2023

Land off Gannow I ane, Burnley

858233 Noise Assessment

NOISE IMPACT ASSESSMENT

REF: 2204t-Land off Gannorv Lane-NIA-V2
DATE: 6tr'January 2023

AUDIO f;sg

I CONTENTS

Content Author: Stuart Cumming MIOA

Contend Checker: Craig Williams

I.INTRODUCTION

Audio Labs has been instructecl to assess noise levels affecting the proposed change ofuse development site at the formel Dexter Paints site on the Land off Gannorv Lane. Bumley.

The assesstnent aims to evaluate tl.re eristing noise levels at the site and cornrnent n the developrnent site's suitability for use in residential purposes.

If the developrnent is not curently suitable for use, this report will piovide recornmendatrons for rnitigation l.neasures. The rnitigatioll measures ivill be designed to achieve a cornfortable intental and e.rternal acoLrstic environrnent. in line with the British Standards and Planning Policy.

The scope ofthe assessment is based on good practice techniques and extensive experience rvith similar' p[r]ol ec ts.

REVISION CHANGES

- V2: Acldition of a vibration noise assesstnent: inclucling arnendments to the guidance section ancl a rvhole new section on viblation iu

2. CRITERIA

PLANNING CONDITIONS & GUIDANCE

To ensure that the above criteria is adheled to, this report is to be primarily based on the following standards:

- The National Planning Policy Frarnervork (2012)
- The Noise Policy Statement for England (2010)
- BS 82-13:2()14.'Gr.ridance on sound insulatit'rn and noise reduction in buildines'

ENGLISH PLANNING POLICY ON NOISE IMPACT - THE NPPF AND NPSE

The NPPF is the over-arching planning policy document that applies to all new developrnents in England. The guidance and assessrnent criteria given (or referred to) in this docurnent can therefore be applied to all other standards in tenns of assessing the suitability of granting planning pennission with respect to noise impact.

The NPPF states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and qirality of life as a result of new developrnent;
- Mitigate and reduce to a mrnimurn other adverse impacts on health and quality of life arising from noise fi'om new development, including through the use of conditions;
- Recognise that development will often create some noise and existing businesses war.rting to develop in continuance oftheir business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and
- Identify and protect areas oftranquillity which have remained relatively undisturbed by noise and are prized fol their recreational arnenity value for this reason.

With specific reference to noise irnpact. the NPPF docurnent refers to the Noise Policy Staternent for England (NPSE). The NPSE provides guidance whicl.r er.rables decisions to be made regarding the acceptable noise burden to place on society, using three key phases -the No Observable Effect Level (NOEL), the Lorvest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL)

In order to provide a consistent frame ofreference (and to allow a view to be taken on the suitability ofthe application with reference to the relevant planning guidance). the levels or criteria given in other relevant documents used in assessrnent will be re-frarned in terms of the following:

No Observuble Elfect Level (NOEL)

The NOEL isthe level of noise irnpact belorv which no effect can be detected, and there rvould be no discernible negative effect on health or quality oflife.

Lov'est Obsen'ecl Ath'erse Elfect Let,el (LOAEL)

The LOAEL is the lorvest level of noise impact above which adverse effects on health ol quality of life can be detected.

Designing noise irnpacts to be equalto-or-less{han the LOAEL should see that any adverse effects on health or quality ol lile a negligible.

Signdicunt Ob.served Adverse Elfect Leyel (SOAEL)

The SOAEL is the level above rvhich significant adverse effects on health and quality of life occur. Designs should ahvays seek to avoid a noise irnpact rvhich rvould be categorised as SOAEL.

NOISE LEVELS WITHTN RESTDENTTAL BUtLDtNG AND EXTERNAL AMENtTy AREAS - BS 8233 / WHO

Figure 2.1 shows the recomrnended internal noise levels for residential dwellings, as prescribed in BS 8233:2014:

Table 2-1: 8S8233:2014 IANL for

Dwellings Area	Day Level (07:00 - 23:00) dB(A)	Night Level (23:00 - 07:00) dB(A)
Living Roorns	35	N/A
Dining Rooms	40	N/A
Bedroorns	35	30

It is therefore recommended that (in order to provide a comfortable environment within habitable rooms). the extemal building fabric be generally designed to achieve the internal night-time noise level of 3OdB(A) and daytime level of 35dB(A).

Tl.re figures given rvould be considered the LOAEL, and levels below tl.re figures above would be considered the NOEL. Levels significantly greater tl.ran the figures would be considered the SOAEL. and should be avoided.

BS 8233:2014 also recornmends than individual noise events at night can be disturbing to sleep pattems, and that a guideline level should be set in tenns of SEL or Lnp.6a1

BS 8233:2014 does not give a definitive level for intemal rnax levels, or define an appropriate nurnber of erceedances pel night. Florvever'. the Wolld Flealth Organisation's (luidelines lor Conrmunity Noise' r'et'crences a stud). h1 Vallet & Veruct. 199 l. u,hich conclucled that "For a good slcep. it is bclieved that indool sonnd pressure levels should uot exceed approximately 45 dB L.rp,,o., more than l0- I 5 times per night."

For the purposes of assessment. less than l0 exceedances per night would be considered the NOEL, with l5 exceedances considered the LOAEL. Numbers significantly in excess of this rvould be considered the SOAEL.

858233 also states that it is desirable that the steady noise level in extemal arnenity areas (such as gardens or outcloor living areas) does not exceed 50dB L1*.1, with 55dB La",l.1 being acceptable in noisier environmetrts.
This is in line with recornrnendations given in the WHO Guiclelir.res for Comrnunity Noise.

However. in the period since the original issue of the WHO guidelines, the Government has set all English Local Planning Authorities specific five-year housing supply targets. This has places greater ernpl.rasis on making efficient use of land resource earmarked fol residential development. BS 8233:2014 recognises this, and states that it should be accepted that these values are not achievable in all circumstances rvhere development wor.rld be otherwise desirable. The docurnerrt goes o11 to suggest that in areas such as city cerltres. or urban areas adjoining the transpofi network. a comprornise (betrveen elevated external noise levels and ensuring development needs) is warranted.

