact on existing residential properties resultant from the operation of the Proposed Development.

3. The assessment also assesses the cumulative effect of the operation of the Proposed Development with other consented development at Kronospan since the original baseline survey in 2011.

4. In terms of noise associated with the operation of the Proposed Development, the following noise sources have been considered:

   - Use of mobile plant (e.g. forklift trucks) operated within warehouse

5. Historic baseline sound survey results (i.e. 2011) have been referred to for establishing residual and background sound levels, which provides comparison and context with the development.

Noise Criteria

6. BS4142: 2014+A1:2019 is relevant to fixed industrial noise sources and is therefore the most relevant standard for the Proposed Development noise assessment.

Noise from the Site

7 The impact of site activity noise at the nearest residential properties around the site has been assessed.

8. Empirical site noise levels from the existing warehouse at Kronospan have been referenced to enable the prediction of noise `break-out' from the building to be determined.

9. Noise levels have been predicted based on ISO9613-2 methodology using computer based software and appropriate input settings.

10. The study benefits from a recent noise survey of new plant that has been installed on site for previous planning applications, which provides an update to assumed noise data for inclusion in this assessment.

Conclusions

11. Following detailed calculations and consideration of appropriate and relevant standards, we have concluded the following:

(i) The Warehouse Facility that is being proposed generates contributory noise levels of between 5dB and 26dB L_{Aeq} during daytime and night-time periods at nearest sensitive receptors.

(ii) The background sound levels at night-time (i.e. lowest likely) for comparison vary between 40dB and 60dB L_{A90} with residual L_{Aeq} levels typically between 43dB and 60dB.

(iii) The Proposed Development is likely to provide a general reduction in overall Kronospan site noise at NSRs towards the east and northeast of the warehouse due to inherent screening effects from the Warehouse building.

(iv) The Proposed Development is not expected to generate any unusual noise characteristics perceptible at nearest sensitive receptors.

(v) The results show that the Proposed Development would not result in any background noise `creep' in accordance with H3 Horizontal Guidance Note for Noise Part 2: Noise Assessment and Control and BAT.

(vi) The magnitude of the impact during daytime or night-time is shown to be a **low impact** (i.e. according to BS 4142: 2014+A1:2019).

(vii) The noise from the operation of the Proposed Development would result in noise levels complying with all relevant standards for noise at the nearest sensitive receptors.

(viii) There would be no increase expected in road traffic movements as a result of the Proposed Development and therefore no impacts on road traffic noise would occur.

(ix) The results show that the cumulative effect of all new plant consented or appealed since 2011 is at least 10dB below the baseline residual noise and therefore would not cause any increase in residual levels.

12. In terms of construction noise, best practice would be applied in accordance with BS5228-1:2009+A1:2014 `Code of practice for control of noise and vibration on construction and open sites' to ensure that reasonable site generated noise is minimised. Construction noise is not considered to generate any significant impacts.

CONTENTS

1.0 INTRODUCTION

1.1 At the request of Axis acting on behalf of Kronospan Ltd, Noise & Vibration Consultants Limited ("NVC") was commissioned to carry out a noise impact assessment.

1.2 This noise assessment is prepared for Kronospan Ltd in support of a planning application made by Kronospan Limited (hereafter referred to as Kronospan) for the development of Warehouse Facility (referred to as the Proposed Development).

1.3 The development would be undertaken at the Kronospan manufacturing facility on the industrial site that forms part of Maesgwyn Farm off Holyhead Road, Chirk, Wrexham.

1.4 The assessment establishes any potential noise impact on existing residential properties resultant from the operation of the Proposed Development. It considers the noise contribution from the new facility to establish whether there is likely to be any increase in ambient noise levels.

1.5 Where appropriate, Noise & Vibration Consultants Ltd will provide recommendations for noise amelioration measures to reduce the effect of noise on any existing dwellings to an acceptable level.

Assessment Aims and Objectives

1.6 The aim of the noise assessment is to provide information for the planning application in relation to the impact of noise from the development on existing residential receptors. This includes the provision of the following:

- Provides information on typical existing noise climate at sensitive receptors.
- Provides information on noise levels from plant that has now been installed and operating from previous approved planning applications, which has been used to update the cumulative effects.
- Provides information on the predicted noise from the Proposed Development at the nearest sensitive receptors and compares the new facility in respect of its noise contribution to the baseline noise climate.
- Provides information on the cumulative impact of the residual noise levels (with the Proposed Development) and impact of permitted or proposed development (post 2011 baseline survey) at the nearest sensitive receptors.
- Where appropriate, provides advice in respect of noise mitigation measures necessary to meet appropriate noise guidance and standards.

1.7 The above potential noise impacts are considered in the context of the existing background noise at site, which is predominantly influenced by local road traffic noise.

Survey Work

1.8 Previous studies relating to the Kronospan site have been undertaken to establish baseline sound levels at the nearest receptor boundaries. Reference is therefore made to a baseline survey undertaken in April 2011 to determine typical noise levels in the area.

Sources of Information

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

- Ordnance Survey maps of the local area;
- general layout of the existing development;
- general layout of the Proposed Development;
- British Standards BS 4142: 2014+A1:2019, BS 7445: 2003, BS 8233: 2014; BS5228-1:2009+A1:2014;
- World Health Organisation: `Guidelines for Community Noise' - April 1999;
- 'Night Noise Guidelines for Europe' WHO 2009
- Technical Advice Note ("TAN") 11, `Noise' – 1997;
- Technical Guidance Note IPPC H3;
- ISO 9613-2: 1996 Acoustics – Attenuation of Sound During Propagation Outdoors;
- NVC Report R16.0204/DRK dated 12th February 2016 for RCF Facility;
- NVC Report R16.0705/DRK dated 21st July 2016 for Chip Wash Pre-heating Plant;
- NVC Report R16.0401/DRK dated 5th April 2016 for proposed building extension for MF Press & relocation of MF Ventilation System;
- NVC Report R15.0903/DRK dated 4th September 2015 for Gas Engine CHP Facility;
- NVC Report R17.0306/DRK dated 8th April 2017 for Wood Chip Preparation Facility; and
- NVC Report R17.0506/1/DRK dated 12th June 2018 for OSB Manufacturing Facility.

1.10 Appendix 1 provides details of technical terms described in layman terms for ease of reference. There is also a table showing typical everyday noise levels to assist in understanding the subjective level of noise in terms of decibels.

2.0 SITE DESCRIPTION

2.1 Introduction

2.1.1 The location for the development is within the existing Kronospan manufacturing site. The Kronospan site is located on land adjacent to Holyhead Road (the B5070), Chirk and covers a total area of approximately 40 hectares.

2.1.2 The Kronospan site comprises a number of large industrial process buildings including air emissions stacks, storage areas for raw materials, warehouse buildings for manufactured products, offices and car parking. The development would be located adjacent to the main manufacturing and warehousing buildings.

2.1.3 The Proposed Development would be located close to the eastern boundary of the site, adjacent and to the north of the existing warehouse and east of the Kronoplus building.

2.1.4 Elevations and a plan view of the Proposed Development is shown on Drawing no. 7000/607 Rev D.

2.1.5 The site covers an area of circa 40ha, with circa 14ha of this developed with industrial buildings and plant. A number of industrial process facilities are located mainly to the west of the site, these facilities are used to process, sort and dry the raw wood materials used in the manufacture of MDF/particle board and include a number of tall structures including stacks that emit process emissions to the atmosphere.

2.1.6 A number of other process buildings are located in the northern half of the site including: a saw mill; formalin plant and the secondary product manufacturing facility (Kronoplus) which produces laminate flooring and worktops.

2.1.7 The site car park, reception building, weighbridge and main site offices are located in the south eastern corner of the site to the south of the MDF/chipboard manufacturing buildings.

2.1.8 The western perimeter of the Kronospan site is formed by the Shrewsbury to Chester railway. Improved railway siding facilities have been constructed within the Kronospan site to enable an increased volume of timber to be imported by rail. The Llangollen Canal is located to the west of the railway line. Water is abstracted from the canal for use in the manufacturing process. The eastern perimeter of the site is formed by Holyhead Road (B5070). An earth bund, planted with trees, has been developed along the eastern perimeter of the site in order to reduce the visibility of the site operations from neighbouring properties on Holyhead Road.

2.1.9 A sewerage pumping station and one property, owned by Kronospan, are located to the immediate north of the site. To the immediate south of the site is the Mondelez factory and the Chirk recreational ground.

