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2 DUMPTON PLACE, LONDON

Car Lift Noise Assessment Report

05/03/2014

Quality Management

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1 Introduction

1.1.1 WSP Acoustics has been instructed by Cubic Building Survey Ltd to undertake an acoustic investigation to assess the external noise emissions associated with a car lift serving the recently constructed mixed commercial and residential development at 2 Dumpton Place, within the London Borough of Camden.

1.1.2 This report presents the details and conclusions of a noise assessment in relation to a car lift which has recently been installed at ground to basement level to service four underground parking spaces.

1.1.3 Communication with the relevant department of Camden Council has been attempted, but at the time of writing, the assessment methodology has not yet been confirmed. However, based on previous correspondence with the Council, it is expected that the assessment will follow similar guidelines as previous assessments in the borough. As such, an assessment in accordance with BS4142: 1997 *Method for Rating industrial noise affecting mixed residential and industrial areas"* has been assumed. The methodology used in the assessment and assumed criteria is further described in Section 4 of this report.

1.1.4 As part of this assessment, WSP has undertaken an environmental noise survey at the site, in order to obtain representative background noise levels in which to base the assessment on. Details of the noise survey are presented in Section 3 of this report.

1.1.5 This report is necessarily technical in nature and contains a certain amount of terminology specific to acoustics. To assist the reader, a glossary of acoustic terminology is presented in Appendix A.

2 Site Description and Project Understanding

2.1.1 The development under consideration is 2 Dumpton Place, a recently constructed mixed commercial and residential building.

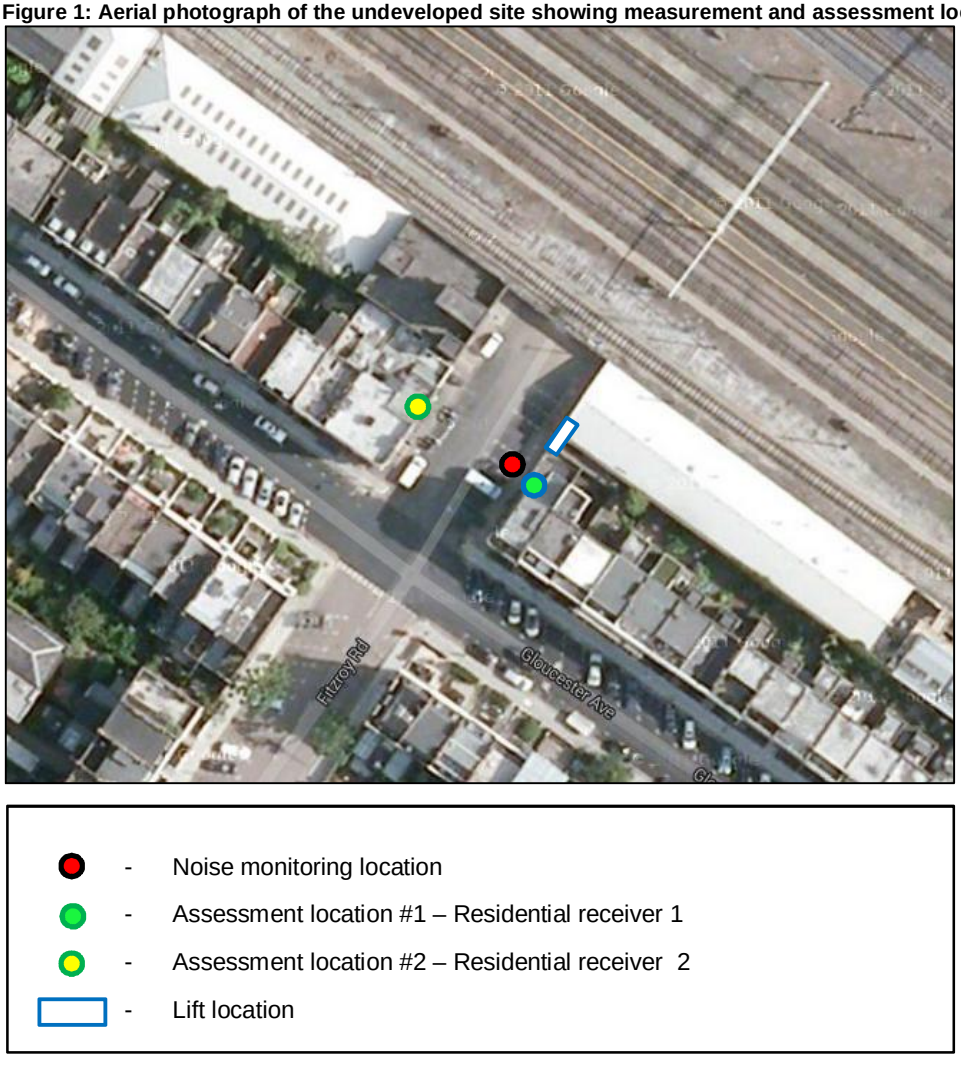
2.1.2 The site is predominantly exposed to noise from rail traffic using the adjacent tracks to the north and west, although noise from road traffic using Gloucester Avenue is also significant. During the night-time periods when the traffic noise is significantly reduced, the area is relatively quiet with the dominant noise source being building services plant from the neighbouring buildings and smaller contributions from the wider road network.