On this basis, levels lorver than 50dB(A) rvill be considered the lr-OEL, with a level of 55dB(A) consideled the LOAEL. Levels significantly greater than this would be considered the SOAEL. but would be addressed on a case-by-case basis, and would not necessarily be considered a barrier to developrnent.

BS 6-172-1:2008 - (Assessment of building vibration rvith respect to human response)

People who are inside buildings can be adversely affected by excessive levels ofvibration. This adverse level is often assessed by finding the vibration dose in the building. Current understanding indicates that the vibration dose value (VDV) is the most useful parameter for this type of assessment.

Values are presented in section 6 ofBS 64'72-I:2008. rvhich can be used to assess human responses to vibration.
These levels are shown in Table 2-2 below:

Table 2-2: BS 6472-1:2008 - Vibration dose value ranges in residential buildings

Place and time	Low probability of comment ms-l' 75	Adverse comment adverse possible ms-l' 75	Adverse comment probable nls-1.75
Residential buildings 16hr day	0.2 -0.4	0.4 - 0.8	0.8 - 1.6
Residential buildings 8hr night	0.1 – 02	0.2 -0.4	0.4 - 0.8

Based on the values shorvn in rable2-2 above, levels measured below those in tlie table should be considered NOEL. Levels that have a 'lol' probabilin' ql udterse comtnent 'or where '.,ldyer.se con,tnent is possihle 'should be considc-red the LOAEI-. Wherc levels are high enoush that 'rlrA'erse comnen! i.s prohahle '(or higher), they should be considered the SOAEL.

BS 5228-2:2009 Code of practice for noise and vibration control on construction and open sites

Although not cornpletely relevarlt, BS 5228 provides lirnit levels lor vibration in residences with regards to Peak particle velocity (PPV). Table B.l shows guidance values on the effects of vibration levels:

Table 8.1 Guidance on effeds of vibration levels

Vibration levelA)'B)'cl	Effed
0.14 mm.s-'	Mbration might be just perceptible in the most sensitive situations for most vibration frequences associated with construction. At lower frequencies, people are les sensitive to vibration.
0.3 mm.s-r	Vibration might be just perceptible in residential environments.
'1.0 mm's-r	tt 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-t	Vibration is likely to be intolerable for any more than a very brief exposure to this level E in most building environments @.

ts

a The magnitudes of the values prerented apply to a measurement position that is reprerentative of the poim 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.

a Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in ewry case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or exp€€ted 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 expoiure is likely to give rise to any degree of adverse comment. @

Using this infonnation. we can show the likely irnpact of annoyance at nearby receptors.

Table 2-3: Peak Particle Velocity (PPV) effect on receptors

Place and time	Low probability of adverse comment ms^{-1}	Adverse comment possible nts-l	Adverse comment probable ms^{-1}
Residential envlronlnents	< 0.3	0.3-1.0	>1.0

Based on the values shown in Table 2-3 above, levels measured below those in the table should be considered NOEL,.Levelsthathar,ea'Iou'probabilin'ofutlversecomne,rt' orwhere'..lth,erseconrmentispossihle'sl-rould be considered the I-OAEL. Where levels ale h igh enou-eh that 'Jrlr'erse contnte nt i.s prohub le' 1or higher'), they should be considered the SOAEL.

Table 8.2 Transient vibration guide values for cosmetic damage

Line (see Figurc 8.1)	Tlpe of building	Peak component particle velocitlr in frequency range of predominant pulse	
		4Hzto15Hz	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 freguencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Furthermore Table B.2 frorn B55228-2 shows the transient vibration guide for cosmetic damage. This is the level ofvibration that is likely to cause stluctural damage to a property.

3. SITE

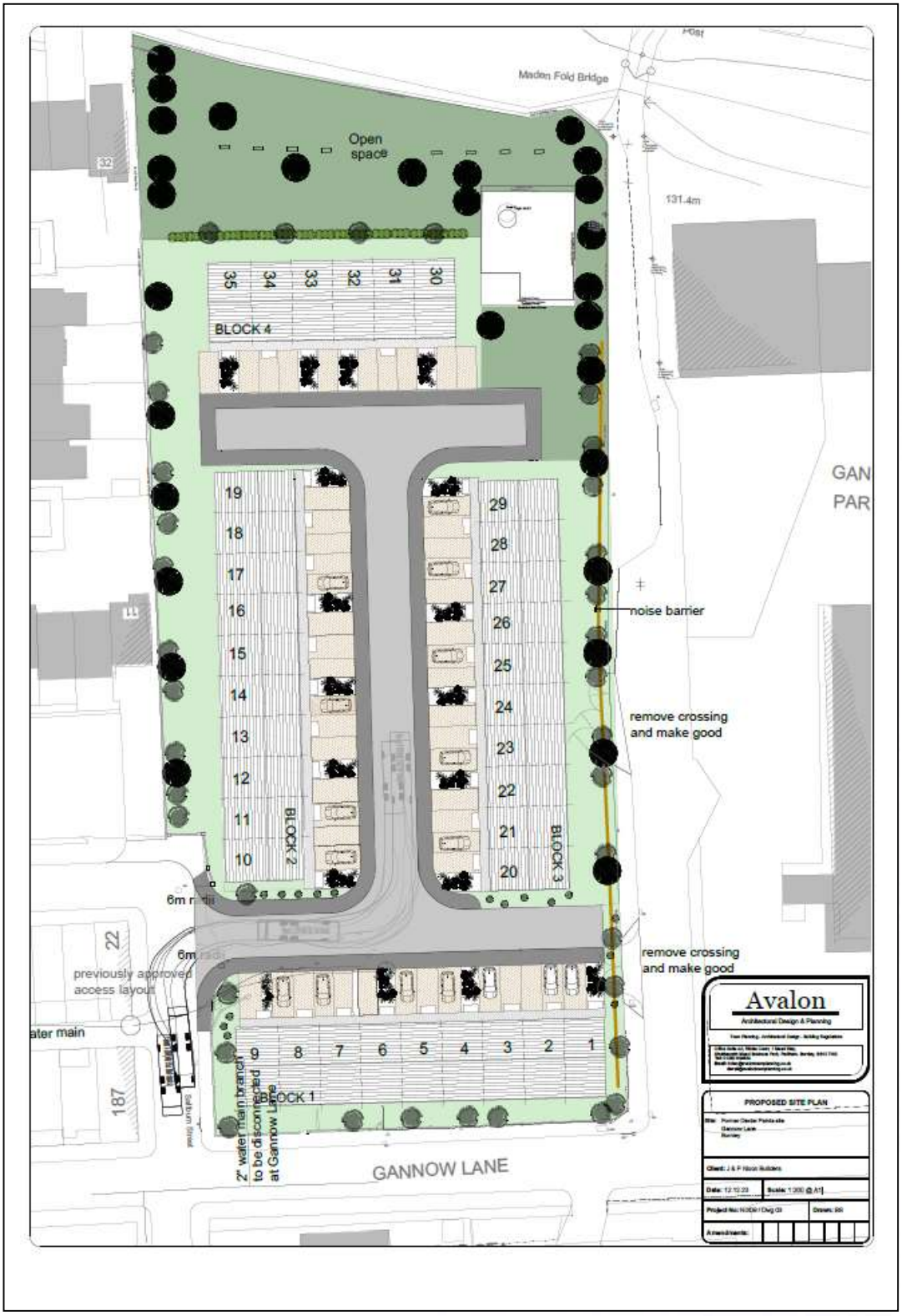
The proposed developrnent is located at Land off Cannow Lane, Bulnley The site is in a mixed-use area, sunounded by industrial. cornmercial and residential properties.

