

Intended for
First Choice Building Supplies

Document type
Acoustic Report

Date
March 2022

SILVERDALE HOUSE **ACOUSTIC BARRIER** **ASSESSMENT**

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Project name **Silverdale House**
Project no. **1620013918**
Recipient **First Choice Building Supplies**
Document type **Report**
Version **-**
Date **04/03/2022**
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Description **Acoustic Barrier Assessment**

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1. INTRODUCTION

Ramboll has been appointed by First Choice building Supplies to undertake a baseline noise survey in relation to a proposed acoustic fence between First Choice Building Supplies and the adjacent residential gardens in Hayes.

A baseline noise survey was carried out on the 11th February 2022 to determine the existing operating noise levels on site and at the nearest noise sensitive receptors. This report describes the methodology used for the noise survey, the measurement locations and the measurement results. The implications of the measured noise levels are reviewed particularly in terms of the acoustic barrier proposals.

2. SITE DESCRIPTION

Silverdale House is located on Pump Lane in Hayes and lies within an urbanised area characterised by mixed use industrial development of varying character, scale and height, as well as residential receptors. The existing site boundary can be seen in the figure below.



Figure 1 - Silverdale House Site Location

The nearest noise sensitive receptors are the residential buildings on Copperdale Road to the West of the site.

3. BASELINE NOISE SURVEY

A baseline noise survey was undertaken between 11:00-13:00 on Friday 11th February 2022. The measurement locations are shown below. The daytime noise survey consisted of a series of 10-minute measurements capturing typical activity noise from inside the site.



Figure 2 - Measurement Locations

3.1 Equipment

The following equipment was used to carry out the noise survey:

- NtI Audio XL2-TA Type 1 Sound Level Meter (serial no. A2A-09209-E0)
- NtI Audio MC230 Microphone (serial no. 8072)
- NtI Audio Sound Calibrator (serial no. 16089)

The sound level meter was calibrated before and after the measurements were taken and no significant drift in calibration was observed. All equipment owned by Ramboll is subject to regular calibration traceable to national standards. Copies of calibration certificated are available upon request.

3.2 Weather

During the attended measurements, the weather was dry and partly overcast with wind speeds less than 5m/s.

3.3 Noise Climate

The noise climate around the site was dominated by the site operations, which included a forklift unloading steel beams from an idling lorry at ST1, which were then transported across the site to ST3 and loaded onto the shelves.

When operations were paused, other audible noise sources included road traffic noise from pump lane, and plant fan noise from the adjacent factory site to the North of Silverdale House.

3.4 Results

The results of the attended measurements are given in the table below

Table 1 - Noise Survey Results

Measurement Location	Time	L _{Aeq,10mins} dB	L _{AFMax,10 mins} dB	L _{A90,10mins} dB	L _{A10,10mins} dB	L _{AMAX} Caused by:
ST1	11 Feb 2022 11:27:38	77	104	59	76	Steel unloaded onto forklift
	11 Feb 2022 11:47:00	71	95	54	73	
ST2	11 Feb 2022 11:37:14	60	85	52	60	Steel unloaded onto forklift
	11 Feb 2022 11:56:22	60	80	54	61	
ST3	11 Feb 2022 12:08:44	82	104	52	75	Steel beam scraping on shelving units

As shown in the results above, whilst the background levels (L_{A90}) were fairly low, high L_{AMAX}'s over 100dBA were caused by steel beams scraping and screeching across the shelves when being unloaded by the forklift. These particular instances were quite rare, and only happened a few times over the measurement periods. Therefore, the noise sources generated during the measurements can be considered worst-case.

4. ACOUSTIC MITIGATION STRATEGY

4.1 Noise Barrier

The acoustic performance of a barrier is determined by both the sound transmitted through the barrier and the refracted noise around the barrier. In practice the refracted noise is dominant compared to the direct noise through the barrier and this will dictate its acoustic performance. The noise reduction for the refracted path is determined by the height and length of the barrier and the relative source and receiver locations. Therefore, the physical dimensions of an acoustic barrier are more significant to its performance than its physical mass or other acoustical properties.

The height of the barrier must be at least the same height (ideally higher) as the highest noise source item being screened. In addition, the lateral extent of the barrier must be such that it provides effective screening in both the vertical and horizontal axis.

In order to mitigate the impact of the site activity noise, it is proposed that an acoustic fence will be erected at the site boundary, indicated as the red and amber line in Figure 3 below.



Figure 3 - Potential Noise Barrier Location

The 'shelves' used to hold the steel beams are located at the northeast of the site, where the amber line is indicated in Figure 3. It is considered that these shelves should have an acoustic barrier built behind them in order to maximise the benefit of the screens. Unloading onto these barriers was noted as the highest noise source so it would be critical to screen these shelves as much as possible to protect residents to the North and west of the yard.



Figure 4 - Shelving Units to North of Site

4.2 Barrier Performance

Table 2 below provides the predicted sound reduction index of a noise barrier of varying heights.

Table 2 - Predicted Sound Reduction Index, dB

Noise Barrier Height	Sound Reduction Index, dB at Octave Band Centre Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
1m	-2.2	-1.3	0.0	0.0	0.0	0.0	0.0	0.0
2m	-4.4	-3.8	-3.0	-2.0	-1.0	0.0	0.0	0.0
2.5m	-5.0	-5.0	-4.9	-4.8	-4.6	-4.3	-3.7	-2.9
3m	-5.1	-5.2	-5.3	-5.7	-6.3	-7.3	-8.9	-11.2
4m	-6.0	-6.9	-8.4	-10.4	-13.0	-15.9	-18.9	-21.9

The calculation above assumes the site activity noise sources to typically be at 2m high, approximately 8m from the site boundary and barrier. The facades of the residential receptors are calculated at 4m high (1st floor level being the worst case scenario), 18m from the barrier.

