

Project:	19 St Peter's Ave, Hayling Ave	Date:	31/03/2022
Client:	Burras Ltd	Ref:	4955



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Report Title:	Environmental Noise Assessment of MVHR and Water Pump Noise		
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Opinions included herein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations, Paragon Acoustic Consultants Ltd reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

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1.0 Introduction

As part of development of a new residential property of address 19 St Peters Avenue, Hayling Island it is proposed that two MVHR units and three pumps be installed within the site demise.

The Local Authority has conditioned noise emissions from the proposed mechanical plant as follows:

- 8 Prior to the installation of any MVHR ventilation system and / or ground water pumping system, details of the proposed systems including any necessary acoustic mitigation measures, shall be submitted to and agreed in writing by the Local Planning Authority. The systems installed shall thereafter be retained and maintained fully in accordance with the approved details unless otherwise agreed in writing by the Local Planning Authority.

BS4142:2014 Requirement

Any external noise resulting from the use of any such plant, machinery or equipment shall be at least 5 dB below the existing typical background level (or lower) when measured according to British Standard BS4142-2014, at the boundary with neighbouring dwellings.

Reason: In order to safeguard the amenities of adjoining residential occupiers and having due regard to policy DM10 of the Havant Borough Local Plan (Core Strategy) 2011 and the National Planning Policy Framework.

The client has requested that this practice assess the MVHR plant and the water pumps below the lightwell base only. No other plant has been considered. If the client has other plant that requires assessment it is imperative that they carry out the necessary assessment and provide noise mitigation measures as necessary in order to meet with the noise limits established.

Paragon Acoustic Consultants Ltd has been commissioned to conduct an environmental noise survey to obtain statistical noise data to characterise the existing local background and ambient noise climate at the site and to derive noise limits to atmosphere based on the requirements of the condition.

If deemed necessary, effective mitigation measures shall be introduced as necessary to achieve the Local Authority condition requirements.

Given the residential nature of the site, the possibility of 24-hour operation has been considered.

2.0 Site Description and Proposed Plant Location

2.1 Site Description

The site under consideration is situated at 19 St Peters Avenue, Hayling Island

The plot lies on the north side of St Peters Avenue. To the east and west lie the adjacent detached residential properties of Number 21 St Peters Avenue to the east and Number 17 St Peters Avenue to the west. Agricultural land is situated to north-east of the plot under consideration, and to the north and north-west lie residential properties and their associated gardens with their frontage generally on St Peters Road and Church Lane. To the south lies the highway of St Peters Avenue, beyond which are located residential properties to the south-west of the site.

The site is illustrated by plan in Appendix A.

2.2 Proposed Plant Location

The proposed location of the plant has been advised by the clients design team, which are indicated in the following figures:

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Figure 1: Proposed Plant Location- MVHR Units

