The Outerspace Project
Manchester City Council

ACOUSTIC PLANNING REPORT



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5	Minor updates	16-08-2016	PM	JS
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EXECUTIVE SUMMARY

Hoare Lea Acoustics have been appointed by Manchester City Council to undertake an acoustic assessment for the proposed Outerspace Project development in Gorton, Manchester. The scheme is a purpose built television and film studio with ancillary support spaces in addition to a number of Small Business Units.

A detailed environmental noise survey has been carried out around the site and a noise egress assessment undertaken in accordance with the latest British Standards, Manchester City Council requirements and Code of Practice on Environmental Noise Control at Concerts.

The findings of this assessment conclude the following:

- Internal noise breakout from the set-assembly and SBU area will be controlled to acceptable levels provided the façade elements meet the minimum sound insulation specifications detailed herein.
- Limits have been set for MEP services based on an assessment of current proposals. Assuming barrier screening can be provided, emission levels are capable of compliance with Manchester City Council criteria.
- Cumulative levels for all sources of noise have been considered and result in compliance with MCC criteria.
- Noise break-out from amplified TV recordings in the main stage has been calculated and meets the recommendations in the Code of Practice on Environmental Noise Control at Concerts for up to 30 events per calendar year.

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1. INTRODUCTION

Hoare Lea Acoustics (HLA) have been appointed by Manchester City Council to undertake an acoustic assessment for the proposed Outerspace Project development.

Works undertaken by HLA comprised the following:

- Environmental noise survey to determine the existing ambient and background noise levels around the proposed site.
- Determination of plant noise egress limits in accordance with BS4142.
- Consideration of noise breakout from the proposed development and the impact this would have on noise sensitive receivers in the surrounding areas.

2. SITE AND DEVELOPMENT DETAILS

The Outerspace Project is a new purpose built production facility on land adjacent to the existing Space Project development. The facility will provide the following:

- A large TV/Film Stage
- Support Spaces – Production offices, dressing rooms, green room
- A dedicated set-assembly area
- Small Business Units (SBUs) –Office, Storage Space or Workshop space for film/TV/media industries

The scheme is bound to the south by Wenlock Way, to the East by Aines Street, to the West by existing Space Project parking spaces and to the North West by Vaughan Street.

An existing Timber yard is located north of the site. Rail links are located further to the north with passing trains audible and visible from the development location.

In general terms, the noise climate comprises road traffic on the nearby A6010 (Pottery Lane), Wenlock Way and Vaughan St/Bennet St.

A site plan is provided in Figure 1 and has been colour coded to illustrate the various use-types throughout the scheme.



Figure 1: Current Masterplan, colour coded illustrating various use-functions.

3. ASSESSMENT CRITERIA

3.1 Manchester City Council – Planning and Noise Technical Guidance 2015

Assessment criteria have been sourced from the Manchester City Council (MCC) guidance document entitled "Planning and Noise Technical Guidance 2015". The following requirements applicable to the scheme have been extracted from the document:

3.1.1 Residential Developments

BS 8233 and the World Health Organisation (WHO) have recommended specific limits for internal noise levels inside residential properties to allow appropriate living and sleeping conditions. MCC has adopted the following internal noise limits for residential properties:

- Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45 dB $L_{Amax,F}$ by more than 15 times)
- Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}
- Gardens and terraces (daytime) 55 dB L_{Aeq}

3.1.2 Entertainment Noise

MCC stipulate that 'Entertainment noise (L_{Aeq}) should be controlled to 10dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location'. Please note that this is the assessment criteria for Entertainment Noise but does not consider infrequent events and therefore reference has been made to the 'Code of Practice on Environmental Noise Control at Concerts', as discussed in detail below.

3.1.3 Plant noise egress criteria

The document stipulates that noise from fixed external plant and equipment shall achieve a noise level (L_{Aeq}) of at least 5 dB below the background noise level (L_{A90}) at the nearest noise sensitive location. This shall be achieved during the quietest time in which the equipment will be in operation. In addition, the plant shall not contain any discernible tonal characteristics and where this does occur, noise from the equipment shall be at least 5 dB below the background noise level (L_{A90}) in each octave band at the nearest noise sensitive location.

