

MARCH 18, 2024



BS8233, BS4142 AND BS6472
ASSESSMENT OF
WYNN OFFA,
WYNNSTAY YARD,
RUABON, LL14 6DP

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1.0 Introduction

- 1.01 E2 Consultants have been commissioned to undertake a noise & vibration impact survey and assessment for Wynn Offa, Wynnstay Yard, Ruabon.
- 1.02 The methodology used for this assessment will be BS8233:2014 as this is a new development within the designated area. BS4142:2014+A1:2019 will also be considered with the possibility of industrial noise to the rear of the proposed dwellings.
- 1.03 Vibration impact levels will be assessed in accordance with BS6472-1.
- 1.04 The report will also issue recommendations of acoustic performance of glazing and, if required, ventilation proposals in order for the future dwelling to meet all necessary criteria.

2.0 Development Description

- 2.0.1 The proposed dwellings are located just off the B5605/Park Road in between Ruabon and Cefn-mawr.
- 2.0.2 The development consists of a two-storey single dwelling with landscaped gardens to the front and rear.
- 2.0.3 The main noise sources likely to disrupt the proposed building is the traffic from the main road and also potentially from the railway line to the rear. An assessment was also conducted to look at any industrial noise from the packing plant and factory area to the North-West of the site.
- 2.0.4 With the above sources in mind the monitoring took place in the currently vacant area. The vibration meter was also placed close to the railway line in order to collect worst-case vibration data and possible impact on the proposed dwelling.

2.1 Locations of Monitors

- 2.1.1 A Type 1 sound level meter was installed in the area that is likely to be the garden for the proposed development. This allowed calculations to be made from likely screening objects from the proposed development itself, and the noise impact for outdoor spaces in accordance with BS8233. Attended assessments were conducted within the packing plant industrial area.
- 2.1.2 Figure 1-4 shows the area where the monitors were installed.
- 2.1.3 All locations are displayed on site map in figure 5.

