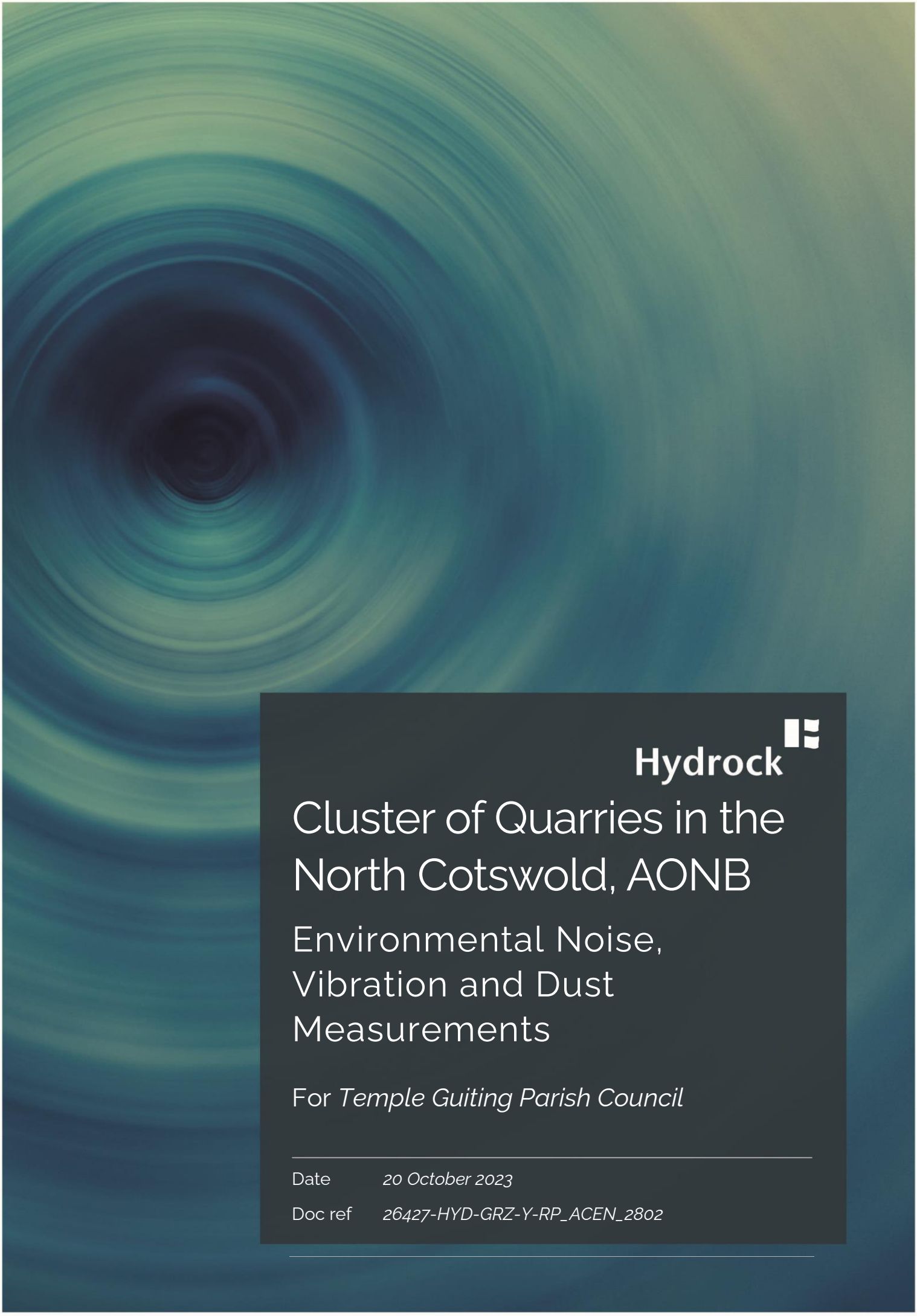

Hydrock

Cluster of Quarries in the North Cotswold, AONB

Environmental Noise, Vibration and Dust Measurements

For *Temple Guiting Parish Council*

Date	*20 October 2023*
Doc ref	*26427-HYD-GRZ-Y-RP_ACEN_2802*

Document control sheet

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Client	Temple Guiting Parish Council	
Project name	Cluster of Quarries in the North Cotswold, AONB	
Title	Environmental Noise, Vibration and Dust Measurements	
Doc ref	26427-HYD-GRZ-Y-RP_ACEN_2802	
Project number	26427	
Status	S3	
Date	20/10/2023	

Document production record		
Issue number	P01	Name
Prepared by		Ian Arthurs BSc (Hons), MSc, MIOA
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Document revision record			
Issue number	Status	Date	Revision details
P01	S1	28/01/2023	Draft Issue
P02	S1	28/04/2023	Draft for Approval
P03	S1	27/06/2023	Updated with Vibration Data
P04	S3	13/10/2023	Update following comments
P05	S3	20/10/2023	Minor Changes
P06	S3	20/10/2023	Minor Changes

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Executive Summary

Hydrock Consultants Ltd (Hydrock) have been appointed by Temple Guiting Parish Council (TGPC) to undertake environmental noise, vibration and dust (particulate) monitoring and consultancy services in relation to heavy vehicle movements from local stone quarrying operations.

The purpose of the noise and vibration measurement was to ascertain:

1. Are acceptable thresholds exceeded,
2. If yes, what reduction in HGV movement or other mitigation methods would be needed to bring them to an acceptable level?
3. If the number of HGVs were to increase by 10% or 20% above the levels at the time of measurement, would they exceed acceptable thresholds?
4. How do noise readings compare to those presented in the Oathill Environmental Statement?7
5. What are the options from here?

The findings of our assessment in answer to the above is presented below:

Are acceptable thresholds exceeded?

On the basis that a partially open window offers approximately 15dB attenuation (as described in BS 8233), the noise measurements indicate that internal noise levels with openable windows **exceed** recommended BS 8233 and WHO criteria and would therefore require mitigation to mitigate external noise ingress.

It should be noted that the 15 dB due to a partially open window could be a lot less when windows are used for the control of overheating and therefore the exceedance would be greater.

If yes, what reduction in HGV movement or other mitigation methods would be needed to bring them to an acceptable level?

As singular HGV passbys exceed the $L_{Amax,F}$ criterion during night time, acceptable levels may only be achieved by restricting night time HGV movements to no more than 10 - 15 events. Significant reductions in HGV movements during day time periods would also be required to meet acceptable limits (in the order of 90% reduction), these might more reasonably be achieved by physical mitigation.

Mitigation would comprise in the form of acoustic glazing and/or alternative ventilation, to allow windows to remain closed, when required, whilst maintaining adequate ventilation rates. It should be noted, the installation of secondary glazing may not be possible due to the Grade II listing of some properties.

If the number of HGVs were to increase by 10% or 20% above the levels at the time of measurement, would they exceed acceptable thresholds?

It is a well-documented effect in environmental noise that 10 or 20% changes in traffic volume usually equate to very minor differences in noise level. When viewed from a micro-perspective; 10 – 20% year on year, changes in traffic flows can easily be justified as 'Negligible'. This does not account for a longer term view of the site where noise levels could have significantly (8 dB+) increased over the last 10 years.

As noted in previously, noise levels already exceed acceptable thresholds and there are no additional thresholds above this to describe an increased adverse effect.

How do noise readings compare to those presented in the Oathill Environmental Statement?

Alongside some technical discrepancies (such as noise data which appeared to be presented incorrectly on certain days). It is difficult to compare the noise readings provided by the applicant as there is no information on exactly how close the measurement location was to the road.

The noise level is very sensitive to even a small difference in setback distance to the road. The only Figure which shows the measurement locations is broad in nature and there is no other accurate description of exactly where the noise measurements were undertaken.

In summary there is insufficient information regarding the conditions of measurements to draw any conclusions from this assessment.

What are the options from here?

The largest exceedance of the recommended criteria is the maximum level ($L_{Amax,F}$) when observed over the night. It is unlikely that typical buildings would be capable of reducing noise by over 40 dB even with windows closed. A clear starting point could be to reduce the volume of HGV movements throughout the night (and prior to 7am) to below 10 - 15 events for all quarries.

Understanding the number of traffic movements across both each day and each month will be important to the management of the cluster. No one quarry or operator is responsible for all of the HGVs and therefore is not responsible for all of the impacts. The impacts are cumulative from successive applications. A clear management plan is needed, inclusive of the above data to drive improvements.

Improving sound insulation in some properties may help but for properties, close to the edge of the highway, this may only be a partial solution. Furthermore, it is unlikely that mitigation will be sufficient to provide amenity in outdoor areas (where noise levels are harder to control).

Any further increases in HGV movements should be considered in the context that acceptable levels are already exceeded, Therefore any future application should be considerate of this rather than relying purely on an assessment of level change, which does not address the existing issue.

1. Introduction

Hydrock Consultants Ltd (Hydrock) have been appointed by Temple Guiting Parish Council (TGPC) to undertake environmental noise, vibration and dust (particulate) monitoring and consultancy services in relation to heavy vehicle movements from local stone quarrying operations.

Hydrock's scope of work includes for the provision of:

- noise, vibration and dust monitoring at locations identified by TGPC within Ford, Costwold District Council, and Upper Coscombe, Tewksbury Borough Council. Following collation of noise, vibration and particulate measurements undertake subsequent analysis and reporting to ascertain:
  - Do measurements taken of the current activity exceed acceptable thresholds;
  - If yes, what reduction in Heavy Goods Vehicle (HGV) movements or other mitigation methods would be needed to achieve an acceptable level; and
  - If the number of HGVs were to increase by 10% or 20% above the levels at the time of measurement, would they exceed acceptable thresholds.

This report looks to present the findings of Phase 1, which includes noise and vibration monitoring only, dust monitoring will be covered during Phase 2 and is detailed in a separate report.

Hydrock Acoustics is a member of the Association of Noise Consultants (ANC) (the trade association for acoustic, noise and vibration consultancy practices in the UK). Our acoustic consultancy staff are corporate members of the Institute of Acoustics (IOA).

