



PREPARED: 20 February 2026

KANES HILL, HEDGE END PLANNING CONDITION 10

CONTENTS

1.0	EXECUTIVE SUMMARY	1
2.0	INTRODUCTION	1
3.0	PLANNING CONDITION	2
4.0	SITE AND LOCATION DESCRIPTION	2
5.0	GUIDANCE DOCUMENTS	3
6.0	ENVIRONMENTAL SOUND SURVEY	6
7.0	CONSTRUCTION SUMMARY AND CONTROL MEASURES	8
8.0	CONSTRUCTION NOISE IMPACT	9
9.0	VIBRATION	10
10.0	CONCLUSIONS	12

LIST OF ATTACHMENTS

AS14422/SP1	Indicative Site Plan
APPENDIX A	Acoustic Terminology
APPENDIX B	Predicted Noise Impact at Pinewood Park
APPENDIX C	Predicted Noise Impact at Chaddlewood
APPENDIX D	Predicted Noise Impact at Copper Beeches

Project Ref:	AS14422	Project Name:	Kanes Hill, Hedge End
Report Ref:	AS14422.260126.CNVIA	Report Title:	Planning Condition 10
Client Name:	MJA Consulting		
Project Manager:	Andrew Nesbitt		
Report Author:	Andrew Nesbitt		
Clarke Saunders Acoustics Winchester SO22 5BE		This report has been prepared in response to the instructions of our client. It is not intended for and should not be relied upon by any other party or for any other purpose.	

1.0 EXECUTIVE SUMMARY

- 1.1 Hi-Acre Construction have planning consent to develop The Land at Netley Firs, Kanes Hill, Hedge End, Southampton, SO19 6AJ, with 23no. B1 Use and B2 Use employment units.
- 1.2 Clarke Saunders Acoustics has undertaken a high-level construction noise and vibration assessment based on information provided in the Construction and Environmental Management Statement by Hi-Acre Construction.
- 1.3 The assessment has demonstrated that noise levels from construction activity can be controlled and managed such that it should not result in a significant adverse impact at nearby sensitive dwellings.
- 1.4 Whilst vibration from construction may be just perceptible when working at the south-east boundary, levels are sufficiently low such that this may be tolerated, provided this is communicated with the nearest affected residents. Vibration levels are significantly below known guidance thresholds for cosmetic damage.

2.0 INTRODUCTION

- 2.1 Outline planning consent and reserved matters approval has been granted by Eastleigh Borough Council to develop The Land at Netley Firs, Kanes Hill, Hedge End, Southampton, SO19 6AJ (the site) with 23 new employment units, for Use Class B1 and B2.
- 2.2 Clarke Saunders Acoustics (CSA) has been appointed to assist in discharging Condition 10 of the outline planning application, ref. O/18/82750, which relates to the control of noise and vibration from demolition and construction operations of the site. The site is currently cleared, so no demolition work is required. As a result, this noise and vibration assessment will address the construction phase only.
- 2.3 The construction programme will be phased and is expected to last for five years. It will be separated into six parts as follows:
 - Site preparation
 - Roads and sewers
 - Groundworks
 - Buildings
 - Final surfacing and footpaths
 - Landscaping
- 2.4 Construction work will take place between 0800-1800 Monday to Friday and 0900-1300 on Saturdays. No construction work will be carried out on Sundays or Bank holidays. This is in accordance with Condition 28 of outline approval reference O/18/82750.
- 2.5 The Construction and Environmental Management Statement (CEMS) undertaken by Hi-Acre Construction has been used to assess noise and vibration contributions from anticipated plant and machinery.
- 2.6 A summary of the acoustic terminology used throughout this report is provided in Appendix A.

3.0 PLANNING CONDITION

- 3.1 Condition 10 of the outline planning application, ref. O/18/82750, is reproduced below:

Condition 10

“Prior to the commencement of any demolition or construction operations (including piling) on the site a detailed assessment of the noise and vibration impacts arising from these operations and a scheme of measures for the mitigation of these impacts shall have been submitted to and approved in writing by the Local Planning Authority. The demolition and construction phase of the approved development shall be carried out only in strict accordance with the approved mitigation scheme, and the implementation of the measures set out there in [sic] shall be verified by the submission to and approval in writing by the Local Planning Authority of a verification report of such implementation.