3.2 Code of Practice on Environmental Noise Control at Concerts

The Noise Council's "Code of Practice on Environmental Noise Control at Concerts" (commonly referred to as the pop-code) recognises that large music events held in sporting stadia, arenas, open air site and within lightweight buildings can cause disturbance to those living in the vicinity. The purpose of the document is to "give guidance on the how such disturbance or annoyance can be minimised." The intent of the venue is a production stage for TV recordings.

Table 1 of the document outlines the level of noise that are considered acceptable from such events. The principle behind the limits presented in Table 1 of the document, reproduced below, is that infrequent amplified music events are granted more leniency in the setting of noise limits as they occur less often and residents in the locality are likely to be more prepared and agreeable to entertainment noise providing it is uncommon. An increase in the frequency of events requires stricter noise allowances whereby the degree of music noise relative to the pre-existing background noise level is reduced.

Table 1 Guide values for music noise level at receiver locations

Concert days per year, per venue	Venue Category	Guideline
1 -3	Urban Stadia or Arenas	The MNL should not exceed 75dB(A) over a 15 minute period
1-3	Other Urban and Rural Venues	The MNL should not exceed 65dB(A) over a 15 minute period
4-12	All Venues	The MNL should not exceed the background noise level by more than 15dB(A) over a 15 minute period

Where

MNL (Music Noise Level)	is the L_{Aeq} of the music noise level measured at a particular location
Background noise level	is the prevailing sound level at a location, measured in terms of the $L_{A90,T}$ descriptor, on an equivalent day at an equivalent time when no concert or sound checks are taking place.

Footnote 5 of the table provides guidance on venues with more than 12 events per year and states:

"For indoor venues used up to about 30 events per calendar year, an MNL not exceed background noise by more than 5dB(A) over a fifteen minute period is recommended for events finishing no later than 2300 hours".

4. ENVIRONMENTAL NOISE SURVEY

An environmental noise survey was carried out between Wednesday 20th January 2016 and Tuesday 16th February 2016. The purpose of the survey was to establish the typical ambient noise levels and background noise levels around the site. This was to determine the minimum background noise levels in order to set maximum noise egress limits for new plant and machinery and to assist in the production of a computer model of the site to establish the noise levels at proposed facades.