2.1.10 The main residential area of Chirk is located to the east of the site with residential properties lining the majority of the eastern side of Holyhead Road. Chirk town centre is located approximately 500m to the south east of the site.

2.1.11 The wider area beyond the urban settlement of Chirk is dominated by agricultural fields and woodland. Chirk Castle and its grounds are located to the west of the site, beyond the Llangollen Canal.

Access

2.1.12 The site is accessed via a T-junction with Holyhead Road (B5070) which runs in a north south direction to the east of the site. The B5070 meets the A5 approximately 1.5km to the north of the site via a roundabout junction, known as Whitehurst Roundabout. Approximately 1km to the east of this roundabout the A5 forms a junction with the A483. The A483/A5 provide links north to Chester, west to Llangollen and south to Shrewsbury. To the south of the site access the B5070 leads to the A5 via Chirk town centre, this route is restricted to non-HGV traffic.

2.1.13 The existing railhead and sidings within the site are used to import timber for the manufacturing process.

2.2 Recent Approved Planning Applications

2.2.1 Kronospan have received planning permission for the following developments after the 2011 baseline study:

(a) RCF Facility Planning Ref: P/2016/0219 (NVC report ref. R16.0204/DRK)
(b) Biomass facility (P/2012/0165 & P/2013/0824)
(c) Chip Wash Pre-heating Plant (NVC report ref. R16.0705/DRK)
(d) Gas Engine CHP Facility (P/20015/0728) (NVC Report R15.0903/DRK)
(e) Wood Chip Preparation Building and WESP Chip Dryer (P/2017/0416)

2.2.2 In addition to the above Wrexham BC refused planning permission for an extension to the melamine facing press hall (P/2016/0336). Kronospan however lodged an appeal against the decision and the appeal was upheld (Appeal Ref. 3165368).

2.2.3 The OSB Manufacturing Facility was refused planning permission, Kronospan however lodged an appeal against the decision and the appeal was upheld (Appeal Ref. APP/H6955/A/19/3227571).

2.2.4 The effect of the Warehouse Facility including the approved developments (including the appeal developments), has been considered as part of this assessment.

2.2.5 We understand that the consented (Appeal Ref. 3193142) Raw Board Store is unlikely to be built and the Wood Flaker Facility (P/2017/0699) relates to new plant that is replacing old and therefore these not considered in this assessment.

2.3 General Environs

2.3.1 The main source of existing noise affecting nearest property positions relates to the movement of local road traffic and industrial activities.

2.4 Baseline Sound Monitoring Positions

2.4.1 Baseline sound monitoring was undertaken in April 2011 at agreed monitoring positions following consultation with WCBC Public Protection Officer to determine typical ambient L_{Aeq} and background L_{A90} levels in the vicinity of the nearest dwelling boundaries during daytime and night-time periods. This included operational noise associated with the Kronospan site at the time prior to the development of the Biomass facility.

2.4.2 Figure 1 attached shows the site position and Figure 3 the site position relative to the receptor locations.

2.4.3 Static noise measurements were undertaken at Position 2a and Position 8 between Friday 8th April and Thursday 14th April 2011. Spot roaming noise measurements were recorded at positions 1 – 9 (excluding Position 2a which was used solely as a static

monitoring position) during an early morning period (i.e. midnight to around 3.00 am) when there was no traffic noise influencing the noise readings.

2.4.4 The static monitoring positions provide broadband noise data of the existing noise climate around the site at the nearest residential properties.

Nearest Sensitive Receptors

Position 1: Position 1 is located northeast of the development area along Linden Avenue. The receptor position is approximately 1080 metres to the nearest building. There is an existing Kronospan building and site boundary earth embankment on intervening land between the receptor and the facility.

Position 2: Position 2 is located northeast of the development area at Wern. The closest receptor in this direction is approximately 800 metres from the nearest building.

Position 2a: Position 2a is located northeast of the development area at Bryn Hyfryd. This is monitoring position is approximately 750m from the nearest building and was used for static monitoring.

Position 3: Position 3 is northeast of the development area at the junction of the Holyhead Road and West View. The approximate distance from the nearest building to this receptor is approximately 680 metres. The site boundary earth mound screen and some existing Kronospan buildings provide some degree of screening in this direction.

Position 4: Position 4 is southeast of the site entrance at Maes-y-Waun at a distance of approximately 540 metres from the development area. The main Kronospan buildings and site boundary earth mound screen provide some degree of screening from the development in this direction.

Position 5: Position 5 is in a south easterly direction at Shepherds Lane at a distance of approximately 880 metres from the development area.

Position 6: Position 6 is at the front entrance of the Mondelez factory to the south of the Kronospan site. The distance from this location to the nearest building is approximately 480 metres.

Position 7: Position 7 is along the access road to the Canalwood Industrial Estate and approximately 210 metres southwest of the development area.

Position 8: Position 8 is adjacent to a small cluster of properties off the Llwyn-y-cil Road, at a distance of approximately 490 metres southwest to west of the development area.

Position 9: This monitoring position is opposite the Castle back gates on high ground at a distance of approximately 980 to the northwest of the development area.

2.4.5 Positions 1 to 5 and Position 8 and 9 are considered to be representative of the nearest sensitive residential properties to the development and are therefore classified as receptors of high sensitivity. Position 6 and 7 are industrial sites and as such are of low sensitivity.

2.5 Site Activities

2.5.1 The Proposed Development comprises the development of a Warehouse Facility and is formed of the following:

- One large warehouse building split into 3 sections

Refer to Figure 1 for information on the location of the Proposed Development.

2.5.2 It is intended that the above facility would operate continuously during day and night-time periods.

2.5.3 The assumed plant noise levels relevant to this application are detailed in Appendix 3 of this report.

3.0 NOISE GUIDANCE AND CRITERIA

3.1 General Planning Guidance

3.1.1 Within the introduction of Technical Advice Note (Wales) 11: 1997 'Noise' 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."

3.1.2 Technical Advice Note 11 (TAN 11) provides the following information:

- It indicates how noise issues should be handled in development plans and development control;
- outlines ways of mitigating the adverse impact of noise;
- provides specific guidance on noisy and noise-sensitive development;
- introduces the use of noise exposure categories; and
- gives guidance on the use of planning conditions relating to noise.

3.1.3 The guidance introduces the concept of Noise Exposure Categories (NEC), which have 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 1, guidance is given for various types of noise sources, which includes road traffic, aircraft and railways.

3.1.4 For reference, the recommended noise exposure categories for new dwellings near existing sources are shown below in Table 3.1. Note that these noise categories are based upon measurements taken in an open site (i.e. without any noise attenuating features in place).

3.1.5 The level at the boundary of NEC A and NEC B is based on guidance provided by the World Health Organisation (WHO) health criteria from 1980, which states that *"general daytime outdoor noise levels of less than 55dB(A) Leq are desirable to prevent any significant community annoyance"*.

3.1.6 The night-time noise level at the boundary of NEC A and NEC B is also based upon the WHO health criteria, stating *"based on limited data available, a level of less than 35dB(A) is recommended to preserve the restorative process of sleep"*.

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

Table 3.1 NEC Categories

NEC Category	Description	Noise Range L_{Aeq},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) 45-57dB(A) night-time (8hr) Road and mixed sources

C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.	63-72dB(A) daytime (16hr) 57-66dB(A) night-time (8hr) Road and mixed sources

3.1.8 In applying these noise exposure categories, it states:

"Different indices have been used to describe noise from different sources, and limits have been set over different time periods. This has caused confusion, and this advice follows the move towards consistency advocated in BS 7445: 1991 by expressing all noises of $L_{Aeq,T}$. The recommended time periods are 0700-2300 and 2300-0700."

3.1.9 Within the general guidance it states *"where there is a clear need for new residential development in an already noisy area some or all NECs might be increased by up to 3dB(A) above the recommended levels. In other cases, a reduction of up to 3dB(A) may be justified."*

3.1.10 For noisy industrial developments, the guidance refers to BS 4142 – `Methods for rating and assessing industrial and commercial sound'.

3.2 Noise Standards and Guidance

BS4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

3.2.1 BS 4142: 2014+A1:2019 ` 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 impact magnitude.

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 will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

3.2.2 In terms of establishing the rating level, corrections for the noise character has to be taken into consideration. These include tonality, impulsivity and intermittency characteristics.

BS 8233: 2014 `Guidance on sound insulation and noise reduction for buildings'

3.2.3 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.