2.1.3 It is understood that Camden Council have requested that a noise assessment be undertaken on the operation of the lift, in order that the amenity of the local residential community is not compromised.

2.1.4 The location of the nearest noise-sensitive residential receiver to the development has been identified to be the rear façade of 88/88A Gloucester Avenue, approximately 5m behind the boundary wall, which will be used as Assessment location #1.

2.1.5 In addition to the above, and in order to form as robust an assessment as possible, a supplementary assessment location has also been considered, approximately 20m away, opposite the entrance to the lift on the first floor of The Lansdowne public house, as this does not benefit from any acoustic screening.

Figure 1: Aerial photograph of the undeveloped site showing measurement and assessment location



3 Background Noise Survey

3.1 Methodology

3.1.1 An attended environmental noise survey was undertaken at the site between 02:20 and 04:20 on Thursday 16 January 2014 in order to establish the lowest noise levels normally experienced at the site and to assist in the determination of noise emission limits for the lift in accordance with the requirements of BS4142.

3.1.2 A sound level meter was attached to a tripod in free field conditions (i.e. at least 3.5m from a noise reflecting façade) and placed in a position representative of the nearest noise sensitive receiver. This position was selected as it was considered to have the least influence from the existing building services plant, due to the acoustic screening from the building façade.

3.2 Equipment

3.2.1 L_{Aeq}, L_{AFmax} and L_{A90} noise levels were measured using the Type 1 equipment listed in Table 3.1 below.

Table 3.1: Noise Survey Equipment

Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
Sound Level Meter	01 dB-Metravib DUO	10328	14 June 2014
Pre-amplifier	01 dB Metravib PRE 22	10233	
Microphone	GRAS 40CD	141201	
Calibrator	01 dB-Stell CAL 21	34134166	14 August 2014

3.2.2 The sound level meter was calibrated prior to, and on competition of the survey using the acoustic calibrator detailed above, which itself had been calibrated within the preceding twelve months by a UKAS accredited calibration laboratory. No significant drifts in calibration (<0.1dB) were observed.

3.2.3 Laboratory calibration certificates for the equipment used in this survey are available upon request.

3.3 Weather

3.3.1 Weather conditions were generally calm and cool throughout the survey period, with a brief period of light rain. Typical wind speeds in the vicinity did not exceed 5 m/s. Meteorological conditions were not considered to have had a significant effect upon the noise measurements.

3.4 Results

3.4.1 A summary of the time averaged ambient noise levels ($L_{Aeq,\ 15mins}$) and minimum measured background noise levels and ($L_{A90,15mins}$) during the survey are presented in Table 3.2 below. A time history displaying the parameters L_{Aeq}, L_{AFmax} and L_{A90}, for the entire survey period is presented in Appendix C

Table 3.2: Noise Survey Results Summary

Time	Measured Noise Level (dB)	
	Average Level $L_{Aeq,\ 15mins}$	**Lowest Background** $L_{A90,\ 15mins}$
02:20	46.9	40.7
02:35	42.4	40.5
02:50	44.1	40.3
03:05	44.4	40.4
03:20	42.1	40.6
03:35	49.4	40.7
03:50	43.4	40.2
04:05	48.1	40.4
Lowest Measured Background Level	-	40.2

4 Noise Emission Criteria

4.1.1 As cited in the introduction, communication with the relevant department of Camden Council has been attempted, but at the time of writing, the assessment methodology has not yet been confirmed. However, based on previous correspondence with the Council, it is expected that this assessment should follow similar guidelines as previously undertaken in the borough. As such, an assessment in line with BS4142: 1997 *Method for Rating industrial noise affecting mixed residential and industrial areas"* has been assumed.