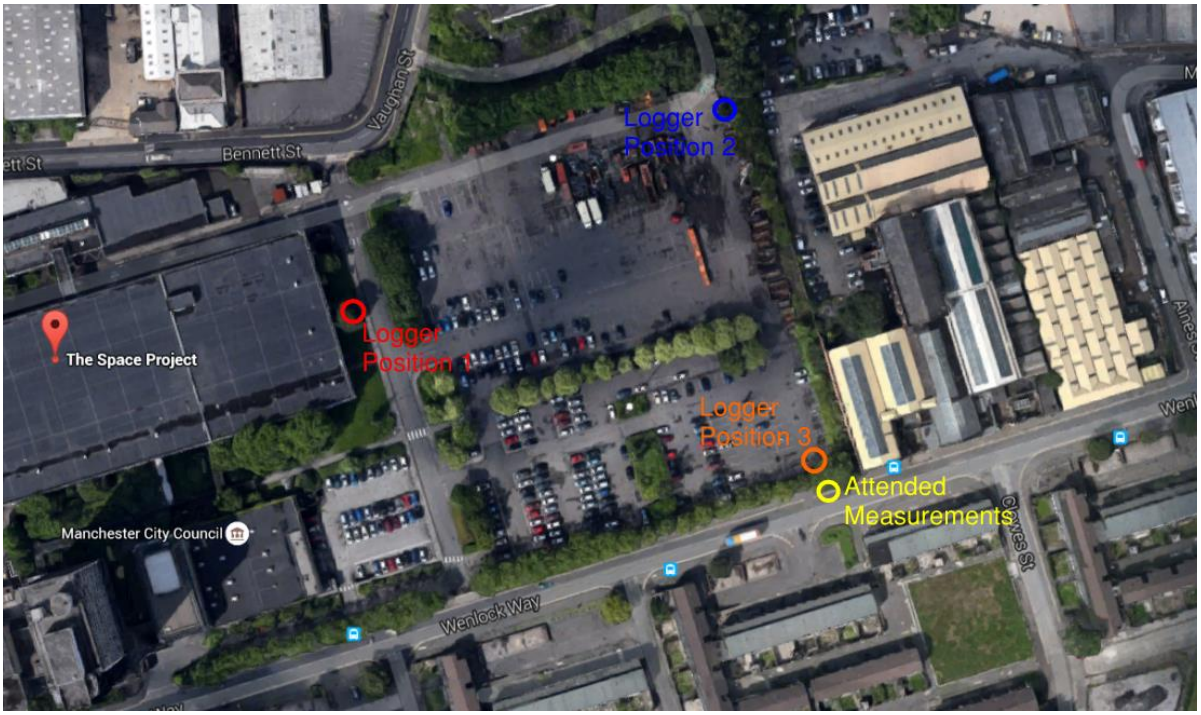


Figure 2 Survey Measurement Positions

4.1 Unattended measurements

Unattended environmental noise monitoring loggers were installed on site at the 3 positions referenced in **Figure 2**.

The measurements were undertaken to quantify the variation of noise around the development site.

Position 1 was chosen to capture noise from the demolition works on the site at the existing Space Project building and is not relevant to this document in terms of planning. Data is held on file and available on request.

Position 2 was chosen such that it is in line with the proposed façade of the new stage building. The screened-positioning of the logger was also considered representative of noise levels on Aines St as it was not possible to safely install a logger on the Aines St elevation during demolition works.

Position 3 was chosen to represent the residential properties along Wenlock Way and, as the logger position is set back from the road and partially screened by an existing wall, it is also deemed to be

representative of levels experienced by the apartment buildings on Aines Street.

The equipment in Position 2 was set to record a continuous series of broadband and octave-band sound pressure levels and the equipment in Positions 1 and 3 were set to record broadband and octave-band sound pressure levels in 5 minute intervals.

Demolition work was being carried out on the east end of the site, Monday – Friday for the duration of the survey. Periods during demolition have been excluded from any analysis.

4.2 Attended measurements

Attended noise measurements were carried out on Wednesday 20th January 2016 and are indicated 'Attended Measurements' in **Figure 2**. The measurements were undertaken to determine any difference from levels captured by the equipment in Position 3 and those at the roads edge due to a step down from street level on the site boundary in this location.

Measurements were conducted over 5 minute periods with a Rion NA-28 Sound Level Meter (SLM) mounted on a tripod approximately 1.2m above ground level. The microphone was fitted with a windshield. The meter was calibrated before and after the survey and no significant drift was noted.

4.3 Equipment Details

Table 2 summarises the details of the equipment used during the attended and unattended environmental noise survey. All equipment used was within dates of calibration and calibration certificates are available on request.

Table 2: Equipment used during the Environmental Noise Survey

ITEM	DESCRIPTION	SERIAL NUMBER	CALIBRATION DATE
Attended sound level meter	Rion - Sound Level Meter: NA-28 Rion - Pre-amplifier: NH-23 Rion - Microphone: UC-59	01260199 60102 05710	07/02/2014
Unattended Sound Level Meter 1	Rion - Sound Level Meter: NL-31 Rion - Pre-amplifier: NH-21 Rion - Microphone: UC-53A	00610338 36703 320324	25/11/2015
Unattended Sound Level Meter 2	01dB - Sound Level Meter: Blue Solo 01 01dB - Pre-amplifier: PRE 21 S GRAS - Microphone: MCE 212	61762 14972 101147	28/03/2014
Unattended Sound Level Meter 3	Svantek - Sound Level Meter: SVAN 949 Svantek - Pre-amplifier: SV 12 GRAS - Microphone: 40 AE	6749 5916 236391	24/12/2015