3.2.4 The guidance provided in section 7.7 of BS8233 provides recommended internal ambient noise levels for resting, dining and sleeping within residential dwellings. Table 3.2 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 $L_{Aeq,8hours}$

3.2.5 For a partially open window the standard refers to a reduction of approximately 15dB. This would therefore indicate a noise level outside the window of approximately 50dB $L_{Aeq,16hours}$ for living rooms during daytime and 45dB $L_{Aeq,8hours}$ during night-time outside bedrooms.

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

3.2.6 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 L_{Aeq} for continuous noise and 45dB L_{Amax} for single sound events. Lower noise levels may be disturbing depending upon the nature of the noise source. At night-time, outside sound levels about 1 metre from the facades of living spaces should not exceed 45dB L_{Aeq}, so that people may sleep with bedroom windows open. This value was obtained by assuming that the noise reduction from outside to inside with the window open is 15dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35dB L_{Aeq}. 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 L_{Aeq} 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 should not exceed 50dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered to represent the maximum desirable sound level for new development.

3.2.7 In 2009, the WHO published 'Night Noise Guidelines for Europe', which it describes as an extension to the WHO 'Guidelines for community noise' (1999). It concludes that "Considering the scientific evidence on the thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the Environmental Noise Directive (2002/48/EC), an $L_{night,outside}$ of 40dB should be the target of the night noise guideline (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 those countries where the NNG cannot be achieved in the short-term for various reasons, and where policy-makers choose to adopt a stepwise approach."

BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites'

3.2.8 BS 5228 refers to "the need for the protection against noise and vibration of persons living and working in the vicinity of, and those working on, construction and open sites. It recommends procedures for noise and vibration control in respect of construction operations and aims to assist architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners."

3.2.9 Part 1 deals with noise in terms of background legislation and gives recommendations for basic methods of noise control relating to construction and open sites where significant noise levels may be generated. The guidance is aimed at giving advice on achieving 'best practice' in controlling noise and vibration from construction and open

sites. There is an example of noise limits given in Annex E, which sets out cut-off limits between 65dB(A) and 75dB(A) or 5dB(A) above the ambient noise, whichever is the greater. Part 2 of BS 5228 deals specifically with vibration control and provide the legislative background to the assessment of vibration and recommendations for controlling vibration at source and management controls (e.g. liaison with communities, supervision, preparation and choice of plant etc.).

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

3.2.10 The assessment of noise will consider the guidance found within the Environment In terms of noise specifically, the use of BAT will have to be considered and balanced within the wider context of other releases to different media (air, land and water) and taking into account issues such as usage of energy and raw materials.

3.2.11 Noise cannot therefore be considered in isolation from other impacts on the environment.

3.2.12 The definition of pollution includes "emissions which may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment". BAT is therefore likely to be similar, in practice, to the requirements of the Statutory Nuisance legislation which requires the use of "best practicable means" to prevent or minimise noise nuisance. In the case of noise, "offence of any human senses" may be judged by the likelihood of complaints. However, the lack of complaint should not necessarily imply the absence of a noise problem. In some cases it may be possible, and desirable, to reduce noise emissions still further at reasonable costs and this may therefore be BAT for noise emissions.

3.2.13 Consequently, the aim of BAT should be to ensure that there is no reasonable cause for annoyance to persons beyond the installation boundary.

3.2.14 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 (i.e. L_{Aeq}) as industry expands and areas develop.

3.2.15 The indicative requirements apply to both new and existing activities but it will be more difficult to justify departures from them in the case of new activities. Indeed, because the requirements for noise are likely to be strongly influenced by the local environmental conditions, new installations will be expected to meet BAT from the outset and to demonstrate that noise reduction or prevention has been built in to the design process.

3.2.16 For new plant clear targets may be needed to ensure that noise emissions do not contribute to a creeping background sound level. In the case of new plant sound levels should be predicted and modelled. Monitoring for compliance may be required and this

monitoring may result in the need for additional noise reduction measures.

Noise Assessment Criteria

Noise Assessment Methodology

3.2.17 In order to determine the noise contribution relative to the residual noise climate we have produced a noise model that reflects the Proposed Development for comparison.

3.2.18 The results of the noise model will assist in determining whether the Proposed Development will increase the noise level contribution at the sensitive receptors. The noise contribution would also be assessed against BS4142: 2014+A1:2019 for further impact analysis.

Fixed Plant Noise

3.2.19 The assessment for fixed industrial noise has been undertaken with reference to BS 4142: 2014+A1:2019. The standard indicates that if the level difference between the representative background sound level and the site rating noise is zero or lower than background then the impact will be low.

3.2.20 Following consultation with Wrexham County Borough Council's EHO, it was that the design of the facility would need to demonstrate that BAT had been implemented. The design of the new development should aim to prevent existing noise from `creeping'.

3.2.21 The calculation method used in this study is based upon ISO 9613: 2, noise propagation model, which takes into account source position, screening effects, distance and direction in relation to the nearest receptor. Noise predictions have been undertaken using CadnaA noise modelling software.

3.2.22 The assessment has used the empirical data obtained at site, based on other warehouse areas of the site to calculate the expected resultant noise contribution at the nearest property boundary locations during daytime and night-time operations (worst case impact will be during the night-time period).

3.2.23 The assessment is based on plant noise levels as outlined in Appendix 3. The noise control measures are intended to reduce noise impacts relative to the nearest receptor so that noise from the development does not increase existing noise levels.

4.0 BASELINE SURVEY

2011 Noise Survey

4.1 The results of baseline levels undertaken in the 2011 noise survey are presented below in Table 4.1.

Table 4.1: Baseline noise levels undertaken in 2011

Receptor Position (Refer to Figure 3)	Time Period	2011 Residual Noise level L_{Aeq} dB	2011 Background Noise level L_{A90} dB
1. Linden Avenue	Daytime Night-time	51 43	47 40
2. & 2a. Wern	Daytime Night-time	58 53	48 46
3. Holyhead Rd/ West View	Daytime Night-time	60 48	50 44
4. Maes-y-Waun	Daytime Night-time	56 52	52 51
5. Shepherds Lane	Daytime Night-time	53 46	48 45
6. Cadbury"s Entrance	Daytime Night-time	57 52	52 50
7. Canalwood Industrial Estate	Daytime Night-time	62 60	60 60
8. Llwyn-y-cil Road	Daytime Night-time	57 50	49 49
9. Opposite Chirk Castle back gates	Daytime Night-time	54 49	48 48

4.2 The results of the baseline survey at that time indicated that the noise climate during early morning periods of the night were dominated by a low level general `hum' from the industrial estate. During the daytime noise is dominated by local and distant road traffic and noise from the industrial estate.

4.3 It should be noted that the baseline survey in 2011 excluded all the additional plant or plant that has been removed from site over the last 10 years. The survey does however include the noise from all other plant operating at the Kronospan site at that time as well as residual noise from noise sources not associated with Kronospan.

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 will 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 will depend on a number of factors. The more significant of which are:-

(a) The sound power levels (SWL's) or sound pressure 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

Operational Noise

5.2.1 For the operational noise of the Proposed Development we have used ISO 9613-2 for the propagation 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, duration of activity, and any screening from local buildings and earth mound screens on site. The noise modelling for the fixed plant assumes that they operate continuously. The prediction calculations therefore provide an indication of the highest likely noise level.

5.2.3 Appendix 5 attached provides details of the input data for the noise prediction modelling used within the CadnaA software programme.

5.3 Plant Complement

5.3.1 The plant sound pressure levels from which the noise predictions were made are presented in Appendix 2. The plant noise levels are based on empirical data from site noise survey work recorded of existing warehouse facilities.

5.4 Results of Noise Predictions

5.4.1 We have used empirical data obtained from Site to maintain the accuracy of the calculations at the nearest property boundary locations during site operations.

Refer to Appendix 4 for noise mapping results.

Noise Assessment:

Proposed Operational Noise

5.4.2 The proposed Warehouse with mobile plant operating inside has been considered and calculated using noise prediction modelling software. Noise map 1 in Appendix 4 represents the resultant noise contribution from the new facility proposed at Kronospan. The results of the modelling are shown in below in Table 5.1 (**including** noise mitigation measures).