The acoustic screen should be located in a position and at a height to reduce the noise at the closest residential receptors to the West on Copperdale Road, as well as the receptors to the North West of the site. A number of height options have been considered ranging from 1 – 4m. The analysis has shown that a height of 2.5m is the minimum height that should be considered as anything below this level is not providing any significant benefit.

Ideally the barrier should be at a height of 3m as this would provide significant screening to the receptors. A 4m height barrier was also considered, and although this provides the most screening it is not considered practicable to build.

As shown in Figure 5, the noise barrier should have a height of at least 3m to effectively block the line of site of typical activities to the nearest residential receptors.

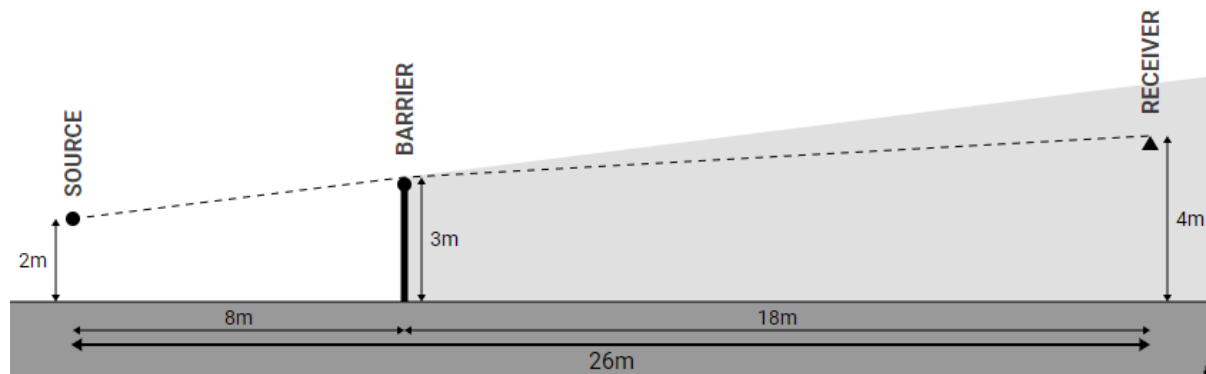


Figure 5 - Line of sight from source to receiver with a 3m barrier

Based on the assumption of a 3m high barrier we have considered the benefit this will provide to the adjacent residential gardens on Copperdale Road. BS8233:2014 – *Guidance on Sound Insulation and Noise Reduction for Buildings* provides guideline noise levels of outdoor amenity spaces such as private gardens. It recommends a noise level of around 50dB_{L_{Aeq}} is appropriate for good amenity level, rising to 55 dB_{L_{Aeq}} in noisier environments.

A noise barrier of 3m would reduce the highest unloading noise levels to below 55 dB_{L_{Aeq}} in the adjacent gardens, which meets the upper guideline value that would be acceptable in amenity spaces such as gardens and patios. This is a strong indication that a meaningful benefit can be provided when compared to the measured noise level of 60 dB_{L_{Aeq}} as measured at location ST2 which is considered representative of the rear gardens.

4.3 Barrier Construction

The exposed elements of the barrier should be constructed of materials able to withstand exposure the environment or made of materials with environmental protective coatings applied accordingly. The construction of the barrier must be suitable to withstand wind loading upon the face of the barrier. The barrier construction mass should be a minimum of 30 kg/m².

The barrier should be constructed so as to avoid any slits, gaps, or holes either with the adjoining panels and modules or along the bottom edge of the barrier. Gaps for construction joints or expansion joints must be filled with non-setting sealant for sealed to the manufacturer's specification. Expanding polyurethane sealant or similar must not be used.

For noise barriers made of 'planks' slotted into upright posts, the planks must be tongue-and-grooved, carefully lapped, or extremely well butted and sealed with a non-setting sealant, to ensure no gaps or slits at the joints.

For barriers manufactured as modules, each module should be factory assembled, unless instructed otherwise. This specification, together with the manufacturer's confirmed guarantee of acoustic performance ratings, should apply to the unit as a fully assembled product.

Barrier modules should be delivered to site sufficiently sealed to prevent contamination or damage by dust, rubble, etc. whilst on site. The inner and outer faces of the barrier modules and any orientation should be clearly marked to aid construction by third parties.

5. SUMMARY

Ramboll has been appointed by First Choice building Supplies to undertake a baseline noise survey in relation to an acoustic fence between First Choice Building Supplies and adjacent residential gardens in Hayes.

The noise climate around the site was dominated by the site operations, which included a forklift unloading steel beams from an idling lorry, which were then transported and loaded onto the shelves at the North of the site. When operations were paused, other audible noise sources included road traffic noise from pump lane, and plant fan noise from the adjacent factory site to the North of Silverdale House.

The noise barrier should have a height of at least 3m to effectively block the line of site to the nearest residential receptors and significantly reduce noise levels.

The noise barrier should be located in a position to reduce the noise at the closest residential receptors to the West on Copperdale Road, as well as the receptors to the North West of the site, as indicated in Figure 3.

It is recommended that the height of the barrier is 3m. Lower than this and the benefit reduces, a barrier height of 2m is considered to provide no significant acoustical benefit.

A noise barrier of 3m would reduce the highest operating noise levels to below 55dBA in the adjacent gardens, which meets the upper guideline value that would be acceptable in amenity spaces such as gardens and patios, in accordance with BS8233:2014 – *Guidance on Sound Insulation and Noise Reduction for Buildings*.