Philip Dunbavin Acoustics Ltd
3 Bridgewater Court
Barsbank Lane
Lymm
WA13 0ER

ACOUSTIC CONSULTANTS

HORWICH HEALTH HUB

POL 05 ASSESSMENT REPORT

REPORT REFERENCE NO. J004610-7600-DH-01

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Tel: 01925 759380 Email: enquiries@pdaltd.com

Registered Number 2302847 England
Registered Office: 3 Bridgewater Court, Barsbank Lane, Lymm WA13 0ER

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Client Address:	Company Address:
Ferry Works Summer Road Thames Ditton Surrey KT7 0QJ	Philip Dunbavin Acoustics Ltd 3 Bridgewater Court Barsbank Lane Lymm WA13 0ER

Issue	Date	Author	Remark	Status
01	20/12/2023	David Hible	Initial Issue	Initial

	Name	Position
Prepared By	David Hible BA(Hons) AMIOA	Consultant
Checked By	Chris Lalley MSc BSc(Hons) MIOA	Senior Consultant

CONTENTS

1.0 SUMMARY

At the request of PRP Architecture, noise egress from plant associated with the proposed healthcare development scheme at Horwich has been modelled.

The report shows that, provided the assumptions therein correspond with the design intent, the noise level due to all proposed plant running simultaneously is predicted to comfortably meet the criteria of BREEAM New Construction 2018, Section Pol 05 and as such the associated credit should be awarded.

Furthermore, assessment has been simplified and made conservative by using the lowest attenuator performance specified in each octave band for all intakes and discharges. In reality the received noise levels will be much reduced as the majority of attenuator performances proposed are greater than those modelled.

2.0 ASSUMPTIONS

The assessment in this report is based on PRP Architects drawings and information regarding mechanical services installations has been taken from Integrated Mechanical Limited drawings for the project as follows:

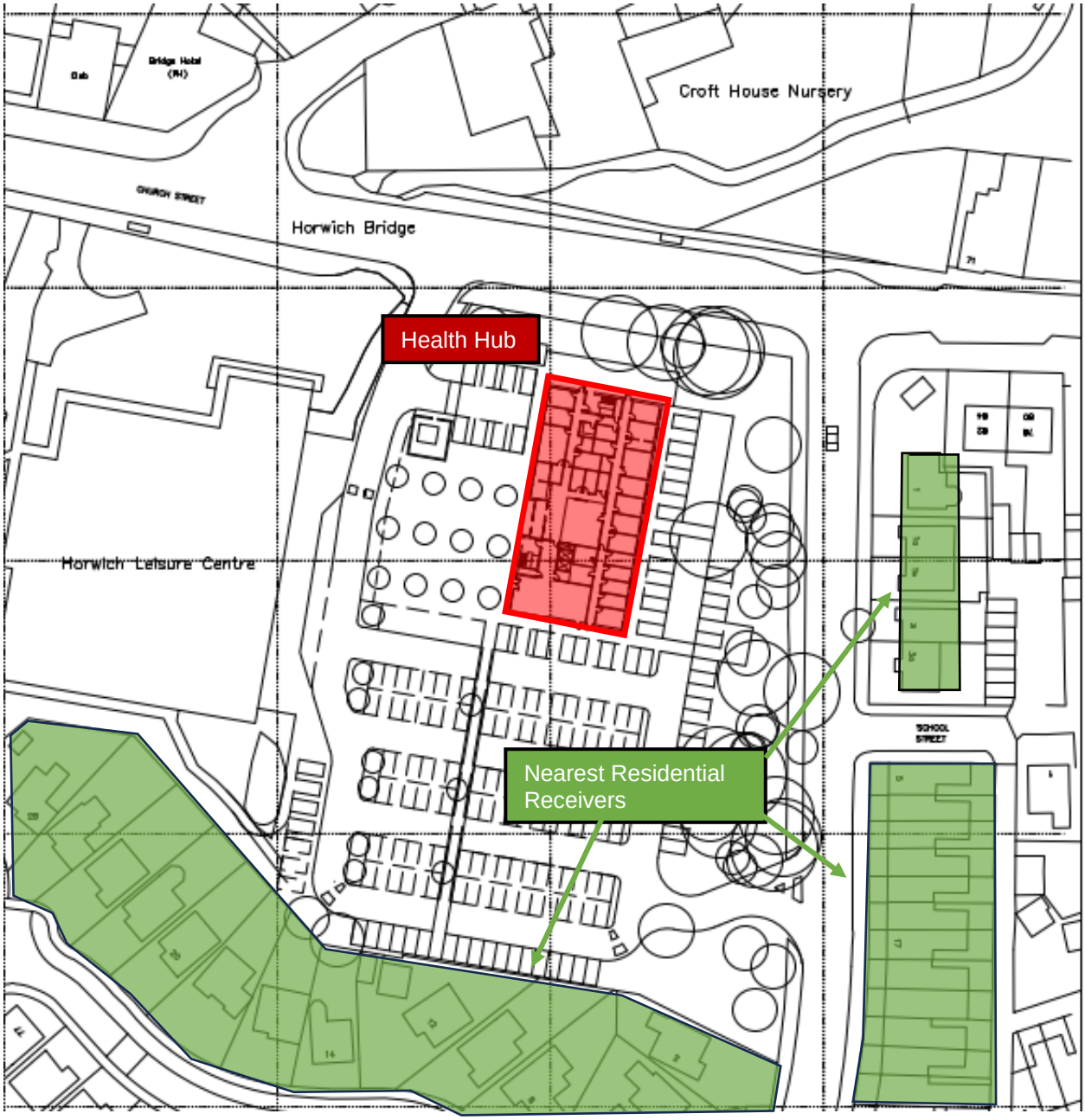
M1680.100_Ground Floor Ventilation Services_S3-Suitable for Review & Comment_P01

