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Consultants in Acoustics, Noise & Vibration

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Silk Street, Newton Heath, Manchester

Residential planning noise report

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Summary

Sandy Brown has been commissioned by Faithful & Gould Limited to provide acoustic advice in relation to the proposed housing development at Silk Street, Newton Heath in Manchester.

An environmental noise survey has been carried out to determine the existing background sound levels in the area and to set appropriate plant noise limits in line with the requirements of Manchester City Council.

A noise survey was performed between 14:04 on 18 April 2019 and 01:45 on 19 April 2019, and between 04:44 and 06:21 on 24 April 2019.

To the west of the site (Smallwood Street), the representative background sound levels measured during the survey were $L_{A90, 15min}$ 49 dB during the daytime and $L_{A90, 15min}$ 48 dB at night. To the east of the site (Droylsden Road), the representative background sound levels measured during the survey were $L_{A90, 15min}$ 47 dB during the daytime and $L_{A90, 15min}$ 43 dB at night.

Based on the requirements of Manchester City Council and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises is to be at least 5 dB below the typical background noise levels measured.

These limits are cumulative, and apply with all plant operation under normal conditions. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied, and the limits will be more stringent than those set.

An initial assessment has been carried out to determine required acoustic performances for the facades and provide guidance on the ventilation strategy.

The assessment indicates that to achieve the relevant internal noise levels for rooms with facades facing Droylsden Road (east), acoustic glazing and attenuated passive ventilation will be required for both bedrooms and living rooms (including those with a dual aspect arrangement). This will also be required for dual aspect bedrooms for facade zone B.

The assessment also indicates that standard thermal double glazing and attenuated passive ventilation will be suitable to control noise ingress to living rooms and bedrooms for the rest of the facades.

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1 Introduction

Sandy Brown has been commissioned by Faithful & Gould Limited to provide acoustic advice in relation to the proposed housing development at Silk Street, Newton Heath in Manchester.

As part of this, an environmental noise survey has been carried out to establish:

- background sound levels around the site and by nearby noise sensitive premises
- ambient and maximum noise levels at the site.

The background sound levels measured during the survey are used as the basis for setting limits for noise emission from proposed building services plant. These limits are set in accordance with the requirements of Manchester City Council.

Ambient sound levels are used to assess building envelope sound insulation requirements to achieve appropriate internal noise levels for residences. These follow standards set in accordance with Manchester City Council's requirements.

This report provides details of the noise survey method, the results of the survey, a discussion of acceptable limits for noise emission from building services plant and the required minimum sound insulation performance of the facade and ventilation strategies, such that appropriate internal noise levels are in line with Manchester City Council (MCC) internal noise limits criteria.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1. The existing site is an open vacant space. The proposed development site is bounded by the Manchester and Rochdale canal to the north, Droylsden Road to the east, Great Newton Street to the south and Smallwood Street to the west.

A public house, The New Crown Inn, is located on 23 Old Church Street approximately 25 m to the west of the site. DJs play amplified music on Friday and Saturday nights and there is karaoke on Sundays. The pub has an outdoor terrace space approximately 20 m from the site.

A supermarket (Lidl) is approximately 35 m to the north west across the canal. It is understood that there is a single daily night time delivery, which can occur any time between 02:00 and 06:00 hours. However, depending on stock and sales, there may be a second (smaller) delivery during the day time.

To the north of the site there is a bakery warehouse (Martins).

Newton Heath working men club is located on 67 Old Church Street and approximately 15 m to the south of the site. It is understood that there are performances and events in the function room located on the first-floor, which may include amplified sound.



Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The proposed development is in a mixed-use area. The nearby premises to the site consist of residential, commercial and industrial accommodation.

Existing residential premises are located on Old Church Street approximately 10 m to the west of the site, and along Droylsden Road approximately 20 m to the east. These are highlighted in red and blue respectively in Figure 1.

The nearest industrial building is located approximately 15 m to the north, this is highlighted in pink in Figure 1.

The nearest commercial and retail units are located on Smallwood Street approximately 18 m to the west and along Old Church Street approximately 25 m to the west of the site. These are highlighted in light green and light blue respectively in Figure 1. In addition, there is a commercial building approximately 35 m to the north. This is highlighted in purple in Figure 1.

Newton Heath Children's Centre is approximately 8 m to the south east of the proposed development site, this is highlighted in orange in Figure 1.