Tl.re main sources of noise affecting tlie noise clirnate at the site are from:

- Local road traffic along Gannorv Lane
- Distant road traffic noise frorn sunounding roacl network
- Some contribution frorn nearby comrnercial I industrial units

Figure 3-1: Site Area

Figure 3-2: Site Boundary



4. ENVIRONMENTAL NOISE

Attended and unattended site rneasurements olenvironmental noise affecting the site lvere taken on the 13th 14th September 2022. Full 24-hour rnonitoring was taken at one extenlal locations as shown in figure 4.1 below:

Figure 4-1 - External Monitoring Locations

Measuretnent location I (NilPl) r,vas unattended and left on site for 24hrs.30 minute spot rleasurements were also taken at MP2 and MP3. [t is r.rnderstood from the engineer on site that the rnain noise source is frorn road traffic along Gannow Road.

Note that i5-rninute lneasurelnent peliod rvas used for daytirne measurements and a 5-rninute period during the night so that a worst-case scenario could be obtained. Full logging data was also obtained usir.rg the fast tirneweighting.

Table 4-1 below provides a list of the monitoring positions used during the survey.

Table 4-1: Monitoring Periods

Date	Period	Time	t\lonitoring Position Surveved
13th - 14'h September 2022	Night (8:00hrs)	23:00 - 07:00	MP1
	Day (16:00lirs)	07:00 - 2-j:00	
l4tr'september 2022	Spot Measurernen	13:12 - 13:42	M P2
l4'r'september 2022	t (30mins) Spot Measulement (30rnins)	13:45 - l4:15	MP3

Full trcise ntottitoring ,ileasrrrentailts cutr be fountl itr .4ppetuli,r .1.

EQU IPM ENT AN D SITE NOTES

Noise rneasurements rvere obtained using the follorving equipurent which lias been calibrated in accordance with BS EN 60651:1994 and BS 7445:1993:

- Class I 01dB Solo sound level rneter (serial number: 065396)
- Vibrock V9000 Seisrnograph (serial number: 2210)

The sound level meter rvas calibrated before and after use at each penod. No significant drift was rvitnessed and calibration certificates for the equipment can be rnade available upon request.

The arnbient ternperature during the survey was noted to be between 10-14'C during the survey. Conditior.rs were noted to be dry. Wind speeds were noted to be <5rns-r on average.

Table 4-2: Monitoring Data Summary

Position	lllonitoring Period	Average L..req,r (dB)	Highest LAF,n,". (dB)	Highest Lrro (dB)	Lorvest L,rso (dB)
MP1	Day	44.1	67.6	46.4	38.8
	Night	40.7	53.1	42.9	33.9
MP2	Spot Measure	49.0	63.2	50.7	45.9
MP3	Spot Measure	53.7	64.4	57.5	47.3

Drscu ssroN

Subjective irnpressions on site and results above suggest that the site is subject to rnoderately-low levels of environmental noise during the claytime and night-time periods. Road traffic noise along Gannow Road and a116 some industrial noise from acljacent site contribute to the overall noise clirnate.

ThehighestLer.n,". levelsexceeding4SdBdidsolessthan l0tirnesanightatMPl.Comectingfordistancefrorr a moving point source gives the highest Lar.mar ?t the closest residences as being 68dB at 10rn. This is broadly in line with the rneasurernents at MP3, although it is slightly louder and istherefore considered a worst-case

scenano.

5. BUTLDING FAqADE CALCULATIONS

RESIDENTIAL DWELLINGS

Cuidance provided in BS 823,1:2014 states that the extelnal building fabric for residential dwellings should be designer'l sothatthe maximum steady-state intemal daytirne level of 35 dB L.asq.1 arid niglit-time level of 30 dB LnEq,1 can be achieved within habitable rooms.

With reference to cunent govemrnental planning policies. these levels would be considered the LOAEL, and therefore using these levels as maxirnum values (and generally providing intemal levels less than these) would be providing the NOEL level of impact.

A reasonable standard in bedroorns should also consider individual noise events, so that sleep patterns are not disturhed. The WHO guidelirres interpret this as an intemal level of Lep.,n.,45 dB being exceeded no more than 1-5 tirnes per night.

BUILDING FABRIC

The weakest elements in the building fabric acoustically are usually noted to be natural ventilators and glazing systerns. ln this case, there are no ventilators. but they will be included in the follorving section as they may be installed as part of the building refurbishrnent.

As such it is considered that suitable glazing and ventilation attenuation can be provided to habitable roolns, such that intemal avel'age noise levels rvould be within acceptable lirnits, as per BS 8233.