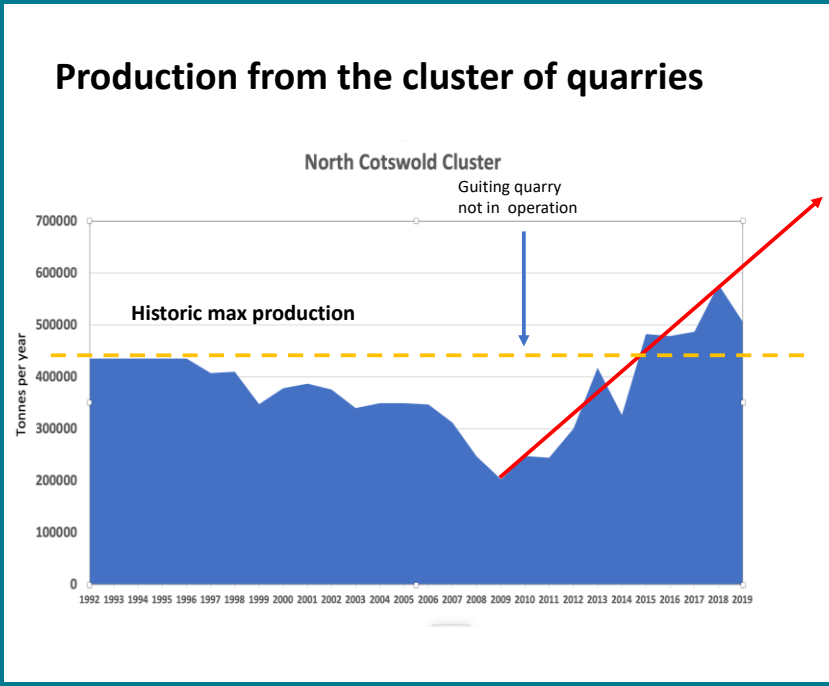
This report is technical in nature; therefore, a glossary of acoustic terminology is provided in **Appendix A** to assist in understanding this report.

2. Background

Project background, as provided by TGPC:

'The North Cotswold AONB currently has a cluster of eight quarries centred in the parish of Temple Guiting (TG). The Minerals Planning Authority responsible for the area is Gloucestershire County Council (GCC) but, of the quarries in the cluster in the north Cotswolds, its Minerals Local Plan 2018 -2032 only includes Naunton quarry and there is no mention of the cluster as a whole. This is because the Plan is only designed to address production of 'strategic' minerals, which includes aggregates, but not building stone. Historically the area has been important for production of Cotswold stone which has, for many years, been used for buildings and dry-stone walls. However, production across the cluster of quarries now includes a significant proportion of aggregates (including crushed stone and agricultural lime).'

Figure 1: Production from the cluster of quarries – (Figure provided by GCC Minerals Planning Authority)



'Access to the cluster of quarries is primarily via the B4077 through Toddington and Ford (running west to east) and along Buckle Street from the A45 to the A465 at Bourton on the Water (running north to south).

Historic production figures provided by the Minerals Planning Authority show that since 2000 production has progressively increased taking current production to a historic high (See Figure 1).

This increase excludes applications currently under consideration, which will push the figure much higher. These naturally translate into a historically high number of HGVs on local roads. Some of these roads are single track with passing places. Although some of the increase has been mitigated through the increased size of vehicles, the number of HGVs is growing not only as a result of higher production levels across the cluster, but also because of the need to import materials for reinstatement. '

Traffic counts for September 2019 and March 2022 show that there has already been an 14% increase in HGV movements through the village of Ford. Higher levels are anticipated in September each year when production peaks. This, combined with current applications, is likely to raise the increase by a further 10 to 20%. In terms of movements, 550 HGV movements were recorded to the west of Guiting quarry (at Upper Coscombe) in March 2022. Approximately 475 HGV movements

were recorded in the village of Ford. HGVs made up approximately 20% of vehicle movements on the local road network in March 2022.

HGV movements are observed on local roads very early in the morning; well before quarry opening times of 06.30 or in most cases 07.00. In an area that is otherwise known for peace and tranquility early morning HGV movements have a significant impact on local residents living along the B4077 and Buckle Street.

Despite repeated requests from local parish councils, Cotswold National Landscape Board and CPRE no formal assessment has been made of the cumulative impacts on local residents. Not surprisingly, residents have raised their concerns, but without a formal assessment and review by the Environmental Health Officers at Cotswold District Council (CDC) and Tewksbury Borough Council (TBC) there is no basis for discussions or evaluations of the situation.

In response to this omission, TGPC has taken the decision to commission independent environmental measurements. TGPC is coordinating the overall scope of work but is supported by other local parish councils (PCs) and local residents across the area. The assessments are being funded from multiple sources including County Councillors, local parish councils and residents.

3. Assessment Methodology

3.1 Policy and guidance

The methodology used for environmental noise and vibration, and subsequent analysis and assessment is based on the following current policy and guidance documents:

- National Planning Policy Framework, 2021 (NPPF);
- Noise Policy Statement for England, 2010 (NPSE);
- Planning Practice Guidance – Noise, 2014 (PPG);
- World Health Organisation (WHO) 1999: Guidelines for Community Noise;
- BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings (BS8233);
- Design Manual for Roads and Bridges Volume 11, Section3, Part 7 (DMRB)
- Department of Transport Technical Memorandum: Calculation of Road Traffic Noise, 1988 (CRTN); and
- British Standard 7445-1:2003 - Description and measurement of environmental noise. Guide to quantities and procedures (BS 7445).

A review of the relevant planning policy and acoustics guidance is found throughout this document and in **Appendix D.**

3.2 Tranquillity

Tranquillity is one of the special qualities of the Costworlds Area of Outstanding Natural Beauty (AONB). The following is an extract from the Costwold Conservation Board position statement on Tranquillity:

'Tranquillity can be defined as a state of calm and quietude associated with peace, experienced in places with mainly natural features and / or historic character, free from man-made noise and other aural and visual disturbance. It is a valuable resource, which can add considerably to people's quality of life.

The Cotswolds AONB has relatively high levels of tranquillity, especially when compared with the surrounding urban areas. However, there is a serious risk that the tranquillity of the AONB could decline as a result of increasing levels of development, infrastructure, traffic and visitor numbers. Whilst some level of noise and other aural and visual disturbance from development is inevitable, especially during construction phases, adverse impacts on tranquillity should be avoided and minimised as far as possible and, ideally, reduced.

This issue is addressed in Policy CE4 (Tranquillity) of the Cotswolds AONB Management Plan 2018-2023 ('the Management Plan'), which states:

1. Proposals that are likely to impact on the tranquillity of the Cotswolds AONB should have regard to this tranquillity, by seeking to (i) avoid and (ii) minimise noise pollution and other aural and visual disturbance.

2. Measures should be taken to enhance the tranquillity of the Cotswolds AONB by (i) removing and (ii) reducing existing sources of noise pollution and other aural and visual disturbance.

The long term aspiration, as set out in Outcome 6 of the Management Plan, is that:

• The tranquillity of the Cotswolds AONB will have been conserved and enhanced, with fewer areas being affected by noise pollution and other aural and visual disturbance'

The Position Statement provides over-arching recommendations, namely:

'All relevant stakeholders1 should ensure that activities and proposals that affect - or have the potential to impact on - the tranquillity of the Cotswolds AONB:

- *accord with Policy CE4 (Tranquillity) of the Cotswolds AONB Management Plan 2018-2023;*
- *give great weight to conserving and enhancing the tranquillity of the AONB;*
- *assess potential impacts on tranquillity, particularly with regards to noise, vehicle movements, landscape and visual impacts and, where appropriate, visitor numbers;*
- *comply with relevant legislation and national and local policies and guidance (e.g. environmental noise regulations and licensing regulations);*
- *have regard to – and be compatible with – the Cotswolds AONB Landscape Character Assessment and Landscape Strategy & Guidelines.*

'Relevant authorities should:

- *have regard to tranquillity when fulfilling their statutory duty of regard under Section 85 of the Countryside and Rights of Way Act 2000, with the expectation that adverse impacts on tranquillity will be: (i) avoided; and (ii) minimised.*

Local authorities should, in addition to the above recommendations:

- *seek to address the issue of tranquillity through relevant policies in their Local Plans, having regard to Policy CE4 of the Cotswolds AONB Management Plan 2018-2023.*
- *consider whether it would be appropriate to explicitly identify any part of the Cotswolds AONB that falls within their administrative boundary as a 'tranquil area' in their Local Plans, such that the AONB merits a special level of regard in relation to tranquillity.*

Government should:

- *implement and regularly monitor a nationally consistent and replicable framework for measuring and mapping tranquillity, which can be applied and regularly updated at the AONB level.'*

4. Environmental Noise Measurements

4.1 Noise Survey Overview

An environmental noise survey was undertaken at two locations within Ford and Upper Coscombe, between Tuesday 18th and Tuesday 25th October 2022.

The noise survey comprised of long-term, unattended noise measurements which were obtained to establish the existing ambient noise environment and measure the diurnal variation in noise levels over weekday, and weekend periods.

Observations of sources governing the existing ambient noise environment were made during the survey setup and retrieval.

Full details of the noise survey including methodology, monitoring locations, equipment, weather conditions, and results are presented in the following sub-sections.