3 Development proposal

The proposed development consists of a housing development project at Silk street, Newton Heath in Manchester, comprising 75 Modular Homes (21 Houses and 54 apartments), site parking and cycle storage.

The site is divided into 3 main areas by Silk Street and Cowley Street.

There are three five storey residential blocks proposed to the north of the site bounded by the Rochdale Canal to the north and Silk Street to the south. This area is outlined in yellow in Figure 2, and comprises 54 apartments with a total number of:

- 27 one Bedroom apartments
- 21 two Bedroom apartments
- 6 two Bedroom + DfA 2 apartments

In addition, there are proposed a total of 21 terrace houses which consist of:

- 5 terrace houses in a single building bounded by Cowley Street to the west, Silk Street to the north, Droylsden Road to the east and Great Newton Street to the south. This area outlined in red in Figure 2
- 16 terrace houses in 4 buildings bounded by Silk Street to the north, Cowley Street to the east, Great Newton Street to the south and Smallwood Street to the west. This are outlined in blue in Figure 2

An image of the proposed development is provided in Figure 2



Figure 2 Image of the proposed masterplan development

4 Method

Details of the equipment used, the noise indices and the weather conditions during the survey are provided in Appendix A. Further information on the specific survey method is provided in this section.

No secure and safely accessible location was available at the site to leave unattended monitoring equipment. Attended sample measurements were therefore carried out by Jose M. Gonzalez at five locations around the proposed development site. These are indicated in Figure 1 as positions A to E.

Attended measurements were carried out over 15 minute periods during the following times to quantify existing noise levels from road traffic, pedestrians and other significant noise sources in the area:

- 13:45 on 18 April 2019 and 01:45 on 19 April 2019
- 04:44 and 05:01 on 24 April 2019.,

Additional attended 5 minute sample measurements were carried out between 05:02 and 06:31 on 24 April 2019 with the purpose of determining noise levels from a supermarket delivery, and warehouse activities located to the north.

In each case the microphone was mounted on a tripod approximately 1.5 m above the ground level and at least 5 m from any other reflective surface.

4.1 Weather conditions

Weather conditions during the survey are described in Appendix A. During the attended noise measurements, the weather was generally clear and dry and no rain occurred. Wind speeds varied between approximately 0 mm/s and 3 m/s.

5 Measurement results

5.1 Observations

The dominant noise sources observed at the site during the survey consisted of road traffic along Droylsden Road and Old Church Street, and cars passing by on Silk Street and Great Newton Street.

Less significant noise sources included The New Crown Inn. From observations on site, the door leading from the main room to the outdoor terrace could be left open at times.

During the survey, vehicle movements and loading/unloading at the bakery warehouse was noted during the daytime and at night, including plant operation.

5.2 Attended measurement results

5.2.1 Daytime attended measurement results

The sound pressure levels recorded are summarised in Table 1. The dominant noise sources noted during the measurements are also described in Table 1.

Table 1 Noise levels and key noise sources from attended measurements

Position	Date	Start time	Sound pressure levels (dB)			Noise sources
			$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
A	18 Apr 19	13:45	55	69	51	Distant road traffic on Old Church St and Droylsden Road, car passing by, aircraft overhead.
		14:58	58	80	51	As above plus distant roller shutter, L_{Amax} 80 dB motorcycle on Old Church St
		19:02	59	87	50	As above, L_{Amax} 87 dB motorcycle on towpath along the canal
		21:33	54	75	49	Distant road traffic on Old Church St and Droylsden Road, distant people talking in outdoor terrace, audible low frequency amplified sound, distant tonal plant

Position	Date	Start time	Sound pressure levels (dB)			Noise sources
			$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
B	18 Apr 19	14:04	55	72	52	Distant road traffic on Droylsden Road, constant plant, distant geese honk, pedestrians passing by talking
		15:14	54	72	52	
B		19:17	51	66	48	Distant road traffic on Droylsden Road
		22:10	50	67	47	Distant road traffic on Droylsden Road, distant siren, cars passing by on Silk St.
C		14:22	67	82	57	Cars passing by Droylsden Road, distant car slamming door, L_{Amax} 90 dB car horn
		15:30	67	90	55	
		19:34	64	77	51	Cars passing by Droylsden Road
		22:27	63	78	47	
D		14:40	59	81	52	Distant road traffic on Droylsden Road, cars passing by, L_{Amax} 81 dB car horn
		15:47	60	83	51	As above, L_{Amax} 83 dB distant siren
		19:52	55	69	49	Distant road traffic on Droylsden Road and Old Church Street, cars passing by
		22:43	54	73	47	As above plus distance siren

Position	Date	Start time	Sound pressure levels (dB)			Noise sources
			$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
E	18 Apr 19	20:10	53	77	50	Distant road traffic on Droylsden Road and Old Church St, people talking in outdoor terrace, audible low frequency amplified sound, distant canal lock waterfall.