Table 5.1: Predicted Noise Contribution from the Proposed Development

Receptor Position	Time Period	Predicted Noise Contribution from Proposed Development L_{Aeq1hr} dB	Typical Residual & Background Noise level L_{Aeq} & [L_{A90}] dB	Rating compared to background noise L_{Aeq1hr} dB	Resultant Increase in residual noise levels due to Warehouse Facility L_{Aeq} dB
1. Linden Avenue	Daytime	14	51 [47]	-37 [-33]	0 [0]
	Night-time	14	43 [40]	-29 [-26]	0 [0]
2. Wern	Daytime	20	58 [48]	-38 [-28]	0 [0]
	Night-time	20	53 [46]	-33 [-26]	0 [0]
3. Holyhead Rd/ West View	Daytime	26	60 [50]	-34 [-24]	0 [0]
	Night-time	26	48 [44]	-22 [-18]	0 [0]
4. Maes-y-Waun	Daytime	12	56 [52]	-44 [-40]	0 [0]
	Night-time	12	52 [51]	-40 [-39]	0 [0]
5. Shepherds Lane	Daytime	8	53 [48]	-45 [-40]	0 [0]
	Night-time	8	46 [45]	-38 [-37]	0 [0]
6. Cadbury's Entrance	Daytime	8	57 [52]	-49 [-44]	0 [0]
	Night-time	8	52 [50]	-44 [-42]	0 [0]
7. Canalwood Industrial Estate	Daytime	7	62 [60]	-55 [-53]	0 [0]
	Night-time	7	60 [60]	-53 [-53]	0 [0]
8. Llwyn-y-cil Road	Daytime	5	57 [49]	-52 [-44]	0 [0]
	Night-time	5	53 [49]	-48 [-44]	0 [0]
9. Opposite Chirk Castle back gates	Daytime	5	54 [48]	-49 [-43]	0 [0]
	Night-time	5	49 [48]	-44 [-43]	0 [0]

Note: Frequency spectral data on site indicates no tonal character and observations indicate no other noise character that is perceptible at receptors at night-time. Column 5 is calculated by subtracting column 3 from 4. Column 6 is calculated by logarithmically adding column 3 and column 4 and subtracting column 4 from the answer.

5.4.3 The predicted noise levels are for the Proposed Development attributable noise in isolation (with mitigation). The fifth column in Table 5.1 shows the difference between the predicted Proposed Development plant noise and typical background noise at the receptor positions. The Proposed Development is not expected to contain any unusual noise characteristics. The rating level in column 5 is therefore in accordance with the methodology found within BS 4142: 2014+A1:2019, which is the most relevant noise criterion. Column 6 in Table 5.1 shows the level difference between the baseline residual noise at the receptors and the predicted noise contribution from the Proposed Development.

5.4.4 The results shown in Table 5.1 above indicate that the Proposed Development are between 18dB and 54dB below the baseline background noise and 22dB and 55dB below residual noise levels. This is a clear indication that the development is acceptable when considered in isolation.

5.4.5 In consideration of the comparison of the Proposed Development noise contributory levels and background and residual sound levels, we conclude that the new plant would not cause any background noise `creep' in accordance with H3 Horizontal Guidance Note for Noise Part 2: Noise Assessment and Control and BAT.

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5.4.6 The magnitude of the impact during daytime or night-time is shown to be a **low impact** (i.e. according to BS 4142: 2014+A1:2019).

5.4.7 Section 6.0 of this report provides the noise control measures that would be employed to ensure the predicted noise levels are achieved.

5.4.8 This assumes that the development includes noise amelioration measures similar to those outlined in Section 6.0. Appendix 4 illustrates the modelled noise impact from the development.

Cumulative Impact Assessment

5.4.9 The cumulative assessment takes into account two elements of Site development, which includes planning applications since 2011, which includes:

a) development that has been granted permission and has been developed, being constructed or proposed to be developed;

b) development that has been successfully appealed and will be developed

5.4.10 All of the above are termed as a group in this report as `*Cumulative Developments'.* Item b) includes the Raw Board Store Facility and OSB Manufacturing Facility.

5.4.11 The effect of development a) that being the Gas Engines, K8 CHP Biomass, RCF Facility, Chip Wash Pre-heating Plant, MF Press & Ventilation System development operating together with development b) in terms of the cumulative noise contribution at nearest receptors has been assessed and is presented below in Table 5.2.

5.4.12 The Wood Chip Preparation, Wood Flaker and WESP Chip Dryer facility is effectively a replacement of existing plant and as such is expected to provide an improvement in noise levels and has therefore not been included in the cumulative assessment.

5.4.13 The recent site survey at Kronospan has enabled us to update the noise model for the assumed noise levels for the Gas Engines, RCF Facility, Chip Wash Pre-heating Plant and MF Press & Ventilation System. The following table provides a summary of the updated noise model prediction results (refer to noise map 2 in Appendix 4).

Table 5.2: Predicted Noise Contribution from the Consented & Appealed development

Receptor Position	**Time Period**	**Cumulative noise level from all consented & appealed Plant L_{Aeq1hr} dB**	**Cumulative noise level from consented & appealed plant including OSB and warehouse L_{Aeq1hr} dB**	**Typical Residual & Background Noise level L_{Aeq} & [L_{A90}] dB**
1. Linden Avenue	Daytime	**32**	**33**	51 [47]
	Night-time	**32**	**33**	43 [40]
2. Wern	Daytime	**33**	**34**	58 [48]
	Night-time	**33**	**34**	53 [46]
3. Holyhead Rd/West View	Daytime	**35**	**36**	60 [50]
	Night-time	**35**	**36**	48 [44]
4. Maes-y-Waun	Daytime	**35**	**37**	56 [52]
	Night-time	**35**	**37**	52 [51]
5. Shepherds Lane	Daytime	**32**	**34**	53 [48]
	Night-time	**32**	**34**	46 [45]
6. Cadbury"s Entrance	Daytime	**35**	**37**	57[52]
	Night-time	**35**	**37**	52 [50]
7. Canalwood Industrial Estate	Daytime	**42**	**46**	62 [60]
	Night-time	**42**	**46**	60 [60]
8. Llwyn-y-cil Road	Daytime	**37**	**40**	57 [49]
	Night-time	**37**	**40**	53 [49]
9. Opposite Chirk Castle back gates	Daytime	**34**	**35**	54 [48]
	Night-time	**34**	**35**	49 [48]

Note: Column 3 includes the noise contribution from the Gas Engines, K8 CHP Biomass, RCF Facility, Chip Wash Pre-heating Plant, MF Press & Ventilation System

5.4.14 The above cumulative noise levels associated with consented/appealed development and the Proposed Development compared with background and residual noise levels are represented below in Table 5.3.

Table 5.3: Predicted Cumulative Noise Contribution from the Proposed Warehouse and Consented/Appealed Development (i.e. CHP Gas Engine facility, Biomass, RCF Facility, Chip Wash Pre-heating, MF Press & Ventilation system & OSB Manufacturing Facility including noise control measures)

Receptor Position	Time Period	Predicted Cumulative Noise Contribution From consented Development & Proposed OSB L_{Aeq1hr} dB	Typical Residual & Background Noise level L_{Aeq} & [L_{A90}] dB	Rating compared to background noise L_{Aeq1hr} dB	Resultant Increase in residual noise levels due to Warehouse Facility L_{Aeq} dB
1. Linden Avenue	Daytime Night-time	**33** **33**	51 [47] 43 [40]	-18 [-14] -10 [-7]	0 [0] 0 [0]
2. Wern	Daytime Night-time	**34** **34**	58 [48] 53 [46]	-24 [-14] -19 [-12]	0 [0] 0 [0]
3. Holyhead Rd/ West View	Daytime Night-time	**36** **36**	60 [50] 48 [44]	-24 [-14] -12 [-8]	0 [0] 0 [0]
4. Maes-y-Waun	Daytime Night-time	**37** **37**	56 [52] 52 [51]	-19 [-15] -15 [-14]	0 [0] 0 [0]
5. Shepherds Lane	Daytime Night-time	**34** **34**	53 [48] 46 [45]	-19 [-14] -12 [-11]	0 [0] 0 [0]
6. Cadbury"s Entrance	Daytime Night-time	**37** **37**	57 [52] 52 [50]	-20 [-15] -15 [-13]	0 [0] 0 [0]
7. Canalwood Industrial Estate	Daytime Night-time	**46** **46**	62 [60] 60 [60]	-16 [-14] -14 [-14]	0 [0] 0 [0]
8. Llwyn-y-cil Road	Daytime Night-time	**40** **40**	57 [49] 53 [49]	-17 [-9] -13 [-9]	0 [0] 0 [0]
9. Opposite Chirk Castle back gates	Daytime Night-time	**35** **35**	54 [48] 49 [48]	-19 [-13] -14 [-13]	0 [0] 0 [0]

5.4.15 The results show that the cumulative effect of all plant consented since 2011 compared with the baseline background and residual noise. The level difference is at least 10dB below the existing residual noise and therefore it would not cause any increase. The cumulative noise level is also at least 7dB below baseline background sound levels.