4.1.2 As with previous assessments in Camden, it has been assumed that when assessing noise emissions from residential properties, the standard criterion should be adopted:

'*The noise level from all plant and equipment (collectively) associated with the application should not be greater than 5dB below the existing background level (L90). This requirement applies both during the day (0700 to 2300 hrs) over any one hour period, and during the night (23:00 to 0700 hrs) over any five minute period, when measured at a distance of 1m from the window of the nearest residential receiver.*

Tonal/impulsive noise frequencies should be considered in any assessment and should carry an additional 5 dB(A) correction.

It is recommended that the agent/applicant submits a noise prediction survey/report in accordance with the principles of BS4124: 1997 Method for rating industrial noise affecting mixed residential and industrial areas.

4.1.3 However, the above criterion refereed to continually operating plant, and as operation of this lift is limited to the four underground parking spaces, it is sensible to assume that the overall usage will be exceptionally low and that a rating level equal to the lowest background noise level is a practical approach to take.

4.1.4 In accordance with BS 4142, the assessment duration should be one hour during the daytime and five minutes during the night time. As the lift process has been assumed to take approximately 15 seconds, an 'on-time' correction would also be applied.

4.1.5 As the lift could potentially operate any time during the day or night, a worse case of one operation per five minute period, during the quietest time in the night has been assumed. The assessment has only been undertaken for the night-time period as compliance with the night-time criterion would indicate automatic compliance with that of the day time period.

4.1.6 With the above considered, the noise emissions criterion for the operation of the lift, when observed at the assessment locations, is presented in the table below.

Table 4.1: Noise emissions criteria for lift operation

Assessment Position	Night time operation (23:00 – 07:00)
1 or 2	40 dB $L_{Aeq, 5\ mins}$

5 BS 4142 Noise Assessment

5.1.1 The assessment method contained within BS 4142 compares the rating level from the source under investigation with the background noise level. The rating noise level is obtained by either using manufacturers' noise data, or measuring the specific noise level from the source in terms of the $L_{Aeq,T}$ noise parameter, correcting for the influence of any residual noise and, if necessary, applying a correction factor to account for the acoustic features present in the noise in question. The correction factor is +5 dB if the noise contains a distinguishable, discrete, continuous note (whine, hiss, screech or hum) or distinct impulses (bangs, clatters or thumps) to obtain the 'rating' level. The background noise level, measured in the absence of the source under investigation, either at the assessment location or at a suitably representative alternative location if the noise in question cannot be switched off or the assessment location is inaccessible, is stated in terms of the $L_{A90,T}$ noise parameter. The period 'T' for the assessment of the specific noise level is five minutes during night-time hours or one hour during the day-time period. The period for the background noise measurements should be sufficient to obtain a representative value of the background noise level. All noise levels are to be rounded to the nearest whole decibel (dB).

5.1.2 The likelihood of complaints about noise from the source in question is determined by subtracting the background noise level from the rating noise level. A difference of around +10dB or more indicates that complaints are likely. A difference of around +5 dB is of marginal significance, whilst a rating level that is more than 10 dB below the background noise level is a positive indication that complaints are unlikely.

5.1.3 As mentioned in the previous section, a criterion of equal to the background noise level has been targeted.

5.1.4 As the lift was not currently in operation, operating noise levels were obtained from the manufacturer and the response is presented below.

Typical in-car figures

Door operation noise level would not normally exceed 75 dB (A) when measured at 1.5 metres above floor and 1.0 metres from the inner door face.

Lift operation noise level during any part of the lift cycle and with an occupancy level between zero and contract load would not normally exceed 55 dB (A) when measured at 1.5 metres above floor level and 1.0 metres from the inner door face.

Lift Lobbies

Door operation noise would not normally exceed 75dB (A) when measured at 1.5 metres from the floor and 1.0 metres from the door outer face.

Lift operation noise during any part of the lift cycle and with any occupancy level between zero and contract load would not normally exceed 55 dB (A) when measured at 1.5 metres above floor and 1.0 metres from the outer door face.