5.2.2 Night-time sample measurement results

The sound pressure levels recorded during the attended measurements are summarised in Table 2. The dominant noise sources noted during the measurements are also described in Table 2.

Table 2 Sound pressure levels from daytime attended measurements performed over 15 minute periods

Position	Date	Start time	Sound pressure levels (dB)			Noise sources
			$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
A	18 Apr 19	23:01	53	74	48	Distant road traffic on Droylsden Road, car passing by on Silk St, distant low frequency amplified sound, geese honk
B		23:32	49	61	48	Distant road traffic on Droylsden Road, constant plant, car passing by on Silk St
		00:55	47	63	45	
C		01:11	58	75	43	Cars passing by, distant road traffic on Droylsden Road, distant plant

Position	Date	Start time	Sound pressure levels (dB)			Noise sources
			$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
D	19 Apr 19	00:06	50	67	46	Cars passing by Great Newton St, distant road traffic on Droylsden Road
		01:30	49	58	46	Distant road traffic on Old Church St
E	18 Apr 19	23:16	51	70	49	Distant road traffic on Droylsden Road, people talking in outdoor terrace, audible low frequency amplified sound, distant waterfall
	19 Apr 19	00:39	52	63	49	
E	24 Apr 19	04:44	48	64	46	Distant road traffic on Droylsden Road, warehouse activities, canal lock waterfall, L_{Amax} 64 dB geese honk

Table 3 Sound pressure levels from night time attended measurements performed over 5 minute periods

Position	Date	Start time	Sound pressure levels (dB)			Noise sources
			$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
E	24 Apr 19	05:02	51	62	47	Bird song, distant road traffic on Droylsden Road
		05:10	48	60	46	
		05:15	49	59	47	
		05:21	51	60	48	As above plus delivery truck arriving to commercial unit

Position	Date	Start time	Sound pressure levels (dB)			Noise sources
			$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
E		05:26	51	64	48	Bird song, distant road traffic on Droylsden Road, distant plant, work outdoor activity on warehouse.
		05:32	50	62	48	Distant road traffic on Droylsden Road, delivery to retail on Smallwood Street (L_{Amax} 72 dB)
		05:37	52	72	48	
		06:03	51	66	48	Distant road traffic on Droylsden Road, bird song
		06:09	52	67	49	
		06:22	53	61	50	
	24 Apr 19	06:29	53	60	50	Distant road traffic on Droylsden Road, delivery truck leaving commercial unit.

As attended measurements have been carried rather than unattended noise monitoring over a few days a statistical analysis to determine the representative background noise level is not considered appropriate. The minimum background sound level measured has therefore been used as the representative background sound level.

To the west of the site (Smallwood Street), the representative background sound levels measured during the survey were $L_{A90, 15min}$ 49 dB during the daytime and $L_{A90, 15min}$ 48 dB at night. To the east of the site (Droylsden Road), the representative background sound levels measured during the survey were $L_{A90,15min}$ 47 dB during the daytime and $L_{A90, 15min}$ 43 dB at night.

6 Assessment criteria

6.1 NPPF and NPSE

The National Planning Policy Framework, February 2019 (NPPF) sets out the UK government's planning policies for England. It supersedes previous guidance notes such as PPG24. No specific noise criteria are set out in the NPPF, or in the Noise Policy Statement for England (NPSE) to which it refers.

The NPPF states:

'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:

- *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 life.*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.'*

and

'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.'

The NPSE states that its aims are as follows:

'Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life*
- *Mitigate and minimise adverse impacts on health and quality of life and*
- *Where possible, contribute to the improvement of health and quality of life.'*

As such, neither document sets out specific acoustic criteria for new residential developments, but they require consideration of the effect of existing noise on the new development and the effect of noise from the development on the surroundings.

6.2 Noise egress

6.2.1 Standard guidance

BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

6.2.2 Local Authority criteria

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance* document dated December 2015 states the following in relation to plant noise egress:

'The development should be designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

6.3 Noise ingress

The Manchester City Council (MCC) *Planning & Noise Technical Guidance* document dated December 2015 Section 3.6.1.1 sets the internal noise limits given in Table 4 for residential development.