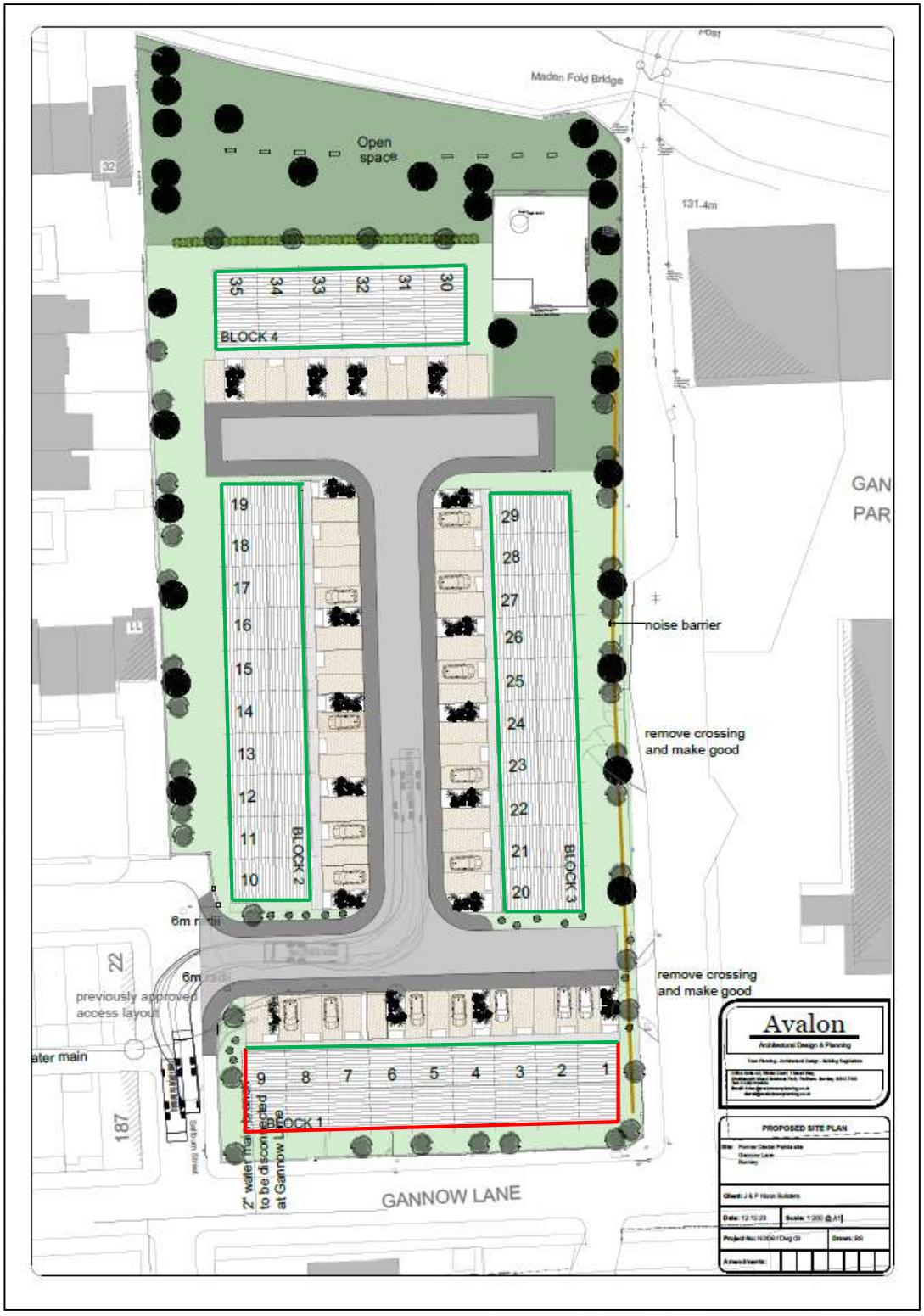
The following calculations are based upon the averaged La.o,1 values. It is then anticipated that if the recommended glazing and ventilation specification are installed as set out herein, intemal average noise levels would be within acceptable limits, as per B58233 critelia. The "mole rigolous calculation method" outlinecl in BS 8233:2014 has been used.

1"q,2= L"q,rrt10to9r6(f rol#+f ro*+arot#+ f ro*'; itltosro(i)*,

It is tvpical that tricklc ventilattrrs are located either in sindorv heads or..through-s'all' and thar thcse at'e designecl to provide the miuimtrm background ventilatiorl rates under Builcling Regulation Part F. It is therefore critical that the internal arnbient noise level targets are rnet with such ventilators in their fu[y-open position.

All of the glazing and ventilation in the building should meet the values providecl fol single-glazed or doubleglazed treatment conditions as coloured belorv as a rninimurn requirement:

Figure 5-1: Glazing Conditions



GLAZING AND VENTILATION TREATMENT

condition 1 (Red)

Calculations sho'uv that the following glazing and ventilation specification can be used to achieve the required ir.rternal ambient noise level:

Double-Gla:.ed

- 8rnrn Glass pane
- 6-l6mm air gap
- 4rnm Laminated pane

This construction should be rated at a rninimurn of R" (C; Cn) 33(-1: -4) dB.

Ventilation

In the event that natural ventilation is to be used; ventilators should be rated at a lninimurn of D,,."",,,(C:Cr,) 55dB. Airbrick type ventilators are recomrnendeci.

Condition 2 {Green)

Calculations show that the follorving glazing and ventilation specification can be used to achieve the required internal arnbient noise level:

Double-Gla:.ed

- 4rnrn Glass pane
- 6-l6rnrn Air gap
- 4mrn Glass pane

This construction should be rated at a rninimtnn of R,, (C; f,,) 29(-1: -4) dB.

Ventilation

In tlie event that natural ventilation is to be used; standard trickle ventilators should be rated at a rninimr.un of Dn."'r' (C;C'J 27dB.

N IGHT-Tl M E Lar,r',rnx EXPOSU RE

As stated above. rvithin beclrooms, BS 8233:2014 recommends that individual noise events should not disturb sleep pattems. The WHO guiclelines interpret this an intemal level of45dB Lrr..", being exceeded no rnore tharl i5 tirnes a night.

The tagade specit'ications stated above should ensure that irnpulsive noise levels should not exceed 45dB rnore than 15 tirnes inside bedrooms during the night.