Figure 1 – Noise at proposed site boundary



Figure 2 – vibration monitor at site boundary



Figure 3 – industrial site measurement 1



Figure 4 – packing plant assessment

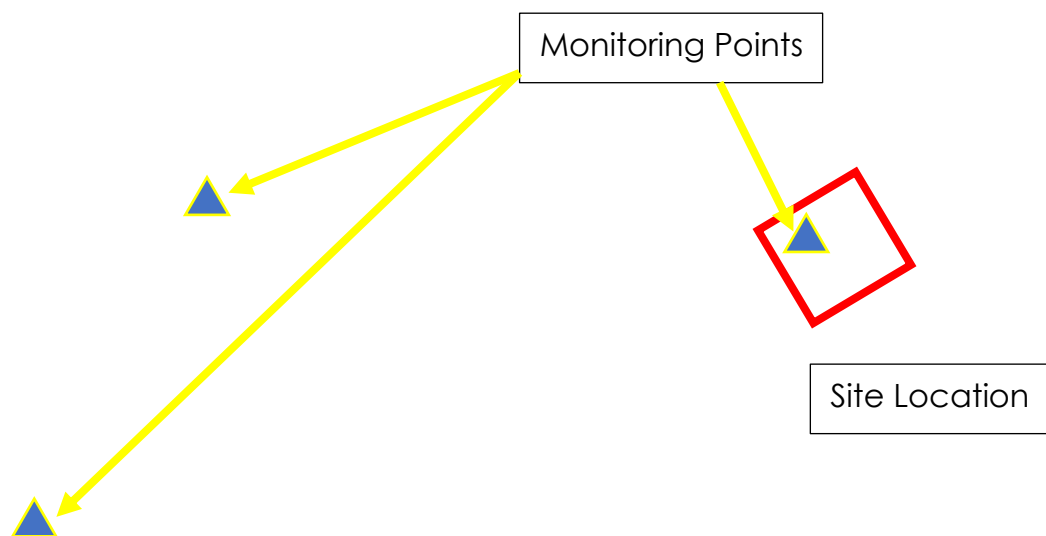


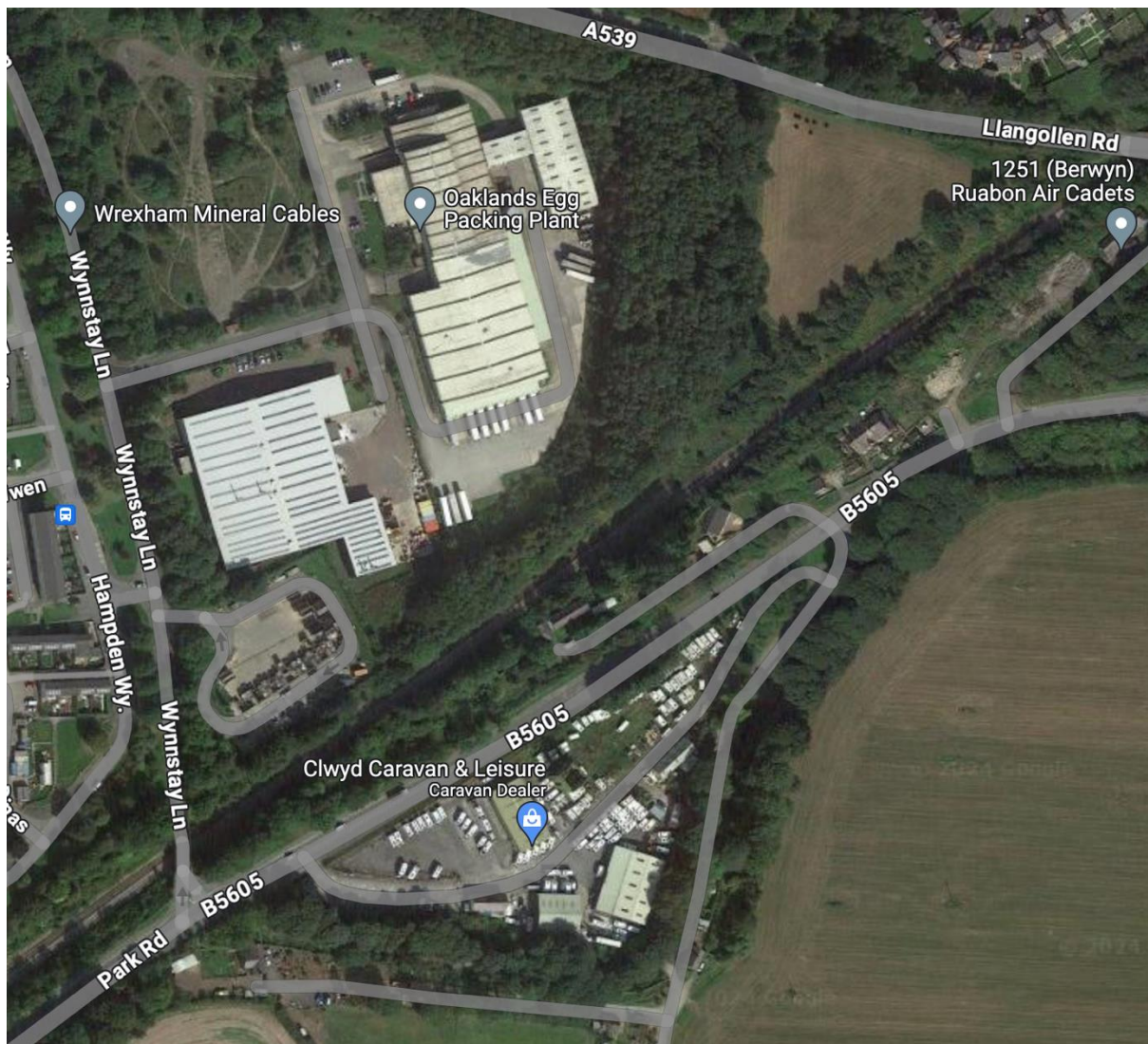
- 2.1.4 Measurements were made in 15 minute periods, on 1 second averaging, to allow for the removal of anomalies and increased accuracy. The data was averaged into L_{Aeq_16hr} daytime and L_{Aeq_8hr} night-time with data also recorded for L_{Amax} in both day and night periods for the BS8233:2014 assessment. L_{A90} was also measured for the BS4142:2014 aspect.
- 2.1.5 The monitoring was conducted using 2 x Type 1 NTI XL2 sound level meter, outdoor case with batteries and outdoor microphone protection. The vibration measurements were conducted using a Sigicom C22 triaxial monitor.
- 2.1.6 The measurements were taken by a fully qualified engineer with AMIOA status with the institute of Acoustics.

- 2.1.7 All measurements were taken after a field calibration was undertaken to ensure accuracy and repeatability of measurements. Drift was also checked post measurement to validate the data collected.
- 2.1.8 Further data such as wind speed, wind direction, rainfall intensity, temperature and cloud cover were all recorded at the beginning and end of the assessment at the monitoring location.
- 2.1.9 Any anomalies (such as noise by the engineer during setup and collection of the kit) were removed from the survey for a true reflection of the ambient levels in the vicinity. This was done by recording audio throughout the survey at each location and listening back through the files during the analysis process to confirm what was recorded manually during the survey.

2.0 Plan Views of Site with Designated Work Areas

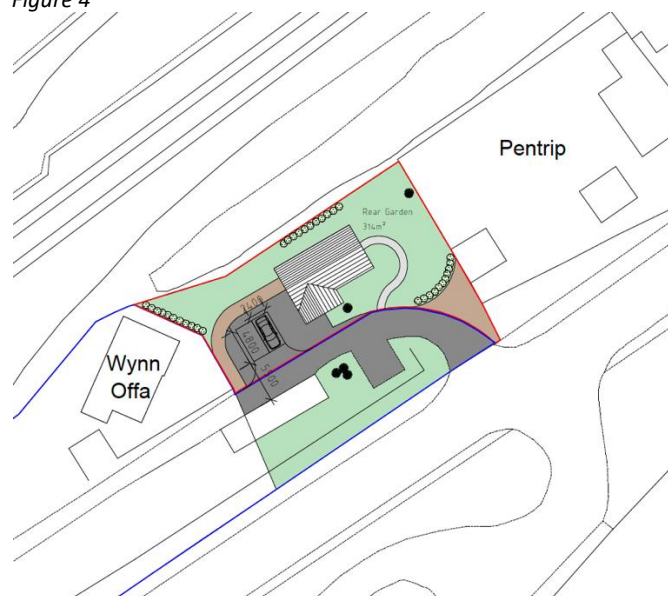
Figure 5





2.3 Proposed Layout

Figure 4



3.0 Noise Assessment Criteria

- 3.0.1 The Planning Policy Wales sets out the Government's economic, environmental and social planning policies. Section 3.22 states;

"Planning authorities should develop and maintain places that support healthy, active lifestyles across all age and socio-economic groups, recognising that investment in walking and cycling infrastructure can be an effective preventative measure which reduces financial pressures on public services in the longer term. The way a development is laid out and arranged can influence people's behaviours and decisions and can provide effective mitigation against air and noise pollution."