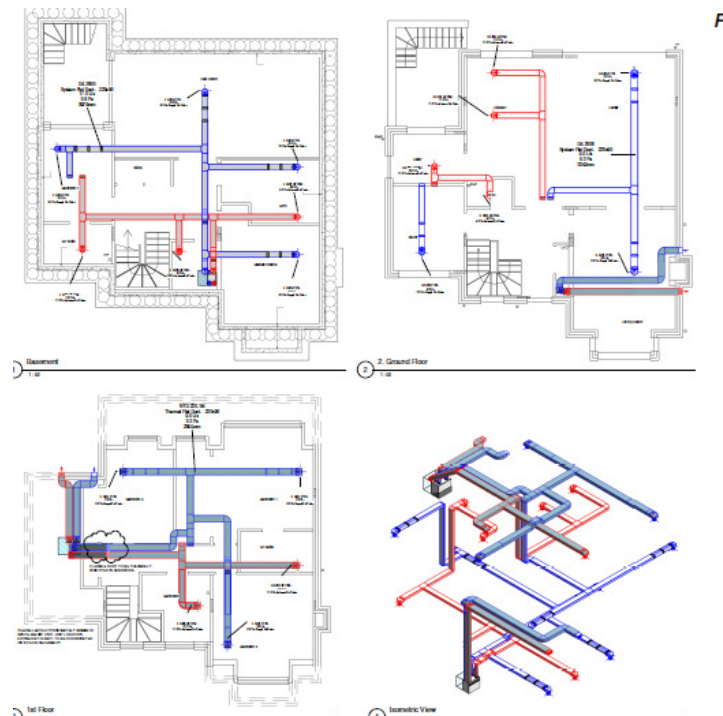
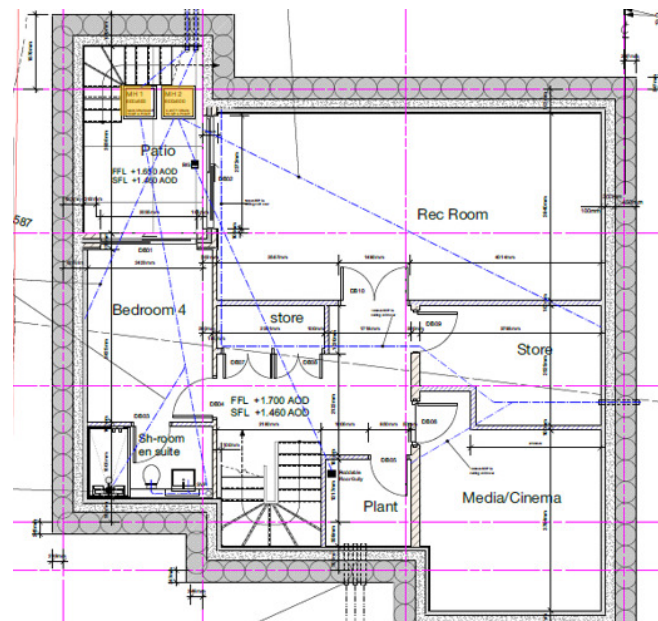


Figure 2: Proposed Plant Location Pumps MH 1 and MH2



Pump location – at base of patio within a recessed pump room and located below a cover comprising a steel drain cover inlaid with patio stone.

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3.0 Environmental Noise Survey

3.1 Existing Noise Climate

3.1.1 Road Traffic

Noise emanating from vehicular road traffic was deemed to provide a contribution to the ambient noise climate proximal to the nearest affected residential premises. The overall noise comprises both individual "event" type emissions from vehicles passing along local roads, and also continuous low frequency "rumble" due to middle distance traffic flows.

3.1.2 Aircraft

Aircraft overflights were not observed during the survey period.

3.1.3 Mechanical Noise Sources

No mechanical noise sources were observed at the site.

3.2 Survey

3.2.1 Measurements

The plant may potentially operate at any time during a 24-hour period. As such the noise levels were measured during the period that will represent the likely quietest period, being during the night. The noise monitoring took place between the following dates/times:

22:15 to 07:30 hours 24/03/2022 - 25/03/2022

Readings were over 15-minute samples times during the survey duration.

The noise monitoring was generally un-manned and was undertaken at the location as described below.

- MP1: At the boundary of the Number 21 property.

The measurement location is illustrated on the site layout drawing in Appendix A.

Various statistical broad-band and spectral sound pressure level measurements were obtained during the survey. A measurement time interval $T_m = 15$ minutes was used for sampling. Measurements of the percentile level $LA_{90,T}$ were made using time weighting F as per clause 3.4 of BS 4142:2014.

The quantities recorded included:

- LA_{eq} : the equivalent continuous A-weighted sound pressure level over the measurement period
- LA_{90} : the A-weighted sound pressure level exceeded for 90% of the measurement period

3.2.2 Weather during survey period

The weather conditions were mild and dry and still during the manned periods of the survey period.

3.2.3 Instrumentation

Sound pressure level measurements were obtained using the following instrumentation complying with the Type 1 specification of BS EN 60804, BS EN 60651, BS EN 60942, BS EN 61260, and BS EN 61672-1:

- Norsonic Type 118 Sound level analyser, serial number 31322
- Norsonic Type 1225 ½" microphone

Additionally, the following equipment was used:

- Tripod

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Calibration checks were made prior to and after completion of measurements using a Norsonic Type 1251 acoustical calibrator complying with Class 1 of BS EN 60942, calibration level 114.0 dB +/- 0.3 dB, @ 1.0 kHz. All instrumentation carries a current manufacturer's certificate of conformance a copy of which is available upon request.