5.4.16 The magnitude of the impact during daytime or night-time is shown to be a **low impact** (i.e. according to BS 4142: 2014+A1:2019).

5.4.17 As the Proposed Development is not predicted to create any increase in residual sound levels due to the fact that the Proposed Development noise contribution is insignificant.

5.4.18 It should be noted that the cumulative assessment assumes the highest likely noise contribution from each development as there is no allowance for potential additional screening which might benefit some of the new plant from the implementation of adjacent development.

5.4.19 It is important to note that the Wood Chip Preparation facility, Dryer and Wood Chipper & Flaker Facility developments are replacements of older plant and as such would have formed part of the baseline levels recorded in 2011. The positive effect of the new plant and overall improvement in noise levels from this particular plant has not been taken into account.

Road Traffic Noise

5.4.20 The impact of any increase in road traffic noise generated by the Proposed Development on nearest receptors to the local road network would be insignificant given that there would be no increase in vehicle movements associated with the Proposed Development.

6.0 MITIGATION

6.1 There are a number of different ways in which the new plant noise levels could be reduced, for example, the use of noise control at source and/or the selection of different plant equipment, which may be quieter. The chosen method/s of mitigation should be appropriate to meet the noise criteria and the application of Best Available Techniques (BAT).

6.2 The predicted noise levels from the site have been calculated with the following examples of mitigation measures in place to ensure that the resultant noise levels are within appropriate guidance and standards.

Warehouse Building

6.3 Introducing suitable cladding to the building that provides adequate noise insulation. The proposed cladding to have an Rw value of 32dB or greater.

6.4 Noise `break-out' via roof ridge vents to have a similar acoustic performance as per the cladding. No ventilation louvres allowed in walls unless acoustically treated to similar performance as described for the cladding.

6.5 Doors into the warehouse to be motorised and have a minimum Rw value of 15dB. The door on the southern façade facing the existing warehouse to be normally closed unless for operational access, maintenance or emergency.

Mobile Plant Noise Character

6.6 The design of the mobile plant reversing alarms should not contain tonal character (i.e. should be of the broadband noise type reversing alarms) and are not perceptible at the nearest sensitive receptors.

7.0 CONCLUSIONS

General

7.1 This noise assessment is prepared for Kronospan Ltd in support of a planning application made by Kronospan for the Warehouse facility at the Kronospan manufacturing facility on the industrial site that forms part of Maesgwyn Farm off Holyhead Road, Chirk, Wrexham.

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7.2 The assessment establishes any potential noise impact on nearest sensitive receptors resultant from the operation of the development.

7.3 The study benefits from site noise surveys of the existing noise sources to inform the noise model.

7.4 The highest likely noise levels have been considered and assessed during the operational phase of the development. Relevant and appropriate noise guidance and standards have been used to determine the noise impact and where appropriate advice provided in terms of mitigation to comply with BAT requirements.

7.5 The results of the data analysis and prediction calculations have concluded the following:

(i) Noise from the operation of the existing warehouse is relatively low and is not considered to be a significant contributor to existing noise levels at sensitive receptors.

(ii) The Proposed Development predictions in terms of contributory noise levels at NSRs are shown to be between 5dB and 26dB L_{Aeq} during daytime and night-time periods at nearest sensitive receptors.

(iii) The background sound levels at night-time (i.e. lowest likely) for comparison vary between 40dB and 60dB LA90 with residual L_{Aeq} levels typically between 43dB and 60dB.

(iv) The Proposed Development is not expected to generate any unusual noise characteristics perceptible at nearest sensitive receptors.

(v) The results show that the Proposed Development would not result in any background noise `creep' in accordance with H3 Horizontal Guidance Note for Noise Part 2: Noise Assessment and Control and BAT.

(vi) The magnitude of the impact during daytime or night-time is shown to be a **low impact** (i.e. according to BS 4142: 2014+A1:2019).

(vii) The noise from the operation of the Proposed Development would result in noise levels complying with all relevant standards for noise at the nearest sensitive receptors.

(viii) There would be no increase expected in road traffic movements as a result of the Proposed Development and therefore no impacts on road traffic noise would occur.

(ix) The results show that the cumulative effect of all new plant consented and appealed since 2011 is at least 10dB below the baseline residual noise and therefore would not cause any increase in residual levels. The cumulative noise level from consented development is also at least 7dB below baseline background sound levels.

Noise Mitigation Measures

7.6 In terms of applying `best available techniques' ("BAT") for the control of noise from the Proposed Development we have recommended appropriate development design levels.

Construction Noise

7.7 In terms of construction noise, best practice would be applied in accordance with BS5228-1:2009+A1:2014 `Code of practice for control of noise and vibration on construction and open sites' to ensure that reasonable site generated noise is minimised. Construction noise is not considered to generate any significant impacts.

REFERENCES

BS4142: 2014+A1:2019 ` Methods for rating and assessing industrial and commercial sound'

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

Guidelines for Community Noise – World Health Organisation: April 1999

BS7445: 2003-`Description and measurement of environmental noise'

ISO 9613-2: 1996 Acoustics – Attenuation of Sound During Propagation Outdoors

BS5228-1:2009+A1:2014 `Code of practice for control of noise and vibration on construction and open sites'

Technical Advice Note ("TAN") 11, `Noise' – 1997.

Technical Guidance Note IPPC H3.

Kronospan Environmental Noise Impact Assessment: February 2012.

'Night Noise Guidelines for Europe' WHO 2009

NVC Report R16.0204/DRK dated 12th February 2016 for RCF Facility

NVC Report R16.0705/DRK dated 21st July 2016 for Chip Wash Pre-heating Plant

NVC Report R16.0401/DRK dated 5th April 2016 for proposed building extension for MF Press & relocation of MF Ventilation System