- 3.0.2 The guidance also sees traffic consideration and management as key when it comes to noise impact assessments. Section 4.1.45 states

"Local authorities must adopt an integrated approach to traffic management. They should consider how different measures can complement one another and contribute to the achievement of wider planning and transport objectives, implementing the Active Travel Act and reducing exposure to air and noise pollution, taking into account the needs of the disabled and less mobile sections of the community."

- 3.0.3 Section 6 of the document also tackles the likely social and well-being impacts of the preservation of 'distinctive and natural places'. Section 6.7.1 refers to the need to protect the soundscape of areas;

“Clean air and an appropriate soundscape, contribute to a positive experience of place as well as being necessary for public health, amenity and well-being. They are indicators of local environmental quality and integral qualities of place which should be protected through preventative or proactive action through the planning system. Conversely, air, noise and light pollution can have negative effects on people, biodiversity and the resilience of ecosystems and should be reduced as far as possible.”

This is then continued in reference to noise in section 6.7.4;

“The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.”

3.0.4. It is possible to apply objective standards to the assessment of noise and the effect produced by the introduction of a certain noise source may be determined by several methods, as follows:

- The effect may be determined by reference to guideline noise values. British Standard (BS) 8233:2014 and World Health Organisation (WHO) “Guidelines for Community Noise” contain such guidelines.
- Another method is to compare the resultant noise level against the background noise level (L_{A90}) of the area. This is the method employed by BS 4142:2014 to determine the likelihood of complaint from noise of an industrial nature. It is best suited to the assessment of steady or pseudo-steady noise.

3.0.5 British Standard 8233:2014 is principally intended to assist in the design of new dwellings; however, the Standard does state that it may be used in the assessment of noise from new sources being brought to existing dwellings.

3.0.6 The WHO guideline values are appropriate to what are termed “critical health effects”. This means that the limits are at the lowest noise level that would result in any psychological or physiological effect.

The WHO/BS 8233 guideline noise values are summarised in the following table:

Table 1

Guidance Document	L_{AeqT}	L_{Amax}	Outcome
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World Health Organisation “Community Noise 2000”	55dB		Serious annoyance, daytime and evening. (Continuous noise, outdoor living areas)
	50dB		Moderate annoyance, daytime and evening. (Continuous noise, outdoor living areas).
	35dB		Moderate annoyance, daytime and evening. (Continuous noise, dwellings, indoors)
	30dB		Sleep disturbance, night-time (indoors)
		60dB	Sleep disturbance, windows open at night. (Noise peaks outside bedrooms, external level).
		45dB	Sleep disturbance at night (Noise peaks inside bedrooms, internal level)
BS 8233:2014 “Sound Insulation and noise reduction for buildings”	55dB		Upper limit for external steady noise. (gardens and patios).
	50dB		Desirable limit for external steady noise. (gardens and patios).
	L _{Aeq} 16 hours = 35 dB		Resting, living room day. (Internal – steady noise)
	L _{Aeq} 16 hours = 40 dB		Dining, dining room day. (Internal – steady noise)
	L _{Aeq} 16 hour = 35 dB		Sleeping, bedroom day (Internal – steady noise)
	L _{Aeq} 8 hours = 30 dB		Sleeping, bedroom day (Internal – steady noise)

3.0.7 For L_{AeqT} criteria the time base (T) given in the documents is 16 hours for daytime limits and 8 hours for night time limits. All surveys are conducted on 1 hour daytime and 15 minute night values – based on 1 second readings on a Type 1 sound level meter. The readings are taken every 5 mins for noise to allow the elimination of erroneous data if required.

3.0.8 The WHO guidelines are also concerned with the L_{AMax} for night-time sleep disturbance. The guideline states:

“For a 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”

- 3.0.9 On this basis, for the purpose of assessing night-time L_{AFmax} noise events, it is considered appropriate to adopt the 10th highest L_{AFmax} noise event occurring in a typical night-time (23:00 – 07:00) period.
- 3.0.10 Audio recordings are taken throughout the measurements to allow for further assessments on high levels. Listening to the audio and performing tonal analysis will allow anomalies to be removed from the data, if required.

3.1 Standards and Guidelines (Vibration)

- 3.1.1 BS6472-part 1 2008 is the Guide to evaluation of human exposure to vibration in buildings. This is an effective assessment procedure for the likelihood of annoyance from vibration. The standard says:

“Whether at home or at work, the vibration tolerance of people varies over a wide range. As well as a large range of individual vibration sensitivity over the population, specific values depend on social and cultural factors, psychological attitudes and the expected degree of intrusion.

Building vibrations as they affect people can be classified usefully according to a combination of descriptions. The time history of the vibration input to the subject can be:

- *continuous;*
- *intermittent; or*
- *occasional”*

- 3.1.2 Impulsive vibration levels are seen as the most likely to cause issues and annoyance to property dwellers through ‘startling’. For this reason the standard employs the vibration dose summation procedure. The standard explains this procedure as;

“allows comparison of all types of vibration exposure on a common basis, i.e. the severity of impulsive and/or intermittent vibration is evaluated on a basis applicable equally to continuous vibration.”

- 3.1.3 Train pass-by measurements are typically done using this Vibration Dose Value measurement technique (VDV) as there is a build-up of energy to a peak.
- 3.1.4 Vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings.

Table 2

Place and Time	Low probability of adverse comment m.s.p1.75 1)	Adverse comment possible m.s.p1.75	Adverse comment probable m.s.p1.75 2)
Residential buildings 16 h day	0.2 – 0.4	0.4 – 0.8	0.8 – 1.6
Residential buildings 8 h night	0.1 – 0.2	0.2 – 0.4	0.4 – 0.8

- 3.1.5 In circumstances where there is an expected level of vibration that will result in Adverse comment it is important to determine the true impact levels on human occupiers of the structures. BS6472-1:2008 provides the following recommendations for vibration measurement:

“Vibration should normally be measured on the floor of the room implicated (where any complaint originates, or where the greatest adverse comment is predicted.) at or near the point of greatest weighted acceleration.”