M1680.101_First Floor Ventilation Services_S3-Suitable for Review & Comment_P01

M1680.102_Second Floor Ventilation Services_S3-Suitable for Review & Comment_P01

The location of the proposed site with the health centre highlighted in red in shown within Figure 1 below:

Figure 1: Building site layout and closest sensitive receivers



3.0 ASSESSMENT CRITERIA

3.1 BREEAM New Construction (United Kingdom) 2018 Pol 05; Reduction of Noise Pollution

There is one credit available under Pol 05 which requires the following to demonstrate compliance;

1 *There are no noise-sensitive areas within the assessed building or within 800 m radius of the assessed site.*

or…

2 Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS 4142:2014 is commissioned. Noise levels must be measured or determined for:

2.a: Existing background noise levels:

2.a.i at the nearest or most exposed noise-sensitive development to the proposed assessed site,

2.ci.ii including existing plant on a building, where the assessed development is an extension to the building,

2.b: Noise rating level from the assessed building.

3 The noise impact assessment must be carried out by a suitably qualified acoustic consultant.

4 The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, must be at least 5dB lower than the background noise throughout the day and night.

5 If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion."

It should be noted that the preparation of this report has been undertaken under supervision of an acoustic consultant that holds qualifications in acoustics and is a full member of the Institute of Acoustics with 19 years continuous experience. This is considered satisfactory to meet the requirements of suitably qualified acoustician as defined under point 3 of BREEAM.

3.2 BS4142:2014 + A1:2019 Method for Rating and Assessing Industrial and Commercial Sound

The effect of commercial and industrial related plant noise emissions on the nearest noise sensitive residences can be assessed in accordance with BS4142:2014 – '*Methods for rating and assessing industrial and commercial sound*'.

The standard describes a method of determining the level of a noise of commercial or industrial nature, together with procedures for assessing the impact of such a noise outside nearby noise sensitive areas.

The standard may be thought of as a procedure for comparing the noise from industrial and commercial sources with background noise levels in the absence of the commercial noise and determining the likely impact of the noise on noise sensitive areas.

In accordance with BS 4142 the background noise level is the typical A-weighted sound pressure level at the assessment position that is exceeded for 90% of a given time interval (L_{A90}). The specific noise level is the equivalent continuous (L_{Aeq}) sound pressure level at the assessment position produced by the noise source over a given time interval.