NVC Report R15.0903/DRK dated 4th September 2015 for Gas Engine CHP Facility

NVC Report R17.0306/DRK dated 8th April 2017 for Wood Chip Preparation Facility

NVC Report R17.0506/1/DRK dated 12th June 2018 for OSB Manufacturing Facility

FIGURES

Figure 1: Location of Proposed Development

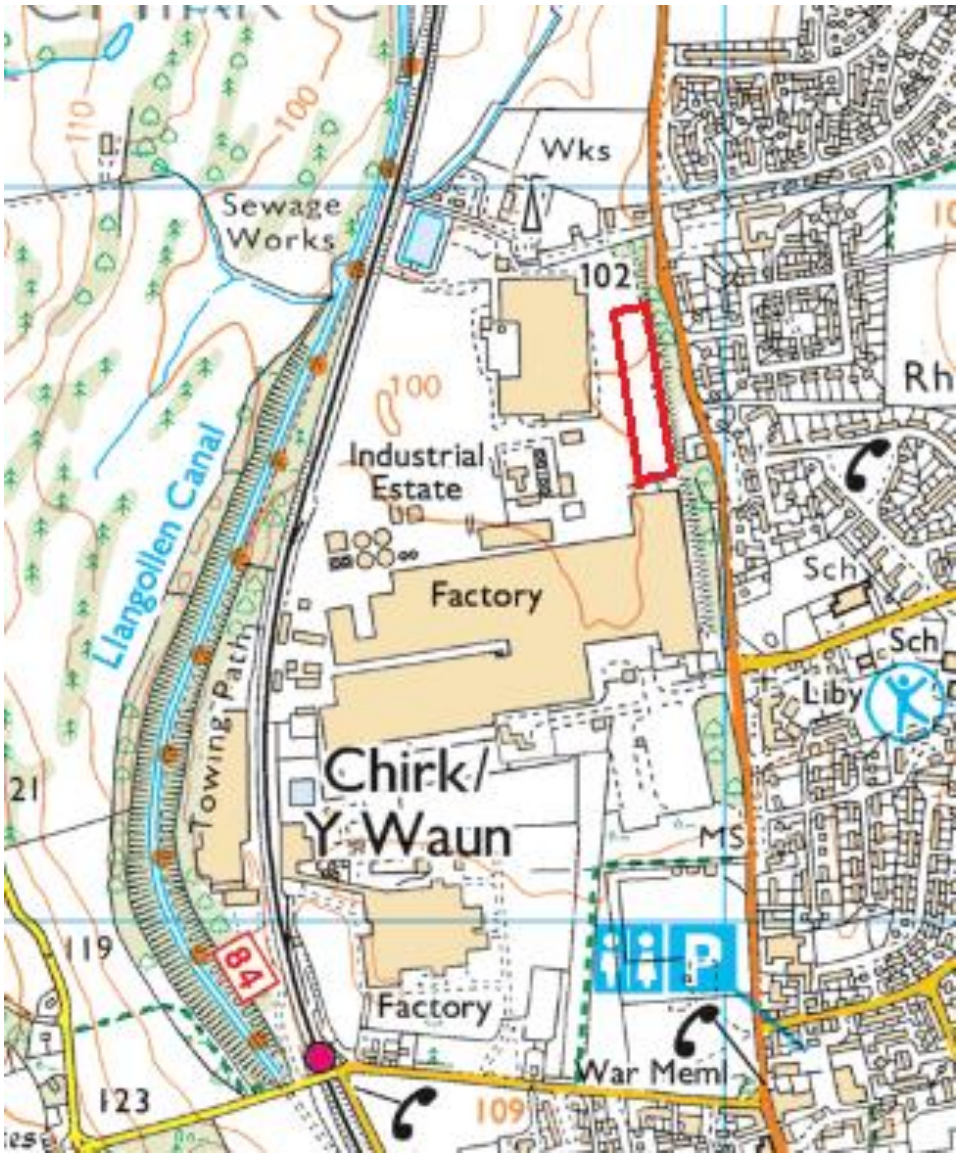


Figure 2: Layout of Proposed Development

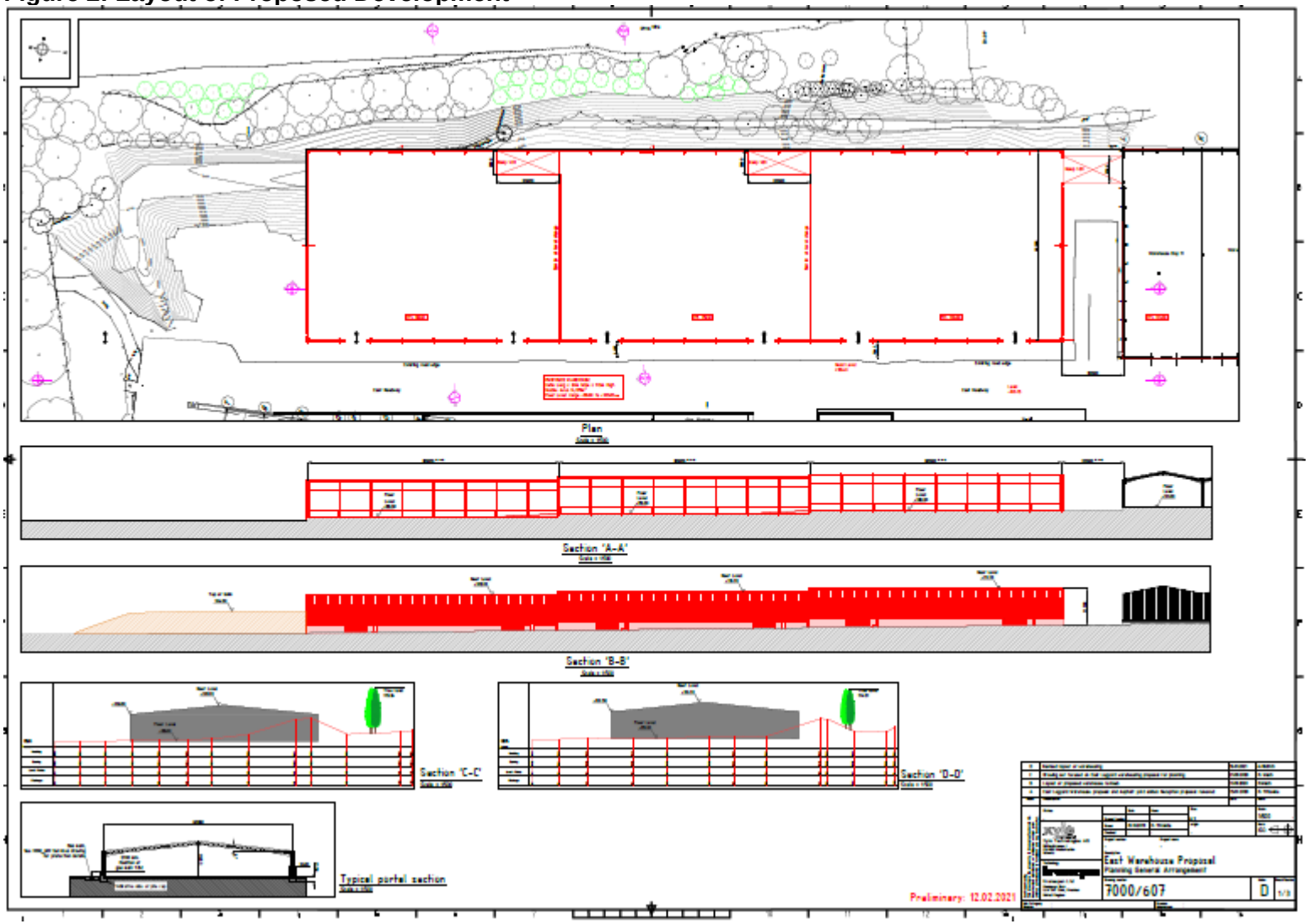


Figure 3: Nearest Sensitive Receptor Location Relative to the Site

Appendix 1

BASIC ACOUSTIC TERMINOLOGY

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

Sound Pressure Level is a measurement of the size of these pressure fluctuations. It is expressed in decibels (dB) on a logarithmic scale. Each 3 dB increase in sound pressure level represents a doubling of the sound energy. The threshold of hearing is approximately 0 dB.

The rate at which the pressure fluctuations occur determines the pitch or frequency of the sound. The frequency is expressed in Hertz (Hz), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hz to 20,000 Hz. Although sound can be of one discrete frequency - a 'pure tone' - most noises are made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same 'subjective' way. This is the basis of the A-weighted sound level dB(A), normally used to assess the effect of noise on people. The dB(A) weighting emphasises or reduces the importance of certain frequencies within the audible range.

Noise Measurement

The measurement of sound pressure level is only really meaningful where the level of noise is constant. In the typical industrial environment noise levels can vary widely and sometimes short duration high levels of noise are interspersed with periods of relative quiet. The most widely used means of 'averaging' the noise over a period of time is the Equivalent Continuous Sound Level. Normally written as L_{Aeq} this value takes into account both the level of noise and the length of time over which it occurs. There are many meters available which are capable of measuring L_{Aeq} by electronic integration over the measurement period.

The L_{Aeq} or A-weighted equivalent continuous noise level is a measure of the total noise energy over a stated time period and includes all the varying noise levels and re-expresses as an 'average', allowing for the length of time for which each noise level was presented.

The L_{An} parameters are defined as the noise levels which are exceeded for n% of the monitoring period, thus, for example, the L_{A90} parameter is the noise level exceeded for 90% of the 15 minute period, i.e. 13.5 minutes. The L_{A50} parameter is the noise level exceeded for 50% of the hourly period, i.e. 30 minutes, etc. The L_{max} parameter is the maximum RMS A-weighted noise level occurring during the measurement period.

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.

L_{Aeq}: 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.