Reason: To minimise the effect of noise and vibration pollution on human health and amenity and on the natural environment.”

4.0 SITE AND LOCATION DESCRIPTION

Existing Site

- 4.1 The existing site comprises a large area of hardstanding in the north part of the site, with the south and east parts of the site generally being undeveloped open grassland. The site was last used by a cement distribution business.
- 4.2 The site is bound by the M27 to the east and A27 to the west. A residential estate, Pinewood Park, lies beyond the A27. To the north, there is further grassland and a collection of existing commercial premises. A wooded copse is located to the south of the site, with sparsely distributed dwellings.
- 4.3 The soundscape is primarily determined by road traffic on the M27 and the A27, which was noted to be generally continuous during both site visits.
- 4.4 The nearest noise-sensitive receptors are:
- Copper Beeches, ca. 45m to the east of the development site;
 - Chaddlewood, ca. 20m to the south-east of the development site;
 - Hilltop and Avalon, located within Pinewood Park, ca. 40m west of the site.

Proposed Development

- 4.5 The proposed development will comprise the construction of 23 new commercial/industrial employment units under Use Class B1 and Use Class B2. The units will comprise a steel frame system with lightweight cladding.
- 4.6 A total of 9 units will be B1 use, namely Units 12 to 20. The B1 units will be positioned in a largely continuous line along the south-east boundary, with additional acoustic screens along the east boundary connecting to Unit 20.
- 4.7 The remaining 14 B2 use units, namely Units 1 to 11 and Units 21 to 23, will be positioned towards the centre and west of the site.

- 4.8 The site will be accessed from a single entry/egress point, toward the north-west of the site on Kanes Hill.
- 4.9 For the construction phase, an area has been designated to the north-east of the site for materials storage, plant parking, HGV parking, refuse and recycling, and welfare, as shown in the appended site plan, Figure AS14422/SP1. This area has been chosen to maximise distance from nearby receptors whilst minimising time spent on the road for deliveries and associated construction vehicles. This area maintains the following separation distances to nearby dwellings:
- Copper Beeches: ca. 100m;
 - Chaddlewood: ca. 200m;
 - Hilltop (Pinewood Park): ca. 200m.

4.10 The appended site plan, Figure AS14422/SP1, shows the site and surrounding area.

5.0 GUIDANCE DOCUMENTS

- 5.1 For the assessment and control of noise and vibration from construction and open sites, guidance is primarily taken from BS5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* (BS5228-1) and BS5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* (BS5228-2).

5.2 BS5228-1

- 5.2.1 BS5228-1 gives recommendations for basic methods of noise control relating to construction sites and open sites, where work activities/operations can generate significant noise levels.
- 5.2.2 As well as tables of noise levels measured from typical construction plant and equipment, the Standard sets out a number of assessment methods in Appendix E for assessing the significance of noise effects.
- 5.2.3 Appendix E of BS5228-1 provides some example methods and criteria for assessing the potential significance of noise effects on sensitive receptors. Two methods are summarised below on the basis of fixed noise limits, and the relative noise change.

Fixed Limits

“The older and more simplistic is based upon exceedance of fixed noise limits which were originally promoted by the Wilson Committee in their report on noise [60] as presented to Parliament in 1963. These noise limits were then included in Advisory Leaflet 72 [61], first published in 1968; the accompanying wording was subsequently revised and the 1976 version is quoted below:

Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut. The noise can be measured with a simple sound level meter, as we hear it, in A-weighted decibels (dB(A))– see note below. Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

- 70 decibels (dBA) in rural, suburban and urban areas away from main road traffic and industrial noise;
- 75 decibels (dBA) in urban areas near main roads in heavy industrial areas.”