4.2 Noise monitoring methodology and locations

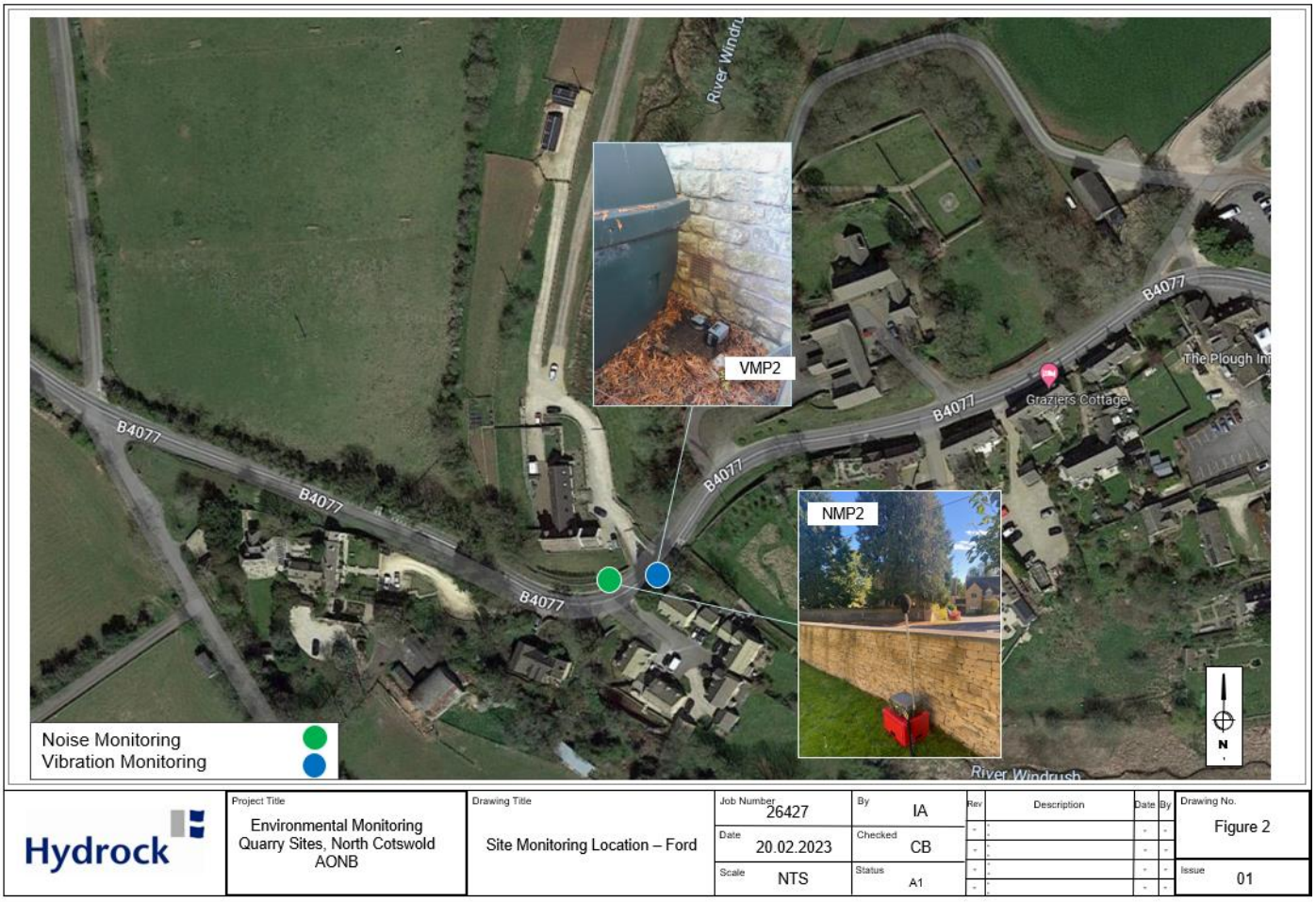
Noise monitoring locations were selected by TGPG. All noise monitoring locations are shown on **Figures 1 -2** and summarised in **Table 1**.

Table 1: Summary of noise monitoring locations

Monitoring location ID	Description	Monitoring period
NMP1 (Upper Coscombe)	Noise monitor installed on north-eastern boundary line, within garden area of residential property Pike Cottage, Upper Coscombe, GL54 5SB, Monitoring position located approximately 2.5 m from B4077 carriageway. Approximately 170 m west of Guiting Quarry western boundary.	Tuesday 18th October to Tuesday 25th October 2022.
NMP2 (Ford)	Noise monitoring installed within garden area of residential property along southern boundary line, Ford, GL54 5RU. Monitoring position located approximately 2.5 m from B4077 carriageway. Guiting Quarry located approximately 1 km to the west, Oathill quarry approximately 1.4 km to the east.	

Figure 2: NMP1 Upper Coscombe

Figure 3: NMP2 Ford



At all monitoring locations the measurement microphone was located at a height of 1.5m above local ground. Measurements were undertaken in accordance with the guidance outlined in the relevant British Standards, BS 4142:2014 and BS 7445-1:2003. The monitoring procedure followed the guidance outlined in BS 7445:2003 Part 1, Section 5.2.3 and section 5.2.2.

Obtained measurements were 'free field' with wind shields fitted.

All noise monitoring was undertaken by Ian Arthurs, BSc (Hons), MSc, MIOA.

4.3 Noise monitoring equipment

Details of the equipment used for the environmental noise measurements are provided in **Table 2.**

Table 2: Noise monitoring equipment details

Monitoring ID	Equipment	Manufacturer	Instrument	Serial No.	Date of last laboratory calibration
NMP1 (Upper Coscombe	Sound level meter	Rion	Rion NL-52	01076307	04/08/22
	Pre-amp		Rion NH-25	76524	
	Microphone		Rion UC-59	12357	
NMP2 (Ford)	Sound level meter	Rion	Rion NL-52	00921231	25/02/22
	Pre-amp		Rion NH-25	21273	
	Microphone		Rion UC-59	04266	
Calibrator			Rion NC-74	35270123	25/02/22

All sound level meters used for the noise survey have been verified as confirming to BS EN 61672-1. The acoustic calibrator used conforms to BS EN IEC 60942.

All sound level meters were calibrated to a reference level of 94 dB at 1 kHz both prior to, and on completion of, the noise survey period. No significant drift in calibration was noted during the survey (≤ 0.5 dB).

4.4 Weather conditions

Average recorded wind speeds during the environmental noise measurement process did not generally exceed 5 m/s.

BS 4142:2014 provides the following guidance with regards to the acquisition of environmental noise measurements and weather conditions:

'An effective windshield should be used to minimize turbulence at the microphone.'

'NOTE Windshields are generally effective up to wind speeds of 5 m/s' and. 'exercise caution when making measurements in poor weather conditions such as wind speeds greater than 5 m/s.' Weather conditions during the noise survey were suitable for the acquisition of noise data. Measurements are therefore considered to adhere to the guidance of the relevant British Standard and no corrections to the measured noise dataset has been applied.

4.5 Noise survey results

Measured noise levels at each location have been separated into daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods, in accordance with current guidance.

The results of the long-term unattended noise measurements obtained at locations NMP1 and NMP2 are presented graphically in time-history form in **Appendix B**. A summary of the 16-hour daytime (07:00 hrs to 23:00 hrs) and 8-hour night time (23:00 hrs to 07:00 hrs) equivalent continuous level ($L_{Aeq,T}$), background sound levels (L_{A90}), 18-hour (06:00hrs to 00:00) L_{A10} sound levels, and maximum L_{AFmax} noise levels are presented in **Table 3**.

Table 3: Average measured daytime and night-time noise levels

Monitoring location	Time period	Measured noise level			
		$L_{Aeq,T}$ dB	$L_{A90,T}$ dB	$L_{A10,18hr}$ dB[1]	L_{Amax} dB
NMP1 (Upper Coscombe)	0700-2300 2300-0700	61 52	33 (20) 20 (<20)	60	94 89
NMP2 (Ford)	0700-2300 2300-0700	69 59	36 (24) 25 (24)	67	97 93

Notes: [1] LA10,18hr = 06:00 - 00:00)

Observations made during the noise survey set-up and retrieval, along with analysis of the captured audio identified the following noise sources contributing to the noise climate at the monitoring locations:

Road Traffic: HGV movements (associated with quarry operations) on B4077 were observed to dominate the ambient noise environment against the otherwise, very low, tranquil noise levels at the monitoring locations.

Other Sources: In the absence of HGV movements, a low noise environment was observed background levels of 33 dB $L_{A90,15min}$ with bird song, and wind in trees audible.

5. Environmental Noise Assessment

5.1 Current Noise Levels

5.1.1 Noise levels in external amenity areas

The lower and upper guideline noise level for external amenity areas is 50dB and 55dB, respectively, in accordance with BS 8233 and WHO's Guidelines for Community Noise, 1999 (WHO).

The results of the noise monitoring at NMP1 (Upper Coscombe) show an overall mean level of 61 dB $L_{Aeq,16hr}$. This exceeds both the lower guideline value of 50 dB $L_{Aeq,T}$ and the upper guideline value of 55 dB $L_{Aeq,T}$ for external amenity spaces..

The results of the noise monitoring at NMP2 (Ford) show an overall mean level of 69 dB $L_{Aeq,16hr}$. This also exceeds both the lower guideline value l of 50 dB $L_{Aeq,T}$ and upper guideline value of 55 dB $L_{Aeq,T}$ for external amenity spaces.

Community response to noise is described in the WHO Guidelines for Community Noise, statements relating to external amenity are as follows:

- 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 $L_{Aeq,16h}$ 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 $L_{Aeq,16h}$.

As noted in Section 2, being within the AONB increases the likelihood that the site could be in a tranquil area. The government guidance on the definition of tranquillity is as follows:

> *'For an area to justify being protected for its tranquillity, it is likely to be relatively undisturbed by noise from human sources that undermine the intrinsic character of the area. It may, for example, provide a sense of peace and quiet or a positive soundscape where natural sounds such as birdsong or flowing water are more prominent than background noise, e.g. from transport.'*
>
> *https://www.gov.uk/guidance/noise--2*

Analysis of the noise measurements and observations obtained at NMP1 and NMP2 indicate that the HGV movements associated with quarrying are more prominent than the natural sounds in the area. The HGV movements are therefore likely to have a detrimental impact on the tranquillity of the area. This tranquillity may also be previously adversely impacted by the HGV movements associated with existing quarrying operations and other road traffic noise sources.

5.1.2 Noise levels in habitable rooms

The sound insulation requirement of the building's façade depends on the external noise profile of the area incident at each façade and the sensitivity of the space internally.

In accordance with BS8233 and WHO, the recommended guideline noise criteria during the daytime in living rooms and bedrooms is 35 dB $L_{Aeq,16hr}$, together with 30 dB $L_{Aeq,8hr}$ during the night-time in bedrooms only. 45 dB $L_{AF,Max}$ should also not be typically exceeded i.e. more than 10 times per night, in bedrooms.

Based on the external measured free-field noise levels at each monitoring location and the internal noise criteria as per BS8233 and WHO guidance, the required minimum composite level difference of to achieve the internal daytime and night-time noise criteria, is summarised in **Table 4**.

Table 4: Average measured daytime and night-time noise levels

Monitoring Location	Period	External free-field noise levels	Internal noise criterion	Minimum required level difference, D_w
NMP1 (Upper Coscombe)	Daytime (07:00 - 23:00)	61 dB $L_{Aeq, 16h}$	35 dB $L_{Aeq, 16h}$	26 dB
	Night-time (23:00 - 07:00)	52 dB $L_{Aeq, 8h}$ 89 dB $L_{Amax,F}$	30 dB $L_{Aeq, 8hr}$ 45 dB L_{AFmax}	22 dB 44 dB
NMP2 (Ford)	Daytime (07:00 - 23:00)	63 $L_{Aeq, 16h}$[1]	35 dB $L_{Aeq, 16h}$	28 dB
	Night-time (23:00 - 07:00)	53 dB $L_{Aeq, 8h}$[1] 87 dB $L_{Amax,F}$[1]	30 dB $L_{Aeq, 8hr}$ 45 dB L_{AFmax}	29 dB 42 dB

Notes: [1] Sound levels have been corrected using the procedures within CRTN including unobstructed propagation over 60-90% absorbent ground. It should be noted that other properties within Ford are directly on the roadside so would be 6 dB greater.