Table 4 Manchester City Council internal noise criteria for residential developments

Internal space	Internal noise level L_{Aeq} (dB)	
	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Living rooms	35	-
Bedrooms	-	30

It is also stipulated that individual events should not normally exceed L_{Amax} 45 dB within bedrooms more than 15 times during the night.

The levels given in Table 4 are the cumulative noise levels to be achieved by external noise ingress in combination with any noise from mechanical ventilation systems.

7 Plant noise limits – noise egress

7.1 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 5.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels. These have been corrected relative to the measured free-field background noise levels by the addition of 3 dB.

Table 5 Plant noise limits at 1 m from the nearest noise sensitive premises

Location	Maximum sound pressure level at 1 m from noise sensitive premises (LAeq,15min dB)	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Residential accommodation on Old Church Street	41	40
Residential accommodation on Droylsden Road	39	35

The limits set out in Table 5 do not include any attention catching features. The penalty corrections for attention catching features may be significant and will need to be considered as the building services design progresses. This is discussed in Appendix C

7.2 Assessment

All building services plant will be designed to achieve the noise limits set out above, including any corrections for attention catching features. At this stage, no information is available in relation to the proposed plant. This will need to be assessed as the design progresses.

8 Facade sound insulation – noise ingress

This section describes an assessment of facade sound insulation to control noise ingress. The required facade specification largely depends on the external noise levels and the internal noise criteria.

The following assessment is based on achieving the internal noise levels set out by Manchester City Council, which are set out in Section 6.3.

The facade sound insulation assessment has been carried out based on the received Stage 2 report (0209 – Stage 2 Report final) architectural drawings which include 5 storey buildings to the north of the site along the Rochdale canal.

For the terrace houses no architectural drawings have been received and 2 storey buildings (7.5 m height) have been assumed.

8.1 Acoustic modelling

A computer model of the development has been made for the purposes of calculating the external noise level at the facade of the building based on the results of the environmental noise survey.

The software carries out calculations using a ray tracing technique. This takes account of the effects of topography, reflections, screening and distance attenuation for noise sources to predict noise levels in three dimensions. Calculations are carried out in accordance with ISO 9613 Attenuation of sound during propagation outdoors. 3D images of the computer model are provided in Figure 3 and Figure 4.

This model has been used to calculate the change in level across the proposed buildings which, in conjunction with the results of the noise survey, has formed the basis of the facade sound insulation assessment.



Figure 3 CadnaA screenshot of the proposed development 3D model (daytime) south west view



Figure 4 CadnaA screenshot of the proposed development 3D model (night time) south west view

8.2 External noise levels

Based on the results of the environmental noise survey and the 3D model, and in order to allow an assessment of the worst case scenario, the highest daytime and night-time external noise levels predicted at each of the proposed facades in the 3D model have been used to assess noise ingress to residential premises. The predicted day and night time external noise level at each of the proposed façade zones are set out in Table 6.

Table 6 Day and night time predicted noise levels at the proposed facade zones

Facade zone (refer to Figures 4 to 7)	External noise level L_{Aeq} (dB)		L_{Amax} not normally exceeded at night
	Daytime	Night time	
A 	64-67	57-59	
B 	61-63	55-56	
C 	58-60	53-54	
D 	55-57	51-52	
E 	52-54	47-50	
AA 	-	-	75
BB 	-	-	74
CC 	-	-	67
DD 	-	-	63

The predicted external noise levels at the various facades of the proposed development are shown in Figure 5.



Figure 5 Predicted external noise level

8.3 Facade sound insulation

An initial assessment of the facade sound insulation performance requirements has been carried out.

Minimum facade sound insulation requirements for the facades are given in Table 7. These have been determined to achieve the internal noise criteria for bedrooms and living areas using predicted external noise levels at the facades.

At this site, the facade performance requirements are driven by the daytime for facade zones A to D and night time ambient noise levels for facade zone E. The facade specification has been determined to ensure that $L_{AFmax\ 15\ min}$ criteria is exceeded on no more than 5 occasions based on the worst affected night during the survey.

No internal layouts have been received, therefore in order to account for dual aspect rooms these have been included in the facade assessment.