5.2.4 The above principle has been expanded over time to include a suite of noise levels covering the whole day/week period taking into account the varying sensitivities through these periods. On the basis of Table E.2 of BS5228-1, the following fixed limits would apply to the permitted working construction hours as measured at any point 1m in front of the most exposed windows of any eligible dwelling:

- Monday to Friday, 08:00 hours to 18:00 hours: 75 dB LAeq,10hr
- Saturday, 08:00 hours to 13:00 hours: 75 dB LAeq,5hr

Relative Limit

5.2.5 The ABC method is a relative assessment methodology based on the change in sound levels with respect to the existing ambient sound levels. Threshold values are determined on the basis of the existing ambient sound climate, rounded to the nearest 5dB. Where noise arising from the construction site exceeds the threshold level, a potential significant impact is indicated. Table E.1 is used to determine the threshold level, reproduced below.

Assessment Category and Threshold Value Period	Threshold Value, in decibels (dB) (LAeq,T)		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Night-time (23:00-07:00)	45	50	55
Evenings and weekends ^{D)}	55	60	65
Daytime (07:00-19:00)	65	70	75
NOTE 1 A potential significant effect is indicated if the LAeq, T noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total LAeq, T noise level for the period increases by more than 3 dB due to site noise. NOTE 3 Applied to residential receptors only.			
^{A)} Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. ^{B)} Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. ^{C)} Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. ^{D)} 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.			

Table E.1: Example threshold of potential significant effect at dwellings

5.3 BS5228-2

- 5.3.1 BS5228-2 gives recommendations for basic methods of vibration control relating to construction sites and open sites, where work activities/operations generate significant vibration levels.
- 5.3.2 The Standard presents response limits to minimise risk of cosmetic damage at nearby sensitive receptors, as well as guidance on human perception and tolerance to vibration levels. It provides several tables with historical vibration levels measured for piling, but does not present any levels for other construction plant and equipment
- 5.3.3 Table B.1 presents typical levels of peak particle velocity (PPV) with respect to human perception.

Vibration Level ^{A), B), C)}	Effect
0.14 mm s ⁻¹	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 mm s ⁻¹	Vibration might be just perceptible in residential environments.
1.0 mm s ⁻¹	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 mm s ⁻¹	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.
^{A)} The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient. ^{B)} A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available. ^{C)} Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.	

Table B.1: Guidance on effects of vibration levels

- 5.3.4 Table B.2 and Figure B.1 provide limits for transient vibration, above which cosmetic damage to buildings could occur.

Line (see Figure B.1)	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

NOTE 1 Values referred to are at the base of the building.

NOTE 2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Table B.2: Transient vibration guide values for cosmetic damage