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

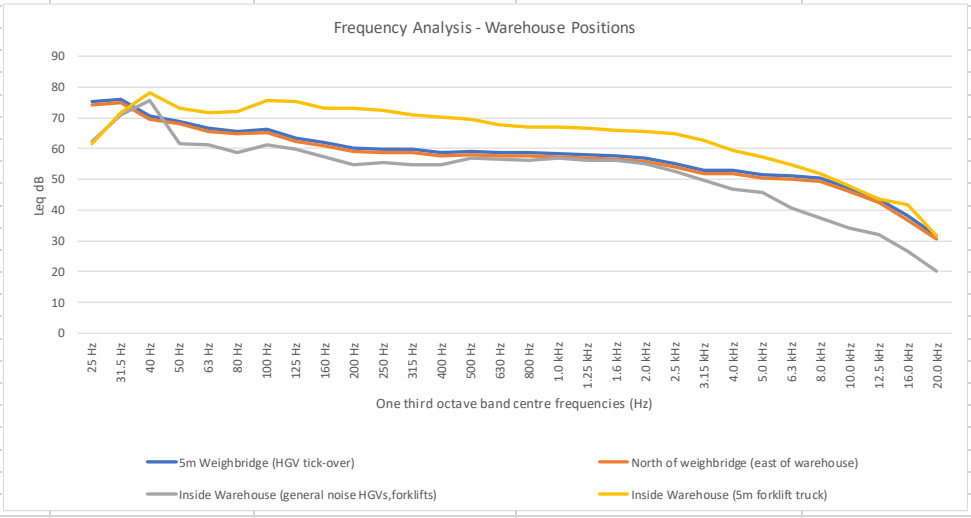
Source/Activity	**Indicative noise level [dB(A)]**
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Busy road at 5km	35-45
Car at 65km/h at 100m	55
Busy general office	60
Conversation	60
Truck at 50km/h at 100m	65
City Traffic at 5m	75-85
Pneumatic drill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

Appendix 2

Measured Noise Levels for Existing Warehouse

Location Weighbridge, Warehouse & Stock Yard	Position	LAeq	LAFmax	Comments
5m Weighbridge (HGV tick-over)	1	68.5	79.9	
North of weighbridge (east of warehouse)	2	60.8 - 67.0	72.6	Affected by road traffic noise
Inside Warehouse (general noise HGVs,forklifts)	3	65.4 - 73.2	79.9	
Inside Warehouse (5m forklift truck)	4	67.9	74	

	5m Weighbridge (HGV tick-over)	North of weighbridge (east of warehouse)	Inside Warehouse (general noise HGVs,forklifts)	Inside Warehouse (5m forklift truck)
25 Hz	75.2	74.1	62.3	61.5
31.5 Hz	76.1	75	71	71.8
40 Hz	70.6	69.5	75.5	78.1
50 Hz	68.8	67.9	61.6	73
63 Hz	66.6	65.5	61.3	71.6
80 Hz	65.6	64.6	58.7	71.9
100 Hz	66.3	65.2	61	75.7
125 Hz	63.3	62.2	59.6	75.1
160 Hz	61.8	60.7	57.2	72.9
200 Hz	60.1	59	54.6	73.2
250 Hz	59.9	58.8	55.3	72.3
315 Hz	59.7	58.6	54.6	70.9
400 Hz	58.8	57.7	54.6	70.3
500 Hz	59	57.9	56.7	69.6
630 Hz	58.5	57.4	56.4	67.8
800 Hz	58.5	57.4	56	67
1.0 kHz	58.4	57.3	57	67
1.25 kHz	57.8	56.7	56.1	66.5
1.6 kHz	57.5	56.4	56	65.8
2.0 kHz	56.8	55.7	54.9	65.4
2.5 kHz	55.2	54.1	52.5	64.9
3.15 kHz	53	51.9	49.8	62.5
4.0 kHz	52.9	51.8	46.8	59.5
5.0 kHz	51.4	50.3	45.6	57.2
6.3 kHz	51	49.9	40.6	54.7
8.0 kHz	50.4	49.3	37.5	51.8
10.0 kHz	47.3	46.2	34.3	47.8
12.5 kHz	43.6	42.5	32	43.7
16.0 kHz	38	36.8	26.7	41.6
20.0 kHz	31.5	30.4	20.2	31.6



Appendix 3

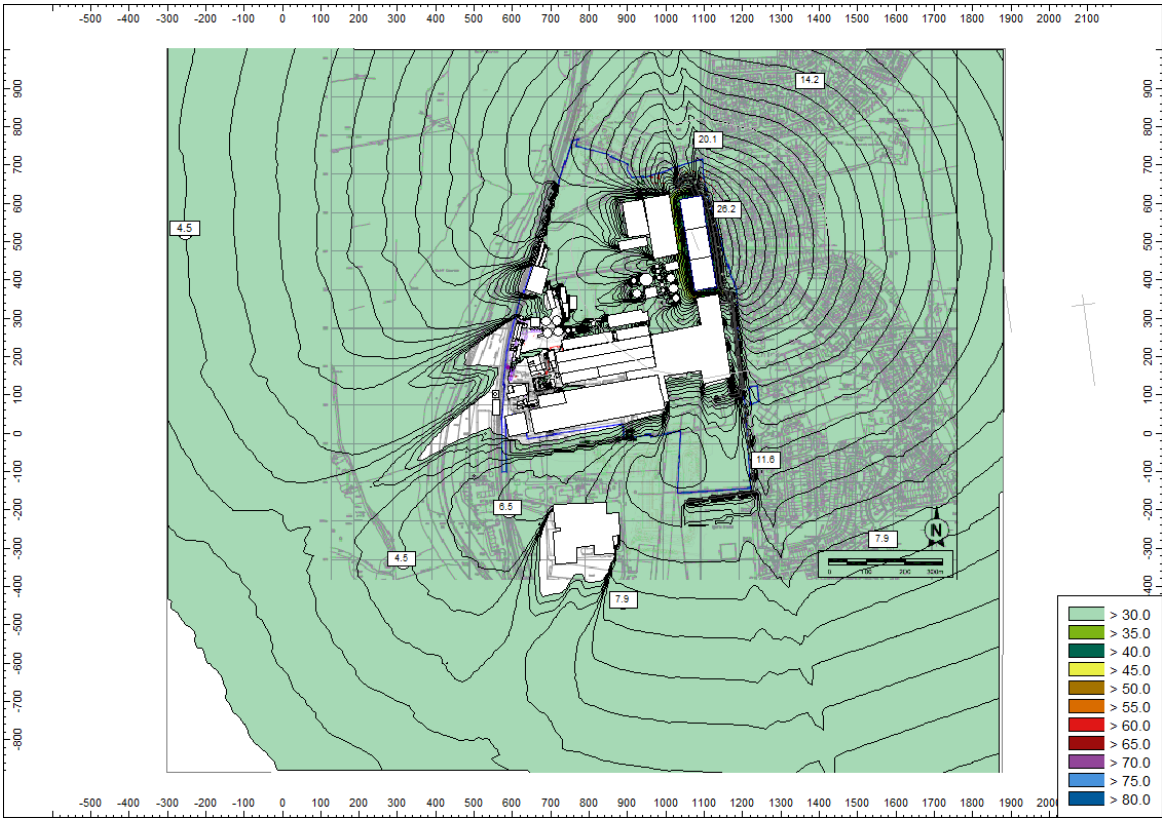
Assumed Design Noise Levels for Proposed Development

Plant Type	Reverberant Sound Pressure Level LAeq dB	Assumed % Operating Time	Period of Operation
Warehouse	75	100	Daytime/ Night-time