4.4 Weather Conditions

Weather reports for the area indicate that temperatures ranged between -1°C to 11°C and that high wind speeds occurred for part of the survey period, particularly from Thursday 28th January to Monday 1st February; as such data from this period has been excluded from any analysis. Reports also suggest that some light rain showers occurred during the measurement period but did not affect measured levels. The measured data used is therefore considered suitable as being representative of typical conditions.

4.5 Local Noise Conditions

The following items comprise the existing sources of noise affecting local ambient noise levels.

Road Traffic

Environmental noise conditions are in general characterised by road traffic on Wenlock Way to the South, Vaughan Street to the Northwest and Pottery Lane to the East.

Construction Noise

During daytime periods, noise levels were affected by demolition works on the development grounds, in addition to construction noise generated by construction of houses on Wenlock Way. Periods affected by construction noise have been discounted from our assessments of the background ambient noise climate.

Timber Yard

The adjacent timber yard Greater Manchester Tree Station, located to the immediate north of the proposed scheme undertakes a number particularly noisy activities. The regularity of such activities are understood to not be regular and have no implication with regards to the noise generation of the scheme proposals, therefore has not been considered further in this document.

Space Project Traffic

At the time of writing, there exists a single entry / exit point into the existing Space Project with access from Vaughan St. This arrangement will remain for the proposed scheme. Traffic information provided by Vectos results in an imperceptible 1dB increase during the predicted peak hour, and over the course of the full daytime period will not result in an increase in ambient noise.

4.6 Summary of Results

Based on the findings of the noise survey exercise, and with respect to the baseline background noise level requirements stipulated by MCC, the following levels summarised in **Table 3** characterise background noise levels at receivers in the vicinity.

Time-history plots illustrating the variation in L_{Aeq}, $L_{Amax,F}$ and L_{A90} noise levels over the full noise survey period are provided in Appendix B at the end of this report.

Table 3: Summary of broadband background noise levels at noise sensitive receiver locations

Area	Period	Background Noise Level	MCC Noise Emission Rating Level
Properties on Aines Street (Position 2)	Daytime Night-time	42dB $L_{A90,\ 1\ hour}$ 38dB $L_{A90,\ 15mins}$	37dB $L_{A90,\ 1\ hour}$ 33dB $L_{A90,\ 15mins}$
Properties on Wenlock Way[1] (Position 3)	Daytime Night-Time	46dB $L_{A90,\ 1\ hour}$ 38dB $L_{Aeq,\ 15mins}$	41dB $L_{A90,\ 1\ hour}$ 33dB $L_{A90,\ 15mins}$

1 The monitoring location was situated within the Space Project car park. The topology of the site is such that the Wenlock Way road surface is approximately 1.5-1.8m higher than the Space Project car park. To determine the screening effects that may occur, an attended exercise was carried out so as to calibrate the long-term monitoring locations, a 6dB screening level correction was derived, in keeping with partial line of sight sources.

With reference to **Table 3**, the lowest daytime values were obtained during a Sunday period whilst night-time values were obtained mid-week during the early hours at approximately 0300 hours.

There is consistency between the positions during night-time periods. Higher levels of background noise are observed at the Wenlock Way location, as was expected given its closer proximity to immediate road traffic.

Representative day and night-time background noise spectra (L_{90}), required for use in the assessment of Stage breakout noise is provided in **Table 4**.

The values correspond to Aines St background noise levels on the basis that these were the lowest observed. Assessing to these values therefore preserves a conservative assessment, thus minimising the likelihood for complaints.