3.3 Results

The following background noise levels were established:

Table 1: Representative Background Sound Levels LA90,15 min

Date	Reading start time	LAeq	LA 90	Date	Reading start time	LAeq	LA 90
24/03/2022	22:15	29.9	26.9	25/03/2022	03:00	28.3	27.5
24/03/2022	22:30	30.1	28.6	25/03/2022	03:15	28.4	27.1
24/03/2022	22:45	30.6	29.3	25/03/2022	03:30	28.5	27.8
24/03/2022	23:00	29.7	28.7	25/03/2022	03:45	27.2	26.3
24/03/2022	23:15	28.6	27.6	25/03/2022	04:00	27.5	26.4
24/03/2022	23:30	30	29.1	25/03/2022	04:15	27.7	26.6
24/03/2022	23:45	30.5	29.6	25/03/2022	04:30	27.9	27.1
25/03/2022	00:00	30.1	27.3	25/03/2022	04:45	29.2	28.3
25/03/2022	00:15	29	27.3	25/03/2022	05:00	28.1	27.3
25/03/2022	00:30	29.2	28.4	25/03/2022	05:15	29.2	27.1
25/03/2022	00:45	29.3	28.6	25/03/2022	05:30	30.8	29.5
25/03/2022	01:00	29.4	27.3	25/03/2022	05:45	33.3	31.2
25/03/2022	01:15	29.2	27.8	25/03/2022	06:00	34.5	32.1
25/03/2022	01:30	29	28.3	25/03/2022	06:15	35.2	32.9
25/03/2022	01:45	29.7	28.3	25/03/2022	06:30	35.1	33.5
25/03/2022	02:00	29.4	27.5	25/03/2022	06:45	38.2	35.1
25/03/2022	02:15	29.2	26.6	25/03/2022	07:00	40.1	36.2
25/03/2022	02:30	28.6	27.9	25/03/2022	07:15	39.2	36.1
25/03/2022	02:45	28.6	27.6	25/03/2022	07:30	41.2	37

The Modal value of the rounded LA90 background sound levels obtained is summarised below:

Table 2: Typical Lowest background sound levels

Measurement Position	Modal value of the rounded LA90 background sound levels L_{A90,(15 min)}
MP1 measurement position	28 dB

Condition 8 requires that:

Any external noise resulting from the use of any such plant, machinery or equipment shall be at least 5 dB below the existing typical background level (or lower) when measured according to British Standard BS4142-2014, at the boundary with neighbouring dwellings. Based on the Typical Lowest background sound level established the mechanical plant shall be required to maintain the following limiting noise levels:

Note that BS4142-2014 will require that the noise levels are maintained at 1m external to the neighbouring property facades, not at the boundary. As such the noise limits apply to 1m external to the neighbouring property facades.

The client has requested that this practice assess the MVHR plant and the water pumps below the lightwell base only. No other plant has been considered. If the client has other plant that requires assessment it is imperative that they carry out the necessary assessment and provide noise mitigation measures as necessary in order to meet with the noise limits established.

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Table 3: Limiting Noise Criteria applicable at the affected premises

Plant Location / type	Receptor	Anytime ^[3] $L_{A,T}$ ^[1]
Any Location on the site - normal operation plant	Adjacent neighbouring properties	23 dB ^{[1] [2]}

[1] **Note:** $L_{A,T}$ is a rating level as assessed in accordance with BS4142.

[2] **Note:** The limiting noise levels are deemed to be considered at a position 1 metre outside the nearest affected premises.

[3] **Note:** As the plant can operate 24/7 the noise limits are dictated by the quietest period of the day / night

4.0 Review of Proposed Plant

4.1 MVHR Units

The new plant will comprise two MVHR units and three pumps.

Detailed calculations have been carried out in order to determine the likely level of airborne noise transmission outside the identified assessment locations due to the operation of the proposed new plant to be installed.

Section 2.2 details the plant location/s used in the assessment.

The following sections provide a record of the proposed new plant, the operational sound levels used as the basis for this assessment, and a specification for noise mitigation treatments.

