



Hough End Leisure Village

Noise Impact Assessment

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A handwritten signature in black ink, appearing to read 'Innes Urbanski', with a stylized flourish at the end.

Comments

Comments

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A. Glossary of Acoustic Terminology

1. Introduction

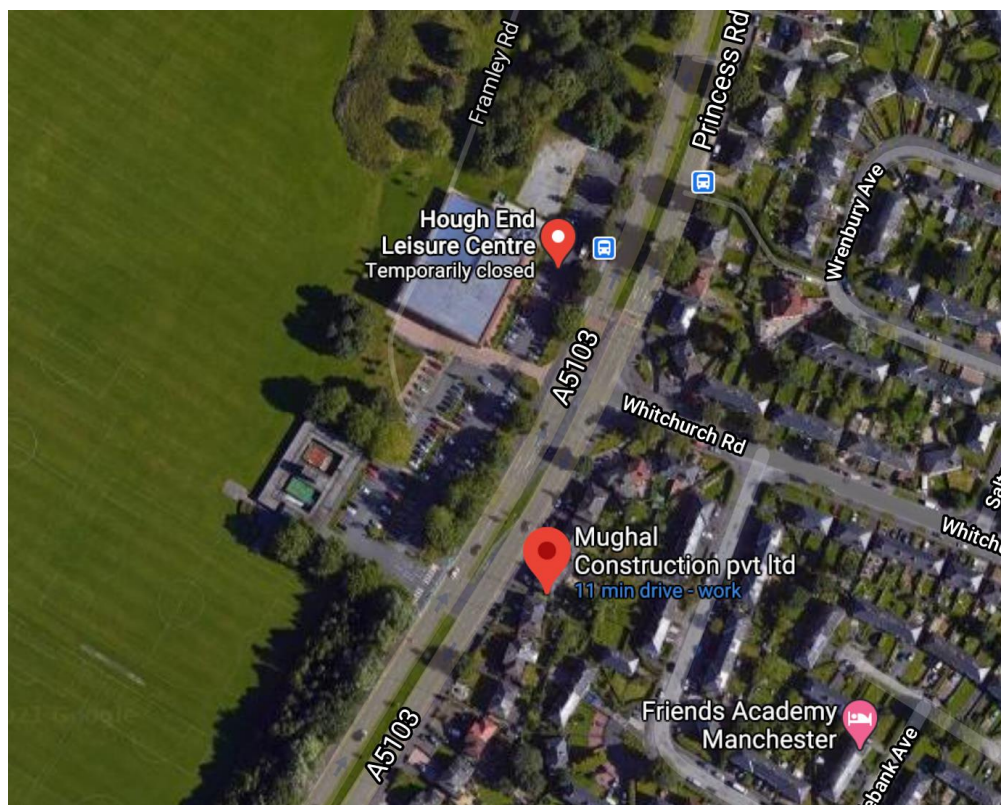
1.1 The Brief

Waterman Infrastructure & Environment Limited (hereafter 'Waterman') has been appointed by Manchester City Council (MCC) to complete a noise impact assessment in support of the construction of an extension to the existing Hough End Leisure Centre located on Princess Road, Manchester.

1.2 The Site

The proposed development site is located off Princess Road, Manchester. The site is bound to the north by the existing leisure centre, to the east by Princess Street, to the south by car parking, and to the west by playing fields. The site location is presented as Figure 1-1 below.

Figure 1-1 Site location



1.3 The Proposed Development

The proposed development includes the erection of a two-storey extension to form sports field changing rooms, cafe facilities, flexible club/social/training rooms and gym space following the demolition of the existing building on site, formation of 3G sports pitches and associated floodlighting and fencing together with an associated 67no.car park.