GENERAL GLAZING NOTES

All rvindows should be well sealed rvhen closed. It is irnperative that the frarne does not comprornise the perfonnance of the glazing. [t is thelefore recornrnended that the frames be of uPVC, hardrvood or aluminiurn constructions and be well sealed into the aperlures.

Softrvood windows could also be used. providing guarantees are given by the manufacturer that acoustic pt'operties will be rnaintarned for the life of the windorvs.

No gaps should be visible around the frame from the exterior.

All glazing should meet with rninirnum requirernents under Part L of Building Requirernents.

GENERAL VENTILATION NOTES

The ventilators should be capable ofproviding the backgroiurd ventilation rates given in Part F ofthe Building Regulations. Calculations have been based upon ploviding one such vent per habitable roorn. Shoukl there be a reqr.tiretnent for an increased nurnber of ventilators per room, the specification of the glazing and ventilation may need to be uplifted accordingly.

Although opening windorvs should not be necessary in order to provide background ventilation. the windorvs may still be opelable for purge ventilation as defined in Parl F (for exarnple following painting or accidental burning ol'ftxrdl or at the occupants' choice.

In this instance, intemal alnbient noise levels may exceed the limits given in Table 2.1. however this wor.rld be consideled acceptable due to the short dulation and infrequent occurrence ofthis situation. where the requirernent to purge airborne toxins temporarily takes precedence over low intemal ambient noise levels.

6. EXTERNAL AMENITY AREAS

BS 823i:2014, the NPPF and the NPSE all indicate that a balanced approach should be taken rvhen detennining the acceptability oisuch external amenity noise levels.

Specifically the guidance given in BS 8233:2014 states:

> 'For tradition c\ternal arc'as that are used for arnenity space, such as garden and patios. it is desirable that the extemal noise level does not erceed 50dB La*.1. rvith an upper guideline value of 55dB L,1.q.1 which would be acceptable in noisier environments. However. it is also recognised that these guideline valLles are not achievable in all circurnstances where developrnent might be desirable.
>
> In higher noise areas, such as city centres or urban areas adjoining the strategic transport netrvork, a cotnpromise betweeu elevated noise levels and other factors. such as the convenience ol living in these locations or making efficient use ofland resources to ensure development needs can be rnet.
>
> might be warranted. In Such a situation, development sl.rould be designed to achieve the lowest practica[rle levels in these extcrnal anrcnit.v spaces. but should not be plohibited.'

The predicted noise levels in garden/arnenity areas at the rear ofthe properties are exposed to levels between 5055dB(A), with sorne areas predicted to have lower levels. This is considered to be the LOAEL.

7. VIBRATION ASSESSMENT

A vibration assessmeut has been requestecl by the local authority. due to the proxirnity ofthe site to nearby industrial land to the east. As discussed in section 2 of this report. the vibration dose value (VDV) and peak particle velocity (PPV) on the site have been assessed as part oftlris survey.

It rvas uoted subjectively by the engineel on site that no vibration rvas f-elt on the floor of the site. No soirrces of vibration rvere obvious near to the site and tl.rat there was no re-radiated noise corning frorr any nearby structures.

The PPV was collected during the vibration survey between the 7th and 8'r'of Decernber'2022. VDV was not collected by the equipment due to a hardrvare enor. lt is noted that a very low level ofvibration has been tneasured in tertns of PPV. As such, it is not thought to be productive to carry out a further survey as it will likely show there is no impact.

The results in Table 7-1 show the maximurn rneasured PPV dtrring the daytirne and night-tirne on each axis. Fufthermole, we can look at the number of events per period which exceed 0.300mrns-r.

Table 7-1: Vibration assessment results - Maximum PPV recorded during survey

Period	L Axis mms-1	V Aris mms-1	T Axis mms-l
Day	0.400	0.475	0.125
Night	0.075	0.375	0.075

Table 7-2: Number of PPV events greater than 0.3 mms'1 Period

L Axis	(Events > 0.300 mms-1)	V Axis mms-1 (Events > 0.300 mms-1)	T Axis mms-1 (Events > 0.300 mms-l)
Day	1	2	C
Night	1		
Discussion		C	C

It can be seen that the probability of adverse colnrnent is lorv. The highest value for PPV is noted to be 0.475 tntns-l rvl.rich is noted to be just perceivable to humans (0.300 rnrns-r is the threshold of perception). Furthermore. the number of events that are greater than the threshold of perception rvas noted to be 4, when all of the axis are sumrned.

It is likely that the vibration noted on site was due to the close proximity of animals or pedestlians as the adjacent industrial site is not though to operate during the night. lfvibration frorn the site is causing these events, further reduction in vibration wor.rld be expected with distance fiom the site boundary and also within the fotLndation of tlie residences. As such it is llot thought that viblation on site will cause a significar-rt issue.

8. CONCLUSIONS

Prevailing noise levels at a proposetl redeveloprnent olthe Land off Ganno.,v Road, Burnley have been assessed in accordance rvith Local and National Planning Policy.

The main sources of road traffic noise occur along Gannow Road. with sorne industrial cleliveries noted at nearby industlial / comrnercial units.

The assesstnent has shown that suitable internal noise levels rvithin habitable roorns can be achieved by specifying appropriate glazing and ventilation systems.

Bl providing the appropliate glazing and ventilatiou constructions to the proposed tagades. calculations indicate that the intemal arnbient noise levels rvithir.r proposed residential areas would be less than 35dB(A) and 30dB(A) fol daytime/night-tirne respectively.

Garden and amenity areas are expected to have external noise levels betrveen 50-55dB L.q.roro.

The in-situ levels would therefore be considerecl the NOEL, ancl noise due to road traffic on the adjacent network should have no perceptible adverse effect on health or quality of life providing the design guidance given in this reporl is followed.

Kind regalds

Mr S Cr.unrning BSc(Hons), MSc, MIOA

Audio Labs Lirnited

Ernai l : stuart(Z audio-labs.co.uk

GLOSSARY

A-weighting: The A-rveighting filter covers the full audio range - 20 Hz to 20 kHz and the shape is sirnilar to the response of the hurnan ear at the lower levels.