“For external excitation (e.g. ground-borne vibration), it is likely that the response of a floor will be dominated by rigid body motion or by its lowest “dish-shaped” mode of vibration. In this case, one or two measurement points in a suitable available area, preferably in the central part within one-third and two-thirds of the width/length, are sufficient to determine the vibration response of the floor to this form of excitation.”

- 3.1.6 Where vibration measurement is not an option within the building (i.e. access issues or due to the fact the structure does not exist) measurements are required at the most reasonable locations and the impact on the proposed structure calculated based on the materials to be used in construction

3.2 TAN 11: October 1997

- 3.2.1 The Technical Advise Note (Wales) 11, Noise – October 1997 provides some further criteria in relation to noise criteria categories for Noise-sensitive developments. These categories have been derived to assist local planning authorities in their consideration of planning applications. These categories are part of Annex A of the guidance document and are displayed in the tables below.

- 3.2.2 *“Local planning authorities should consider whether proposals for new noise-sensitive development would be incompatible with existing activities, taking into account the likely level of noise exposure at the time of the application and any increase that may reasonably be expected in the foreseeable future. Such development should not normally be permitted in areas which are, or are expected to become, subject to unacceptably high levels of noise and should not normally be permitted where high levels of noise will continue throughout the night.”*

Table 2: RECOMMENDED NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS NEAR EXISTING NOISE SOURCES					
Noise Levels ⁽¹⁾ corresponding to the Noise Exposure Categories for New Dwellings L _{Aeq,TdB}					
Noise Source		Noise Exposure Category			
		A	B	C	D
road traffic	0700-2300	<55	55-63	63-72	>72
	2300-0700 ⁽²⁾	<45	45-57	57-66	>66
rail traffic	0700-2300	<55	55-66	66-74	>74
	2300-0700 ⁽²⁾	<45	45-59	59-66	>66

TABLE 1: NOISE EXPOSURE CATEGORIES	
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

3.3 BS4142:2014 +A1 (2019)

- 3.3.1 Noise effects on residential properties due to the current operational hours and extended hours have been assessed according to the guidance in BS 4142:2014. This standard primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the ‘specific sound’ from the proposed development) at residential sensitive receptors.
- 3.3.2 The specific sound level may then be corrected for the character of the sound (e.g. perceptibility of tones and/or impulses), if appropriate, and it is then termed the ‘rating level’, whether or not a rating penalty is applied. The ‘residual sound’ is defined as the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
- 3.3.3 According to BS 4142:2014, the background sound levels adopted for the assessment should be representative of the periods being assessed. The standard recommends that the background sound level should be collected from continuous measurements of

normally not less than 15-minute intervals. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. It is particularly difficult to determine what is 'representative' of the night-time period because it can be subject to a wide variation in background sound levels between the shoulder night periods.

- 3.3.4 The method chosen for this section of the report is to use the data collected at the nearest NSR for the day and night periods to provide the ambient and background noise levels. The mode $L_{Aeq_1hr(Day)}$ and $L_{Aeq_15min(Night)}$ value will then be used for each time period over the course of the measurement as the most appropriate way of creating a representative value.
- 3.3.5 The specific sound levels have been determined separately in terms of the L_{Aeq1hr} during the daytime $L_{Aeq15min}$ during the night-time. Daytime is typically between 07:00 and 23:00 hours and night-time is typically between 23:00 and 07:00 hours, so these periods have been adopted for this assessment.
- 3.3.6 At each of the most likely sensitive receptor locations, the rating level has been determined from the predicted specific sound level. Where it has considered it to be appropriate, a rating penalty has been applied for tonality, impulsivity and/or intermittent specific sounds as described in the commentary to paragraph 9.2 of BS4142:2014. This has been applied with consideration for the main sound sources from site that contribute to the level of specific sound at the receptor location.
- 3.3.7 As per the requirements of the standard, an initial estimate of the impact of the specific sound has been obtained by subtracting the measured background sound level from the rating level of the specific sound. Table 2 provides the initial evaluation of impact following this method.

Table 3

Magnitude	Difference Between rating Level and Background Level	Comments
High	+10dB	Significant Adverse impact Likely
Medium	+5 to +10dB	Adverse impact Likely
Low	0 to +5 dB	Adverse impact unlikely
Negligible	Less than 0dB	Low chance of Adverse Impact

- 3.3.8 Following the initial evaluation of impact, the context of the sound has also been considered, which is a key requirement of the Standard. In evaluation of the context, the following factors have been considered:
- the absolute level of the sound;
 - the character and level of the residual sound compared to the character and level of the specific sound and

- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

3.4 Chosen Criteria

- 3.4.1 Based on the proposed development for a new dwelling, BS8233 was selected for this assessment. BS4142:2014 will also be looked at due to the presence of plant/machinery noise to the rear of the proposed dwelling. Vibration assessments will be conducted in accordance with BS6462-1