Certain acoustic features can increase the impact over that expected from a simple comparison between the specific noise level and the background level. Where such features are present, these are taken into account by adding corrections to the specific noise level.

The corrections are applied based on whether the following features occur, or are expected to be present. The correction values can either be determined subjectively, or by various objective measurement procedures.

- The noise contains a distinguishable, discrete, continuous tone (whine, hiss, screech, hum, etc.). 0 – 6 dB penalty
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps). 0 – 9 dB penalty.

- Other features (including intermittency). 0 – 3 dB penalty.

From the addition of the above penalties where appropriate the rating level is established, this being the value that is compared with the background noise.

According to BS 4142 an initial estimate of the impact is given for a rating level of:

- 10 dB(A) or more above the background is an indication of significant adverse impact, depending on the context.
- 5 dB(A) above the background is an indication of an adverse impact, depending on the context.
- where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context.

The above initial assessment may then be modified depending on the context to take into account;

- The absolute level of the sound.
- The character and level of the residual sound compared to the character and level of the specific sound.
- 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, such as:

1. Façade insulation treatment
2. Ventilation and / or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
3. Acoustic screening

4.0 SURVEY METHODOLOGY

4.1 Equipment

A noise survey has been carried out at the site in compliance with BS 7445 and the existing background noise level at the nearest or most exposed noise-sensitive development to the proposed development has been determined. The noise survey is as detailed in PDA Ltd report ref '*J003861-5647-LK-01',* dated 27th June 2022.

The current report details the determination of the rating noise level resulting from proposed plant noise sources at the site.

4.2 Suitably Qualified Acoustician (SQA)

This report has been produced by Mr David Hible BA(Hons) who holds a post graduate diploma in the Institute of Acoustics and is an Associate Member of the Institute of Acoustics (AMIOA), however under the requirements of BREEAM does not meet the requirements of a SQA. Therefore the report has been checked by Mr Chris Lalley MSc, BSc(Hons), MIOA to find and verify that the assessment:

- Represents sound industry practice
- Be appropriate given the building being assessed and scope of works proposed
- Avoid invalid, biased and exaggerated recommendations.

Mr Chris Lalley satisfies the BREEAM criteria of a Suitably Qualified Acoustician as follows:

- More than 19 years working in the industry of Acoustics
- Member of the IOA

4.3 Proximity to NSR (Nearest Sensitive Receiver)

The nearest noise sensitive receivers are approximately 60m to the east and 70m to the south of the proposed site as shown in Figure 1 in Section 2.