Background Noise: The noise at a given location and tirne, measuretl in the absence of any alleged noise nuisance sources, also known as Residual Noise.

Decibel: dB :a relative unit of measurement widely used in acoustics, electronics and communications. The dB is a Logarithrnic unit used to describe a ratio between the measured level and a reference or thleshold level of 0dB-

Dnr.,,: Weighted standardized level clifference. Single-nLrmber quantity that chalacterizes the ailborne sound insulation betrveen rooms.

Impact: Short dr-rration noise(s), usually associated in acoustics rvith an object in lnotion hitting another object.

Lrro: ls the noise level just exceeded for l0% of the rneasurernerrt period. A-rveighted and calculated by Statistical Analysis.

Lrqn: Is the noise level exceeded for 90% ofthe measurement period. A-weighted and calculated by Statistical Analysis.

Lr"q: A-weighted. equivalent soulld level. A rvidely used noise pararneter describing a sound level with the same Energy content as the varying acoustic signal measured.

L,rF-u*i A-weighted. Fast. Maximurn. Sound Leve[.

R,,: Weighted sound reduction index. single-number quantiry which characterizes the airborne sound insulating properties of a rnaterial or building element over a rarlge of frequencies

Sound Pressure Level: SPL is the RMS value ofthe lnstantaneous Sound Pressures measured over a specified period of time, measured in decibels (dB).

APPENDIX A - SURVEY DATA

POSTTTON 1(P1)

IIPI - External Logger 1T:lSmin Daytime)

Date / Time		L.r"q (dB)	Lrn,-"* (dB)	L_{A10}	L_{A90}
13109/2022	1.4	441	668	42.3	38.3
131091202	1.5 14	404	495	41,.7	38.4
2	30 t4	427	s83	42.9	39.2
13/09/2022	45 15	428	563	44.I	38.8
73109/2022	00 15	492	646	50.2	43..
13/09/2022	15 15	473	629	48.8	2
t3/09/2022	30 15	463	613	45.8	41.3
L3los/2022	45 16	454	590	45.8	4t.6
1.3109/202	00 16	444	630	44.9	403
2	15 16	430	567	43.6	42.3
13/0912022	30 16	438	540	45.2	413
13/oe/2022	45 17	453	556	47.4	40.8
t3/os/2022	00 17	436	563	455	422
731091202	t5 t7	442	582	466	442
2 Blag/2022	30 t7	423	s35	446	405
t3/oe/2022	45 18	463	590	460	38s
13los/2022	00 18	428	668	457	383
13/ol/2022	15 18	435	622	448	38s
t3/09/2022	30 18	432	553	435	395
13/09/2022	45 19	428	496	427	39s
t3l09/2022	00 19	443	525	436	40·1
t3/0s/2022	15 19	4L6	60 1	434	403
t3lo9/2022	30 t9	440	618	440	393
131091202	45 20	424	647	447	396
2	00 20	41.2	497	425	393
13/09/2A22	15 20	41.2	498	427	393
t3lo9/2022	30 20	407	492	422	392
Bl09/2022	45 21	41.9	498	432	388
7310s/2022	00 2L	402	473	4L3	394
73/09/2022	1.5 27	398	481	41.3	38s
13/09/2022	30 2t	390	431	407	377
!3/09/2022	45 22	397	4t0	4t2	362
73/09/2022	00 22	389	440	402	377
L3109/2022	t5 22	428	473	451	369
B/3191/2022	30 22	423	510	439	39 1
t34Os/2022	45 07	443	547	457	398
					422

1.4/09/2022 07:15	445	535	45.8	42.1
1.4/09/2022 01:30	430	s08	44.2	4L2
L4/o91202207:45	434	566	453	410
1.4/09/2022 O8:0o	429	516	441	4t7
MlO9/202208:15	451	5s0	469	426
14109/202208:30	447	s93	47	406
la/091202208:a5	443	610	1.	40 1
14/09/2022 09:00	426	55 1	457	397
t4/o91202209:15	438	584	440	4t9
t4lO9/202209:30	441	562	44L	427
La/09/202209:45	466	604	447	422
74109/2022 L0:00	433	585	495	396
ta/091202210:15	450 413	55.6 55 1	455	394
14/o9/202210:30	441 423	57.7 493	423	399
1.4109/2022 L0:a5	429	57.0 54.4	438 472	473 404
M/0912022L1.:O	424	s0.9	456	402
O La/09/20221I:t5	422	6r.6	447	406
7a10912022 LL:30	502	55.4	436	404
t4/0912022 11.:45	486	56.0	436	428
La/o9/2022 t2:00	429	60.4	524	423
la/09/202212:15	425	55.6	518	399
1.410912022 t2:3o	426	53.4	443	400
L4/O9/2022 t2:45	439	57.2	44	398
u/09/2022L3:00	442	54.1	1.	40.4
14/09/2022 t3:1.5	452		42.9	4L3
14109/2022 73:30	446		453	41.9
M/09/2022 B:aS				
Ml09/2022u:00			454	425
13109/202223:00	43.8	46.8	44.9	42.
t3/091202223:o5	43.4	47.	45.0	O
13/09/202223:L0	42.8	O	44.5	4L.3
t3/o9/2022 23:15	4t.t	47.4	42.5	40.4
!3/o9/202223:20	39.s	46.9	41.5	39.2
t3/o91202223:25	37.6	44.3	39.s	36.8
13109/2022 23:3o	38.2	42.2	39.6	35.1
t3/091202223:35	38.7	43.9	40.6	36.1
t3/09/2o22T:aO	40.0	44.2	41..7	35.6
t3/o9/202223:45	39.2	50.0	40.8	35.7
t3/O9/202223:5O	40.9	44.2	42.7	3s.8
		44.9		38.0

NIPI - External Logger (T=Smin Night-time)