2. Noise Impact Assessment Criteria

2.1 Fixed External Plant and Industrial Operations

The primary source of guidance in relation to noise which is industrial in nature, such as fixed building services plant, industrial and commercial operations, is provided in BS 4142:2014+A1:2019¹. BS 4142 states that the potential impact from industrial / commercial sound is based on the level difference between the source, known as the 'specific sound level' ($L_{Aeq,Tr}$), compared with the 'background sound level' ($L_{A90,T}$) that exists in the absence of the source in question. Where the sound contains any acoustic characteristics such as tonality, impulsiveness and intermittency then the specific noise level is adjusted in-line with BS 4142 to determine the 'rating level' ($L_{Ar,Tr}$).

Typically, the greater the difference between the rating level and the background sound level the greater the potential of an adverse impact. BS 4142 states:

- A difference of +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of +5dB or more is likely to be an indication of an adverse impact, depending on the context; and
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

BS4142 further states; "*Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.*"

Context is an important consideration of a BS4142 assessment, and the impact may require modification due to context, which may include:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- Design measures that secure good internal and / or outdoor acoustic conditions, such as: façade insulation treatment; ventilation and / or cooling techniques which reduce the need to have open windows and acoustic screening.

2.1.1 Manchester City Council – Planning & Noise Technical Guidance

As stated within Section 1, the Site falls under the local authority jurisdiction of Manchester City Council and is therefore subject all relevant local planning policies and guidance. To support developers MCC has produced a technical guidance document in relation to noise planning assessments; the Planning & Noise Technical Guidance (PNTG) document outlines what information, assessments and good design practices are expected from prospective developers in relation to current local and national noise guidance and policy.

In relation to the proposed development, the PNTG states that any application for fixed plant, equipment or machinery must demonstrate that:

'Externally mounted ancillary plant, equipment and servicing shall be selected and / or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

¹British Standard Institute (BSI) (2019) BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. BSI.

It is considered by MCC that the impacts of a development which achieves the above criteria would be negligible. Additionally, the PNTG also states that additional relevant noise criteria can be employed where considered applicable.

When considering noise breakout from the units as a result of amplified music a typical condition imposed by MCC would be as below.

“The premises shall be acoustically insulated and treated to limit the break-out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.

Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 10dB below the LA90 (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively.

Reason - To safeguard the amenities of the occupiers of the building and occupiers of nearby properties.”

2.2 Road Traffic Noise

Assessment of noise level changes arising from forecast changes in road traffic volume, composition and speed associated with the scheme has been undertaken using the calculation methodology detailed within the Calculation of Road Traffic Noise² (CRTN) and magnitude criteria within the LA 111 DMRB³.

As set out in the CRTN methodology, road traffic noise levels are typically measured and predicted in units of L_{A10} (18 hour) dB. The L_{A10} parameter is the A-weighted sound level in decibels exceeded for 10% of the measurement period, which in this case is the 18-hour period between 06:00 and 24:00 hours. This noise index has been shown to correlate well with people's subjective annoyance arising from road traffic noise. The basic noise level (BNL) is the L_{A10} (18 hour) dB at a distance 10 metres from the carriageway edge. It is the change in the BNL with the Enlarged Scheme that is used to determine the magnitude of the level of change in road traffic noise.

A change in noise level of 1dB is considered the smallest detectable change over the short-term assessment period (sudden change) whereas a change in noise level of 3dB is considered the smallest detectable change over a long-term period (gradual change).

The BNL is calculated based on the 18-hour Annual Average Weekday Traffic (AAWT) volume, percentage of HGVs and speed in kph.

The magnitude of the change in BNL over the short-term and long-term are presented in Table 1 and have themselves been drawn from LA 111 DMRB.

Table 2-1: Magnitude of Change in BNL

Magnitude	Short-Term	Long-Term
Major	≥5.0	≥10.0
Moderate	≥3.0	≥5.0
Minor	≥1.0	≥3.0
Negligible	<1.0	<3.0

² DoT. (1988) Calculation of Road Traffic Noise. HMSO.

³ Highways England. (November 2019) Design Manual of Roads and Bridges. LA 111 Noise and vibration. Crown Copyright.