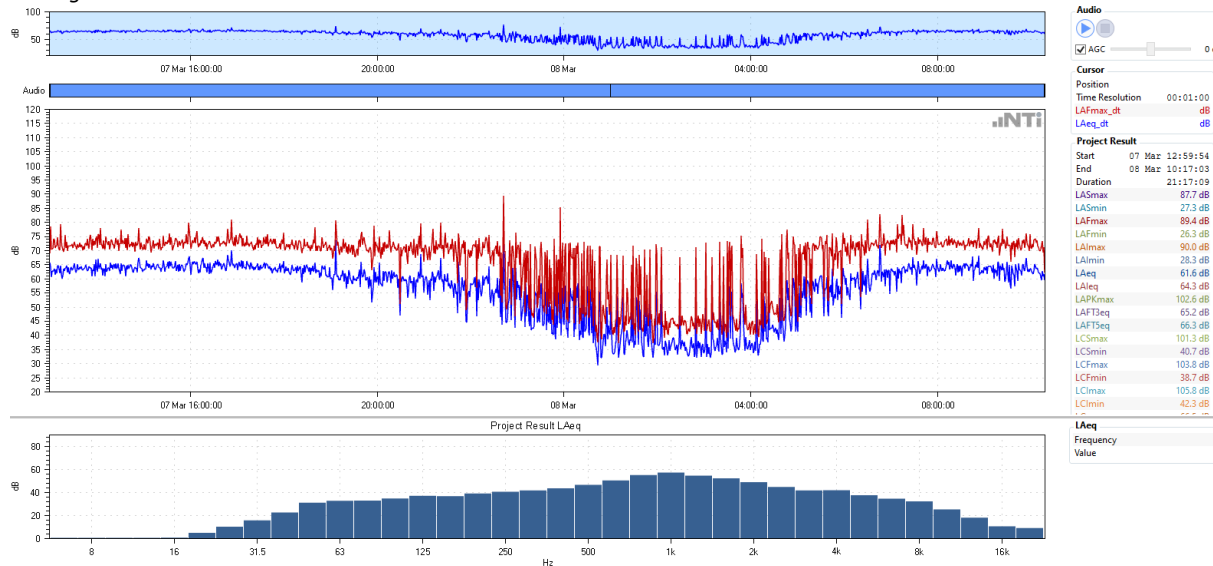
4.0 Results

4.1 Noise Assessment – 12.59pm 07/03/24 – 10.17am 08/03/24

Table 4

Location	L _{Aeq_16hr}	L _{Aeq_8hr}	L _{Amax} (10th highest)	L _{A90}
Day	63.0dBA			52.9dBA
Night		51.4dBA	75.2dBA	36.8dBA

Figure 4



4.1.1 Comments: Mainly traffic pass-by noise. No tonal features

Table 5

Day/Time	Cloud Cover	Temperature (Celcius)	Presence of fog/snow/ice	Wind Speed (m/s)	Wind Direction
Installation	1	9	No	1.7	SW
Collection	3	4	No	2.6	SSW

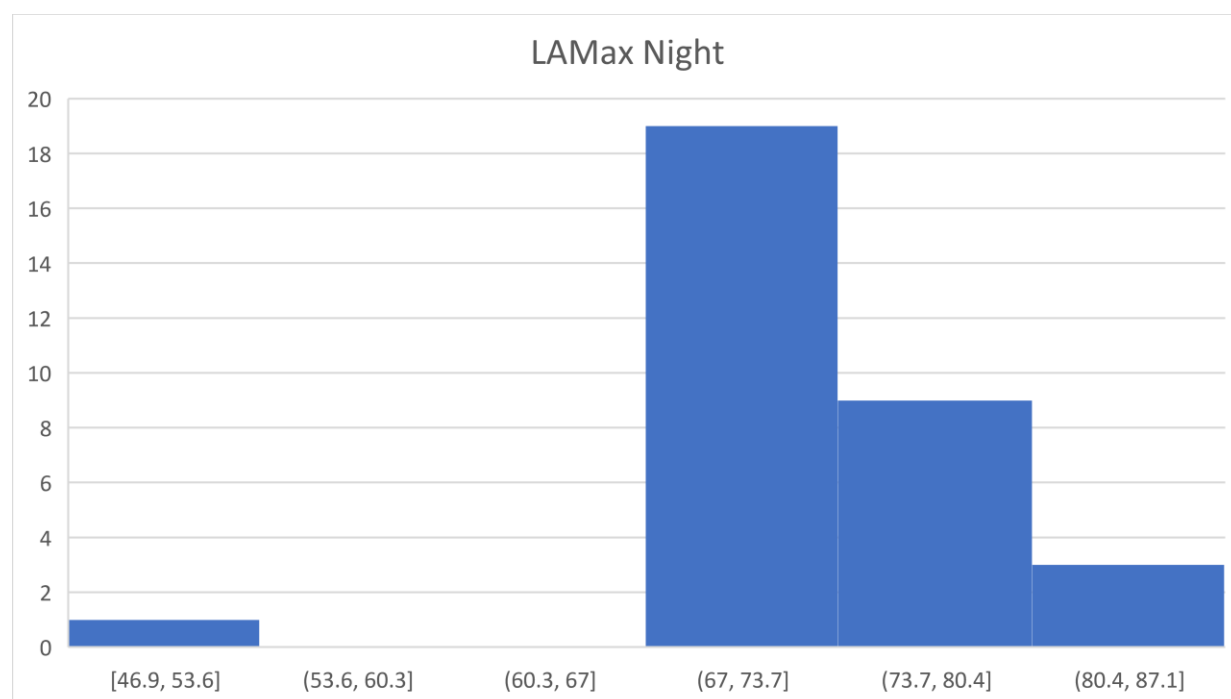
4.2.1 Comparison of Results to BS8233

Table 4

Location (Front)	L _{AeqT} (16hr Day & 8hr Night)	L _{AMax}	BS8233 & WHO Internal noise	BS8233 & WHO External Noise	Difference to L _{Aeq} (internal/external) limit	Difference to Max (internal/external)
Day (0700-2300)	63dBA		35dBA	55dBA	(+28dBA/ +8dBA)	-
Night (2300-0700)	51dBA	75dBA (10 th Highest)	30dBA (45dBA L _{AMax})	(60dBA L _{AMax})	(+21dBA)	(+30dBA)