Date / Time	L.r"q (dB)	L.rr.n'" (dB)	L_{A10}	L_{A90}

L3/09/2022	23:55	43.O	527	46.8	39.7
'J.4/09/202	00:00	40.2	458	41..9	36.8
2	00:0s	40.0	436	4L.3	38.1
t4/oe/2022	00:10	37.5	473	39.4	33.9
14/09/2022	00:15	37.5	474	39.2	33.2
14/09/2022	00:20	37.r	41.O	39.0	34.0
14/09/2022	00:25	37.4	434	39.8	34.4
L4/09/2022	00:30	38.0	455	40.7 39.7	34.8
L4/Oe12022	00:3s	38.7	435	42.4	35.9
t4/0912022	00:40	40.3	450	4L.L	37.r
1,4/Os/202	00:45	38.8	392	39.2	34.7
2	00:50	37.5	385	37.5	3s.2
L4/0e/2022	00:55	35.4	384	35.3	32.3
t4/0912022	01:00	33.3	397	36.1	31.0
1410e/2022	01:05	33.7	41.5	36.9	29.6
t4l09/2022	01:10	34.3	420	38.0	30.8
t410912022	01:15	3s.8	478	37.8	32.1
14109/2022	01:20	35.7	42.t	38.7	32.4
14/09/2022	01:25	36.3	428	39.3	30.7
14/09/2022	01:30	36.9	47.1	39.9	33.7
1,4/09/202	01:35	37.L	46.3	41.8	33.8
2	01:40	39.s	43.6	42.3	35.4
1.4/09/202	01:45	38.7	44.9	39.6	33.1
2	01:50	36.4	45.7	40.4	31.6
L4109/2022	01:55	37.6	44.9	39.5	33.0
t4/oe/2022	02:00	37.2	43.6	41.9	33.0
L4l0e/2022	02:05	39.3	4t.9	41.8	35.1
74/09/2022	02:10	39.4	39.4	39.9	36.s
L4l0e/2022	02:15	37.9	38.9	37.4	34.r
1,4/09/202	02:20	35.5	370	374	32.7
t4/09/2022	02:25	3s.8	43.3	383	33.7
2	02:30	36.s	460	389	335
14/09/2022	02:35	372	43.0	35 1	337
1,4/09/202	02:40	337	426	404	3'1.7
2	02:45	378	476	404	329
14109/2022	02:50	377	45t	392	337
t4/os/2022	02:55	372	424	400	332
74/0s12022	03:00	369	425	388	329
1,4/Oe1202	03:05	36 1	423	383	320
2	03:10	358	408	396	313
1.4/091202	03:15	376	41.5	375	345
2	03:20	341	436	39 1	304
14/09/2022	03:25	370	430	4t0	332
t4/09/2022		389		393	338
t4/09/2022		376			348
L4/oe/2022					
1.4/0s/2022					
1,410e/202					
2					
74/0e/2022					
1,4/Os/202					
2					
L4/0912022					
L4/0s/2022					

t4/09/2022o3:40	36.8	42.2	386	346
t4/09/202203:45	36.7	40.1	383	343
M/091202203:50	37.4	43.0	39 1	35 1
1.4/09/2022 O3:55	38.9	44.L	408	362
t4/09/202204:OO	37.0	42.6	39 1	339
La/09/202204:05	36.9	41.0	384	3s0
741091202204:t0	36.8	42.O	387	332
L4/09/2022o4:I5	36.2	43.5 40.7	383	329
1.4109/2022 0a:20	37.2	45.9 47.5	399	33s
1,410912022 04:25	39.8	46.4	425	350
M/09/20220a30	4t.o	46.L	439	361
L4109/202204:35	40.4	46.2	428	360
1.410912022	40.4 42 1. 41.0	42.7 48.1	429 45.L 436	363 383 370
04:40	406 39.3	46.3	424	383
Ia/09/202204:45	402	42.7 44.4	407 413	373 386
t4/09/202204:50	4L4	41.2	428	396
L4l0912022Oa:55	4t9	s0.3	433	398
1.4109/2022	418	45.6	428	398
05:00	424	44.8	44 1.	407
L4/09/202205:05	41.9	45.9	429	407
1,4109/2022 O5:L0	424	48.0 49.2	432	4L3
1,4/0912022	428	49.0	445	409
Ml09/202205:55 O5:t5	428	46.5	446	410
M/09/202206o0	420	46.7	441	392
1.410912022 ta/09/2o22o6:05 0s:20	41_ t	49.O	436	382
Jal09/2022o6:10 1a109120220s:25	408	46.6	44L 420	390
Ml09/202206:1 5 14/09/202205:30	424	51.4 45.0	430 444	398
L4l09/2022O6:20 ul09/202205:35	426	46.3	43L	405
74109/2o2206:25 14109/202205:a0	4L4	45.9	448	393
14109/202206:30 t4/09/202205:a5	4L7	47.3	440	40
7a109/202206:35 14/09/20220s:50	432	46.8	430	1.
Ial09/2022 06:40	429	53.1	435	4t3
M/09/2022o6:45	42L	s2.9	462	41.2
MlO9/202206:50	425	52.4	480	409
L4lO9l2022O6:55	439		489	411
	459			4t4
	466			430
				435

APPENDIX B _ CALCULATTONS

PROPAGATION CALCULATIONS

E d h	ru1	h	n W a z 2	&d	2
PEld tb	trddc€'rh Su*t	enllr-	$	tu	
	cm		o	tvts	6

	W.lgfrthq										
	bA	n l B t a 2 s s t t t & l									
A*ltug		{a , .,/l? 0.6 l -' 0u 1 2 '1 -l.l									
TEllt Fb										@	
TrftS9d										c	
l b y @ V d b											
th											
Ul0,rArOlhhRd	87.f S	n n D s 3 3 3 5 r $								r00m	
Lr{. lF O loi is Rd		s . 7 t 1 J $ n s a f l 4 5 1 a 9 0									2
Xlhhl 4trolonfrmRod		t 5 a s E g 9 g 0 a 7 s Q a 1									
b h d * b f f i t		-t0 -io .t0 .r0 .!o .10 .t0 -10 -t0									
t u f f i y r g		E . f 3 1 J E A 7 S 9 1 7 4 a 1 3 3									
7On											
Otu -h		ſ	€	4	€	€	.8	4	4	ſ	70.0m Q=2
hd.tsh-hilrb.'td			5	-5	6	-5	6	€	ſ	{	
Ul0,1& O 7On frsRd	713 A	ta	fi	fi	5l	3	.3	4	3	tf	
U.q,tAr e ton frD.n Rod	n3 a7t	n	g	s	a9	u	41	3E	$	5	
XtffiUqeOThimRd	8 . 3	1 1 3 A S . 7 p ! 6 ? 1 4									
1G											
h - h		.to	-10	-10	.10	-t0	.lo	-t0	-r0	-10	rmo n O{
holqtn-ffirffi		-5	€	€	-5	6	5	-5	,5	s	
uto.lftotGhb	n . T a a t T t { 5 5 s { 4 ! ! 6 3 5										
rAq.l€lr € rGn fr6 Rd	m7s	n	&	s	17	a	r	5	tl	3	
xirriF uatY alon frn Rd	6 r . 9 l 9 t a l g a a 0 x 3 l 2 9 a										