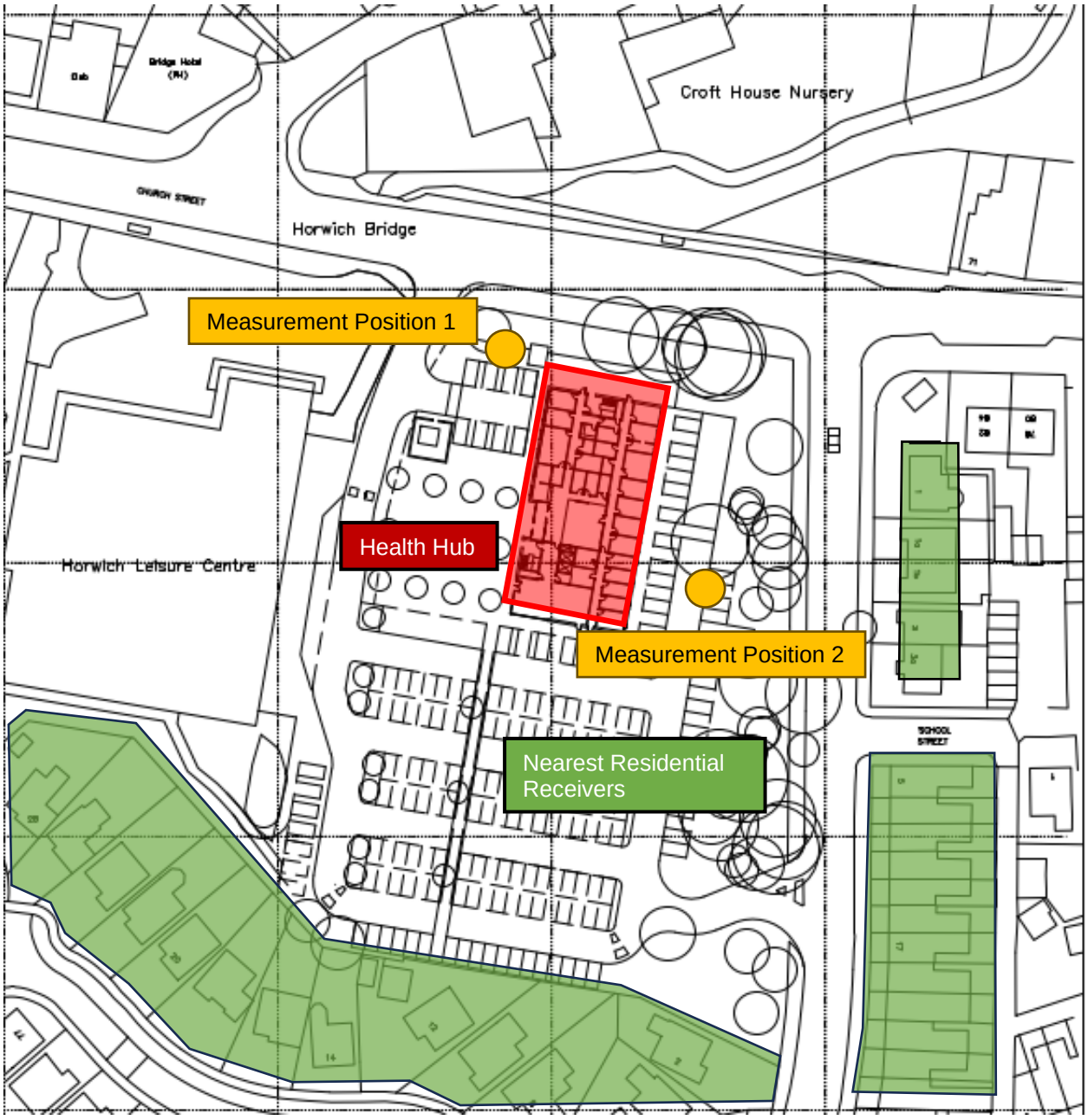
5.0 ASSESSMENT

5.1 Existing Background Noise Levels and Pol05 Criteria Noise Levels

A noise level survey was undertaken at the proposed development site between 08:20 and 11:20 hours on Monday 20th June 2022. The noise level survey was undertaken during a representative daytime period of the expected time that the proposed facility is expected to operate. The positions of which can be seen in Figure 2 below which also highlights the location of the closest noise sensitive receivers (NSRs). The noise survey was carried out in accordance with the requirements of BS 4142.