On the basis that a window which is partially open for ventilation purposes offers approximately 15 dB outdoor to indoor attenuation (as described in BS8233), internal noise levels with windows partially open for ventilation would exceed recommended criteria and would therefore require measures to mitigate external noise ingress. Such measures could comprise in the form of acoustic glazing and/or alternative ventilation, to allow windows to remain closed, when required, whilst maintaining adequate ventilation rates.

WHO criteria states that to avoid sleep disturbance, indoor sound pressure levels should not exceed approximately 45 dB L_{Afmax} more than 10-15 times per night.

Analysis of the instantaneous maximum (L_{Amax}) events verified through audio recordings captured, indicate the WHO criteria is **not achieved.**

5.2 Previous Noise Surveys

Hydrock has been provided a noise assessment which supported the Oathill Quary Environmental statement. Hydrock have been asked to provide comment on the existing noise assessment and draw comparisons to the findings of the this report. Our comments are as follows:

- For the 25/09. The daily average L_{Aeq} value is greater than the $L_{Amax,F}$ value which is technically impossible. More so, and to illustrate the point the L_{AFmin} value is greater than the L_{AFmax} value so this day has been disregarded from our analysis.
- It is difficult to compare the noise readings provided by the applicant as there is no information on exactly how close the measurement location was to the road. The noise level is very sensitive to even a small difference in setback to the road. The only Figure which shows the measurement locations is broad in nature and there is no other accurate description of exactly where the noise measurements were undertaken.
- The averaged 16hr/8hr levels are less than what was measured at NMP2 in this report. Result of this report show 69 $L_{Aeq16hr}$/59 L_{Aeq8hr} compared to a maximum of 69 $L_{Aeq16hr}$/58 L_{Aeq8hr} even though average number of HGVs was much higher during the September 2019 survey (the ATC survey was fortunately coincident with the measurements undertaken in September). This would indicate that the measurement location in the survey was potentially further back.

In summary there is insufficient information regarding the conditions of measurements to draw any conclusions from this assessment.

5.3 Future Noise Levels

The scope of works includes an assessment of the effect of increasing HGV traffic flows by 10% and 20%. The historic and current traffic are considered in the following section. The data is then extrapolated to include future levels of traffic for 10% and 20% increases respectively.

5.3.1 Traffic Flows

Current traffic count data across the cluster of quarries from several sources has been provided by TGPC which give an indication of traffic movements and the number of HGVs using the B4077. Data sources include:

- Visual traffic count in Ford on 24 October 2022 carried out by residents.
- Planning applications for Oathill Quarry September 2019 (14/0101/CWMAJM dated Dec 2019) and from March 2022 (14/0101/CWMAJM dated May 2022).

The traffic count data is summarised in **Table 5**. These figures include the total HGV movements observed (i.e. the sum of both directions). The figures for Sept 2019 and March 2022 are reported to be a weekday average figure.

Table 5: Recorded HGV movements

Measurement Date	*Ford*	*Upper Coscombe*
September 2019	*418*	*580*
March 2022	*474*	*550*
14 October 2022	130	Not available
24 October 2022	190	Not available
17 May 2023	130	Not available
06 June 2023	139	Not available

Early morning movements of HGVs are also reported in the traffic survey reports from September 2019 and March 2022 for Oathill Quarry.

It is also understood that current applications to increase production at Oathill Quarry (ref: 14/00101) CWMAJM) and at Three-Gates Quarry (ref: 22/0035/CWROMP) could further increase the number of HGV movements. Data in these applications indicate that seasonal variations in production and associated HGV movements occur in August – September. The figures reported for March 2022 may therefore not be the peak for HGV movements across the cluster of quarries.

Insufficient data is available on production from the cluster of quarries and from traffic counts to be able to provide a detailed assessment of noise levels associated with peak numbers of HGV movements.

Further historic road traffic data has been sourced from the DfT where a manual traffic count was conducted between 2003 and 2009. The measurement site (DfT reference: 930018) was on the B4077 2 km south-east of Oathill Quarry. The annual average traffic daily traffic flows are presented in Table 6 below:

Table 6: Historic traffic counts DfT measurement site: 930018 (source Road traffic statistics - Manual count point: 930018 (dft.gov.uk)

Measurement Year	Annual Average Daily HGVs (vpd)	Annual Average Cars & Vans (vpd)	%HGV
2003	101	1847	5%
2004	67	2011	3%
2005	110	2325	5%
2006	49	1856	3%
2007	75	1949	4%
2008	49	1954	2%
2009	43	1814	2%

The historic data above would indicate a significant increase in HGV movements between the 2003 - 2009 average to the current levels of HGV movements reported in **Table 5**.

5.3.2 Noise Calculations

Detailed noise predictions conducted in accordance with CRTN (which considers traffic flows, gradient, road surface, reflections, and propagation) are beyond the scope of this report. In the absence of this modelling, scaling factors obtained from the standard have been applied to the measured data to correct for increases in HGV movements and distance between measurement location and calculation receptor position.

The increase in average level is dependent on the number of HGVs as a percentage of the overall traffic flow. A very busy road, for example, would experience only a modest increase in averaged noise levels when compared to quieter road which has a lower ambient noise environment.

Complete current traffic information for all types of vehicular movements has been provided only for the 20th of October 2022, so this has been used as the basis of the assessment.

Table 7: 20 October 2022 traffic count information

	Existing (vehicle movements 06:30 - 18:00) 20 October 2022 data	10% HGV Increase Scenario (vehicle movements 06:30 - 18:00)	20% HGV Increase Scenario (vehicle movements 06:30 - 18:00)
Cars & Vans	1965	1965	1965
HGVs	190	209	228
%HGV	9%	10%	10%

In terms of change in averaged $L_{Aeq,18hour}$ for the two scenarios discussed, the following is observed:

- Based on an initial level of 190 HGV movements in a day, a 10% increase in HGV movements would result in a 0.1 dB increase in $L_{Aeq,16hour}$ noise levels.
- Based on an initial level of 190 HGV movements in a day, a 20% increase in HGV movements would result in a 0.4 dB increase in $L_{Aeq,16hour}$ noise levels.

With a greater initial level of HGV movements (474 as per March 2022), a 0.3 dB and 0.6 dB increase in road traffic noise levels would be observed for the 10% and 20% scenarios, respectively. In all cases, the change in ambient noise levels likely to be 'Negligible' as per the DMRB guidance.

When comparing to historical averages between 2003 and 2009, an 8 dB increase in traffic noise levels is calculated which is categorised as a 'Major' increase in the DMRB guidance. As noted in previous sections, it is unclear whether the measurement location of the historical data captured the routes from the quarries.

The use of ambient level change criteria for determining the significance of an effect is not appropriate for all situations, particularly those with low background noise levels. The ambient level change assessment method is most appropriate for pseudo-steady state noise sources such as motorway traffic, or other roads with high volumes of traffic where the assessment location is distant. In situations where the noise fluctuates, or when the noise occurs during a more sensitive time periods (such as night), other methods to determine significance are appropriate. This is acknowledged in the DMRB guidance:

> *'Where specific local circumstances mean that an alternative method for determining significance is more appropriate, the alternative method can be submitted as a departure from the standards to the Overseeing Organisation for approval.'*

Analysis of the recorded audio indicates that quarry HGV movements commence before 07:00 hrs, and as such, due to these movements occurring during the night-time period there would be 20% more events that could cause night-time awakening (without appropriate mitigation) which could be a significant effect. When comparing to the historical context a significant increase in traffic flows is observed.

6. Vibration Measurements and Discussion

6.1 Vibration survey overview

Vibration monitoring was undertaken between Tuesday 18th October and Tuesday 25th October 2022. The vibration monitoring comprised of unattended vibration measurements at 1 no. external location at Upper Coscombe. The purpose of the monitoring was to establish vibration levels at the property and assess against adopted thresholds and criteria.

Further vibration monitoring at Ford will be reviewed as part of the Phase 2 monitoring works.

All vibration measurements were undertaken by Ian Arthurs BSc (Hons), MSc, MIOA.

6.2 Vibration equipment

Vibration measurements were obtained using a Omnidots SWARM Vibration Monitor with built-in tri-axial accelerometer. The vibration monitoring location is shown on **Figure 1** and summarised in **Table 8** along with details of the equipment.

Table 8: Vibration monitoring equipment details

Monitoring location	Monitoring description	Monitor type & serial number
VMP1 (Upper Coscombe) Round 1 (October 2022)	Unattended monitor. Monitor fixed to a heavy-duty mounting plate, placed externally at point of entry of western façade of Pike Cottage.	Omnidots B.V. SWARM V2.2c-E [MIZDEO]
VMP2 (Ford) Round 2 (May 2023)	Unattended monitor. Monitor fixed to a heavy-duty mounting plate, placed externally at point of entry of western façade of Pike Cottage	01dB Orion Ser. 10463

The vibration monitor was mounted on a heavy-duty metal mounting plate. The mounting plate meets the requirements identified in DIN standard 45669-2:2005. Equipment fixing methods and monitoring locations were based on guidance presented in the ANC Red Book[1] , and the vibration monitoring equipment manufacturer.

The vibration monitor was powered by external lithium-ion batteries and configured to measure simultaneous Peak Particle Velocity (PPV, mm/s) and Vibration Dose Value (VDV, $m/s^{1.75}$) in three axis, at 60s intervals.

The clock and time stamp on the monitor was synchronised to a GPS clock.

[1] *Association of noise consultants (ANC). Measurement and Assessment of Groundborne Noise and Vibration (Red Book). 2020*

6.3 Vibration monitoring results

The results of the vibration measurements are summarised in **Table 9** which present the maximum PPV values and corresponding frequency obtained, plus the VDV for the measurement period.

The measured PPV time-history is presented in **Appendix B**.

Table 9: Summary of vibration monitoring results

Monitoring Location	Time Period	Maximum PPV level measured (mm/s)	Maximum VDV ($ms^{-1.75}$)
VMP1 (Upper Coscombe)	07:00 - 23:00	0.62	0.02
	23:00 - 07:00	0.28	0.01
VMP2 (Ford)	07:00 - 23:00	0.34	-
	23:00 - 07:00	0.28	-

6.4 Discussion - vibration monitoring results

The results of the unattended vibration monitoring obtained at VMP1 (located at Upper Coscombe) indicate the highest PPV value was 0.62 mm/s At Ford the highest measured PPV value was 0.34 mm/s.

Low background vibration levels in the absence of HGV movements can be seen from **Appendix B** to fall under the 0.3 mm/s perceptible guideline value.

Analysis of the vibration time history presented on **Appendix B** shows an increase in low state vibration levels, likely to be associated with road traffic movements, as per **Appendix B** annotations.