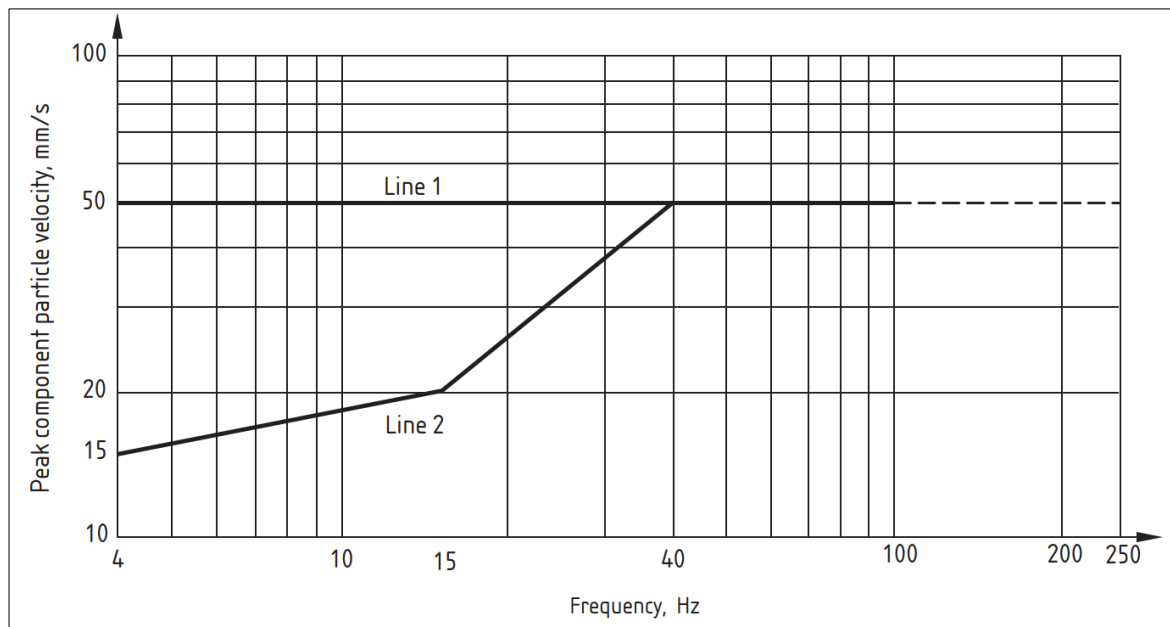


Figure B.1: Transient vibration guide values for cosmetic damage

6.0 ENVIRONMENTAL SOUND SURVEY

- 6.1 To determine existing ambient sound levels at the site for the purposes of a relative noise change assessment, an environmental sound survey was undertaken in proximity to the identified noise-sensitive receptors.
- 6.2 Additional attended measurements were undertaken to further understand variation in environmental sound levels at dwellings in Pinewood Park.

6.3 SURVEY PROCEDURE AND EQUIPMENT

6.3.1 Automated measurements of consecutive 5-minute L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} sound pressure levels were taken at positions LT1 and LT2, as shown in site plan AS14422/SP1, between 16:00 hours on Friday 23rd January and 09:15 hours on Thursday 29th January 2026, following procedures in BS7445:1991 *Description and measurement of environmental noise Part 2: Acquisition of data pertinent to land use*.

6.3.2 Some periods of adverse weather were observed during the survey. These periods are highlighted in grey in the relevant time histories, and the data measured during these times have been omitted from further analysis. Overall, there were sufficient periods of calm and dry weather, which were suitable for the purposes of the survey.

6.3.3 The equipment used during the survey was as follows:

- 2 no. Rion Class 1 sound level meter type NL52;
- 1 no. Rion sound level calibrator type NC74.

6.3.4 Calibration of the sound level meters was verified before and after the surveys, with no significant calibration drift detected. All CSA equipment has current traceable laboratory calibration, which is available for inspection upon request.

6.4 SURVEY RESULTS

6.4.1 The ambient sound levels measured across the typical permitted construction hours at positions LT1 and LT2 are summarised in Table 6.1.

Position	Monitoring Period	Average Ambient $L_{Aeq,10hr}$
LT1	Operational Hours T = 10hrs, 08:00hrs - 18:00hrs	62dB
LT2	Operational Hours T = 10hrs, 08:00hrs - 18:00hrs	60dB

Table 6.1: Measured average ambient and typical background sound levels [dB ref. 20 μ Pa]
*derived as the 90th percentile of the relevant L_{AFmax} dataset

6.4.2 Ambient sound conditions at the Pinewood Park dwellings were similar, where the attended measurements indicated that ambient noise conditions were circa 4dB higher than those measured at Position LT2, due to the receptors' proximity to Kanes Hill.

6.4.3 The environmental sound survey results would place threshold levels under Category A, as determined by the ABC method and Table E.2 of BS5228-1.

7.0 CONSTRUCTION SUMMARY AND CONTROL MEASURES

7.1 The construction will be phased as follows:

- Site preparation
- Roads and sewers
- Groundworks
- Buildings
- Final surfacing and footpaths
- Landscaping

7.2 From the CEMS, it is understood that the plant and machinery used during the site preparation and construction phases will include:

Site Preparation

- 6no. 360 degree excavators;
- 2-4no. front tipping dumpers;
- 2no. concrete crusher.

Balance of works

- 6-10no. 360 deg excavators;
- 6-10no. front tipping dumpers;
- 2no. 1-3 ton roller;
- 2no. telescopic forklift;
- 2no. 35 ton crane.

