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REPORT AS6935.150507.NIA12.1

COOPERVISION SP3, LATHING TOILET BLOCK EXTENSION

NOISE IMPACT ASSESSMENT

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1.0 INTRODUCTION

Clarke Saunders Associates has been commissioned by Coopervision to assess the potential noise impact of a new plant room enclosing a small compressor on nearby noise sensitive receivers. The enclosure is to be located to the rear of Southpoint 3.

2.0 PREDICTED NOISE IMPACT

2.1 Selected Plant

The selected plant has been confirmed as:

- 1 no. Reliable VT75 oil free compressor unit

2.2 Compressors

Rotary screw compressors use two meshing helical screws, known as rotors, to compress the gas. In a dry running rotary screw compressor, timing gears ensure that the male and female rotors maintain precise alignment. In an oil-flooded rotary screw compressor, lubricating oil bridges the space between the rotors, both providing a hydraulic seal and transferring mechanical energy between the driving and driven rotor. Gas enters at the suction side and moves through the threads as the screws rotate. The meshing rotors force the gas through the compressor, and the gas exits at the end of the screws.

The effectiveness of this mechanism is dependent on precisely fitting clearances between the helical rotors, and between the rotors and the chamber for sealing of the compression cavities. Rotary screw compressors tend to be compact and smooth running with limited vibration and thus do not require spring suspension.

2.3 Plant Noise Levels

Manufacturer's spectral plant noise data for the proposed units are shown below. Where the manufacturer has only provided a dB(A) noise level for the units, the assumed spectral noise levels used in the calculation have been based on a similar sized unit, corresponding to the dB(A) level quoted by the manufacturer.

Lp @1m	63	125	250	500	1k	2k	4k	8k	dB(A)
VT75 compressor	83	76	76	79	75	69	66	61	42

Table 2.1 - Noise levels for pump units **[dB ref. 20µPa]**

The unit is proposed to be housed in a purpose built plant room, comprising a blockwork construction with steel doors to the front. Figure 2.1 shows the predicted noise level 1m from the plant room.