6.5 Vibration - building damage thresholds

According to BS 7385-22 for residential or light commercial buildings, the threshold for the onset of potential cosmetic damage (i.e. formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces) to buildings varies with frequency. This ranges from a Peak Particle Velocity (PPV) (component) of 15 mm/s at 4 Hz, rising to 20 mm/s at 15 Hz, and to 50 mms^{-1} at and above 40 Hz. BS 7385-23 also states that the probability of building damage tends towards zero at 12.5 mm/s peak component particle velocity.

The same thresholds are referenced in BS5228-2[3] and are presented in **Table 10**.

[2] *BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration*

[3] *BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2; Vibration*

Table 10: Vibration guide values for cosmetic damage

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures **Industrial and heavy commercial buildings**	50 mm/s at 4 Hz and above	
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

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

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

To summarise the above, vibration levels below 12.5mms-1 are unlikely to give rise to building damage. The highest measured PPV was 0.64 mms-1 at VMP1 (as presented in **Table 9**) which is below building damage thresholds.

6.6 Vibration - human response

Vibration is perceptible at levels well below those likely to cause building damage. Vibration may in some circumstances be perceptible at approximately 0.14 mm/s , particularly at higher frequencies. Guidance on the human response from vibration is principally contained within BS 6472-1[4]. BS 5228-2 references BS 6472-1 and provides the following guidance on the effects of vibration on building occupants:Table 11: BS-5228-2 Guidance effects of vibration levels perceptible to humans

Vibration Level A), B), C)	Effect
0.14 mm/s	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	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environmental will cause complaint, but can be tolerated if prior warning and explanation has been given to residents
10 mm/s	Vibration is likely to be intolerable for more than 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.

[4] *BS 6471-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting*

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.

Measured VDV levels at VMP1 (Ford) have been compared against BS 6472-1 guidance on the probability of adverse comment within residential buildings.

Table 12: Vibration assessment and probability of adverse comment in residential buildings

Monitoring Location	Period	Probability of adverse comment (VDV ms-1.75)
VMP1 (Upper Coscombe)	Day (07:00 to 23:00) Night (23:00 to 07:00)	0.14 Below "Low Probability of Adverse Comment" 0.14 Below "Low Probability of Adverse Comment"

The results presented in **Table 12**, indicate measured vibration levels at VMP1 (Upper Coscombe) are below "Low Probability of Adverse Comment" as per the criteria presented in BS 6472. Given that velocity levels and frequency of occurrence are similar, it is likely that the measurement point at VMP2 would be similar or less.

Vibration levels at surrounding areas of interest will depend on several factors including:

- Source of vibration;
- Frequency content of vibration created;
- Ground conditions (soil stiffness, damping);
- Distance to receptor; and
- Receptor building foundation and structure design.

7. Summary and Conclusions

Hydrock have been appointed by TGPC to undertake environmental noise, vibration and dust monitoring and consultancy services in relation to vehicle movement from local stone quarrying operations.

The purpose of the noise and vibration measurement was to ascertain:

1. Are acceptable thresholds exceeded,
2. If yes, what reduction in HGV movement or other mitigation methods would be needed to bring them to an acceptable level?
3. If the number of HGVs were to increase by 10% or 20% above the levels at the time of measurement, would they exceed acceptable thresholds?
4. How do noise readings compare to those presented in the Oathill Environmental Statement?7
5. What are the options from here?

Noise and vibration measurements were undertaken between Tuesday 18th October, and Tuesday 25th October 2022.

HGV movements (associated with quarry operations) on B4077 were observed to dominate the ambient noise environment against the otherwise, very low, tranquil noise levels at the monitoring locations.

The results of the noise monitoring indicated both lower and upper guideline values for external amenity areas in accordance with BS 8233 and WHO were exceeded.

On the basis that an openable window offers approximately 15dB attenuation (as described in BS 8233), the noise measurements indicate that internal noise levels with openable windows would exceed recommended BS 8233 and WHO criteria and would therefore require mitigation to mitigate external noise ingress. Such mitigation would comprise in the form of acoustic glazing and/or alternative ventilation, to allow windows to remain closed, when required, whilst maintaining adequate ventilation rates. It should be noted, the installation of secondary glazing may not be possible due to the Grade II listing of some properties.

Analysis of the dB L_{Amax} events and audio recordings captured, indicates the WHO criteria is not achieved, with audio playback indicates the L_{Amax} exceedances were associated with HGV pass-by's.

Based on an initial level of HGC movements in a day, a 10%, and 20% increase in HGV movements would result in a 0.1 dB, and 0.4 dB increase respectively.

With a greater initial level of HGV movements (474 as per March 2022), a 0.3 dB and 0.6 dB increase in road traffic noise levels would be observed for the 10% and 20% scenarios, respectively. In all cases, the change in ambient noise levels likely to be 'Negligible' as per the DMRB guidance.

In absence of insufficient traffic data, historical traffic data has been sourced from the DfT where a traffic count was conducted between 2003, and 2009. When comparing historical averages between 2003, and 2009, an 8 dB increase in traffic noise levels is calculated which is categorised as a 'Major' increase in the DMRB guidance. This increase may have coincided with a broader reduction in noise levels.

In any case the ambient level change criteria should be considered in the context of the already elevated noise levels caused by quarrying.

Vibration levels are unlikely to give rise to building damage. The highest measured PPV was 0.64 mms-1 at VMP1 which is below building damage thresholds.

Measured VDV levels have been compared against BS 6472-1 guidance on the probability of adverse comment within residential buildings. The results indicate levels are below "Low Probability of Adverse Comment" as per the criteria presented in BS 6472

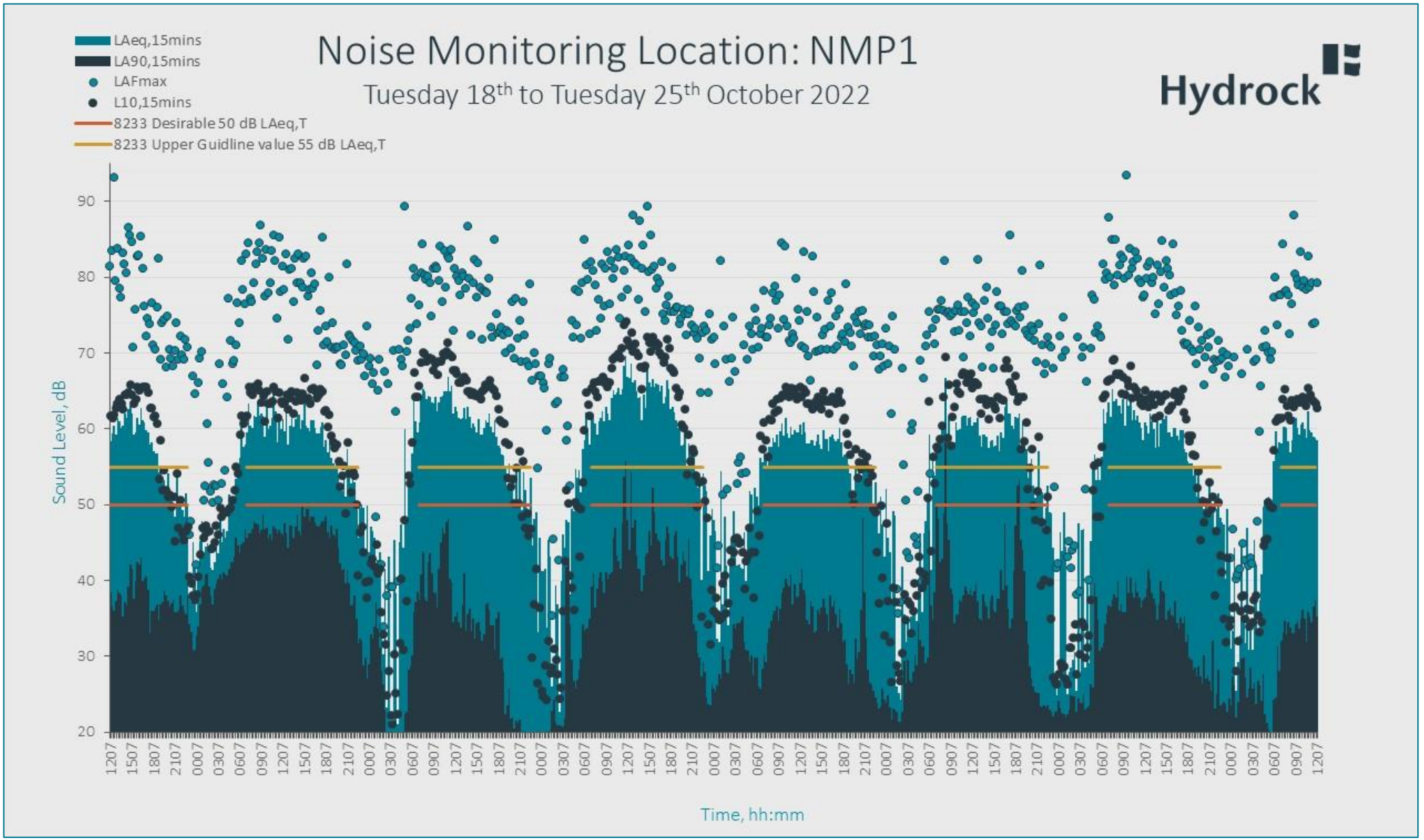
HGV traffic on B4077 will pass through other communities so the findings in Ford and Upper Coscombe are also relevant for properties in Toddington, and for residents on the B4077 and Buckle Street.