7.3 It should be noted that these are estimated numbers for plant and machinery, which may vary during the course of the development. All plant and machinery will be used and maintained by fully qualified operatives.

7.4 The total number of construction vehicle trips is not expected to exceed a maximum of 30no. arrivals and 30no. departures per day. This includes all deliveries and collections of materials and equipment, which will be scheduled on an "as-required" basis and will vary throughout the construction programme.

7.5 The layout and massing of the site has been designed and co-ordinated to reduce noise levels from site operations to the nearest noise-sensitive receptors to the east. As the site continues to develop, and the buildings and acoustic screen are completed, noise emissions from construction activity are expected to reduce. Construction of the B1 units and acoustic screens will be prioritised to reduce the resultant construction noise impact as early as possible.

7.6 Landscaping will take place towards the end of the construction phase, once the employment units are largely complete. This is to enable the retention of areas for the storage of building materials, plant, machinery and operative parking.

7.7 NOISE CONTROL MEASURES

7.7.1 The following control measures will be implemented to reduce construction noise emissions emanating from the site:

General Considerations

- Acoustic screening effects will be maximised where possible.
- Rubber linings will be used in chutes.
- The site compound is located optimally with respect to nearby noise-sensitive receptors. The compound will be used for material storage, plant storage, deliveries, refuse and recycling.
- Some materials will be stored in pre-designated areas to minimise the need to transfer material again to where it will be used. All materials will be stored neatly and appropriately with the aim of preventing double handling.

Plant

- Quiet technology used where practicable.
- Fixed plant will be screened from receptors where possible.

Vehicle Activity

- Parking for HGVs will also be located at the site compound.
- Upon arrival at the site, all delivery vehicles will be directed to designated unloading areas within the site compound, away from the public highway and nearby sensitive receptors.
- In instances where reversing cannot be avoided, a qualified banksman will be employed to supervise reversing manoeuvres. This will minimise the number of movements and requirements for reversing alarms.
- Carefully managed vehicular activity to avoid 'stacking'.

Construction Works

- All high noise activities conducted within permitted working hours.
- Start concrete pours early to avoid overruns.
- Conduct noisy works internally, where possible.

Community Liaison

- Send regular updates to affected neighbours.
- Notify neighbours of any future works outside of working hours, if permitted.

8.0 CONSTRUCTION NOISE IMPACT

8.1 The wide range of construction works and locations will be conducted across the duration of the development. The associated uncertainty is acknowledged. The following high level construction noise impact assessment is prepared to demonstrate that the mitigation measures in place are appropriate for controlling construction noise levels from a reasonable worst-case scenario, to below the thresholds given in BS5228-1.

8.2 Noise propagation calculations have been undertaken to nearby noise-sensitive dwellings on the basis of the equipment provided in the CEMS, referencing library activity noise levels for equivalent plant and machinery from BS5228-1.

- 8.3 Operational 'on-times', that is the time in which the plant or equipment is operating and generating noise, has been taken from use of the equipment in which CSA has witnessed and measured at similar projects.
- 8.4 The calculations are undertaken on the basis of Section 278 works and internal roadwork being undertaken and completed in Spring and Autumn 2026. Calculations for works including groundworks, buildings, final surfacing and footpaths, and landscaping include necessary construction programme assumptions, which is not yet finalised.
- 8.5 The relative position of noise sources with respect to the dwellings has been accounted for. Construction activity is assumed to be distributed across the site, where different works areas are represented in the calculations as near to the receptor, centrally within the site, and far from the receptor.
- 8.6 Noise calculation summaries to the three nearest noise-sensitive receptors are presented in Appendices B to D, on the basis of the known phasing and works. The source noise levels and associated BS5228-1 table reference are provided for transparency.
- 8.7 These high-level calculations have demonstrated that neither the fixed noise threshold nor relative noise threshold as per the ABC method, are expected to be exceeded from the primary noise sources.
- 8.8 It is fully acknowledged that over the course of the five-year build programme, a wider range of plant, machinery, equipment and construction noise sources may be present. This high-level assessment addresses the primary significant noise sources identified in the CEMS. Impact from smaller equipment and machinery, including hand-held tools will be lower in most cases, due to lower source noise levels.
- 8.9 Furthermore, hand-tools and equipment associated with later stages of the construction programme will generally be reduced because of acoustic screenings effects afforded by the building massing and acoustic barriers, and from the internal working environment in the case of fitout works. The lightweight cladding proposed for the commercial units is expected to produce a reasonable resistance to sound transmission, with typical thermal cladding panels providing a sound reduction performance of at least R_w 25dB.