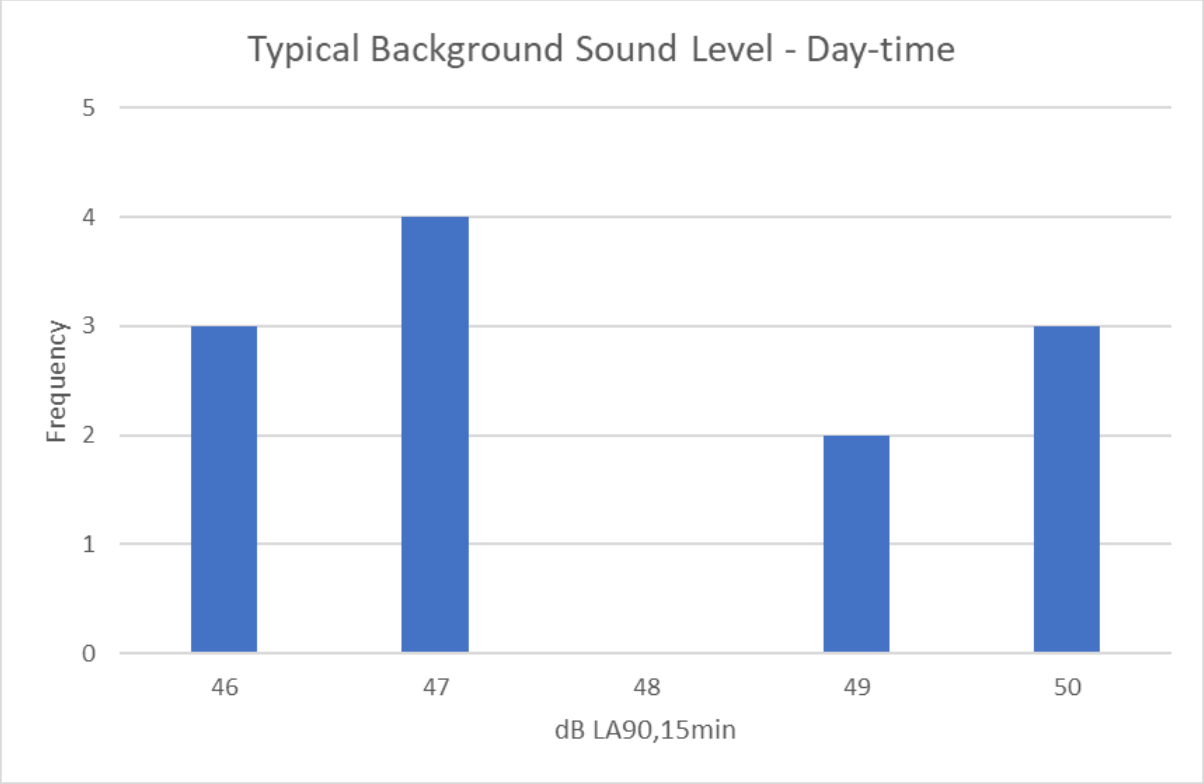
It is PDA's understanding that there will be no external plant operating outside of opening hours of the proposed health hub, understood to be 08:00 – 18:00 hours. Therefore an assessment for the night-time period has not been accounted for.

Figure 2: Noise measurement locations



The measured background sound level results from the noise survey are shown in Figure 3 below:

Figure 3: Statistical analysis of typical background noise levels



In accordance with the requirements of BS4142 the determination of background is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during relevant time periods.

Within BS4142 the following is stated:

"8.1.4 The monitoring duration should reflect the range of background sound levels for the period being assessed. In practice, there is no "single" background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed.

NOTE 1 To obtain a representative background sound level a series of either sequential or disaggregated measurements ought to be carried out for the period(s) of interest, possibly on more than one occasion. A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

By taking the measurement data for each position the representative background sound level has been calculated by taking the modal value for day-time periods. The derived background sound levels can be seen in Table 1.

A summary is presented in the table below BREEAM Pol 05 noise limits for noise egress, as experienced at the façade of an NSR are determined thus:

- 5dB $L_{Aeq,T}$ below background for the daytime period

Based on the above, typical day-time background noise levels and subsequently derived Pol05 noise limits are given in Table 1 below:

Table 1: Assessed Typical Background Noise Levels and subsequent derived Pol05 noise Limits

Period	Time (hh:mm)	Reference period, T (hh:mm)	Representative background level at nearest noise sensitive receiver location - L_{A90} (dBA)	Criteria for level which should not be exceeded at receiver due to noise egress from site for BREEAM Pol. 05 accreditation – $L_{Aeq,T}$ (dBA)
Day time	07:00 – 23:00	01:00	47	42

5.2 Plant Details

The plant on site consists of Heat Recovery Unit (HRU) intake and discharge terminals, extract fan discharge terminals and ground floor plant room:

5.2.1 HRUs

Looking at the drawings, the ventilation units consist of Lossnay LGH 50, 65, 80, 100 Heat Recovery Units (HRUs 0-01 – 2-07). We note that noise data available for these units is not of high quality but we have used other data from different manufacturers to normalise the available data to allow estimation of noise levels in the rooms served.