4.2.2 L_{AMax} Histogram

Figure 5



5.0 Observations and Further Discussions

- 5.0.1 The measured L_{Aeq} values for both the day and the night periods are shown in table 4. The day period is 28dBA above the limit for indoor noise levels to the front of the building. Although there may be some shielding when the building has been constructed it is unlikely to reduce the overall noise level greatly due to the presence of trains to the rear.
- 5.0.2 The night value is also 21dBA above the recommended value for internal noise to prevent sleep disturbance to the front of the proposed dwelling.
- 5.0.3 BS8233 assumes that a standard double-glazed window will provide up to 15dB reduction when open (with some council guidelines leaning on the side of caution and assuming a 10dB reduction). Either option would mean that any modern double-glazed window in the building cannot be the main source of ventilation with a low chance of sleep disturbance being had by the inhabitants of the proposed dwellings. Trickle vents/acoustic vents will therefore be required throughout the proposed building to prevent overheating in accordance with document O of the building regs.
- 5.0.4 The L_{Amax} value to prevent the likelihood of sleep disturbance is set at 60dBA external and 45dBA internal. Based on the highest value from the tenth-highest daily value measured during the week the reading for L_{Amax} night was 75dBA at the front. This value is 30dBA above the required value externally for sleep disturbance.
- 5.0.5 As the internal layout, bedroom size etc is not currently known these linear values will be used as the guide for the glazing. Once the bedroom sizes, locations and orientations have been decided upon these values should be checked against the BS8233:2014 Annex G calculation methodology.

6.0 Glazing, Structural and Ventilation Recommendations

6.1 External Walls

6.1.1 External walls of the proposed building are understood to be traditional 9" brick:

Table 6

Description	Octave Band Centre Frequency (Hz)					
	Sound Reduction Index R dB					
	125	250	500	1k	2k	4k
Traditional solid 9" brick	39	44	51	58	63	68

6.2 Glazing

6.2.1 Suitable sound insulation performance of all windows and patio doors of the development may be achieved with standard double-glazing type 4-airgap-4, typically $\geq R_w 30$ dB. An example product for noise reduction is shown in table 6.

Table 7

Description	Octave Band Centre Frequency (Hz)						Rw (C; Ctr)
	Sound Reduction Index R dB						
	125	250	500	1k	2k	4k	
6 mm / (6-16 mm) / 4mm Pilkington	21	20	26	38	37	39	32 (-2,-4)

6.3 Ventilation

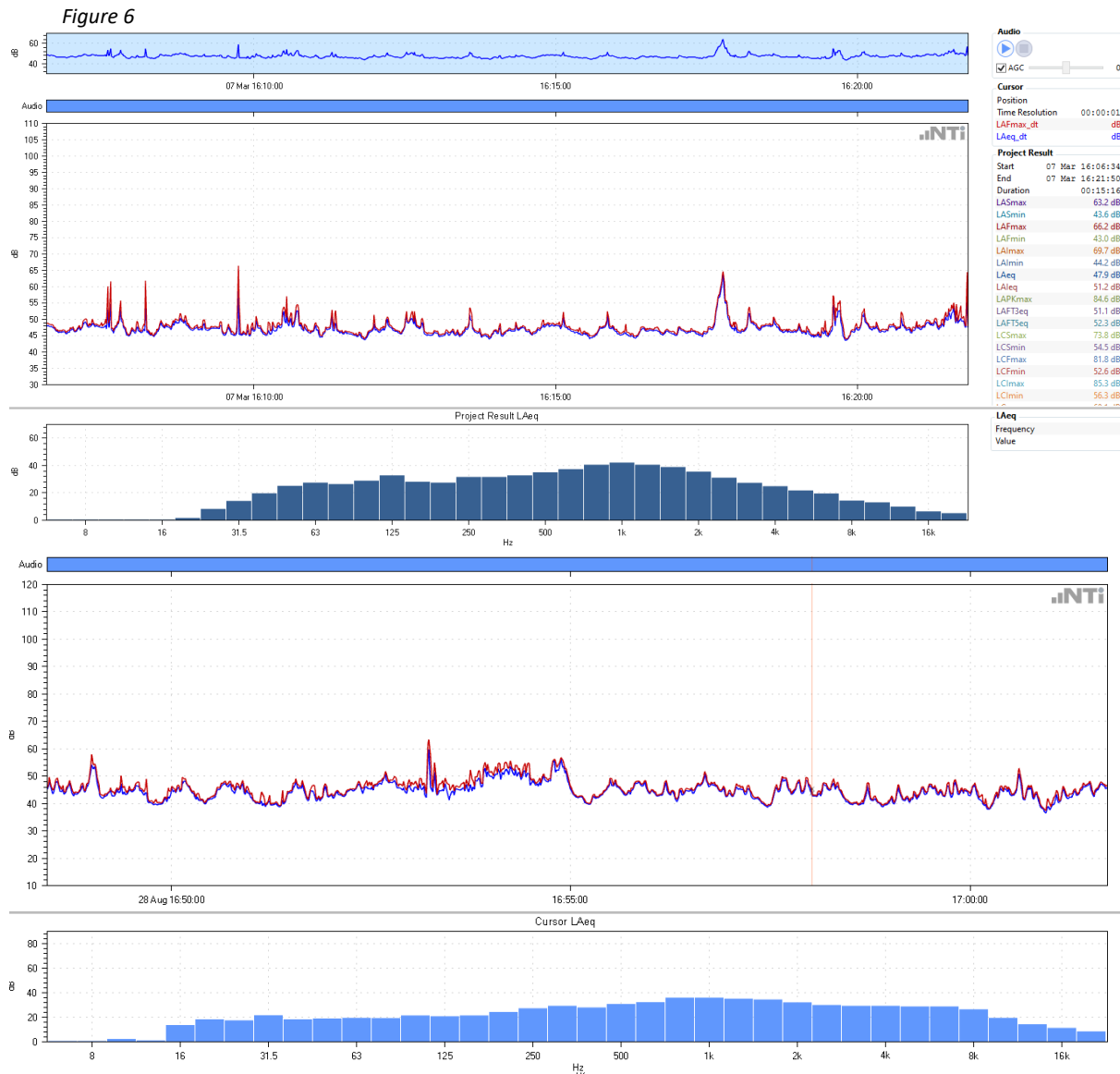
6.3.1 It is anticipated that a ventilation system will be needed to be incorporated into the scheme design, such that residents of the properties are able to have background ventilation without necessarily needing to open windows.

