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Proposed Residential Development 12-14 Station Road, Hampton Wick, Kingston upon Thames, KT1 4HG

Construction Noise Assessment

For:
CIRC Construction Management Limited

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1 Introduction

1.1 Overview

Environmental Noise Solutions Ltd (ENS) has been commissioned by CIRC Construction Management Limited to undertake a construction noise assessment for the proposed redevelopment of a care home at a site known as Orione House at 12-14 Station Road, Hampton Wick, Kingston upon Thames, KT1 4HG (hereafter referred to as 'the site').

This report details:

- The methodology and results of a baseline noise survey conducted at the site
- The assessment of potential noise impact associated with the demolition and construction phase of the development
- Recommendations for mitigation at the site to minimise the noise impact of the proposals

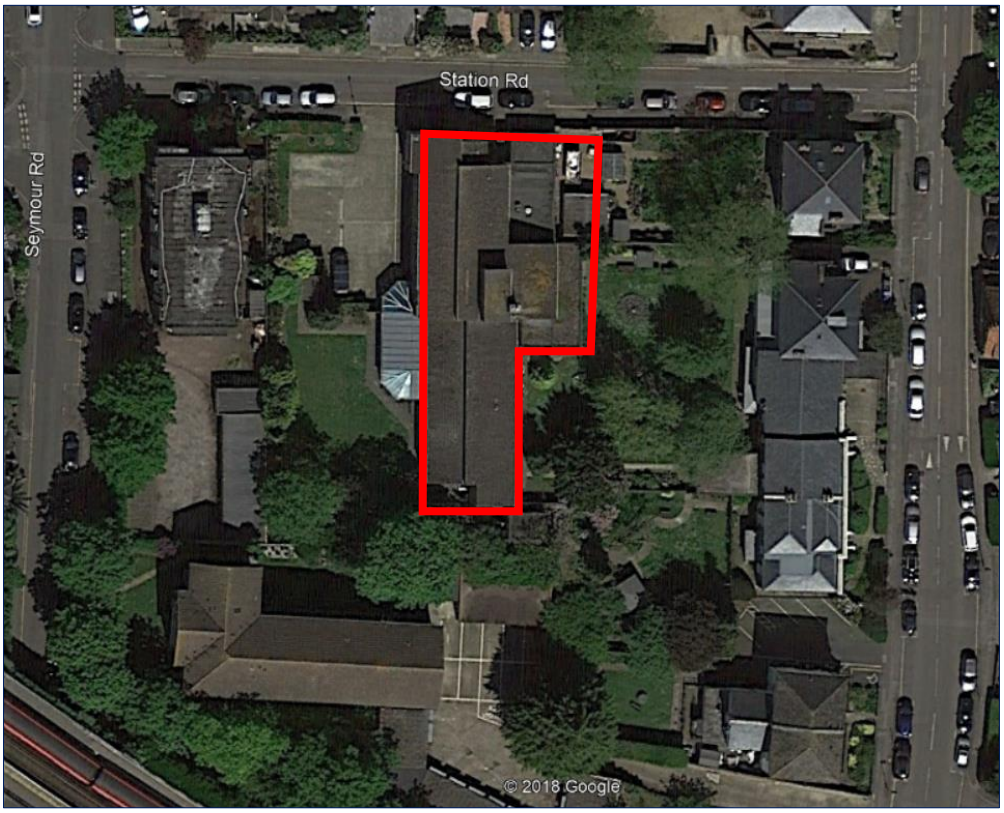
The report has been prepared for CIRC Construction Management Limited for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties referring to the report should consult CIRC Construction Management Limited and ENS as to the extent to which the findings may be appropriate for their use.

A glossary of acoustic terms used in the main body of the text is contained in Appendix A.

1.2 Proposal

The proposal comprises the demolition of the existing Orione House building before the construction of a new extra care facility at the same location, off Station Road in Kingston upon Thames, as shown in Figure 1.1.

Figure 1.1: Location of Proposed Development



The nearest noise sensitive receptors (NSRs) to the proposed development are:

- Dwellings at 9-11 Station Road, approximately 15 metres to the north of the existing building (NSR1)
- Flats at Wick House on Seymour Road, approximately 20 metres to the west of the existing building (NSR2)
- A church at 25 Lower Teddington Road, approximately 20 metres to the east of the existing building (NSR3)
- Flats at Seymour Lodge, approximately 17 metres to the south of the existing building (NSR4)

2 Assessment Guidance

2.1 British Standard 5228-1:2009+A1:2014

British Standard 5228-1:2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites. Noise' (BS5228-1)[1] sets out techniques to predict and assess the likely noise effects from construction works, based on detailed information on the type and number of plant being used, their location, and the length of time they are in operation.