9.0 VIBRATION

- 9.1.1 The following figure presents historic PPV levels, with distance, for a range of construction equipment.

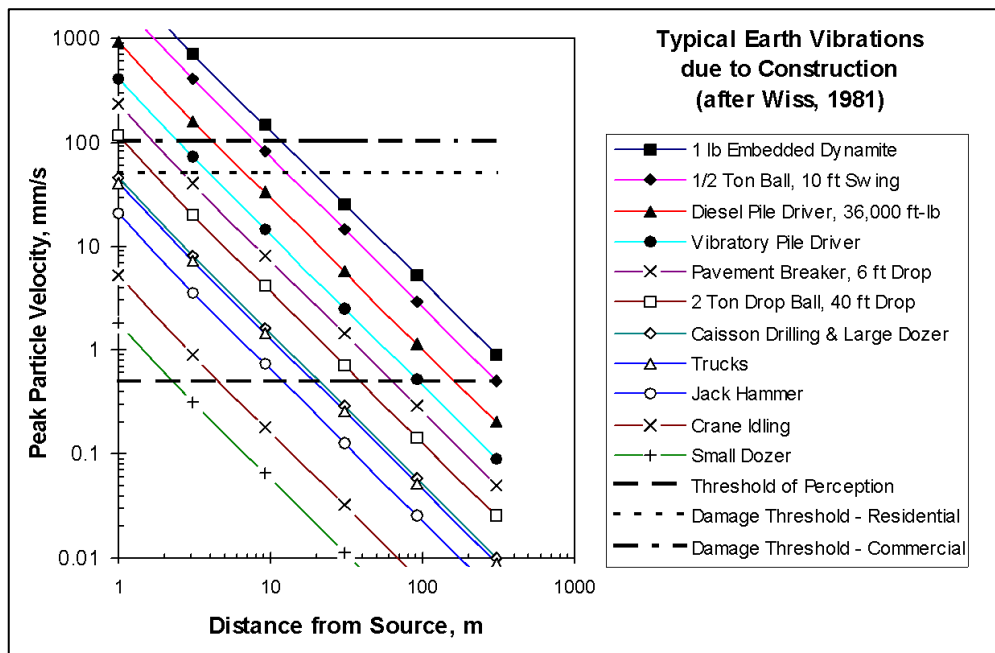


Figure 9.1: PPV variation of typical construction activity with distance, J.F. Wiss (1981)¹.

- 9.1.2 As shown in Figure 9.1, with the exception of large impact and piling equipment, PPV levels from most construction activities can be controlled to 1 mm/s PPV at a distance of 20m, depending on ground conditions. The nearest dwelling to the site is Chaddlewood, ca. 20m from the south-east boundary. Occupants at this receptor should, therefore, be given advanced notice about higher impact vibration works in proximity to the boundary, however, in general, construction vibration levels are expected to be tolerable and significantly below guidance thresholds for cosmetic damage.

Piling

- 9.1.3 Consideration is given to piling which has the potential to generate higher vibration levels than other construction equipment, and will be required along the south-east boundary for the construction of the B1 units.
- 9.1.4 To minimise impact, Continuous Flight Auger (CFA) piling will be used throughout the construction programme. The levels of vibration associated with continuous flight auger injected piling and pressed-in piling do not involve rapid acceleration or deceleration of tools in contact with the ground but rely to a large extent on steady motions. Resultant vibration levels are, therefore, significantly lower than impact piling or vibro-piling equivalents.
- 9.1.5 BS5228-2 presents data in Table D.6, demonstrating that auger piling such as CFA may result in PPV levels between 0.05 mm/s PPV and 0.23 mm/s at a distance of 20m. Vibration from piling activity may, therefore, tend towards perceptibility, but is likely to be tolerable where prior explanation is given. Vibration levels would not be expected to result in cosmetic damage, so no further mitigation measures should be required.