The HRU types and estimated sound power levels are as follows:

Table 2: LGH100RVX, HRV's, estimated Sound Power Levels (L_W's)
HRU no. 0-02,3,4,7,8,9/ 1-(01-08)/ 2-04,6,7

	Octave Band (Hz), Sound Power Levels, dB							
	63	125	250	500	1000	2000	4000	8000
Intake Termination	79	79	72	73	71	63	74	73
Discharge Termination	75	78	68	76	69	68	78	73

Table 3: LGH RVX 80, HRV's, estimated Sound Power Levels (L_W's)
HRU no. 0-05, 02-02,5

	Octave Band (Hz), Sound Power Levels, dB							
	63	125	250	500	1000	2000	4000	8000
Intake Termination	76	80	76	70	72	64	75	71
Discharge Termination	72	79	72	73	70	69	79	71

Table 4: LGH RVX 65, HRV's, estimated Sound Power Levels (L_W's)
HRU no. 0-01, 2-01,3

	Octave Band (Hz), Sound Power Levels, dB							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Intake Termination	72	75	68	66	63	54	65	63
Discharge Termination	68	74	64	69	61	59	69	63

Table 5: LGH RVX 50 HRV's, estimated Sound Power Levels (L_W's)
HRU no. 0-06

	Octave Band (Hz), Sound Power Levels, dB							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Intake Termination	71	75	71	66	64	58	70	65
Discharge Termination	67	74	67	69	62	63	74	65

5.2.2 Extract Fans

We would note that there is no specification provided on the extraction units which serve various toilet, utility and changing spaces, thus we have assumed the units will be Vent-Axia extract fans 200T similar to previous projects. Manufacturers noise data is as follow:

Table 6: EF - Vent-Axia ACM220T Manufacturer's Sound Power Levels (L_W's)

	Octave Band (Hz), Sound Power Levels, dB							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Discharge Termination	63	68	69	73	70	69	62	54

5.2.3 Attenuators

Recommendations are as follows:

Table 7. Silencer required Insertion Loss (Supply and Extract) for all HRUs and Extract Fans

Typical Product	**Insertion Loss IL (dB) Octave Band Centre Frequency (Hz)**							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Vent Axia Airtrak 600mm long 250mm diameter or equivalent performance	3	6	10	19	24	29	19	8

In addition, a typical end correction attenuation for a 300mm diameter duct (worst case) has been applied as follows:

Table 8. Typical Assumed End Correction Attenuation

Typical Product	Insertion Loss IL (dB) Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
300mm diameter duct, End Correction	13	8	4	1	0	0	0	0

5.2.4 Ground Floor Plant Room

With regard to the plant room, based on previous assessments plant rooms containing boilers, CHP units, pumps etc. rarely exceed 75 dB(A) L_{eq} as an internal sound pressure level. In light of this, for conservatism, we have assumed an internal sound pressure level of just over 78 dB(A) based on a similar plant room from a recent project (i.e. including water booster pump as the dominant source hence the relatively high level). Further assuming for a 1.5m^2 louvre gives the following sound power level for the plant room louvre:

Table 9: Sound Power Level of Louvre Outlet

Sound pressure level in plant room, L_P (dBA)	78
Plant room volume (m^3)	45
Predicted Reverberation time in Plant room (Typical), RT (s)	1.0
Correction for Diffuse – Free-field (dB)	-6
Louvre Outlet area (m^2)	1.5
Sound power of Louvre Outlet, L_W (dBA)	**71**

NOTE: Louvre assumed as a fully open gap and therefore no sound reduction index has been applied to the calculation.

Based on the above assessment the sound power level spectrum is as follows:

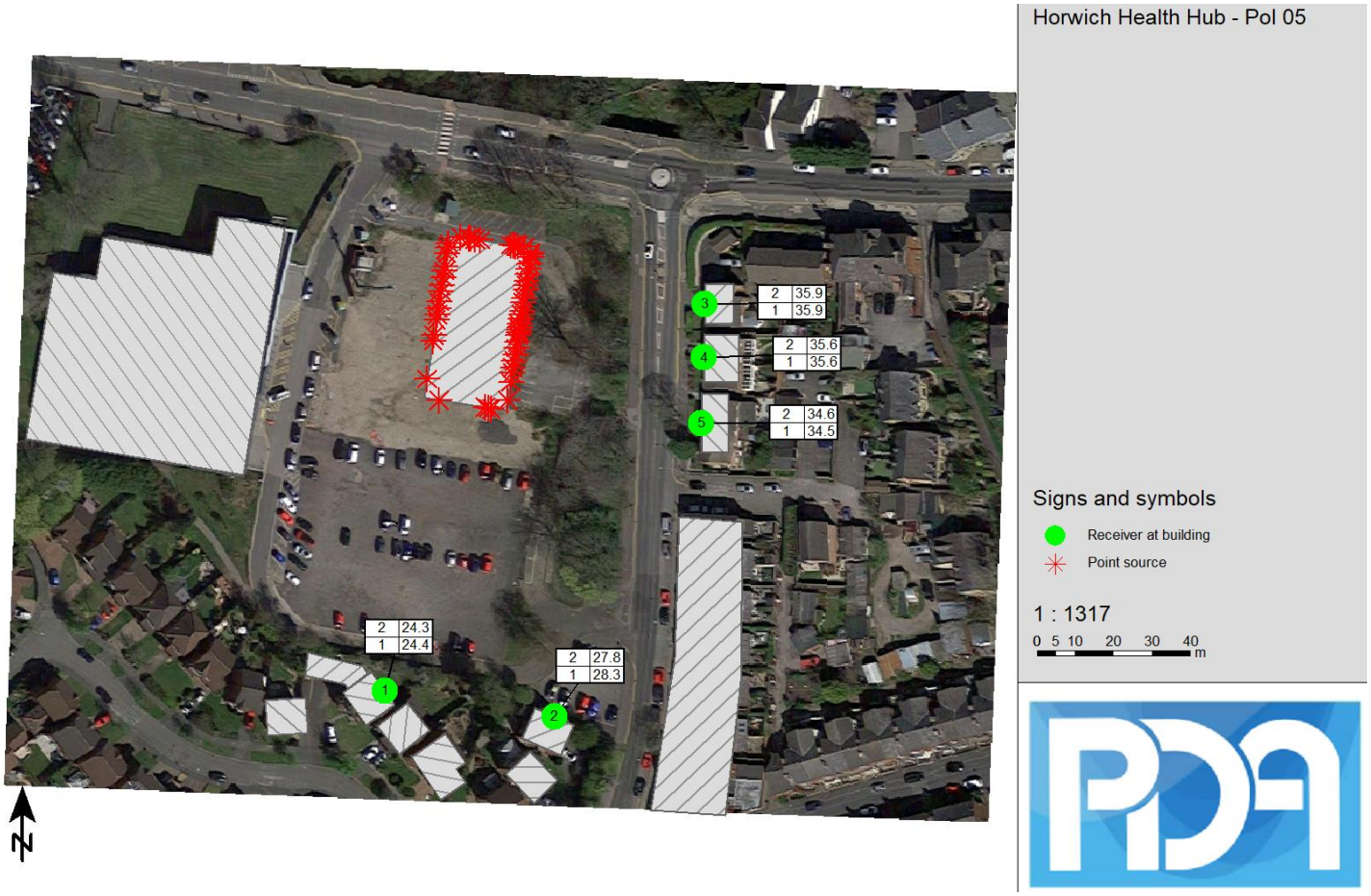
Table 10: Plant Room Estimated Sound Power Levels (L_W) Spectrum

	Octave Band (Hz), Sound Power Levels, dB								
	63	125	250	500	1000	2000	4000	8000	dBA
Plant Room Louvre	65	68	72	72	68	65	62	57	**73**

5.3 Plant Noise Assessment

The sound power levels have been adjusted for the indicated attenuators to the HRU terminations, and end loss reflections as detailed above have been incorporated into a 3-dimensional computer noise model for the site. The noise model has been created using SoundPLAN noise modelling software. The software uses the method of ISO 9613 'Acoustics – attenuation of sound during propagation outdoors – general method of calculation' and takes into account geometric spreading, ground effects, air attenuation, barrier attenuation and reflections. Each HRU intake, discharge and extract unit has been modelled as a point source at a height of 2.6m for the ground floor, 5.6m for the first floor and 8.6m for the second floor. The model is shown in Figure 4 below:

Figure 4: SoundPLAN Model Showing Plant Noise Sources and NSR Locations



5.4 Results

The following shows the predicted SoundPLAN results based on the **minimum** attenuator performance specified as detailed in Table 7:

Table 11. Calculated Plant Noise Levels L_{Aeq}

Location	Period	SoundPLAN Calculated L_{Aeq} dB
NSR1	Day	24
	Night	- *
NSR2	Day	28
	Night	- *
NSR3	Day	36
	Night	- *
NSR4	Day	36
	Night	- *
NSR5	Day	35
	Night	- *

*It is understood that plant will not be running at night.