Table 7 Facade sound insulation performance requirements

Facade		Overall sound insulation performance R'_w+C_{tr} (dB)			
		Bedrooms		Living rooms	
		Single aspect	Dual aspect	Single aspect	Dual aspect
A		32	35	29	32
B		28	31	26	29
C		25	28	24	27
D		22	25	22	25
E		19	22	20	23

8.4 Guidance on facade construction, glazing, and ventilation strategy

Table 8 sets out some examples of glazing configurations and ventilation strategies that could achieve the required sound insulation performances.

Table 8 Example glazing configurations and ventilation strategies for overall facade sound insulation

Overall facade sound insulation, R'_w+C_{tr} (dB)	Example glazing configuration	Ventilation strategy
19-27	6 mm glass/16 mm cavity/6 mm glass	Acoustically attenuated passive ventilation (eg, trickle vents)
28-29	6.8 mm acoustic laminate/16 mm cavity /6 mm glass	Acoustically attenuated passive ventilation (eg, trickle vents)
31-32	8.8 mm acoustic laminate /16 mm cavity/6 mm glass	Acoustically attenuated passive ventilation (eg, trickle vents)
33-35	8.8 mm acoustic laminate/16 mm/10 mm glass	High performance acoustically attenuated passive ventilation

The performance required by each element will depend on the relative areas of glazed and non-glazed elements, and the ventilation strategy. If applicable, this includes the acoustic performance of trickle ventilators and the number of ventilators per room. As a guide, for a mechanically ventilated room with a 50% glazed facade, the glazing sound insulation requirement would typically be 3 dB lower than the overall facade sound insulation requirement. This is provided the non-glazed external wall elements provide at least 10 dB more sound insulation than the glazed elements.

A more detailed facade assessment will be needed as the design develops to ensure the overall performance requirements are met.

9 Conclusion

A noise survey has been carried out to determine the existing background sound levels in the vicinity of the site and surrounding noise sensitive premises. To the west of the site (Smallwood Street), the representative background sound levels measured during the survey were $L_{A90, 15min}$ 49 dB during the daytime and $L_{A90, 15min}$ 48 dB at night. To the east of the site (Droylsden Road), the representative background sound levels measured during the survey were $L_{A90, 15min}$ 47 dB during the daytime and $L_{A90, 15min}$ 43 dB at night.

On the basis of the requirements of Manchester City Council and on the results of the noise survey, the cumulative noise level from plant at 1 m from the worst affected window of the nearby, noise sensitive premises is to be at least 5 dB below the typical background noise level measured.

These limits are cumulative, and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features the limits should not exceed 5 dB below the typical external noise level in octave bands. These limits are set out in Table 5

At this stage, no detailed information is available in relation to the proposed installation of building services plant, and this will need to be assessed in detail as the design progresses.

Based on the results of the surveys and a 3D acoustic computer model of the development, an initial facade assessment has been carried out to determine the acoustic performance of the building envelopes to meet the internal noise criteria.

An initial assessment of the required facade sound insulation performances across the proposed development site has been carried out based on controlling external noise ingress to meet the MCC criteria.

The assessment indicates that to achieve the relevant internal noise levels for rooms with facades facing Droylsden Road (east), acoustic glazing and attenuated passive ventilation will be required for both bedrooms and living room (including those with a dual aspect arrangement). This will also be required for dual aspect bedrooms for facade zone B.

The assessment also indicates that standard thermal double glazing and attenuated passive ventilation will be suitable to control noise ingress to living rooms and bedrooms for the rest of the facades.

Guidance on example glazing configurations capable of meeting the facade sound insulation requirements is also provided.

Appendix A

Survey details

Equipment

A Rion NL 52 sound level meter was used to undertake the attended measurements. The calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00242704	Rion	24 May 20	TCRT18/1459
Microphone	UC-59/06187	Rion	24 May 20	TCRT18/1459
Pre-amp	NH-25/32732	Rion	24 May 20	TCRT18/1459
Calibrator	SV30A/7451	Svantek	24 May 20	TCRT18/1457

Calibration of the sound level meters used for the tests is traceable to national standards. The calibration certificates for the sound level meter used in this survey are available upon request.

The sound level meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{ASmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a slow time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Weather conditions

During the attended measurements carried out between 18 and 19 April 2019 and on 24 April 2019, the weather was generally clear and dry and no rain occurred. Wind speeds varied between approximately 0 m/s and 3 m/s.

These weather conditions are considered suitable for obtaining representative measurements

Appendix B

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142: 2014.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.