2.3 Artificial Grass Pitches

Guidance on the assessment of noise from Artificial Grass Pitches (AGP) pitches is provided in the Sports England Design Guidance Note – Artificial Grass Pitch. This document advises that based upon the WHO ‘Guidelines for Community Noise’ noise emissions should not exceed 50dB L_{Aeq, 1 hour}.

3. Baseline Conditions

3.1 Noise Sensitive Receptors

The nearest noise sensitive receptors (NSR) to the site boundary were identified following study of aerial imagery. The NSRs are described in Table 3-1.

Table 3-1: Noise and Vibration Sensitive Receptors

Monitoring Location (Appendix B)	Description	Approximate distance from façade of new construction block	Observation and Predominant Noise Source
NSR A	Residential dwellings on Princess Street	70m east of the proposed development	Dominant noise source identified as road traffic noise

3.2 Baseline Conditions

At the time of writing the initial assessment travel restrictions were in due to COVID-19 lockdown, subsequently at the time of assessment traffic flows were understood to be significantly lower than those normally experience as a result of people working from home as such, any surveys completed at this time would not be representative of typical and future noise climate due to potentially reduced traffic flows. To allow the existing noise climate to be determined, a review of publicly available noise maps for the daytime and night-time periods for the area surrounding the development has been completed. Noise contours from the national strategic noise mapping programme (accessed via: extrium.co.uk/noiseviewer) are presented as Figure 3-1 (daytime) and Figure 3-2 (night-time) overleaf.

Figure 3-1 Daytime Noise Levels, dB $L_{Aeq,16hr}$.