At this stage, the scope of work herein is limited to the consideration of mechanical plant noise emissions to atmosphere and does not include evaluation of the transmission of noise from this plant into the clients own property of 19 St Peters Avenue, Hayling Island.

4.1.1 Plant Noise Data MVHR Units

The noise levels / acoustic data for the proposed new plant items are shown below:

Figure 3: Noise data for MVHR Unit at front of the building (St Peters Avenue side intake and exhaust towards 21 St Peters Avenue)

Technical Data

MRXBOX-ECO - Wall Mounted Multi Room Xbox
Fan Code: **MRXBOXAB-ECO2**
Installation Manual Links: 671795
Required duty: 44 l/s at 129 Pa
Actual duty: 62 l/s at 260 Pa
Actual at required flow: 44 l/s at 421 Pa
When speed controlled to required duty (70.55%):
Motor Input Power: 0.054 kW
Specific Fan Power: 1.2 W/(l/s)
Velocity at required duty: 3.586 m/s
At full speed:
Motor Input Power: 0.155 kW
Specific Fan Power: 2.5 W/(l/s)
Maximum Fan Speed: 3,750 RPM
Electrical Supply: 230V, 1 Phase, 50 Hz
Motor current (I_{lc}): 1.2 A
Max. operating temp: 40°C
Weight: 20 kg
Starting currents are nominal.

Sound Data

Acoustic performance to ISO 13347 and AMCA 300.
Noise calculated speed controlled to required duty (70.55%)
Sound Power Levels re 1 pWatts (Hz):

Hz	63	125	250	500	1k	2k	4k	8k	dBA
Breakout	62	56	51	50	42	38	27	<16	32
Open Inlet (Intake & Extract)	43	44	56	48	43	39	27	17	
Open Outlet (Supply & Exhaust)	54	62	61	63	58	57	46	37	

dBA is hemi-spherical at 3 metres. For spherical deduct 3 dBA.

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Figure 4: Noise data for MVHR Unit at rear of the building (Intake and exhaust towards above light well space)

Technical Data

MRXBOX-ECO-AE - Wall Mounted Multi Room Xbox with Acoustic Enclosure

Fan Code: MRXBOXAB-ECO2-AE
Installation Manual Links: 671824

Maximum Fan Speed: 3,750 RPM
Electrical Supply: 230V, 1 Phase, 50 Hz
Motor current (flc): 1.2 A
Max. operating temp: 40°C
Weight: 45 kg
Starting currents are nominal.

Sound Data

Acoustic performance to ISO 13347 and AMCA 300.

Noise calculated speed controlled to required duty (100%)

Sound Power Levels re 1 pWatts (Hz):

Hz	63	125	250	500	1k	2k	4k	8k	dBA
Breakout	56	58	50	44	26	18	<16	<16	28
Open Inlet (Intake & Extract)	48	52	59	56	50	46	35	28	
Open Outlet (Supply & Exhaust)	60	67	69	69	65	65	55	47	

dBA is hemi-spherical at 3 metres. For spherical deduct 3 dBA.

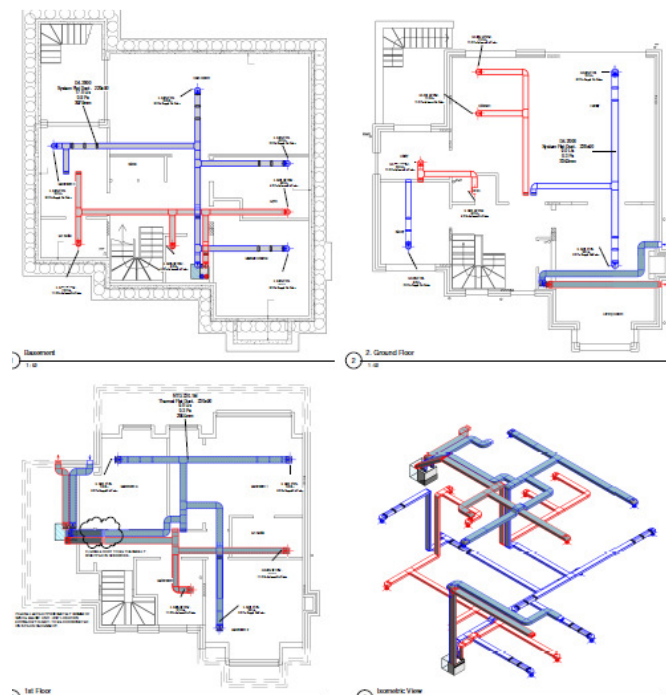
Unless otherwise advised the stated noise levels are maximum noise levels to be maintained by the proposed mechanical plant. If the plant noise levels exceed the stated levels it may be necessary to increase attenuation measures accordingly, the cost of which will be by others.