The noise prediction method is used to establish likely noise levels in terms of the $L_{Aeq,T}$ over the core working day. This Standard also documents a database of information, comprising previously measured sound power levels for a variety of different construction plant undertaking various common activities.

The standard provides methods for determining the significance of construction noise levels considering the change in the ambient noise level brought about by the construction work. For one of the example assessment methods, the ABC method, the threshold limits are replicated in Table 2.1.

Table 2.1: BS5228:1 – Example Thresholds of Significant Effects (ABC Method)

Assessment Period	Threshold value $L_{Aeq,T}$ (dB)		
	Category A[A]	Category B[B]	Category C[C]
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends [D]	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
NOTE 1: A significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the Category appropriate to the ambient noise level.			
NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.			
NOTE 3: Applied to residential receptors only.			
[A] Category A: threshold values to use when ambient levels (when rounded to the nearest 5 dB) are less than these values. [B] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values. [C] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values. [D] 19.00-23.00 weekdays, 13.00-23.00 Saturdays and 07.00-23.00 Sundays			

[1] British Standard 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites. Noise, 2014. British Standards Institution.

3 Baseline Noise Survey and Results

3.1 Overview

In order to establish existing ambient noise levels in the vicinity of the site, a baseline noise monitoring exercise was performed on Thursday 3rd January 2019.

The adopted noise monitoring position (shown in red in Appendix B) was in the Orione House car park, approximately 5 metres from the existing building.

3.2 Equipment

Noise measurements were undertaken using a Bruel & Kjaer 2250 Type 1 integrating sound level meter. The meter was connected to a windshield covered microphone positioned at 1.5 metres above ground, in free-field conditions (i.e. > 3.5 metres distance from a vertical reflective surface), at the location detailed in the foregoing Section 3.1.

The calibration of each measurement system was verified immediately before and after the survey period using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration levels greater than 0.5 dB was noted.

Measurements consisted of A–weighted broadband parameters including L_{Aeq} together with linear octave and third octave band data.

3.3 Weather

During the survey, the noted weather conditions were cool, dry and calm (wind speeds < 5 m/s). Weather conditions were therefore considered appropriate for noise monitoring.

3.4 Summary of Results

Table 3.1 presents a summary of the noise data for each measurement session, at the baseline measurement position, rounded to the nearest decibel.

Table 3.1: Summary of Baseline Noise Measurement Data – 03/01/2019

Time (hh:mm)	L_{Aeq} (dB)	Comment
10:30 – 10:45	49	Vehicle movements on nearby roads; occasional overhead aircraft and trains
10:45 – 11:00	43	Vehicle movements on nearby roads; occasional trains; distant sirens
11:00 – 11:15	44	Vehicle movements on nearby roads; occasional trains
11:15 – 11:30	43	Vehicle movements on nearby roads; pedestrians; occasional overhead aircraft and trains
11:30 – 11:45	56	Vehicle movements on nearby roads; occasional trains; HGV delivery to a nearby dwelling; window cleaners at nearby dwellings
11:45 – 12:00	46	Vehicle movements on nearby roads; occasional overhead aircraft and trains; window cleaners at nearby dwellings
12:00 – 12:15	46	Vehicle movements on nearby roads; occasional trains
12:15 – 12:30	42	Vehicle movements on nearby roads; occasional overhead aircraft and trains; distant sirens

It can be seen that measured ambient noise levels were around 42 - 56 dB $L_{Aeq,15min}$. A typical baseline noise level of 49 dB $L_{Aeq,15min}$ has been determined by considering the logarithmic average of the measured ambient noise levels presented in Table 3.1.

4 Assessment

4.1 Overview

Assumed standard working hours are 07:00 - 19:00 hours (Monday to Friday) and 07:00 - 13:00 hrs (Saturdays), unless otherwise agreed. It is assumed that working on Sundays and Bank Holidays will not occur.