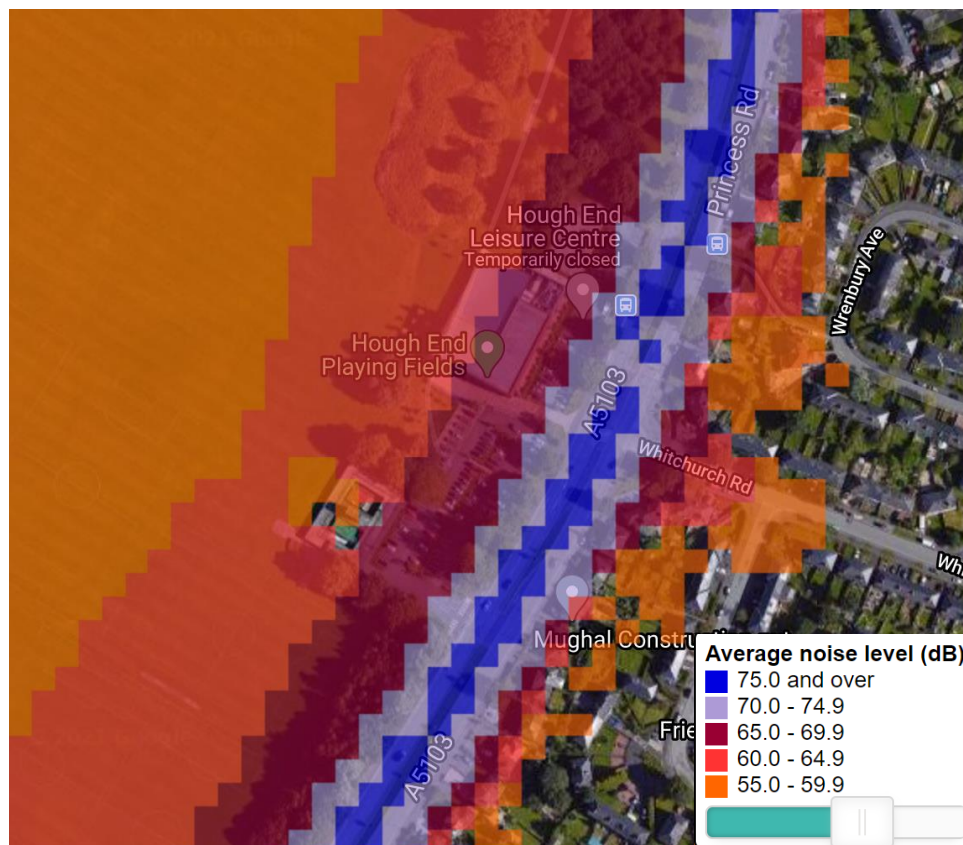
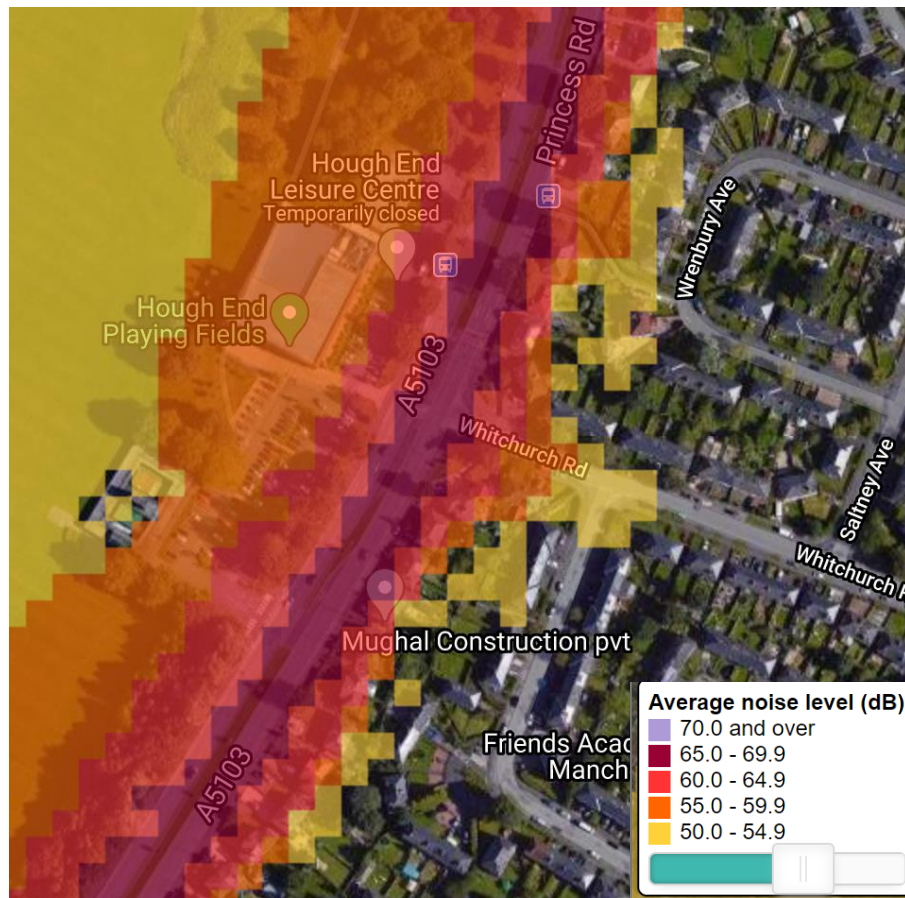


Figure 3-2 Night-time Noise Levels, dB $L_{Aeq,8hr}$



With reference to Figure 3-1 and 3-2 it can be seen that the site and its surrounds are exposed to very high noise levels. Both the facades of the development and nearby noise sensitive receptors are exposed to noise levels in the region of 65-70dB $L_{Aeq,16\text{ hour}}$ during the daytime and 60-65dB $L_{Aeq,8\text{ hour}}$ during the night-time period.

In addition to the above, baseline noise surveys were completed by Waterman in support of the New Didsbury High School approximately 1km south of the proposed development in September 2017. Although the survey was undertaken somewhat away from the site, it is considered that the survey locations would be exposed to similar levels as those surrounding the Hough End Development as a result of traffic using Princess Road. Typical baseline noise levels from the 2017 survey are presented as Table 3-2 below.