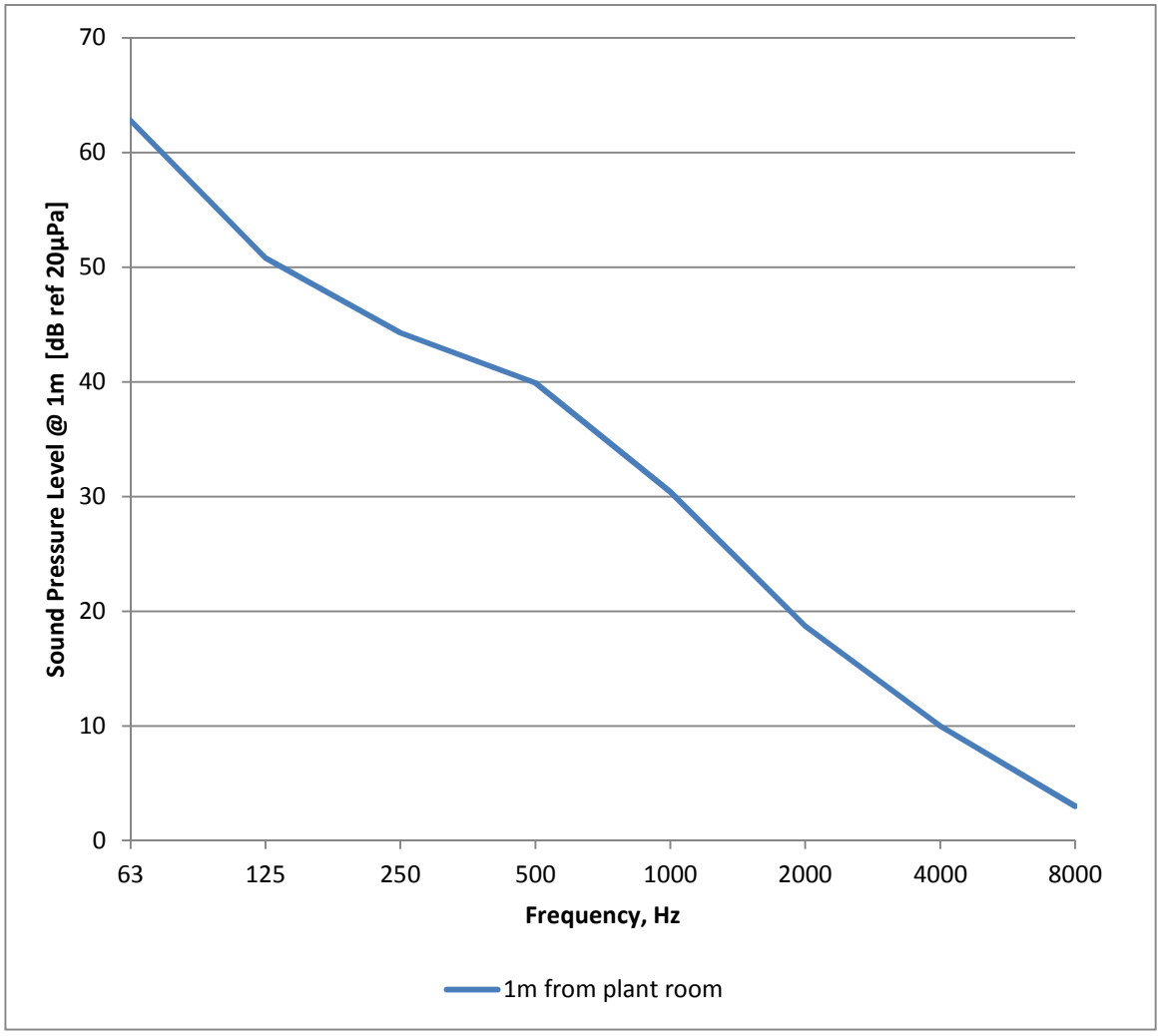

Figure 2.1 - Source noise data (sound pressure) 1m from plant room

3.0 PREDICTED NOISE LEVELS

The units are to be located in the area indicated in figure AS6935/SP1.

The total predicted noise level at the nearest receiver is shown in the graph below, against the ambient noise 'envelope' established for the area around the Coopervision site (see CSA report ref.AS6935.120521.R2). As an overall dB(A) level, this equates to 4dB(A), considerably below the typical L_{A90} levels at these locations.