¹ Vibrations During Construction Operations, U.S. Department of Transportation, Federal Highway Administration, June 1981. J.F. Wiss

10.0 CONCLUSIONS

- 10.1 It is proposed to develop The Land at Netley Firs, Kanes Hill, Hedge End, Southampton, SO19 6AJ, with 23no. B1 Use and B2 Use employment units.
- 10.2 Clarke Saunders Acoustics has undertaken a high-level construction noise and vibration assessment on the basis of the information provided in the Construction and Environmental Management Statement by Hi-Acre Construction.
- 10.3 The assessment has demonstrated that noise levels from construction activity can be controlled and managed such that it should not result in a significant adverse impact at nearby sensitive dwellings.
- 10.4 Whilst vibration from construction may be occasionally perceptible, levels are sufficiently low such that this may be tolerated where this is communicated with the nearest affected dwelling. Vibration levels should be significantly below known guidance thresholds for cosmetic damage.
- 10.5 On the basis of the assessment, Condition 10 of the outline planning application, ref. O/18/82750 can be discharged.



Andrew Nesbitt MIOA
CLARKE SAUNDERS ACOUSTICS



Indicative Site Plan

Figure AS14422/SP1

Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A .
L_{eq}:	A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90}:	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max}:	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.
NR	<i>Noise Rating</i> . A single figure noise level rating that takes into account the frequency content of an acoustic environment.
R	<i>Sound Reduction Index</i> . Effectively the Level Difference of a building element when measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010 and corrected for its size and the reverberant characteristics of the receive room.
D	The sound insulation performance of a construction is described in terms of the difference in sound level on either side of the construction in the presence of a

sound source on one side and the reverberant characteristics of the adjoining 'receive' space. D is the arithmetic Level Difference in decibels between the source and receive sound levels when filtered into frequency bands.

D_{nT}	<i>Weighted Standardised Level Difference.</i> As defined in BS EN ISO 717-1, representing the Weighted Level Difference, when standardised for reference receiving room reverberant characteristics.
$D_{n,e}$	Normalised sound insulation of small building elements of fixed dimensions, such as vents, measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010.
$D_{n,f}$	Flanking sound insulation of lightweight elements, such as curtain wall mullions, measured in an accredited laboratory test suite in accordance with the procedures laid down in ISO 10848-2:2006
R_w D_w $D_{nT,w}$ $D_{n,e,w}$ $D_{n,f,w}$	Value of parameter, determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1 to provide a single-figure value.
C , C_{tr}	Spectral adaptation terms to be added to a single number quantity such as $D_{nT,w}$, to take account of the sound insulation within frequency ranges of particular interest.
$L'_{nT,w}$	<i>Weighted Standardised Impact Sound Pressure Level</i> as defined in BS EN ISO 717-2, representing the level of sound pressure when measured within a space where the floor above is under excitation from a calibrated tapping machine, standardised for the receiving room reverberant characteristics.
ΔL_w	Change in impact sound pressure level when a floor is fitted with a 'soft' or resilient covering, as measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-3:2010.

Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band.

In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000
------------------------------------	----	-----	-----	-----	------	------	------	------

Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other

experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if they climb up a ladder (and are closer to the top of the barrier) than if they were standing at ground level. Equally if they sat on the ground the sound would seem quieter than if standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