4.1.2 MVHR Noise Mitigation

Noise mitigation measures shall be introduced on the ducts connecting the MVHR units to the intake and discharge openings to atmosphere. Others shall consider all internal noise requirements.

The following positions are now advised for the MVHR intake and discharge openings to atmosphere:

Figure 5: Proposed MVHR Unit intake and discharge openings to atmosphere



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On the basis of these opening positions and the noise data advised this practice has undertaken an assessment of the duct attenuator insertion loss requirements for attenuators on the atmosphere side of the plant.

The following attenuators shall be installed into the systems:

Table 4: Attenuator Specification – MVHR Units – to be installed within ducts between the MVHR units and the outlet / inlet as applicable

Ref	Description	Duty		Approximate Size (mm)			Minimum Insertion Losses							
		Vol (m3/s)	Max res (Pa)	Width	Height	Length	Octave Band Centre Frequency							
							63	125	250	500	1k	2k	4k	8k
A1	MVHR Unit at front of the building (intake and exhaust towards 21 St Peters Avenue) Inlet to atmosphere	tba	15	tba	tba	tba	1	6	25	26	35	35	35	30
A2	MVHR Unit at front of the building (intake and exhaust towards 21 St Peters Avenue) exhaust to atmosphere	tba	15	tba	tba	tba	5	21	37	40	45	45	42	30
A3	MVHR Unit at rear of the building (Intake and exhaust towards above light well space) Inlet to atmosphere	tba	15	tba	tba	tba	1	4	17	26	28	30	25	15
A4	MVHR Unit at rear of the building (Intake and exhaust towards above light well space) exhaust to atmosphere	tba	15	tba	tba	tba	4	12	32	35	40	40	35	30
Attenuator construction to be suitable for the application – Attenuator supplier to liaise with the design team to agree sizes.														

Dimensions are not stated in the above Table. Attenuator suppliers may have their own preferred standard sizes. The insertion loss requirements and maximum pressure drops stated in the Table shall be maintained

The above Table includes attenuators for the control of noise to atmosphere only. Others shall undertake assessment to determine any enhancements to the attenuation with respect to control of noise to internal areas of the building. In addition, others shall assess all paths of noise to internal areas of the building and shall select suitable roomside attenuators.

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4.1.3 MVHR Predicted noise levels to atmosphere

The predicted noise levels to atmosphere for the MVHR units are indicated below:

Table 5: Predicted Noise Levels at nearest affected premises

Plant under consideration	Worst case assessment location	Approx. distance to receiver	Direct line of sight?	Predicted Lp	Derived noise limit dB LArT
MVHR Units only	Residential property at 17 St Peters Avenue	7 m	Yes	23 dB	23 dB
	Residential property at 21 St Peters Avenue	3 m	Yes	23 dB	23 dB

It is considered that the plant shall not be intermittent, tonal or impulsive at the receiver location.

It can be seen that the MVHR plant, together with their associated noise mitigation measures detailed, **would** maintain the requirements of Condition 8 confirmed herein.

4.2 Pumps

4.2.1 Pump Noise Data

The pumps proposed are confirmed as follows:

- 1 number foul pump by Packaged Pumps Systems Ltd model D10Sa
- 2 number Newton Waterproofing Systems pumps models CP250

This practice has contacted both pump manufacturers and has been advised that the noise data for the pumps is not available.

In the absence of such noise data it is only possible to undertake a provisional estimate of the pump noise transmission to neighbouring properties.