Lift Motor Room

Lift Operation noise level would not normally exceed 70 dB(A) when measured at 1.5 metres from the face of the oil tank and 1.0 metres above the level of the motor room floor. Measures should be taken by others in the design & construction of the lift motor room to contain this level of noise.

5.2 Noise Predictions

5.2.1 Calculations have been undertaken on the operation of the car lift based on an operating time of 15 seconds with a door opening lasting three seconds. Noise predictions for the operation are presented in Table 5.1 below.

Table 5.1: Predicted source noise levels from lift operation.

Process	Duration (s)	Measurement location	Noise level (dB)	On-time correction (dB)	Cumulative Noise level (dB)
Lift Operation	15	1m from outer door	55	-13	55
Door	3	1m from outer door	75	-20	

5.2.2 Using the predicted operating noise levels, calculations of the noise impact on the assessment locations have been undertaken and are presented in Table 5.2 below.

Table 5.2: Predicted source noise levels from lift operation.

Assessment location	Source noise level	Distance Correction (dB)	Screening Correction (dB)	Feature Correction (dB)	Result (dB)	Criterion (dB)	Excess (dB)
1	55	-14	-9	+5	37	40	-3
2	55	20	0	+5	40	40	0

5.2.3 From the Table 5.1 above, it can be seen that the predicted noise impact from lift operation is in accordance with the recommended noise limits.

5.2.4 It should be noted however, that the above assessment is undertaken based on the lift operating during the quietest period of the night, and should be considered as a worst case and highly irregular occurrence.

6 Conclusions

6.1.1 WSP Acoustics has been instructed by Cubic Building Survey Ltd to undertake an acoustic investigation to assess the external noise emissions associated with a car lift serving the recently constructed mixed commercial and residential development at 2 Dumpton Place within the London Borough of Camden.

6.1.2 It has been calculated, using a worst case when assumptions have been considered, that the noise emissions from the car lift will be within the recommended maximum noise limit criteria for 24 hour operation and are classified as 'Marginal Significance' when assessed in accordance with BS4142: 1997 *Method for Rating industrial noise affecting mixed residential and industrial areas"*

Appendices

Appendix A: Glossary of Technical Terms

A-WEIGHTING

The human ear is not equally sensitive to all frequencies of sound. It is relatively much less sensitive to very low frequencies such as 'mains hum', and to very high frequencies such as the call of a bat, than to the 'mid-frequencies' important for human voice communication. In order to make sound level meters, which would otherwise be indiscriminate in registering sound pressures, respond in a way which reflects human perception of sound, they usually are fitted with a set of filters to progressively filter out the high and low frequency energy. The filters are made to an internationally standardised specification and the filtered noise level is said to be 'A-weighted'.

Sometimes A-weighted decibel levels are denoted 'dB(A)', but the correct, internationally standardised format for reporting requires the 'A' to be appended to the noise descriptor e.g. $L_{Aeq,T}$, L_{Amax}, etc.

AIRBORNE SOUND

Sound transmitted through the air rather than through the structure of a building or the ground.

AMBIENT NOISE

This is the totally encompassing sound at the measurement position over a specified time interval and usually comprises sound from many different sources both near and far.

ATTENUATION

A general term used to indicate the reduction of noise or vibration, or the amount (in decibels) by which it is reduced.

AVERAGING

In the absence of a dominant steady source, the sound level at a point, indoors or outdoors, varies continuously. For example, the variation may be over a few dB about an average value in a quiet room, or over 10 dB or more in a noisy outdoor environment. In order to define a level to represent the relative level of noise in the space it is necessary to define that average value. The most common averaging methods are energy averaging (L_{Aeq}) and statistical averaging (L_{AN} where N is a percentage between 1 and 100). The $L_{A10,T}$, the noise level exceeded for 10% of the measurement time interval T, is commonly used in the UK for the assessment of road traffic noise.

BACKGROUND NOISE LEVEL, $L_{A90,T}$

Background noise level is a term used to describe that level to which the noise falls during quiet spells, when there is lull in passing traffic for example. It is quantified by the $L_{A90,T}$ which is the noise level that is exceeded for 90% of the measurement time interval, T.