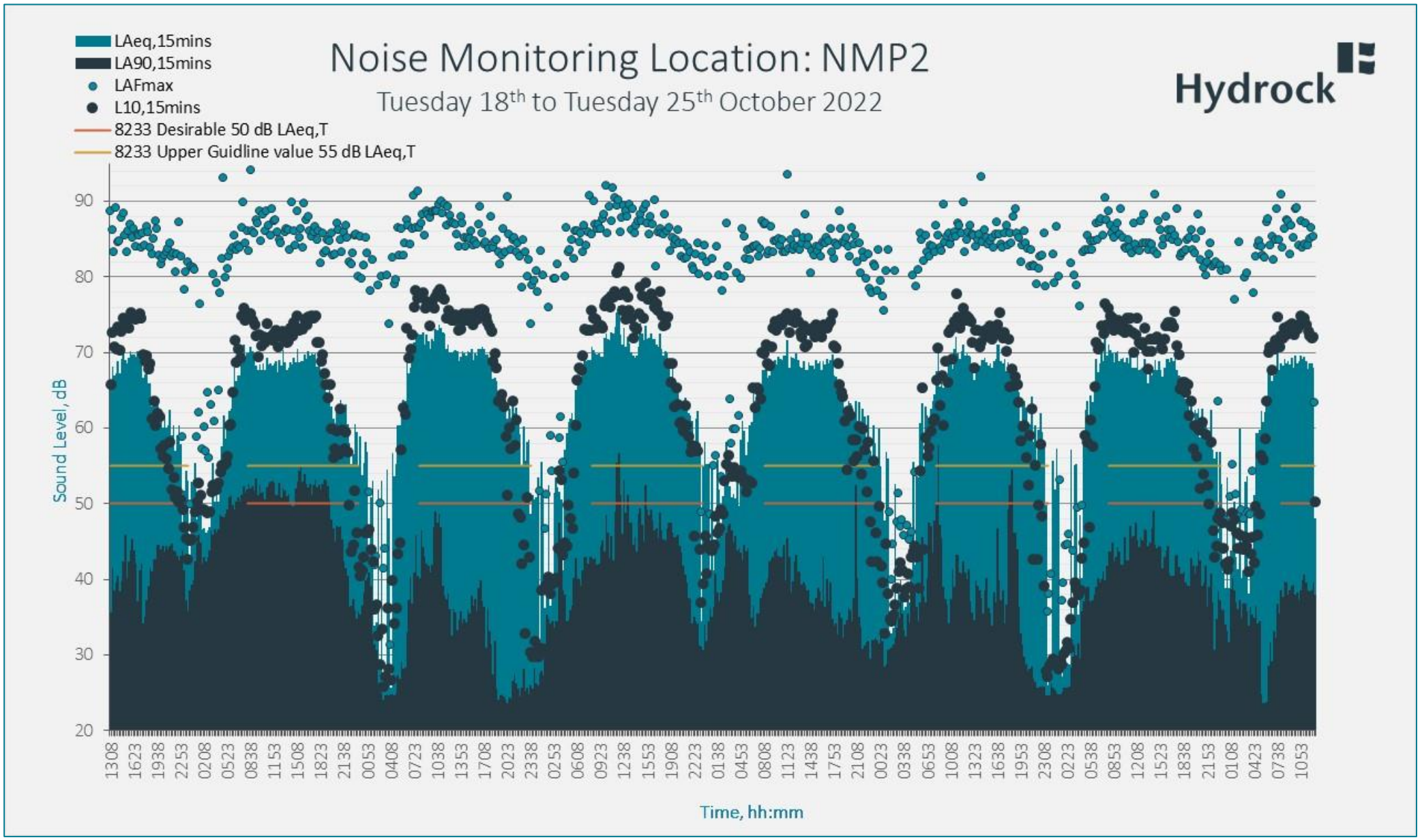
Appendix A Glossary

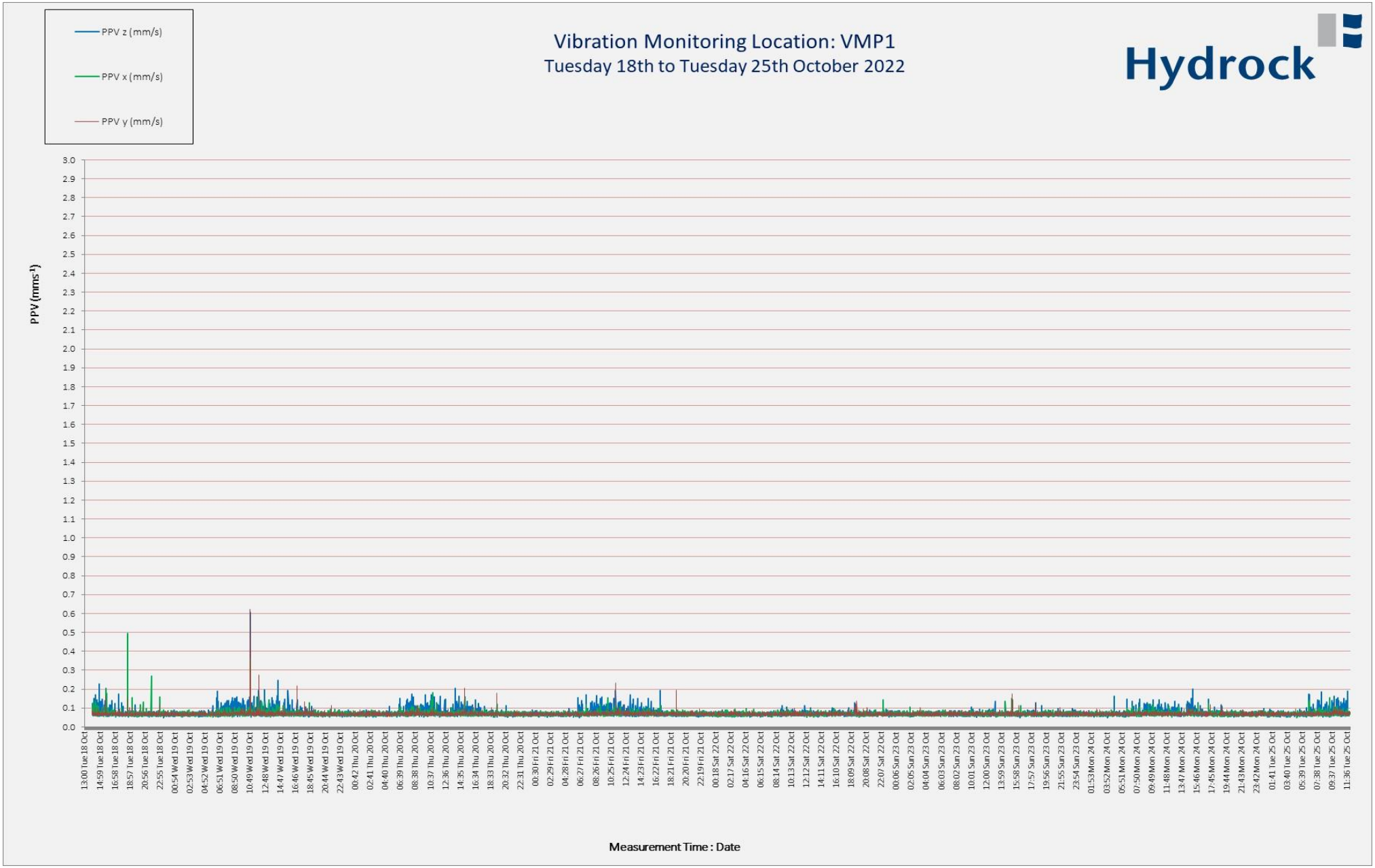
Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence the L_{10} is the level exceeded for 10% of the time.LA10 is the index generally adopted to assess traffic noise.
L_{90}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence the L_{90} is the level exceeded for 90% of the time.
R_w	R_w is the single-number quantity which characterizes the sound insulating properties of a given material over a range of frequencies. This is typically measured in a laboratory in accordance with BS EN ISO 717-1.

$D_{n,e,w}$	$D_{n,e,w}$ is the single number quantity which characterizes the airborne sound insulation performance across a given 'element' and is typically used to describe the acoustic performance of trickle ventilators etc.
C_{tr}	C_{tr} is a correction term applied to single-number sound insulation values (R_w, $D_{n,e,w}$ etc.) to afford additional weighting against low frequency performance.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and at least 3m from buildings.

Appendix B Noise & Vibration Results


LAeq,15mins
LA90,15mins
LAFmax
L10,15mins
8233 Desirable 50 dB LAeq,T
8233 Upper Guidline value 55 dB LAeq,T
Noise Monitoring Location: NMP1
Tuesday 18th to Tuesday 25th October 2022
Hydrock
Sound Level, dB
90
80
70
60
50
40
30
20
1207
1507
1807
2107
0007
0307
0607
0907
1207
1507
1807
2107
0007
0307
0607
0907
1207
1507
1807
2107
0007
0307
0607
0907
1207
1507
1807
2107
0007
0307
0607
0907
1207
1507
1807
2107
0007
0307
0607
0907
1207
Time, hh:mm


LAeq,15mins
LA90,15mins
LAFmax
L10,15mins
8233 Desirable 50 dB LAeq,T
8233 Upper Guidline value 55 dB LAeq,T
Noise Monitoring Location: NMP2
Tuesday 18th to Tuesday 25th October 2022
Hydrock
Sound Level, dB
90
80
70
60
50
40
30
20
1308
1623
1938
2253
0208
0523
0838
1153
1508
1823
2138
0053
0408
0723
1038
1353
1708
2023
2338
0253
0608
0923
1238
1553
1908
2223
0138
0453
0808
1123
1438
1753
2108
0023
0338
0653
1008
1323
1638
1953
2308
0223
0538
0853
1208
1523
1838
2153
0108
0423
0738
1053
Time, hh:mm