Table 3-2: Typical Baseline Noise Levels

Period	dB L _{Aeq,T}	dB L _{A90,T}	L _{Amax}
Daytime	75 ¹	54 ¹	92
Night-time	66 ¹	45 ¹	84

4. Noise Impact Assessment

4.1 Fixed Mechanical Plant

The primary source of noise associated with the proposed Development would be fixed mechanical plant. The plant proposed is as described below:

- Heat pumps located in an external plant area at ground floor level
- First floor open plant area containing 4no. Air Handling Units and 2no. VRF Condensers

It is understood that the plant would have the potential to operate at full duty during the daytime period and for the most part would not be operational during the night-time (23:00-07:00); however, there would be the potential for the heat pumps and VRF units to be working during pre-heat and cool down phases during the night-time period. The system would also operate where frost protection is required.

4.1.1 Design Goals

Proposed mechanical plant associated with the operation of the development would have the potential to generate noise. As such, limiting criteria have been set for the closest identified NSR to the plant areas (refer to Table 4-1). The limiting criteria for the plant have been set based upon the baseline noise data summarised in the preceding section and MCC's planning requirements.

It is important to recognise that the noise limits apply to the total contribution of noise from all plant items associated with the proposed plant scheme that may run during any particular period. Moreover, if there is determined to be tonal or intermittent content emitting from plant then an acoustic feature correction must be applied to the limiting criteria as defined in BS4142:2014+A1:2019 to obtain a 'rating' plant noise level. It should be noted that during the evening (19:00 to 23:00) and night-time (23:00 to 07:00) background noise levels are very low.

Table 4-1: Plant Noise Limits at Nearest Noise Sensitive Premises

Location	Period	Minimum Measured L _{A90}	Plant Noise Emission Limit (L _{Aeq})
Residential dwellings on Princess Road (NSR A)	Daytime (07:00-19:00)	54	49
	Night-time (23:00-07:00)	45	40

4.1.2 Building Services Plant Noise Assessment

Although at this stage in the design process the exact make and model of plant to be installed is unknown, an assessment of plant noise impacts has been completed based upon manufacturers data for plant similar to the proposed.

The source noise data for the plant in question is presented as Table 4-2 below.

Table 4-2: Plant Noise Limits at Nearest Noise Sensitive Premises

Plant Item	Number	Sound Power Level
Heat Pumps	3	85
Air Handling Units ¹	4	65
VRF Units	2	73

Note 1: Air handling units would be fitted with attenuators. At this stage allowance has been made for a circa 1m attenuator, full specification would be provided once the design progresses.

Plant noise levels have been calculated at a location 1m from the façade of the closest identified NSR to the plant area. The assessment results are presented as Table 4-3. It should be noted that for assessment purposes, it has been assumed that plant would be operating concurrently and at full design duty throughout daytime, evening periods and at reduced duty during the night-time when the centre is closed.

Table 4-3: BS 4142:2014+A1:2019 – Princess Parkway

Parameter	Period	
	Daytime ^[1]	Night-time ^[2]
Predicted Specific Noise Level at Receiver ($L_{A,r,Tr}$)	42	38
Rating Penalty	0	0
Rating Level ($L_{A,r,Tr}$)	42	38
Noise Limiting Criteria ($L_{A,r,Tr}$)	49	40
Difference (dB)	-5	-2

Note 1: Calculation completed for closest point in garden to the development

Note 2: Calculation completed for location representative of the closest bedroom window

A rating penalty of zero has been applied, on the basis that the predicted specific noise levels at the receptor location are significantly below the prevailing ambient noise levels for the respective time periods and therefore unlikely to be discernible against the residual noise climate in terms of acoustic character or intermittency.

The assessment results demonstrate that the noise levels associated with the proposed development would meet the requirements in terms of mechanical plant noise as provided by MCC and described in Section 2.1.1.