Based on the findings of the baseline noise survey, Table 4.1 summarises the ambient noise levels anticipated to affect existing noise sensitive receptors in the vicinity along with corresponding construction threshold determined using the BS5228-1 'ABC' method.

Table 4.1: Baseline Noise Levels and BS5228-1 Construction Noise Threshold

Daytime (07:00-19:00) Ambient Noise Levels L_{Aeq} (dB)	Category	Daytime (07:00-19:00) Construction Noise Threshold Level L_{Aeq} (dB)
49	A	65

The techniques available to predict the likely effect of noise from construction works, such as those contained within BS 5228-1, are necessarily based on detailed information of the type and number of plant items being used, their location and the length of time they are in operation. Sufficient detailed information upon which to base detailed construction noise calculations such as exact construction techniques and equipment to be used is not currently available. Notwithstanding this, for purposes of assessment, construction noise levels have been calculated based on typical construction phases, techniques and equipment, as anticipated by the client[2], as presented in Table 4.2.

Table 4.2: Anticipated Construction Phases / Equipment

Phase	Plant/Equipment	No. Required	Estimated 'On-Time' (%)
Demolition	15t 360 Tracked Excavator	1	100
	15t 360 Tracked Excavator	1	50
	Dump Truck	1	5
Basement Dig / Ground Works	15t 360 Tracked Excavator w Breaker	1	50
	15t 360 Tracked Excavator	1	50
	Dump Truck	1	5
Basement Construction	Concrete Pump + Cement Mixer Truck	2	100
	CFA Piling Rig*	1	100
General Construction	Hand-held Circular Saw	2	10
	Hand-held Core Drill	1	5
*May not be required depending on the results of a soil survey			

4.2 Construction Noise Levels

The predictions have been undertaken based on the methodology contained within BS 5228-1 and are in terms of the equivalent continuous sound level ($L_{Aeq,T}$) over the core working day.

Table 4.3 sets out the typical plant and corresponding noise levels (sourced from BS5228-1 reference tables) that have been used in the noise level predictions.

[2] As advised by Lavinia English and Pat Gethings, CIRC Construction Management Limited on 08/01/2019 (via email and telephone)

Table 4.3: Plant and Equipment Assumed for Construction Phase

Phase	Plant/Equipment	BS5228-1 Reference	Sound Pressure Level, (dB) at 10m
Demolition	360 Tracked Excavator	Table C.2 No. 7	70
	Dump Truck	Table C.1 No. 11	80
Basement Dig / Ground Works	360 Tracked Excavator	Table C.2 No. 7	70
	360 Tracked Excavator w Breaker	Table C.1 No. 5	72
	Dump Truck	Table C.1 No. 11	80
Basement Construction	Concrete Pump + Cement Mixer Truck	Table C.4 No. 24	67
	CFA Piling Rig	Table C.3 No. 16	79
General Construction	Hand-held Circular Saw	Table C.4 No. 72	79
	Hand-held Core Drill	Table C.4 No. 69	85

In practice, the plant items identified for each stage will move around the Site, operating at different times, for different durations and at different locations on any one day for the duration of the works. As a consequence, noise levels at any receptor may vary considerably day-on-day. However, for the purpose of assessment, it is necessary to rationalise the geographic and temporal spread of activities to obtain a meaningful prediction (and subsequent assessment). To this end, various assumptions have necessarily been made as follows:

- With respect to the geographical location of the plant presented in Table 4.1, the full complement of plant for each stage, as identified above, is assumed to operate simultaneously in an area roughly central to the site.
- No barriers have been included for preliminary calculations
- Acoustically 'hard' (reflective) ground cover has been assumed between each noise source and receptor
- No atmospheric absorption has been included
- Meteorological conditions have been taken to be 'neutral'

On the basis described above (along with the information provided in Tables 4.2 and 4.3) construction noise levels have been determined at NSRs using the guidance of BS5228-1. The results are presented in Table 4.4.

Table 4.4: Calculated Construction Noise Levels

Phase	Calculated Construction Noise Levels, $L_{Aeq,T}$ (dB)			
	NSR1	NSR2	NSR3	NSR4
Demolition	62	64	63	62
Basement Dig / Ground Works	62	64	62	61
Basement Construction	69	71	69	68
General Construction	64	66	65	64

Table 4.4 shows the Category A construction noise threshold (detailed in Table 4.1) would generally be satisfied at all NSRs during the Demolition, Basement Dig / Ground Works and General Construction[3] phases. However, it can also be seen that threshold would be exceeded at all NSRs during the Basement Construction phase. Mitigation will therefore be required in order to reduce the propagation of construction noise to NSRs in order to satisfy the BS5228-1 construction noise threshold, see Section 4.3 for further details.