APPENDIX B

AS14422

BS5228-1 Construction Noise Levels at Pinewood Park

Calendar		Section 278 Works and Internal Roadworks														Groundworks, Buildings, Final Surfacing and Landscaping																																			
		360° Excavator		360° Excavator		360° Excavator		Dumper		Dumper		Crushing Concrete (tracked crusher)		Crushing Concrete (tracked crusher)		Total Sound Pressure Level, LAeq,10hr (dB)	360° Excavator		360° Excavator		360° Excavator		Dumper		Dumper		Dumper		Road Roller		Road Roller		Mobile Telescopic Crane (incl. idling)		Mobile Telescopic Crane (incl. idling)		Telescopic Handler		Telescopic Handler		Crawler Mounted Rig (CFA Piling)		Delivery Vehicles		Concrete Pump + Concrete mixer truck		Power Float		Total Sound Pressure Level, LAeq,10hr (dB)		
		Near		Central		Far		Near		Central		Near		Far			Near		Central		Far		Near		Central		Far		Near		Far		Near		Far		Near		Far		Near		Compound		Near		Near				
		C.2, 16		C.2, 16		C.2, 16		C.4, 3		C.4, 3		C.1, 14		C.1, 14			C.2, 16		C.2, 16		C.2, 16		C.4, 3		C.4, 3		C.4, 3		C.5, 19		C.5, 19		C.4, 46		C.4, 46		C.4, 55		C.4, 55		C.3, 21		C.11, 10		C.3, 26		D.6, 44				
		On Time'		20%		20%		20%		5%		5%		20%			20%		10%		10%		10%		5%		5%		5%		20%		20%		20%		20%		10%		5%		20%		20%						
		Reference SPL, dB(A)		75 @ 10m		75 @ 10m		75 @ 10m		76 @ 10m		76 @ 10m		82 @ 10m			82 @ 10m		75 @ 10m		75 @ 10m		75 @ 10m		76 @ 10m		76 @ 10m		76 @ 10m		80 @ 10m		80 @ 10m		67 @ 10m		67 @ 10m		70 @ 10m		70 @ 10m		79 @ 10m		77 @ 10m		75 @ 10m			72 @ 10m	
Distance to Receptor		65m		100m		140m		65m		100m		70m		185m		75m		115m		145m		75m		115m		145m		80m		135m		90m		135m		75m		145m		70m		195m		80m		80m					
Year	Months	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)	No.	Adjusted SPL, dB(A)								
2026	January																																																		
	February																																																		
	March	2	55	2	51	2	48	2	50	2	46	1	58	1	50	61																																			
	April	2	55	2	51	2	48	2	50	2	46	1	58	1	50	61																																			
	May	2	55	2	51	2	48	2	50	2	46	1	58	1	50	61																																			
	June																																																		
	July																																																		
	August																																																		
	September	2	55	2	51	2	48	2	50	2	46	1	58	1	50	61																																			
	October	2	55	2	51	2	48	2	50	2	46	1	58	1	50	61																																			
	November	2	55	2	51	2	48	2	50	2	46	1	58	1	50	61																																			
	December																																																		
2027	January															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40			30	53					60					
	February															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40			30	53					60					
	March															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40			30	53					60					
	April															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40			30	53					60					
	May															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40			30	53					60					
	June															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40			30	53					60					
	July															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	August															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	September															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	October															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	November															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	December															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
2028	January															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	February															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	March															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	April															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	May															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	June															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	July															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	August															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	September															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	October															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	November															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
	December															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	46	1	40	1	52	30	53					61					
2029	January															2	51	3	49	4	48	2	48	3	47	4	46	1	55	1	50			1	41	1	37			30	53	2	53	2	50			60			
	February															2	51	3	49	4	48	2	48	3	47	4	46						1	41	1	37	1	46	1	40			30	53	2	53	2	50			60
	March															2	51	3	49	4	48	2	48	3	47	4	46						1	41	1	37	1	46	1	40			30	53	2	53	2	50			60
	April															2	51	3	49	4	48	2	48	3	47	4	46						1	41	1	37	1	46	1	40			30	53	2	53	2	50			60
	May															2	51	3	49	4	48	2	48	3	47	4	46						1	41	1	37	1	46	1	40			30	53	2	53	2	50			60
	June															2	51	3	49	4	48	2	48	3	47	4	46						1	41	1	37	1	46	1	40			30	53	2	53	2	50			60
	July																																																		

AS14422

[illegible]

AS14422

Calendar