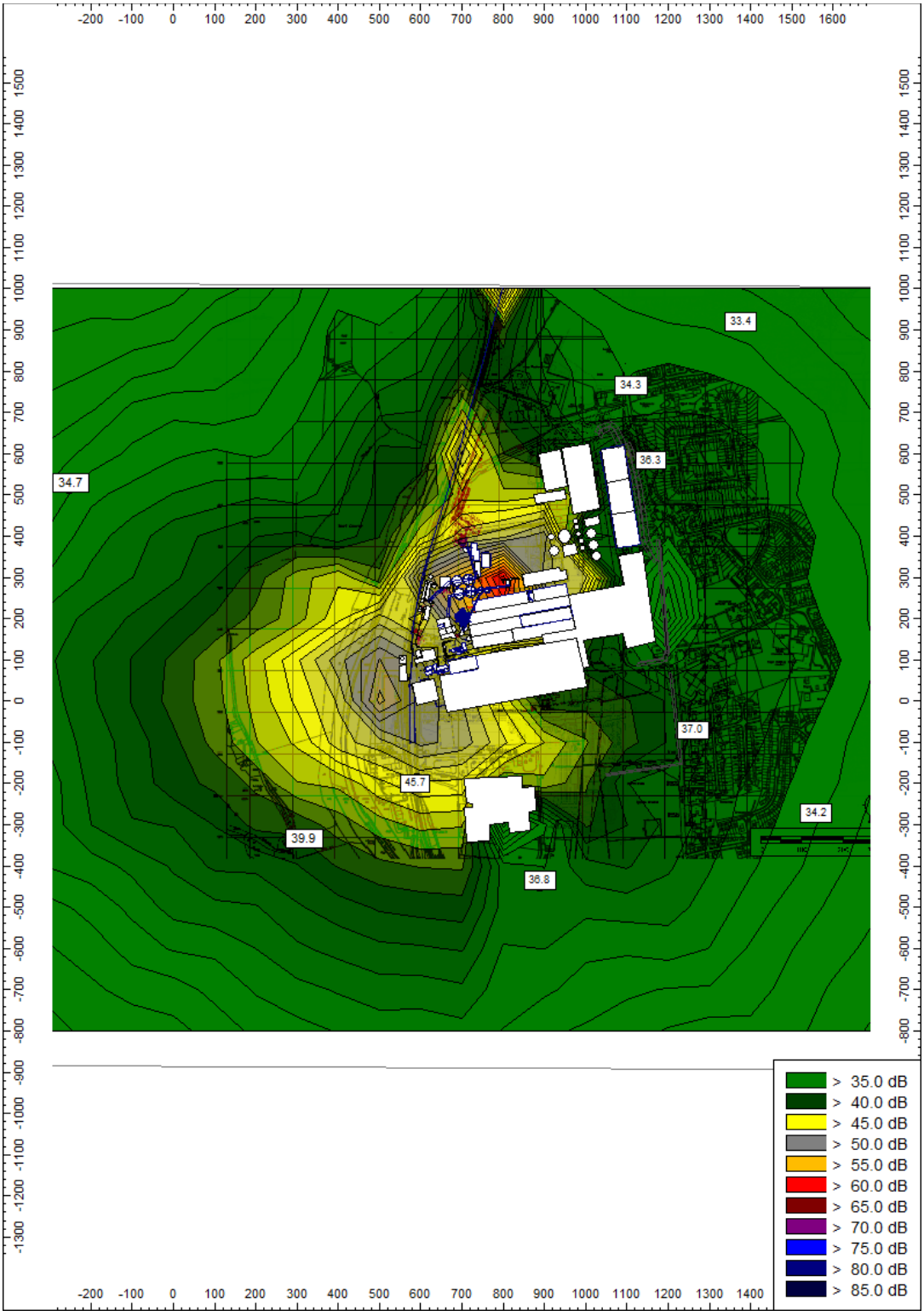
Appendix 4

Noise Mapping

NOISE MAP 1: OPERATION FROM EAST WAREHOUSE



NOISE MAP 2: CUMULATIVE EFFECTS OF CONSENTED/APPEALED PLANT & WAREHOUSE



Appendix 5

Input Data For ISO 9613 Noise Model

Noise Prediction Model

There are a number of empirical or semi-empirical sound propagation models in common use. One of these is ISO9613-2 which is the International Standard used to predict noise propagation.

The noise levels produced by the Wood Chip Preparation Plant at each of the nearest sensitive receptors has been calculated using a computer model, which is based on ISO 9613, Acoustics – Attenuation of Sound During Propagation Outdoors [1996]. The propagation model described in Part 2 of the standard provides a method for predicting sound pressure levels.

The computer model utilises octave band frequency data of the noise source to assess and predict the noise contribution with the site in full operation.

The ISO propagation model provides a method for calculating the sound pressure level at a specific position by taking the sound power level radiating from the building facades in frequency bands and subtracting a number of attenuation factors according to the following:

Predicted sound pressure level =

$Lw + D – A_{geo} – A_{gr} – A_{bar} - A_{misc}$

The prediction modelling uses octave band frequency sound power level data calculated in different wall and roof areas of the CHP plant and corrects the level for the following additional propagation factors and attenuation:

Octave band frequency spectra:

Based on empirical noise measurements recorded at a similar site in the UK when under load conditions. The noise levels at specific face positions are provided below that have been used for the noise model.

D – Directivity Factor

The Directivity Index will depend on the radiating surface and whether it is located in free space, at junction of two surfaces or more and the correction factor changes accordingly. Directivity factor is generally = 2.

A_{geo} - Geometrical Divergence

The geometrical divergence of sound waves accounts for the spherical spreading in the free field from a point source resulting in attenuation depending on distance, which relates to the following correction:

$A_{geo} = 20 \times \log (d) + 11$ [where d = distance from the noise source]

Receiver height assumed = 1.5m (castle gate position higher ground assumed), original survey of baseline measured at 1.5m above FFL.

A_{atm} - Atmospheric Absorption

When sound energy propagates through the atmosphere it is attenuated as a result of the conversion of the sound energy into heat. The attenuation is dependent upon the relative humidity and the temperature of the air through which the sound energy is travelling. The attenuation is also dependent upon the frequency content of the sound energy with higher levels of attenuation towards higher frequencies.

The attenuation therefore depends upon the distance from the sound source and according to ISO9613 is calculated according to the following formula:

$A_{atm} = d \times \alpha$ [Where d = distance from the source
a = atmospheric absorption coefficient in dB/m]

From ISO9613 Part 1 [1996] I have used values of `a' corresponding to a temperature of 10°C and a relative humidity of 70%. This will give an indication of the lowest likely atmospheric attenuation as examples worked at 20deg C and -5deg C indicate a reduction of around -0.5dB(A) on those values calculated.

A_{gr} – Ground Effect

Ground Effect for Calcs = 0.5 (mixed ground absorption)

The ground effect is a result of the interference of sound reflected by the ground which interferes with the direct sound propagating from the noise source to the receiver. The prediction of the ground effects is relatively complex and is dependent upon a number of factors including ground conditions, source height, receiver height and the propagation height between the source and receiver. The ground conditions are described according to a variable `G' which varies between 0 for `hard' ground and 1 for `soft' ground. Hard ground refers to paving, concrete and any sites with low porosity. Soft ground refers to grassland, trees or other vegetation. I have assumed a ground factor of G = 0.5 to represent mixed ground conditions. I have taken the source height as being the height of the relevant section of building and a receiver height of 4 metres.

A_{bar} – Barrier Attenuation

When there is a solid barrier between any noise source and the receiver position the noise level will be reduced. The level of attenuation resulting will depend upon the barrier position, barrier size, receiver position and frequency content relative to the noise source. For the purpose of these calculations, we have included for any local screening from existing buildings.

A_{misc} – Miscellaneous Other Effects

This additional attenuation effect described in ISO9613 allows for the effects of propagation through foliage. I have not taken account of any such effects and in my expert opinion they are unlikely to significantly reduce noise levels below those predicted.

Appendix 6

Consultants Experience & Qualifications

Consultant: Dean Robert Kettlewell - MSc MIOA MAE I.Eng
(Director - Principal Acoustic Consultant)

Précis

As Director and Principal Acoustic Consultant with Noise & Vibration Consultants Ltd, Dean has over 35 years background experience in a wide range of issues relating to environmental, industrial and commercial noise and vibration assessment. He currently manages corporate and unit specific contracts for:

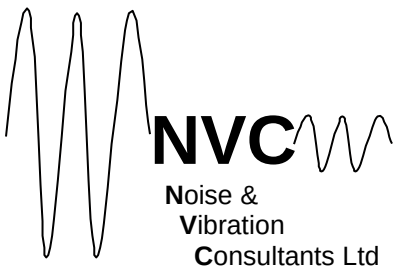
- Assessment of Environmental & Industrial Noise
- Environmental Noise Impact Assessments
- Expert Witness representation for Deafness and `Vibration White Finger' Claims
- Integrated Pollution Prevention and Control (IPPC) Applications
- Industrial Noise Assessment and Control
- Planning Issues for Residential and Commercial Development
- Noise at Work Regulations Assessments
- Building Acoustics and Sound Insulation Tests
- Wind Farm Noise Impact Assessments
- Entertainment Noise Assessment and Control
- Architectural Acoustics
- Specialist knowledge in the Design of Noise Control Systems
- Ground borne vibration measurement and assessment
- Project Management of Noise Control Systems
- Hand-arm Vibration Assessments

Relevant Work Experience

Director & Principal Consultant - Noise & Vibration Consultants Ltd	2001- to date
Senior Acoustic Consultant - Vibrock Limited	1998 - 2001
Associate & Principal Acoustic Consultant - John Savidge & Associates	1994 - 1998
Technical Manager – LBJ Limited (Noise Control Division)	1990 - 1994
Technical Engineer/Technical Manager (1988) - Vibac (Noise Control) Ltd	1982 - 1990

Qualifications and Education
M.Sc. Applied Acoustics (Derby University – Distinction)
HNC Electrical & Electronic Engineering
IOA Diploma in Acoustics & Noise Control
IOA Certificate in Law and Administration
Certificate of Competence in Workplace Noise Assessment
Certificate of Competence in Ground Vibration Monitoring

Affiliations: Member of Institute of Acoustics (MIOA)
Member of Academy of Experts (MAE)
Member of Association of Noise Consultants (ANC)
Incorporated Engineer (I.Eng)


NVC
Noise &
Vibration
Consultants Ltd