4.2 Noise Breakout

4.2.1 Internal Source Noise Levels

As previously described the upper floors of the new building would be used as a gym, new club room and training room. There would be the potential for some limited amplified music to be played within all of these spaces. As such an assessment of noise breakout through the building structure has been completed. The assessment has been based upon typical internal noise levels as monitored by Waterman within a similar gym environment to that proposed.

Table 4-4: Adopted Internal Engineering Workshop Noise Levels

Source	Source Noise Levels 1/1 Octave (dB)							Source Noise Level (dB(A))
	63	125	250	500	1k	2k	4k	
Gym Noise	67	72	68	84	84	81	72	88

Table 4-5: Sound Reduction Index for Proposed Building Envelope

Location	Construction Element	Sound Reduction Index (SRI)							dB Rw
		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1000	2000	4000	
Facade	Solid Façade Elements	31	52	52	62	70	73	76	66
	Glazed units	16	27	26	29	39	45	46	32

The internal source noise levels presented as Table 4-4 and the construction information for the proposed building as presented in Table 4-5 have been used to calculate noise levels at the nearest noise sensitive receptors approximately 70m from the Development. The results are provided in Table 4-6 for daytime operation. It should be noted that the presented calculated noise levels are worst case, in reality internal noise levels are likely to be lower than those assumed for the majority of the time.

Table 4-6: BS 4142:2014+A1:2019 Assessment – Princess Road

Parameter	Period
	Daytime
Predicted Specific Noise Level at Receiver dB $L_{Aeq,Tr}$	30
Rating Penalty	0
Predicted Rating Level dB $L_{A,r,Tr}$	30
Background Noise Level (L_{A90})	49
Difference	-19

A rating penalty of zero is applied as the predicted specific noise level is significantly below the measured daytime prevailing noise level of circa 70 to 75dBdB $L_{Aeq,T}$ and therefore unlikely to be discernible in terms of acoustic character or intermittency at the receptor location.

With reference to Table 4-6 it can be seen that under a worst-case scenario, noise levels generated as a result of noise breakout would fall 19dB below the monitored background noise levels at this location indicating a low impact.

As required by MCC an assessment of noise levels in each octave band has also been completed. The assessment is presented as Table 4-7.

Table 4-7: Sound Reduction Index for Proposed Building Envelope

Period	Parameter	Noise Level							dB(A)
		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1000	2000	4000	
Daytime	Predicted Noise Level	2	5	10	28	21	14	3	30
	Background Noise Level	57	51	47	45	45	42	37	49
	Difference	-55	-46	-37	-17	-24	-28	-34	-19

4.3 Road Traffic Noise

The likely change in road traffic noise resulting from operational traffic associated with the Development was determined in accordance with CRTN; the results of which are presented in Table 4.8.

Table 4-8: Road Traffic Noise Assessment

Road Link	Difference in dB $L_{A10,18hr}$ BNL (Base + Development) - (Base)		
	2022 - Without Development (Base)	2022 - With Development (Base + Development)	Change
A5013 North of the Site	72.8	72.9	0.1
A5013 South of the Site	72.8	72.9	0.1

The assessment results indicate that there would be a maximum increase in noise levels associated with the operation of the proposed development of 0.1dB. Such an increase in noise levels would be imperceptible to nearby residents and as such give rise to negligible effects.

4.1 AGP Assessment

With regards to noise generated by sports facilities such as the proposed AGP research conducted by Sport England included monitoring of nine sports sessions of different types, with participation by men, women and children, with the objective being to determine the 'typical' noise level from an AGP sports session (58 dB $L_{Aeq,1hr}$). The research does not make a distinction between competitive and practice type sessions, implying that the typical level reported would account for both these applications. In sports facilities used for local league competitions, large crowds of vocal supporters are not anticipated and as such the figure reported in Sport England guidance is deemed suitable for use in the assessment.