Table 8

Description	Octave Band Centre Frequency (Hz)					
	Sound Reduction Index $D_{n,e}$ dB					
	125	250	500	1k	2k	4k
Standard non-acoustic trickle ventilator typically $\geq D_{n,e,w}$ 30dB	30	30	30	30	30	28

7.0 BS4142:2014+A1:2019 Consideration

7.0.1 With the possibility of industrial noise to the rear of the proposed development it is important to consider the BS4142:2104 standard in addition to the BS8233 proposal. Measurements were therefore taken at the packing plant and refuse works area to the North of the development. Figure 6 shows the short-term assessments that were conducted at this location to examine any potential industrial noise in the area.

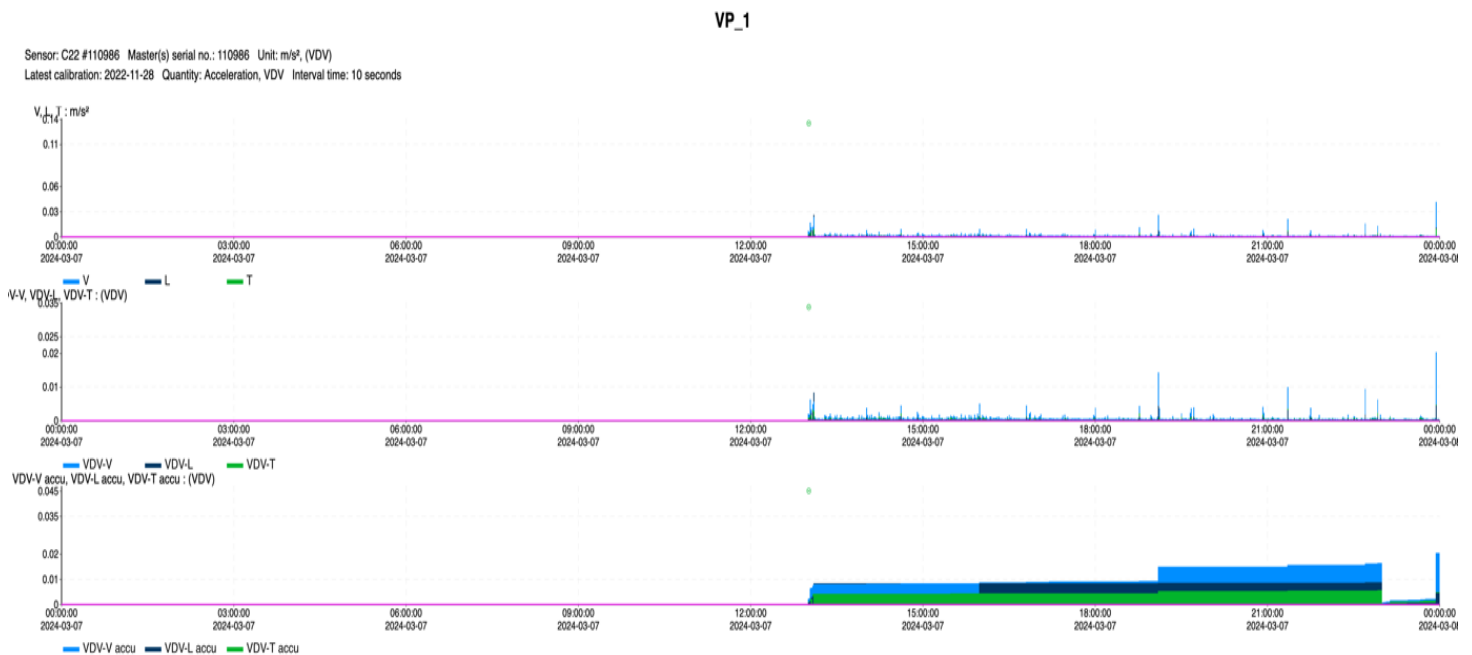


7.0.2 The one noise source of note came 16.54pm with a digger moving waste around at the disposal yard. This would only provide a specific noise level of 57dBA at a distance of approximately 20m. Extrapolating this level to the development site would produce a specific noise level of approximately 33dBA; well below the background noise level for the proposed site. This would mean that even if this source was consistent, it would be inaudible at the development site.

7.0.3 With the lack of any dominant noise sources other than passing traffic at the location, and no obvious external plant that may cause issues at the proposed development, it can be concluded that there are no noise sources of an industrial nature that are likely to increase the possibility of adverse comment to anything above 'low' in accordance with BS4142:2014.