PPV z (mm/s)
PPV x (mm/s)
PPV y (mm/s)
Vibration Monitoring Location: VMP1
Tuesday 18th to Tuesday 25th October 2022
Hydrock
PPV (mms-1)
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
13:00 Tue 18 Oct
14:59 Tue 18 Oct
16:58 Tue 18 Oct
18:57 Tue 18 Oct
20:56 Tue 18 Oct
22:55 Tue 18 Oct
00:54 Wed 19 Oct
02:53 Wed 19 Oct
04:52 Wed 19 Oct
06:51 Wed 19 Oct
08:50 Wed 19 Oct
10:49 Wed 19 Oct
12:48 Wed 19 Oct
14:47 Wed 19 Oct
16:46 Wed 19 Oct
18:45 Wed 19 Oct
20:44 Wed 19 Oct
22:43 Wed 19 Oct
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02:41 Thu 20 Oct
04:40 Thu 20 Oct
06:39 Thu 20 Oct
08:38 Thu 20 Oct
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12:36 Thu 20 Oct
14:35 Thu 20 Oct
16:34 Thu 20 Oct
18:33 Thu 20 Oct
20:32 Thu 20 Oct
22:31 Thu 20 Oct
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02:29 Fri 21 Oct
04:28 Fri 21 Oct
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08:26 Fri 21 Oct
10:25 Fri 21 Oct
12:24 Fri 21 Oct
14:23 Fri 21 Oct
16:22 Fri 21 Oct
18:21 Fri 21 Oct
20:20 Fri 21 Oct
22:19 Fri 21 Oct
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02:17 Sat 22 Oct
04:16 Sat 22 Oct
06:15 Sat 22 Oct
08:14 Sat 22 Oct
10:13 Sat 22 Oct
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18:09 Sat 22 Oct
20:08 Sat 22 Oct
22:07 Sat 22 Oct
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02:05 Sun 23 Oct
04:04 Sun 23 Oct
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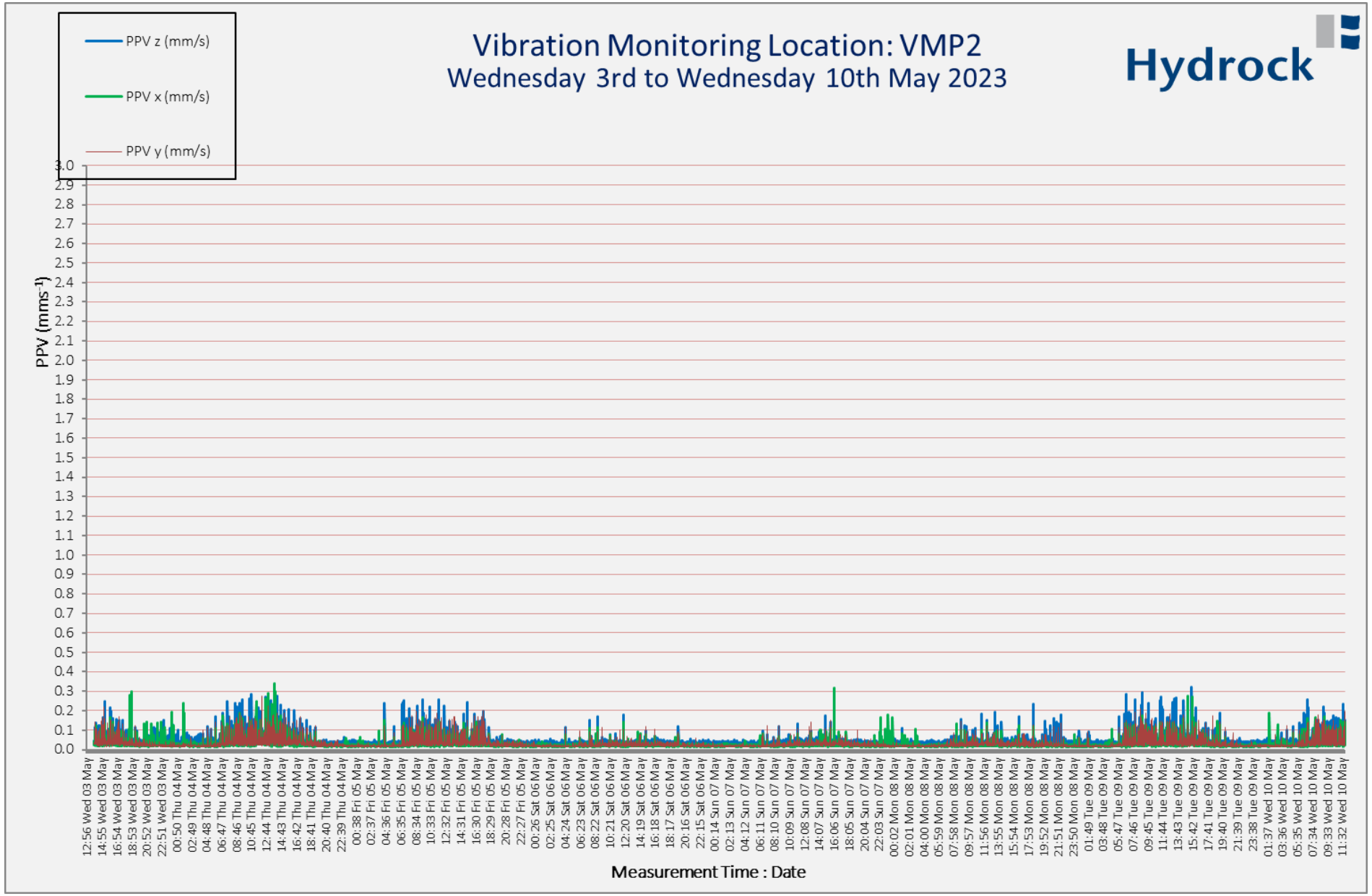
07:50 Mon 24 Oct
09:49 Mon 24 Oct
11:48 Mon 24 Oct
13:47 Mon 24 Oct
15:46 Mon 24 Oct
17:45 Mon 24 Oct
19:44 Mon 24 Oct
21:43 Mon 24 Oct
23:42 Mon 24 Oct
01:41 Tue 25 Oct
03:40 Tue 25 Oct
05:39 Tue 25 Oct
07:38 Tue 25 Oct
09:37 Tue 25 Oct
11:36 Tue 25 Oct
Measurement Time : Date


Vibration Monitoring Location: VMP2
Wednesday 3rd to Wednesday 10th May 2023
Hydrock
PPV z (mm/s)
PPV x (mm/s)
PPV y (mm/s)
PPV (mms-1)
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
12:56 Wed 03 May
14:55 Wed 03 May
16:54 Wed 03 May
18:53 Wed 03 May
20:52 Wed 03 May
22:51 Wed 03 May
00:50 Thu 04 May
02:49 Thu 04 May
04:48 Thu 04 May
06:47 Thu 04 May
08:46 Thu 04 May
10:45 Thu 04 May
12:44 Thu 04 May
14:43 Thu 04 May
16:42 Thu 04 May
18:41 Thu 04 May
20:40 Thu 04 May
22:39 Thu 04 May
00:38 Fri 05 May
02:37 Fri 05 May
04:36 Fri 05 May
06:35 Fri 05 May
08:34 Fri 05 May
10:33 Fri 05 May
12:32 Fri 05 May
14:31 Fri 05 May
16:30 Fri 05 May
18:29 Fri 05 May
20:28 Fri 05 May
22:27 Fri 05 May
00:26 Sat 06 May
02:25 Sat 06 May
04:24 Sat 06 May
06:23 Sat 06 May
08:22 Sat 06 May
10:21 Sat 06 May
12:20 Sat 06 May
14:19 Sat 06 May
16:18 Sat 06 May
18:17 Sat 06 May
20:16 Sat 06 May
22:15 Sat 06 May
00:14 Sun 07 May
02:13 Sun 07 May
04:12 Sun 07 May
06:11 Sun 07 May
08:10 Sun 07 May
10:09 Sun 07 May
12:08 Sun 07 May
14:07 Sun 07 May
16:06 Sun 07 May
18:05 Sun 07 May
20:04 Sun 07 May
22:03 Sun 07 May
00:02 Mon 08 May
02:01 Mon 08 May
04:00 Mon 08 May
05:59 Mon 08 May
07:58 Mon 08 May
09:57 Mon 08 May
11:56 Mon 08 May
13:55 Mon 08 May
15:54 Mon 08 May
17:53 Mon 08 May
19:52 Mon 08 May
21:51 Mon 08 May
23:50 Mon 08 May
01:49 Tue 09 May
03:48 Tue 09 May
05:47 Tue 09 May
07:46 Tue 09 May
09:45 Tue 09 May
11:44 Tue 09 May
13:43 Tue 09 May
15:42 Tue 09 May
17:41 Tue 09 May
19:40 Tue 09 May
21:39 Tue 09 May
23:38 Tue 09 May
01:37 Wed 10 May
03:36 Wed 10 May
05:35 Wed 10 May
07:34 Wed 10 May
09:33 Wed 10 May
11:32 Wed 10 May
Measurement Time : Date

Appendix C TGPC Traffic Counts

Traffic Count at Ford (west side) conducted on 14 October 2022

		Towards Tewkesbury			Towards Stow on the Wold		
From	**To**	**HGV**	**Car & Van**	**Motor Cycle**	**HGV**	**Car & Van**	**Motor Cycle**
06:00	08:30	9	103	0	11	206	1
08:30	08:40	1	8	0	3	6	0
08:40	08:50	1	22	0	3	23	1
08:50	09:00	1	9	0	0	16	2
09:00	09:10	2	11	0	0	17	3
09:10	09:20	1	8	0	3	15	4
09:20	09:30	1	4	0	1	14	5
09:30	09:40	0	20	0	2	29	6
09:40	09:50	1	7	0	0	7	7
09:50	10:00	6	11	0	2	18	8
10:00	10:10	2	10	0	1	32	9
10:10	10:20	2	8	0	0	16	10
10:20	10:25	1	17	0	4	7	11
10:25	10:35	0	8	3	0	15	0
10:35	10:45	1	10	0	1	17	1
10:45	10:55	1	14	0	2	16	1
10:55	11:05	1	16	0	0	19	0
11:05	11:15	0	9	0	1	14	0
11:15	11:25	0	6	0	0	19	1
11:25	11:35	2	10	0	1	21	0
11:35	11:45	1	18	0	1	21	0
11:45	11:55	1	18	1	0	16	0
11:55	12:05	1	15	0	4	18	0
12:05	12:15	0	17	0	1	17	0
12:15	12:25	1	18	0	1	16	1
12:25	12:30	0	3	0	0	5	0
12:30	15:00	23	183	4	24	135	4
15:00	15:10	1	24	0	1	17	0
15:10	15:20	1	35	0	0	23	0
15:20	15:30	0	14	0	0	16	1
15:30	15:40	0	29	0	0	20	0
15:40	15:50	1	18	1	0	15	0
15:50	16:00	0	28	1	0	11	1
Totals:		**63**	**731**	**10**	67	**857**	**77**

Traffic Count conducted on 24 October 2022 between 06:30 and 18:30

From	To	Towards Tewkesbury				Towards Stow on the Wold			
		All HGV	Comm. Van	Car	Motor Cycle	All HGV	Comm. Van	Car	Motor Cycle
06:30	07:00	2	4	15	0	6	5	36	0
07:00	07:30	3	6	14	0	4	15	28	0
07:30	08:00	2	10	31	0	5	23	56	0
08:00	08:30	4	10	19	0	7	20	44	0
08:30	09:00	3	6	25	0	3	9	30	0
09:00	09:30	6	6	26	0	12	14	25	0
09:30	10:00	4	4	19	0	2	13	30	1
10:00	10:30	11	3	24	0	11	5	54	0
10:30	11:00	4	12	25	0	5	12	41	0
11:00	11:30	4	9	20	0	3	6	42	0
11:30	12:00	3	26	21	0	2	6	30	2
12:00	12:30	4	16	39	0	7	7	33	0
12:30	13:00	4	11	29	0	2	7	34	0
13:00	13:30	7	9	24	0	6	8	35	0
13:30	14:00	5	6	32	0	3	8	25	0
14:00	14:30	8	11	35	0	3	4	25	0
14:30	15:00	8	8	35	0	3	13	32	0
15:00	15:30	7	14	25	0	4	13	38	0
15:30	16:00	5	7	30	0	2	7	24	1
16:00	16:30	1	22	34	1	0	12	34	1
16:30	17:00	1	10	47	0	1	7	30	0
17:00	17:30	0	14	51	0	1	10	41	0
17:30	18:00	0	8	42	0	1	5	23	0
18:00	18:30	1	5	29	0	0	3	15	0
Totals:		**97**	**237**	**691**	**1**	**93**	**232**	**805**	**5**