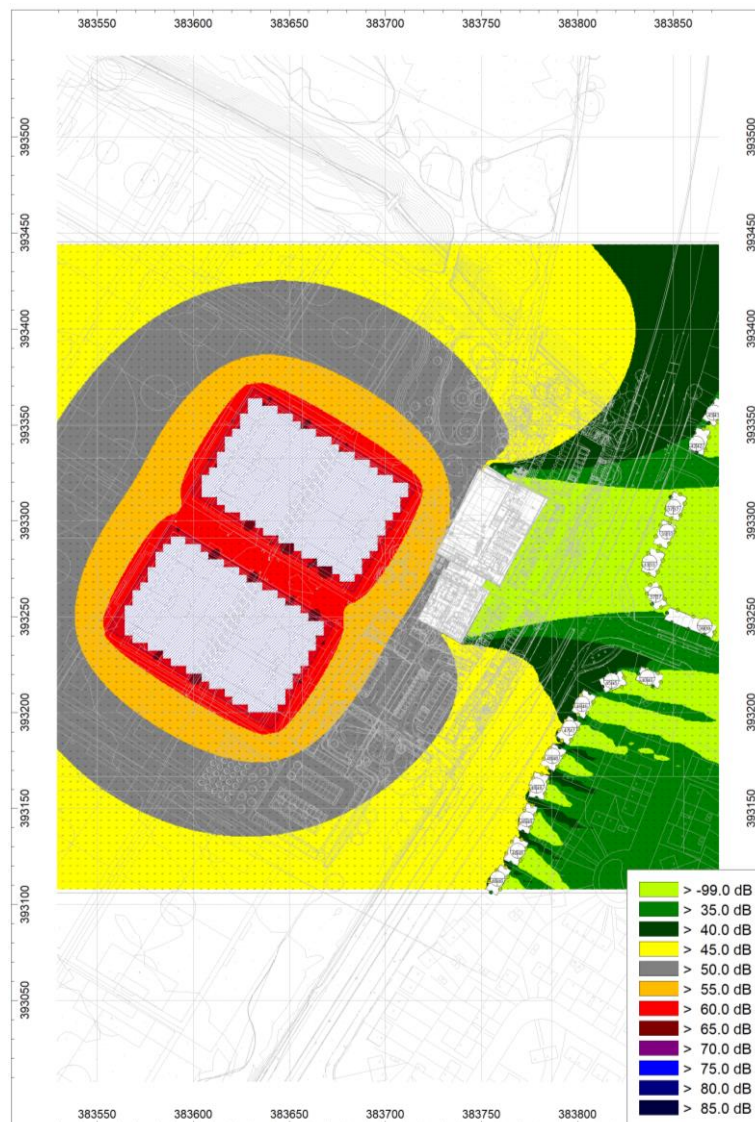
Table 4-9 summarises the various noise data sources that have been used within the acoustic model.

Table 4-9: Road Traffic Noise Assessment

Description	Parameter	Source Distance	Level
Typical Level of an AGP	dB $L_{Aeq,1\text{ hour}}$	10m from side-line	58
Male Vocal Shout	dB L_{Amax}	1m	82
Football Impacting on Fence	dB SEL	1m	77

Based upon the above a noise model of the site has been developed with the AGP being represented by area sources located 1.5m above ground level. For assessment purposes it has been assumed that all pitches would be operating simultaneously.

Figure 4-1 Assessment of Noise from AGP



The assessment results indicate that noise levels as a result of activities at the AGP would fall below the adopted 50dB $L_{Aeq,1 \text{ hour}}$ criteria with the maximum predicted noise levels at the closest noise sensitive receptors as a result of normal activities being 46dB $L_{Aeq,1 \text{ hour}}$.

Further to the above the predicted noise levels fall circa 30dB(A) below the daytime and 20dB(A) below the night-time baseline noise levels presented as Table 3-2 as such it is unlikely that noise associated with the use of the AGP would adversely impact upon the amenity of existing residents.