8.0 Vibration Data

Figure 7



Location	Date/Time	VDV Value (m/s ^{1.75})	Peak Event (m/s ^{1.75})
Railway Boundary	13.00pm 07/03/24 – 10.18am 08/03/24	0.020	0.0203

8.1 Vibration prediction values

8.1.1 The VDV values measured during the assessment are well below those, described in table 2, from BS6472-1:2008 as having 'low probability of adverse comment' so therefore full models based on the proposed structure construction are not considered necessary.

- 8.1.2 As a check the following procedure for the train pass-by in isolated events was performed: This is where the vibration conditions are constant or repeated regularly, only one representative sample, of duration τ seconds, needs to be measured. If the vibration dose value determined is $VDV_{b/d,\tau}$ then the total vibration dose value for the day, $VDV_{b/d,day}$ will be given by;

$$VDV_{b/d,day} = \left(\frac{t_{day}}{t_{\tau}} \right)^{0.25} \times VDV_{b/d,\tau}$$

Based on the assessment there are an average of 2 trains per hour, resulting in maximum 32 trains over a 16hr day period (28 in the assessment for just under 24hrs) and $VDV_b = 0.0075$

Therefore:

$$VDV_{b/d,day} = 32^{0.25} \times 0.0203$$

$$VDV_{b/d,day} = 0.0483 \text{ (m/s}^{1.75}\text{)}$$

- 8.1.3 According to Table 2 there is likely to be low probability of adverse comment from the rail route adjacent to the proposed development. There were only 4 events through the night period (mainly from 6am-7am) so this level would be even further below the values for adverse comment from table 2.

9.0 Categorisation to TAN 11: Oct 1997

- 9.0.1 The daytime levels measured at the location of the potential development produced L_{Aeq} values of 63.0dBA. This would mean that, in accordance with the Noise Exposure Categories (NEC) provided by the TAN guidelines, the development would be placed into category B for exposure to both road & rail noise. This means that noise should be considered and mitigation measures imposed where possible.
- 9.0.2 The glazing and ventilation strategy proposed in section 6 would provide more than sufficient mitigation measures to be considered acceptable under the Tan guidelines. This has been created by the specified glazing, the trickle vents and would also be further attenuated by the erection of a garden fence to reduce levels to the rear of the building. The creation of the property itself will also further screen the garden/outdoor space area to the rear and bring this area well within the guideline values of 55dBA as an enclosed space. The gardens to the front of the property are not expected to be used as outdoor leisure spaces and therefore, the fact that this area will be above the recommended values, it not seen as a determining factor for the construction of the new property.

- 9.0.3 The night values for the external façade of the proposed dwelling were measured as L_{Aeq} 51.4dBA. This would also put the proposed development into the Category B NEC with the same comments as the daytime measured values. Existing and proposed mitigation for the glazing and ventilation strategy and fencing to the rear and sides would again be considered sufficient measures.
- 9.0.4 The further criteria for night-time noise classification is the L_{Amax} should not 'regularly exceed 82dB L_{Amax} several times in any hour'. There are only 1 spike through the entire night period (11pm – 7am), that exceeded the 82dB L_{Amax} limit. The most frequent gathering of trains is from 6-7am where there are 3 trains – none of which exceed the 82dB L_{Amax} .
- 9.0.5 Screening is required at the boundary in order to reduce the noise impact on the proposed garden space by a value of at least 11dB. This is to meet the 55dBA outdoor noise target. This can be achieved by the use of a 2m high fence with density of at least 10kg/m². The garden should be enclosed on all three sides (with the fourth being the house) in order to achieve this target,

10.0 Conclusion

- 10.0.1 If the recommendations of this report are followed the proposed dwelling should produce a residence that does not produce adverse comment from the surrounding noise sources. It is recommended that the same glazing specification is used at the front and rear of the proposed development.
- 10.0.2 The vibration levels on site do not warrant any further mitigation measures being imposed on the building to improve the impact on future inhabitants of the proposed dwellings. They are well below the recommended values so there is no chance of sleep disturbance or, indeed, annoyance through the day within the proposed development.

11.0 Credentials

Name	Title	Credentials
James Flitton BSc AMIOA	Acoustic Consultant	CSCS Professionally Qualified person
		Associate Member Institute of Acoustics
		Diploma in Acoustics and Noise Control
		Affiliate Member of IDE
		Affiliate Member of IOR
Signed		

Appendix A – Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10}(s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, 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.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A-weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level.

Appendix B - Noise Survey Instrumentation

Type	Manufacturer	Model	Serial Number	Last Cal	Cal Due
SLM	NTi	XL2-TA	A2A-18475-E0	19/10/2022	18/10/2024
Pre-amp	NTi	MA220	9378	19/10/2022	18/10/2024
Microphone	NTi	MC230A	A19093	19/10/2022	18/10/2024
Calibrator	NTi	CAL200	19829	20/11/2023	20/11/2024

Appendix C – Weather Conditions Chart Used

(Blank version)

Weather Conditions				
Measurement Location	Date/Time	Description	Beginning of Survey	End of Survey
		Temperature:		
Cloud Cover Symbol Scale in oktas (eighths) 0 Sky completely clear 1 2 3 4 Sky half cloudy 5 6 7 8 Sky completely cloudy (9) Sky obstructed from view		Precipitation:		
		Cloud cover (oktas - see guide)		
		Presence of fog/snow/ice		
		Presence of damp roads/wet ground		
		Wind Speed (m/s)		
		Wind Direction		
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)		

Appendix D – Additional Graphs/Data