DECIBELS

Noise conventionally is measured in decibels (dB). The decibel is a logarithmic unit and decibel levels do not add and subtract arithmetically. An increase or decrease of 3 dB in the level of a steady noise is about the smallest that is noticeable. It represents a doubling or halving of noise energy. An increase or decrease of 10 dB represents a ten-fold change in noise energy, and is perceived as a doubling or halving of loudness.

The threshold of hearing for a typical young, healthy adult is 0 dB A-weighted sound pressure level. A noise level of 140 dB(A) can cause physical pain. Most people listen to their televisions at about 60 to 65 dB(A). Alongside a busy main road the ambient noise level may be in the 70 to 80 dB(A) range; on a quiet day in the country it might be as low as 30 dB, in town 40 to 50 dB(A).

DECIBEL ADDITION

If two similar noise sources operate together their combined noise level at an observer's position some distance away is 3 dB higher than the noise level generated by just one of them. If two further machines are switched on the noise level generated by all four at the observer's position is 3 dB higher than the level generated by the two. If the number of machines is again doubled, to eight, the noise level increases by another 3 dB, and so on.

EQUIVALENT CONTINUOUS A-WEIGHTED SOUND PRESSURE LEVEL, $L_{Aeq,T}$

The 'equivalent continuous A-weighted sound pressure level' is an average of the fluctuating sound energy in a space. It is the value of the A-weighted sound pressure level of a continuous, steady sound that, over the specified time period, T seconds, has the same root mean square sound pressure as the varying sound. It can be likened to the mean petrol consumption of a car over a specific journey during which the instantaneous consumption peaked during periods of acceleration and fell during periods of coasting or braking.

FAÇADE SOUND LEVELS

Road and railway traffic noise levels often are specified in terms of the sound level at a position 1 m in front of the most exposed façade of potentially noise sensitive premises. Such levels are assumed to be 3 dB(A) higher than sound levels measured at an equivalent position away from the noise reflected off the building façade and any other surfaces (excluding the ground).

FREE-FIELD SOUND LEVELS

The free-field refers to sound level measurement positions in an open area well away from any buildings or other sound reflecting surfaces other than the ground. Generally the minimum distance from building façades for free-field measurements is taken to be 3.5 m.

LINE, POINT AND PLANE SOURCE

A noise source may be characterised either as a ‘point source’, a ‘plane source’ or a ‘line source’.

Point sources usually are fixed sources of relatively small dimensions (although an aircraft in flight behaves as a point source) the sound from which generally decreases at a rate of 6 dB per doubling of distance.

Plane sources generally are large sources such as the wall of a factory building where the noise originates within the building and is emitted uniformly through the wall. Attenuation of sound from a plane source is related to the size of the sound radiating surface and the distance of the receiver from it but as the distance increases so the attenuation rate tends towards that of a point source.

Railways and roads are the most common examples of a line source. The attenuation rate from a line source is 3 dB per doubling of distance.

MAXIMUM SOUND LEVEL, L_{Amax}

This is the maximum instantaneous sound level occurring during the measurement period. Because of the standardised response time characteristics of the sound level meter a L_{Amax} level measured on Slow response normally will be a lower value than the same noise measured using Fast response.

RATING LEVEL, $L_{Ar,Tr}$

The term used in BS 4142: 1997 to describe the specific noise level plus any adjustment for the characteristic features of the noise.

RESIDUAL NOISE

The ambient noise remaining at a given position in a given situation when the specific noise is suppressed to a degree such that it does not contribute to the ambient noise.

L_{AE} (SEL)

The sound exposure level in dB(A) which, if it lasted for 1 second, would produce the same A-weighted sound energy as the actual event.

SPECIFIC NOISE LEVEL, $L_{Aeq,Tr}$

The noise of the particular source under investigation.