With respect to whether any acoustic feature corrections would be deemed applicable to the calculated noise levels as per Section 5.2 above, it is noted that most modern plant items do not display tonality. For example, it is generally the case that modern fan units are not tonal. They are also designed to run continuously using speed variation rather than intermittent switching to cope with demand, so an acoustic feature correction is generally not appropriate.

In addition, where plant noise emission is made up of contributions from a number of different sources with individual tonal or other characteristics, even if they do exist, will be masked by other plant contributions. As such no feature corrections are deemed appropriate for the plant in question.

Based on the above and Table 11, the rating levels calculated in accordance with BS4142 are as follows:

Table 12. Comparison of Calculated Rating Levels $L_{Ar,Tr}$ against BREEAM 2018 New Construction Pol05 Criteria

Location	SoundPLAN Predicted Rating Sound Level $L_{Ar,Tr}$ dB	BREEAM Pol05 criterion dB	Level difference to Pol05 Criteria
NSR1	24	42	-18
NSR2	28		-14
NSR3	36		-6
NSR4	36		-6
NSR5	35		-7

As noted the predicted rating levels comfortably meet the criteria of Pol05 BREEAM 2018 New Construction and as such the associated credit should be awarded.

Furthermore, our assessment has been simplified by using the lowest attenuator performance specified in each octave band for all intakes and discharges. In reality, we would expect the received noise levels will be much reduced as the majority of attenuator performances are higher than those modelled.

6.0 CONCLUSION

At the request of PRP Architecture, noise egress from plant associated with the proposed healthcare development scheme at Horwich has been modelled.

The report shows that, provided the assumptions therein correspond with the design intent, the noise level due to all proposed plant running simultaneously is predicted to comfortably meet the criteria of BREEAM New Construction 2018, Section Pol 05 and as such the associated credit should be awarded.

APPENDIX A – NOTES FOR QUALITY CONTROL

1. Blockwork

All blockwork is to be mortared to an almost fair faced standard both horizontally and vertically. Only perfect blocks may be used with no pitting or cracks. The blockwork must seal effectively to the underside of the soffit.

Where blockwork walls form a cavity wall, care should be taken to avoid rubble and snots from bridging the cavity. This is especially important where one or more of the leaves is floating.

2. Plasterboard

All plasterboard joints are to be butted tight. The rule of thumb is that the joint should be tight enough over its entire length to prevent a normal business card from being inserted. Multiple layers should be fitted with staggered joints.

Base details and deflection heads are to be as per the British Gypsum White Book unless otherwise stated, and copious amounts of mastic to be used when fitting to the walls, floor and ceiling respectively.

3. Mineral Fibre

Mineral fibre slabs are to be butted tightly together and to boundary structures, to form a homogeneous layer.

4. Windows

All window frames are to be a good tight fit into the building structure with any gaps to be filled both internally and externally with a non-setting mastic in addition to the usual weather proofing seal to the exterior. Any gaps between the frame and building that are greater than 5 mm are to packed with a dense mineral fibre prior to mastic sealing.

5. Electrical Sockets

Electrical sockets must not be fitted back to back and removed areas of blockwork and plasterboard should be kept to an absolute minimum.

6. Water Pipes

All water pipes (and any other pipework) are to be resiliently mounted to avoid “water hammer”. This is particularly important for plasterboard walls.

7. Penetrations

Penetrations are to be dealt with as described in this report. Details for specific services penetrations may be supplied upon request.

8. Approved Samples and Inspections

Samples of each individual acoustic element should be provided for inspection at the beginning of its installation. Once approved, the Clerk of Works must ensure that the same level of quality continues throughout construction.