Further to the above it is noted that noise associated with balls impacting rebound boards and people shouting may also affect the noise climate. Based upon the source noise levels presented in Table 4-9 maximum noise level in the region of 35dB L_{Amax} would be expected. In the context of the existing noise climate (refer to Table 3-2) it is unlikely that such noise levels would be audible at nearby sensitive receptors.

In light of the above it is considered that the potential noise impacts associated with the AGP facilities would



be negligible at nearby sensitive receptors under normal operation.

5. Conclusions

Waterman Infrastructure & Environment Limited were appointed by ISG to complete an assessment of environmental noise in support of the construction of an extension to the existing Hough End Leisure Centre, Princess Road, Manchester.

Due to COVID-19 lockdown restrictions the assessment has been completed based upon historic monitored noise levels obtained by Waterman for an alternative site on Princess Road and with reference to publicly available noise maps. This is considered a robust approach as background noise levels generally increase overtime, notwithstanding the effect of COVID-19 on environmental noise levels.

The assessment results indicate that based upon the currently proposed layout and construction detail, noise associated with fixed mechanical plant, noise breakout and the outdoor pitches would not adversely impact the adjacent residential areas.



APPENDICES

A. Glossary of Acoustic Terminology

A-Weighting	The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.
Ambient noise	The totally encompassing sound in a given situation.
Decibels (dB)	Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic. The dynamic range of the auditory system is generally taken to be 0dB to 140dB. Generally, the addition of noise from two sources producing the same sound pressure level, will lead to an increase in sound pressure level of 3dB. A 3dB noise change is generally considered to be just noticeable, a 5dB change is generally considered to be clearly discernible and a 10dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness. Examples of typical sound intensity levels within the decibel range of 0 to 120dB are listed below: • Four engine jet aircraft at 100m 120dB • Riveting of steel plate at 10m 105dB • Pneumatic drill at 10m 90dB • Circular wood saw at 10m 80dB • Heavy road traffic at 10m 75dB • Telephone bell at 10m 65dB • Male speech, average at 10m 50dB • Whisper at 10m 25dB • Threshold of hearing, 1000Hz 0dB
Frequency	Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18,000Hz. The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.
Free Field	Free field noise levels are measured or predicted such that there is no contribution made up of reflections from nearby building façades.
Façade Noise Level	A noise level measured or predicted at the façade of a building, typically at a distance of 1m, containing a contribution made up of reflections from the façade itself (+3dB).
$L_{Aeq,T}$	The A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.
L_{A10}	The noise level exceeded for 10% of the measurement period. It has been used in the UK for the assessment of road traffic noise.
L_{A90}	The noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise which is present even during the quieter parts of the measurement period.
L_{Amax}	Maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax F}$, or Fast, is averaged over 0.125 of a second and $L_{Amax S}$, or Slow, is averaged over 1 second. Maximum noise levels were all monitored using the Fast response.
PNL	The Perceived Noise Level (PNL) is a rating scale used to determine the subjective noise of an event, mainly aircraft noise, by taking into account the presence of any pure tones (eg. engine whine). The calculation procedure requires a complicated spectral analysis of the event over 0.5 second samples to determine the level of 'noisiness' in units called 'noy'. While the full calculation procedure is complex, it has been found that an approximation of PNL can be given using: $PNL = dB(A) + 13$
Sound Power	These two units are used to express sound level. Sound power level is the inherent property

Level (L_w) and Sound Pressure Level (L_p)	of a source, whilst sound pressure level is dependent on surroundings/distance/directivity etc. The sound level that is measured on a meter is the sound pressure level, L_p .
Sound Reduction Index (R)	The sound reduction index is a single-number rating of the sound reduction through a wall or other building element. Since the sound reduction may be different at different frequencies, test measurements are subjected to a standard procedure which yields a single number that is about equal to the average sound reduction in the middle of the human hearing range.
Weighted Sound Reduction Index (R_w)	The R_w incorporates a correction for the ears' response. It is derived from comparing the window sound insulation to frequency curve with a family of reference curves.

UK and Ireland Office Locations