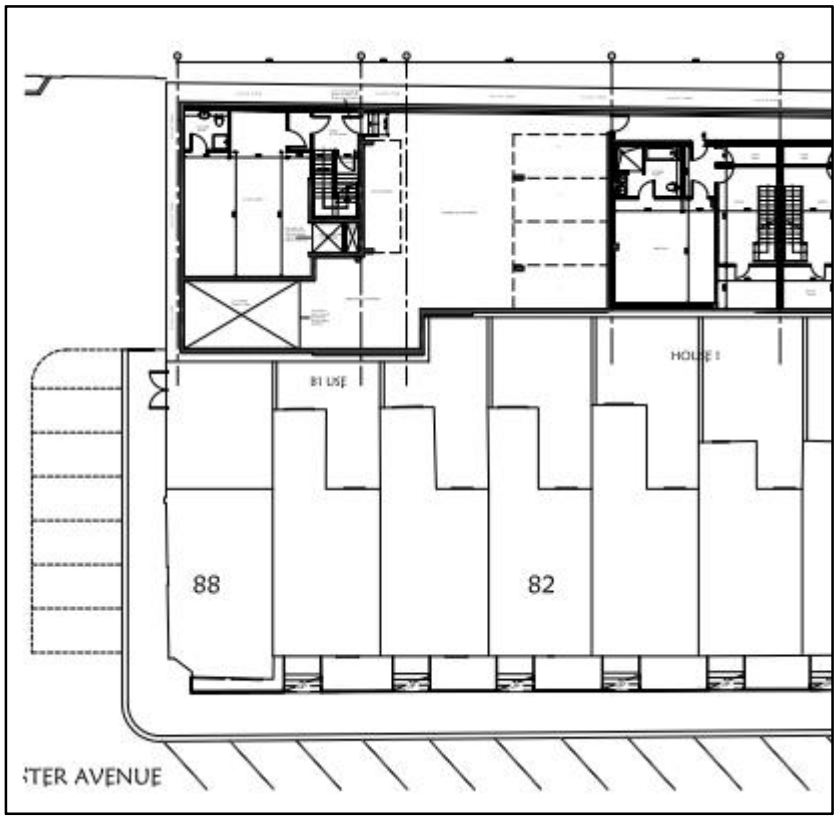
VIBRATION

Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far something moves from the equilibrium position), velocity (how fast something moves), or acceleration (the rate of change of velocity). When describing vibration, one must specify whether peak values (i.e. the maximum displacement or maximum velocity) or rms/rmq values (effectively an average value) are used. Standards for the assessment of building damage are usually given in terms of peak velocity (often referred to as Peak Particle Velocity, or ppv), whilst human response to vibration is often described in terms of rms or rmq acceleration.

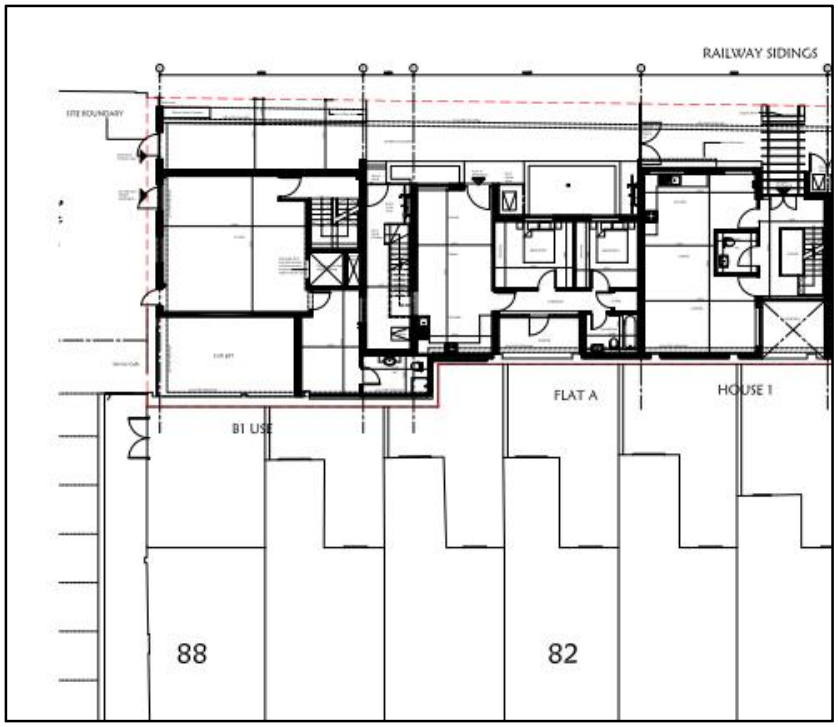
VIBRATION DOSE VALUE

This is a measure of the amount of vibration that is experienced over a specified period, and has been defined so as to quantify the human response to vibration in terms of comfort and annoyance. The vibration Dose Value (VDV) is used to assess the likely levels of adverse comment about vibration, and is defined mathematically as the fourth root of the time integral.