The publication Engineering Noise Control by David A. Bies and Colin H Hansen provides a method to estimate pump noise levels. Using the pump suppliers running speed and power rating the pump noise can be estimated. The pump suppliers rpm and Watts advised are confirmed as follows:

- 1 number D10Sa foul pump - run speed of 2850rpm at 750 Watts.
- 2 number CP250Newton Waterproofing pump - Newton Pump Range: CP250 - 2900RPM at 250watts

Base on the running speed and Power rating the pump noise level is estimated as:

- 1 number D10Sa foul pump – 68 dBA at 1m (Hemispherical)
- 2 number CP250Newton Waterproofing pump – 63 dBA at 1 metre (Hemispherical)

Using the spectral corrections provided in the same publication the spectral sound levels have been estimated.

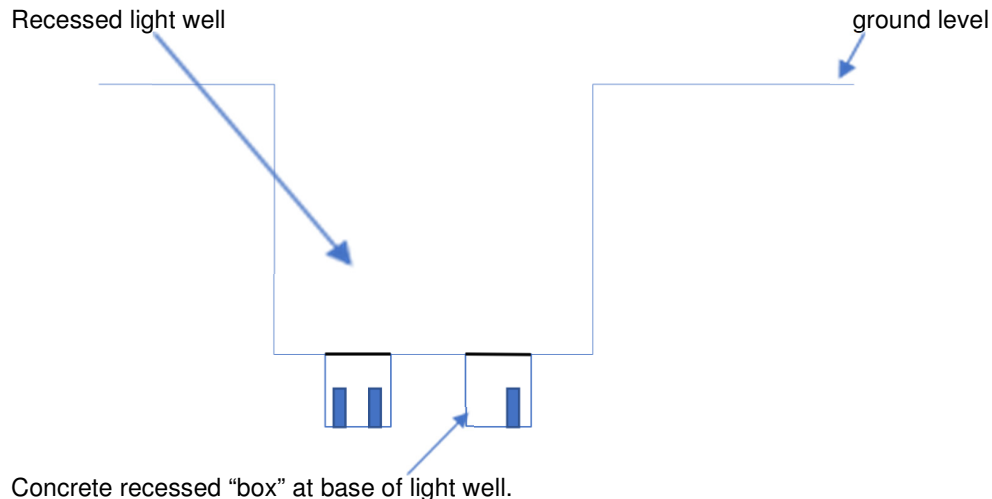
4.2.2 Pump locations / housings

It has been advised that the pumps are located in concrete recessed “Boxes” beneath the patio area. It is our understanding that the pumps are located in small, recessed concrete “boxes” below the lower ground level of the lightwell

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Figure 6: Paragon Acoustic understanding of pump arrangement

Sectional view



Concrete recessed "box" at base of light well.

It has been verbally advised that the pump box is sealed at the top such that it is level with the patio by using "Man-hole" covers. It has been advised that the man-hole covers are recessed and are to be infilled with patio paving blocks of at least 50mm thickness to match the surrounding patio. The patio blocks shall be full filled grouted (gaps between paving blocks to be sealed) . It has been advised that the man-hole covers are sealed with a neoprene gasket around the periphery of the cover.

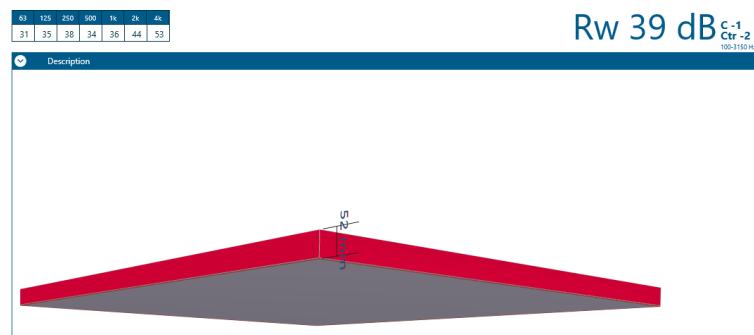
It has been verbally advised that these pump "Boxes" below the patio do not have any connecting pipes / ducts / drainage pipes or other air passages to atmosphere and that they are fully sealed.