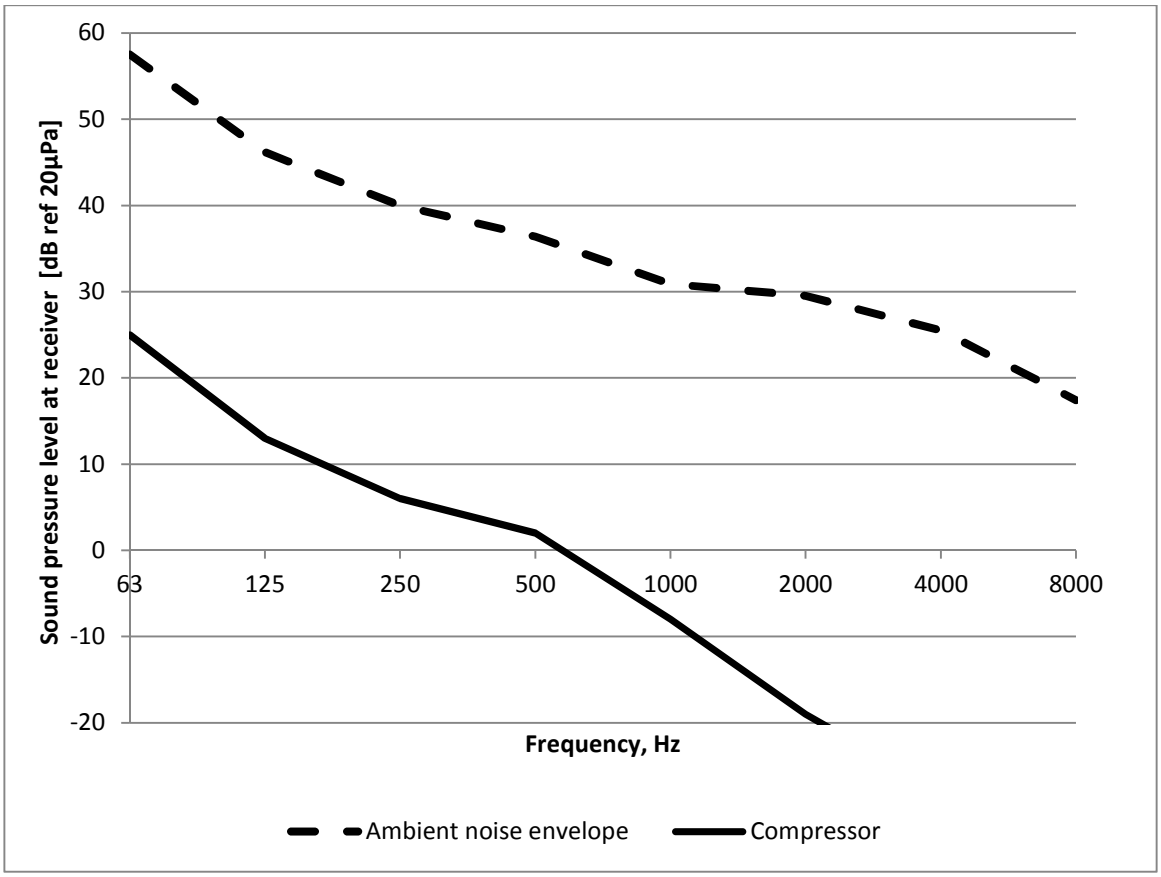

Figure 3.1 – Individual and compressor noise levels at receiver

A summary of the full calculations are shown in Appendix B.

4.0 CONCLUSIONS

A noise impact assessment of new compressor housed within a building at South Point 3 has been undertaken.

Data for the proposed plant has been used to predict the noise impact on the nearest residential receivers.

A detailed assessment of plant noise characteristics and frequency related features has been presented for consideration within the soundscape of the area.

Noise from the proposed units has been shown to be significantly below the ambient noise envelope and hence no adverse noise impacts are considered likely to occur.

Jamie Duncan MIOA

CLARKE SAUNDERS ASSOCIATES



Figure AS6935/SP1

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

1.1 Acoustic Terminology

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

dB (A): The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

L_{10} & L_{90}: If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the `average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.

It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

L_{eq}: The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).

The use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

Because L_{eq} is effectively a summation of a number of noise events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute noise limit.

L_{max}: L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

D The sound insulation performance of a construction is a function of the difference in noise level either side of the construction in the presence of a loud noise source in one of the pair of rooms under test. *D*, is therefore simply the *level difference* in decibels between the two rooms in different frequency bands.

D_w D_w is the *Weighted Level Difference* The level difference is determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1.

$D_{nT,w}$ $D_{nT,w}$ is the *Weighted Standardised Level Difference* as defined in BS EN ISO 717-1 and represents the *weighted level difference*, as described above, corrected for room reverberant characteristics.

C_{tr} C_{tr} is a spectrum adaptation term to be added to a single number quantity such as $D_{nT,w}$, to take account of characteristics of a particular sound.

$L'_{nT,w}$ $L'_{nT,w}$ is the *Weighted Standardised Impact Sound Pressure Level* as defined in BS EN ISO 717-2 and represents the level of sound pressure when measured within room where the floor above is under excitation from a calibrated tapping machine, corrected for the receive room reverberant characteristics.

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation have agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, eg. 250 Hz octave band runs from 176 Hz to 353 Hz. The most commonly used bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that noise levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) is not twice as loud as 50 dB(A) sound level. It has been found experimentally that changes in the average level of fluctuating sound, such as traffic noise, need to be of the order of 3 dB(A) before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10 dB(A) is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in traffic noise level can be given.

INTERPRETATION

Change in Sound Level dB(A)	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in noise level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a 3 metre high barrier exists between a noise source and a listener, with the barrier close to the listener, the listener will perceive the noise source is louder, if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the noise source would seem quieter than it was if he were standing. This may be explained by the fact that the "effective screen height" is changing with the three cases above, the greater the effective screen height, in general, the greater the reduction in noise level.

Where the noise sources are various roads, the attenuation provided by a fixed barrier at a specific property will be greater for roads close to the barrier than for roads further away.

APPENDIX B

EXTERNAL PLANT NOISE EMISSIONS CALCULATIONS

Calculation 1:

			63	125	250	500	1000	2000	4000	8000	dB(A)
1m from plant room	Lp	1 m	63	51	44	40	30	19	10	3	42
Distance Loss		75 m	-38	-38	-38	-38	-38	-38	-38	-38	
Level At Receiver			*25*	*13*	*6*	*2*	*-8*	*-19*	*-28*	*-35*	4