Appendix B: Site Plan: Development Lay-out



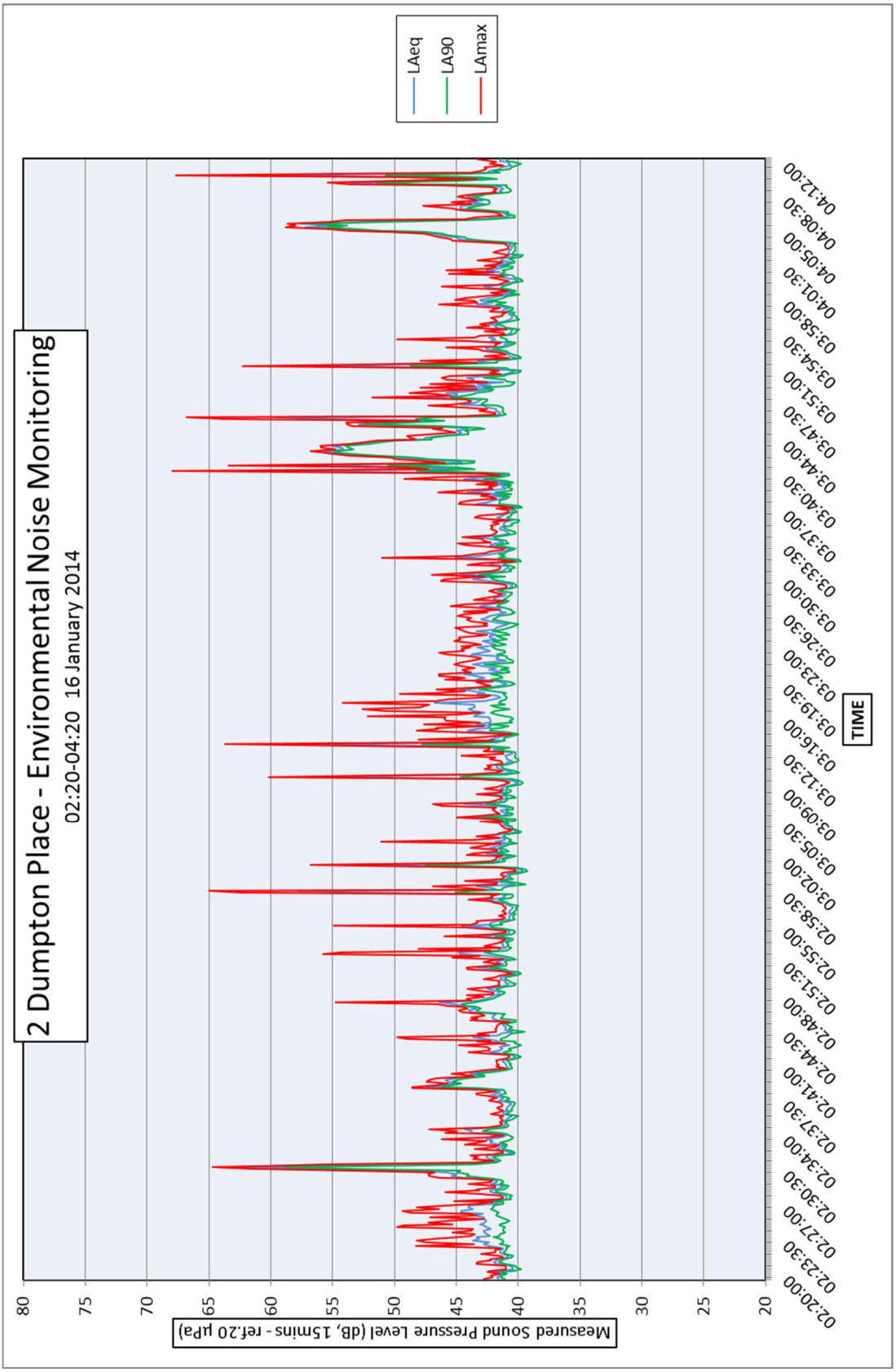
Basement plan showing lift location



Ground floor plan showing lift location

Appendix C: Background Noise Measurements.

Time History of 10 second measurements



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