[3] An excess of 1 dB above the threshold at NSR2 during the General Construction phase is not considered significant

4.3 Mitigation

Localised Screening

The greatest noise impact is expected to occur during piling (if required). In order to reduce noise propagation to neighbouring receptors during the piling stage, it is recommended that a temporary, localised enclosure be applied around the piling rig. The enclosure should comprise:

- Several panels consisting of 2.4-metre-high Heras type fencing
- Panels are to be positioned as close to the source as possible to maximise barrier attenuation, completely surrounding the rig (in a hexagonal/octagon/circular shape)
- The panels are to be wrapped with a canvas covered barrier material (mass per unit area ≥ 10 kg/m^2) applied to the whole area.

One example of proprietary solution addressing the above is the Heras Acoustic Barrier System (https://www.heras-mobile.co.uk/fencing/noise-reduction)

Perimeter Screening

Further to the above, it is understood that 2.4-metre-high butt-jointed perimeter hoarding (assumed mass per unit area ≥ 10 kg/m^2) is proposed for the site, where it is practicable to erect[4]. This will further serve to reduce noise propagation from the site.

Additional Recommendations

Best Practicable Means (BPM) of noise control should be applied during construction works to minimise noise (including vibration) at neighbouring residential properties receptors arising from construction activities. BPM are defined in Section 72 of the Control of Pollution Act 1974 and Section 79 of the Environmental Protection Act 1990 as those measures which are:

'reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to financial implications.'

The Contractor should adopt the following measures in accordance with the recommendations set out in BS5228:

Control Measures

- Vehicles and mechanical plant are to be maintained in a good and effective working order and operated in a manner to minimise noise emissions.
- HGV and site vehicles should be equipped with broadband, non-tonal reversing alarms.
- Compressor, generator and engine compartment doors are to be kept closed and plant turned off when not in use.
- All pneumatic tools should be fitted with silencers/mufflers (where practicable).
- Care will be taken when unloading vehicles to avoid un-necessary noise.
- The use of particularly noise plant will be limited, i.e. avoiding use of particularly noisy plant early in the morning.
- Restrict the number of plant items in use at any one time.
- Plant maintenance operations will be undertaken at the greatest possible distance from noise-sensitive receptors.
- Minimise the speed of on-site vehicle movements.

[4] As advised by Pat Gethings, CIRC Construction Management Limited on 08/01/2019 (via telephone)

- Ensure that operations are designed to be undertaken with any directional noise emissions pointing away from noise-sensitive receptors.
- When replacing older plant, consider the quietest available plant as a substitute.
- Drop heights are to be minimised when loading and unloading vehicles.
- Vehicles should be prohibited from waiting within the site with their engines running or alternatively, located in waiting areas away from sensitive receptors.
- Any proposed piling is to be carried out according to the method that minimises both noise and the transmission of vibration to sensitive receptors.

Notifications

Occupiers of adjacent properties should be informed by the Contractor up to two weeks in advance of the works taking place, including the duration and likely noise effects. Potentially affected residents will also be notified of the helpline number for the Contractor.

5 Summary and Conclusions

A construction noise assessment has been performed for a proposed redevelopment of a care home known as Orione House at 12-14 Station Road, Hampton Wick, Kingston upon Thames, KT1 4HG.

Baseline noise monitoring was carried out on Thursday 3rd January 2019 to establish existing ambient noise levels in the vicinity of the site.

Section 4 presents an assessment of the construction noise impact associated with the proposals. Recommendations have been made with regard to the control of construction noise to satisfy BS5228-1 criteria.

Appendix A - Abbreviations and Definitions

Sound Pressure Level (L_p)
The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$L_p = 20 \log_{10}(p/p_o)$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_o = reference sound pressure (20 μPa).

A-weighting
A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$
The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$
The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$
The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF\ max}$
The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Single Event Level / Sound Exposure Level (SEL or L_{AE})
The energy produced by a discrete noise event averaged over one second, regardless of the event duration. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_W)
Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_W is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix B – Noise Measurement Position