4.2.3 Estimated Man-hole Acoustic Performance

Based on the above this practice has undertaken an estimate of the man-hole cover acoustic performance.

The performance has been estimated using Insul V 9.0 sound insulation prediction software and the performance is predicted to be 39 dB Rw as indicated on the below screenshot.

Figure 7: Estimated Pump Man-hole cover performance



Based on the estimated pump noise data for all three pumps and an operating condition that all three pumps operate simultaneously (considered an unlikely event) the estimated noise level of the **pumps is 30 dBA at 1m external to the neighbouring property**. This estimated will not meet with the requirements, however, we advise as follows:

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The condition references BS 4142: 2014. This standard also includes the following statements:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following".

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

Background sound levels at the site are very low at night, and the pumps will potentially operate 24/7. In this context absolute noise levels are clearly relevant, with appropriate guidelines discussed below.

4.2.4 World Health Organisation

The World Health Organisation (WHO) document "Guidelines for Community Noise" provided a review of the effects of noise and a description of the principles of health criteria. Table 1 of the document presents guideline values arranged according to specific environments and critical health effects. Noise indices to be adopted and the accompanying time base to be used for the assessment are also presented.

The guideline values consider all health effects for a specific environment. An adverse health effect refers to any temporary or long-term impairment of physical, psychological or social functioning associated with noise exposure.

The specific noise limits were set for each health "using the lowest noise level that produces an adverse health effect"

Table 6: WHO Guideline values for community noise in specific environments

Specific environment	Critical health effect(s)	L_{Aeq} [dB]	Time base [hours]
Dwelling, indoors	Speech intelligibility & moderate annoyance daytime & evening	35	16
	Sleep disturbance, night-time	30	8

World Health Organisation Night Noise Guidelines for Europe also provide details of the Health effects observed in the population based on the average night noise level over a year Night,outside.

Table 3 – "Effects of different levels of night noise on the population's health given in the document is reproduced as follows:

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Figure 8: World Health Organisation Night Noise Guidelines for Europe extract

Average night noise level over a year $L_{night, outside}$	Health effects observed in the population
Up to 30 dB	Although individual sensitivities and circumstances may differ, it appears that up to this level no substantial biological effects are observed. $L_{night, outside}$ of 30 dB is equivalent to the no observed effect level (NOEL) for night noise.
30 to 40 dB	A number of effects on sleep are observed from this range: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and the number of events. Vulnerable groups (for example children, the chronically ill and the elderly) are more susceptible. However, even in the worst cases the effects seem modest. $L_{night, outside}$ of 40 dB is equivalent to the lowest observed adverse effect level (LOAEL) for night noise.
40 to 55 dB	Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.
Above 55 dB	The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases.

It will be seen that up to 30 dB “Although individual sensitivities and circumstances may differ, it appears that up to this level no substantial biological effects are observed. $L_{night, outside}$ of 30 dB is equivalent to the no observed effect level (NOEL) for night noise”.

As such, it is suggested that the estimated noise levels of 30 dB $L_{night, outside}$ should be acceptable to the Local Authority when considering that this is equivalent to the No Observed Effect Level. It is recommended that this be passed to the Local Authority for their consideration prior to procurement of goods and equipment in relation to this assessment.

5.0 Conclusions

A background noise survey has been undertaken to determine the noise climate likely to exist in the vicinity of 19 St Peters Avenue, Hayling Island, where the positioning of new mechanical MVHR and Water pumps plant are proposed.

The requirements of the condition have been confirmed herein and the assessment of MVHR units shows that following noise mitigation measures confirmed herein the requirements of Condition 8 can be maintained.

The noise data for the pumps is not available from the manufacturers and as a result an estimate of pump noise has been undertaken based on the Engineering Noise Control publication. The pump estimated noise level has been confirmed and although the estimated noise does not meet with the condition the very low noise level predicted is expected to be at a level equivalent to the “No Observed Effect Level” as explained herein. It is suggested that the estimated noise levels of 30 dB $L_{night, outside}$ should be acceptable to the Local Authority when considering that this is equivalent to the No Observed Effect Level. It is recommended that this be passed to the Local Authority for their consideration prior to procurement of goods and equipment in relation to this assessment.