RED CON DITION Lare,orvrrve CALCULATION

AFgd(A-b.Std Calculation 9-

	u l		11rqd&	EE	I
hi€r			$		
	U F.pd.				6

	talffr	hHc.frF .E									
		x . t o t a B s r l l * l									
		3. -2'- AB 2 Q l'									
brF*d. (L(')	n7@		n	n		I	$	$	Sl		
bri{n{6t											t6 zŚ 6.O x8 g t_f r0.0 g rl tt a0 g
Eqtr b4)											
Tdgfub{a}		T r l									
rrE(Rnt											
		r 9 9 $ S 7 r E									
tsrrq$JrOl		1G4	2ff	284	tG4	tGd	LH	L-4	tEo	3G4	
			z	n	21	a	t 4 a ,				3tr..)
tsrlq.HlO1		tfr	3*d	* 4	alg	lEG	are	Str	i lEd	3*@	
			a			4	v	a	6		
tsr1qff0)		2-d	5.84	qGd	9ro	t€a	tFs	tg	1E4f	2f,5	
fak		r r c € F 9 9									
(srrqff!o)		t.r€4	f,E 11	G.tt	a G-1t	lG.tt	f,€.tt	f,€n 1	tEnl	t tgt	
ffig(€)	gag		a	g	q	a	1t	r0			

RED CO N DITI O N Lar.rvrax, N lG HT-TIME CALCU LATION

erlae

AF-eA-bi8tn Calculation Strt

	8 1	t1btI&		2
hIdE		$		
	b Ftd.			q

	*ICftE	h a d c f r F | q r y . E										
		t ! . t 6 t ! a S t t I t I										
		g I '5! €t s t2										
b h d * n												
biFqd. ,e')	a7 d_0		u	E	r	u	€t	$	i		S	
												4@
brsF(n)												24
rbdrqh(il|												a@
												l@
th {rl												0.6
E{dr bG)												ff
												to!
Idsfub(st												S
												ta
												f0
												ao
		P P g S O r t f S										g
(errqsjol		384	ac$	tG4	i*4	rGd	L@	2_ro	trg	3Ed		
		t r n t t (a f										3 tt:a)
{sr1qtu$)		tE&	!E4	tg	a|g	tEs	am	5.84	rtEo	Sff		
			4			£	v	&	a			
(sriq.Er0)		2*ir	5*6	9sd	0*d	t€4	a E	7*O	IEO	2*41		
C.th		r s E 9 a e *										
(sf!q&r0)		t_rE4	ac-lr	a*.rl	aGr!	iE-tt	a€ll	aE.I	IGi!	t lgr		
	9t rl		r	t	6	3	i	!3	3			

GREEN CONDITION Laee,oayrrue CALCULATION

errae

AF?ffA.Od{h Calculation tu

	4 r		11lqdM	u	3
hldft		EE-	$		
	h h h F p d .				c t

	lr|rfrr	hadcrhF ,E								
		t l . 5 € r t E s r l t t l								
a i-re		ß · .42 .t? 2								
b d r.ga. (144	Śr 6.1	$	al	a2	37	S	p	ı		
										am
bnHqn(c)										a4
										ao
										x6
										0.5
E{d Et.)										.,f
										io.0
										3 !
										ıı
										ft
C-rh(h,										AN
		n n n n n n								n
terrq&d0)		3Ed	s g	tGd	5Gq	IG4	ag	5G&	aEg	3Gd
		2 1 A t 1 6 ! r 3 !								AGt:()
rsrrquo)		5*@	a.g	.ı	i1E4	lE4	tEs	rts	444	aE&
			4	4	4	4	g	@	6	
(5)'1o(ff0)		2t4	5F6	94d	9f4	5GS	9lg	1fa	1 E4t	714
-ib		t * € € € € r								
{srrqer0,		trEot	i*-t l	r-lt	aE.rt	i€.lr	iE-t l	tG-lt	l4-tl	ttE4r
lfrs(o)	gt it		g	v	B	tl	l2	9	f	

G REE N CON DITIO N Lar,vax,N IG HT-TI ME CALCU LATION

e lr''qe

AftA.OA.ES Calculation tu

	8 1	h	11FAe?'El		
hldr		z4F.t	$		
	h Fqd.				g

	fttrbt	bbcfr ,b									
	hA	! t . t € t a a s r t t l l									
A W4rs		4t	U	l_t	(l	M	l2				
brF*d0fE.o	6t.r 4!		o	P	af	12	ʃ	a	r		5
											a@
bn*F(i)											14
bLqa(E)											fo
											l6
											05
Eatr h(A)											f7
											10.0
											3t
											tt
											f.t
-9&r(tu)											to
		n n n n T n 2									zf
lAbrlqsJrcl		l€S	sE4	5Cg	584	tru	af4	5.Gg	s4	3.Gq	
			A	ti	7f	A	_	tf	lt		ttt:a)
tsrlqryto)		ts&	a€4	a.a	itEd	r.Ed	rre	ttE6	a4G	5ft&	
			£		u	$	g	@	6		
($t1tx&lo)		2*4t	5F4	9&S	944	t€4	a*4	rtm	ltd	2 for	
C.-!k		e g F 9 r 9 9									
(sriq&i0'		ttEs	f,E-l	lF.tt	l€-tl	lE-!t	iGtt	ec(t	tc-ti	trs	
frW/-(41	4.7 tt		&	?	u	r	t7	(	t2		

APPENDIX C - VIBRATION SURVEY DATA