Visual Traffic Counts Ford B4077			17th May 2023					
Summary								
		Towards Stow on the Wold				Towards Stow on the Wold		
From	To	HGV	Car & Van	Motor Cycle		HGV	Car & Van	Motor Cycle
06:00	08:30	9	103	0		11	206	1
08:30	08:40	1	8	0		3	6	0
08:40	08:50	1	22	0		3	23	1
08:50	09:00	1	9	0		0	16	2
09:00	09:10	2	11	0		0	17	3
09:10	09:20	1	8	0		3	15	4
09:20	09:30	1	4	0		1	14	5
09:30	09:40	0	20	0		2	29	6
09:40	09:50	1	7	0		0	7	7
09:50	10:00	6	11	0		2	18	8
10:00	10:10	2	10	0		1	32	9
10:10	10:20	2	8	0		0	16	10
10:20	10:25	1	17	0		4	7	11
10:25	10:35	0	8	3		0	15	0
10:35	10:45	1	10	0		1	17	1
10:45	10:55	1	14	0		2	16	1
10:55	11:05	1	16	0		0	19	0
11:05	11:15	0	9	0		1	14	0
11:15	11:25	0	6	0		0	19	1
11:25	11:35	2	10	0		1	21	0
11:35	11:45	1	18	0		1	21	0
11:45	11:55	1	18	1		0	16	0
11:55	12:05	1	15	0		4	18	0
12:05	12:15	0	17	0		1	17	0
12:15	12:25	1	18	0		1	16	1
12:25	12:30	0	3	0		0	5	0
12:30	15:00	23	183	4		24	135	4
15:00	15:10	1	24	0		1	17	0
15:10	15:20	1	35	0		0	23	0
15:20	15:30	0	14	0		0	16	1
15:30	15:40	0	29	0		0	20	0
15:40	15:50	1	18	1		0	15	0
15:50	16:00	0	28	1		0	11	1
Totals:		63	731	10		67	37	30

Visual Traffic Counts Ford B4077 (west side) **6th June 2023**

		← West Towards Toddington				East Towards Stow on the Wold →			
From	**To**	**HGV**	**Comm. Van**	**Car**	**Other**	**HGV**	**Comm. Van**	**Car**	**Other**
06:00	06:30	0	0	10	2	4	10	16	1
06:30	07:00	0	3	14	0	10	10	16	1
		0							
07:00	07:10	0	3	10	0	0	4	14	0
07:10	07:20	0	1	1	1	2	4	17	0
07:20	07:30	1	3	1	0	1	8	24	0
		0							
07:30	07:40	0	2	5	0	4	1	9	2
07:40	07:50	2	2	2	0	2	4	28	2
07:50	08:00	3	5	9	0	3	5	14	0
08:00	08:10	5	2	3	2	2	6	12	1
08:10	08:20	1	3	10	1	2	5	12	1
08:20	08:30	0	3	7	1	3	8	15	1
08:30	08:40	2	2	7	0	0	7	21	1
08:40	08:50	1	1	13	1	0	6	11	0
08:50	09:00	0	2	11	0	1	6	10	0
09:00	09:10	1	5	6	1	5	8	19	0
09:10	09:20	1	4	8	0	1	11	10	0
09:20	09:30	1	1	4	1	0	6	10	0
09:30	09:40	0	3	7	0	6	5	7	0
09:40	09:50	2	3	2	0	5	3	12	0
09:50	10:00	0	5	9	0	1	2	11	0
10:00	10:10	1	3	6	0	3	2	9	0
10:10	10:20	3	3	4	0	3	9	15	0
10:20	10:30	1	1	9	0	0	5	8	0
10:30	10:40	3	7	9	0	0	4	5	0
10:40	10:50	2	1	10	1	0	3	11	1
10:50	11:00	2	2	9	0	2	5	13	0
11:00	11:10	1	6	8	0	1	3	17	0
11:10	11:20	2	1	6	0	2	6	14	0
11:20	11:30	1	4	4	0	3	5	17	0
11:30	11:40	1	1	4	0	0	4	11	0
11:40	11:50	0	2	4	0	1	2	9	0
11:50	12:00	0	3	16	0	0	3	20	0
12:00	12:10	1	6	2	0	1	7	18	2
12:10	12:20	1	3	10	0	0	1	13	1
12:20	12:30	4	3	6	0	0	1	11	0
12:30	12:40	1	1	6	1	0	1	14	0
12:40	12:50	1	2	9	0	4	3	17	0
12:50	13:00	0	1	12	0	2	1	15	1
13:00	13:10	0	2	9	0	0	3	10	0
13:10	13:20	1	0	14	0	0	2	10	4
13:20	13:30	1	2	6	1	3	6	13	0
13:30	13:40	0	2	10	0	2	6	15	4
13:40	13:50	0	3	15	0	2	0	20	0
13:50	14:00	0	2	11	0	1	1	6	0
14:00	14:10	2	1	11	17	0	1	14	3
14:10	14:20	1	5	3	0	0	1	13	0
14:20	14:30	0	1	10	3	1	1	9	0
14:30	14:40	0	5	11	0	1	4	14	0
14:40	14:50	0	3	9	0	1	2	8	0
14:50	15:00	0	3	6	0	3	3	13	0
15:00	15:10	3	4	9	0	0	0	14	0
15:10	15:20	0	5	9	0	0	0	14	0
15:20	15:30	1	3	13	0	1	0	9	0
15:30	15:40	0	3	14	0	0	0	4	0
15:40	15:50	1	0	12	0	0	0	6	0
15:50	16:00	2	5	16	0	0	0	11	0
16:00	16:10	1	11	14	0	0	2	8	1
16:10	16:20	0	6	20	0	0	3	14	0
16:20	16:30	0	7	8	0	0	3	20	2
16:30	16:40	0	4	14	0	0	2	8	1
16:40	16:50	0	4	19	0	0	3	12	1
16:50	17:00	0	6	17	0	1	3	13	0
17:00	17:10	0	7	16	0	0	1	15	1
17:10	17:20	0	3	18	0	0	0	18	1
17:20	17:30	1	4	16	0	0	2	15	1
17:30	17:40	0	1	14	1	0	2	9	0
Totals:		59	**205**	**617**	**34**	90	**235**	**860**	**34**

Appendix D Policy and Guidance

National Planning Policy Framework (NPPF)

Published in February 2019, this document sets out the Government's planning policies for England and supersedes the previous version of the NPPF published in 2012. It makes the following reference to noise in the section entitled Conserving and enhancing the natural environment:

> *"170. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *[…]*
>
> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."*

It also makes the following references to noise in the Section entitled Ground conditions and pollution:

> *"180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life60;*
>
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*
>
> *60 See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)."*

And

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

Noise Policy Statement for England (NPSE)

Published in March 2010, the Noise Policy Statement for England (NPSE) sets out the long-term vision of Government noise policy as follows:

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

The NPSE identifies three observed effect levels, names "No Observed Effect Level" (NOEL), "Lowest Observed Adverse Effect Level" (LOAEL) and "Significant Observed Adverse Effect Level" (SOAEL).

The NPSE contains little detail on assessment methodologies and specific parameters at which the varying observed effect levels would occur in the context of a residential development.

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

As discussed above, there is no specific guidance contained within the Planning Condition and the NPSE. In lieu of this, the approach that is generally adopted when assessing environmental noise sources on residential developments is to undertake an assessment in accordance with BS 8233: 2014.

BS 8233 provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building. The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in the table below:

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

Whilst BS 8233:2014 recognises that a guideline value may be set in terms of SEL or L_{AFmax} for the assessment of regular individual noise events that can cause sleep disturbance during the night-time, a specific criterion is not stipulated. Accordingly, reference has been made in this assessment to the World Health Organisation (WHO) 1999: Guidelines for Community Noise below.

With respect to external amenity space such as gardens and patios it is stated that it is desirable that the noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and locations adjoining the strategic transportation network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

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

As with the 'good' and 'reasonable' criteria in BS 8233, the L_{AFmax} criterion in BS8233 is largely concordant with the World Health Organisation (WHO) guidance 1999: Guidelines for community noise. This document draws upon guidance from Vallet and Vernay, which states:

> *"For good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night"*

Design Manual for Roads and Bridges, Volume 11, Section 7

An approach to assessing noise and vibration effects from roads is described in Design Manual for Roads and Bridges (DMRB) and whilst DMRB is intended for use in the assessment of new or altered highways, it does provide a useful reference for considering the impact of traffic increases due to other types of development.

The DMRB approach to assessing noise and vibration impact is to compare the noise levels for a 'do something' (with scheme) scenario against levels that would occur if the proposed development did not take place, i.e 'do minimum' (without scheme) scenario.

The assessment methodology considers the change in noise levels due to the scheme in the short and long term and provides a description of the magnitude (reproduced in below Table).

Short-Term and Long-Term Magnitude of Change in Road Traffic Noise, according to DMRB

Level of Magnitude	Short Term Change in Noise Level L10,18hour dB(A)	Long Term Change in Noise Level L10,18hour dB(A)	Significance of Impact – as described in DMRB
High	≥ 5.0	≥ 10.0	Major
Medium	3.0-4.9	5.0-9.9	Moderate
Low	1.0-2.9	3.0-4.9	Minor
Negligible	0.1-0.9	0.1-2.9	Negligible

The significance criteria used to assess changes in road traffic noise is as presented in below Table (from DMRB). This table describes the effect of noise at a given magnitude. The descriptions are based upon IEMA Guidelines for Environmental Noise Impact Assessment and the Noise Exposure Hierarchy in PPG-Noise.

Effect of Road Noise Impact at Residential Properties

Descriptor	Description of Effect
High	Impact resulting in a considerable change in baseline environmental conditions predicted either to cause statutory objectives to be significantly exceeded or to result in severe undesirable/desirable consequences on the receiving environment.
Medium	Impact resulting in a discernible change in baseline environmental conditions predicted either to cause statutory objectives to be marginally exceeded or to result in undesirable/desirable consequences on the receiving environment.
Low	Impact resulting in a change in baseline environmental conditions with undesirable/desirable conditions that can be tolerated.
Negligible	No discernible change in baseline environmental conditions.

Calculation of Road Traffic Noise (CRTN)

The Calculation of Road Traffic Noise (CRTN) document provides a method for assessing noise from road traffic in the UK and a method of calculating noise levels from the Annual Average Weekday Traffic (AAWT) flows and from measured noise levels.. The calculation methods provided include correction factors to take account of variables affecting the creation and propagation of road traffic noise, accounting for the percentage of heavy goods vehicles (HGV), different road surfacing, inclination, screening by barriers and relative height of source and receiver.