Table 4: Background Day-time Noise Spectrum

Representative Background Noise Spectrum: Aines St and Wenlock Way	Octave Band Centre Frequency (Hz)							
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Daytime - dB $L_{90,1hr}$	57	50	45	41	39	40	29	12
Night-time - dB $L_{90,15min}$	57	49	43	39	35	34	23	13

Range Roofing to demonstrate compliance with this and install has been carried out correctly

5. B

The follow erstanding with regards to the external building envelope, which will contro se associated with the scheme.

5.1 Stage Areas

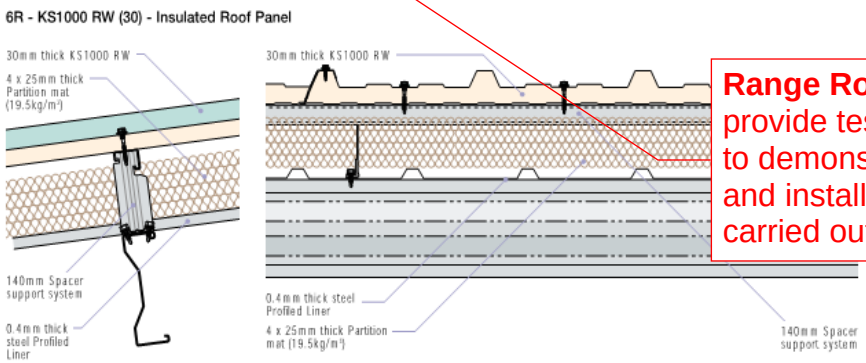
External Facade

External cavity wall; Euroclad Elite 53 cladding system with 160mm insulation, Kingspan cladding rail, 12mm nominal CP board, 202mm Metsec sheeting rail and 2 x 15mm SoundBloc plasterboard layers (each 12.8 kg/m^2).

We understand that the Euroclad outer panel of this system provides a sound insulation performance of 40dB R_w. The incorporation of the cementitious board and internal plasterboard lining will significantly enhance the performance. HLA analysis of this wall type indicates a performance in the region of 55-58dB R_w. **This is on the basis that the cementitious board and the cladding are continuous layer within the façade build-up, with no gaps.**

Roof

The new build roof is expected to take similar form to that of a Ziploc system with acoustic rating in the region of 44dB R_w. Data for this system is not presently available therefore an equivalent Kingspan system with an acoustic sound insulation performance of 45dB R_w has been assumed for calculation purposes. The build-up is as described in **Figure 3**.



Range Roofing to provide test certificate to demonstrate this and install has been carried out correctly

Figure 3: Kingspan Roof Build-up Option

Main Stage Door

The main stage doors (2 no.) are specialist retractable um acoustic performance of 55dB Rw.

Certificate from door supplier to be provided to demonstrate that doors capable of achieving requirements and have been installed correctly

Standard Doors / Pedestrian Entrance

Sound transmission via the doors from the Stage to external be an issue due to the acoustic lobby door arrangement as per the Space

5.2 Support Areas

Noise breakout from support spaces is not considered to be a noise generating component of the scheme therefore is not considered in this document.

5.3 Set-Assembly Area

Façade

Facades are currently assumed to comprise a Euroclad cladding system only. The sound insulation of which, from test data received thus far, is 40dB R_w.

Certificate for Set Assembly facade to be provided and installed correctly

Glazing

There are no glazed elements within the set assembly areas.

Sectional Overhead Doors

The sectional overhead doors are SAFE-door Soundsec systems, with a sound insulation performance of 3

Range Roofing details to be provided indicating compliance and installation correct

Roof

The roof is currently understood k system. This is a lightweight single component system providing an acoustic sound insulation performance of 35dB R_w.

Certificate from door supplier to be provided to demonstrate that doors capable of achieving requirements and have been installed correctly

Doors

Doors to the Set-Assembly Areas are assumed to be a minimum 35dB R_w specification.

5.4 Small Business Units

The Small Business Units are to be flexible spaces, potentially used as studios further workshop space.

Range Roofing details to be provided indicating compliance and installation correct

Façade

Facades are currently assumed to comprise a Euroclad cladding system only. The sound insulation of which, from test data received thus far, is 40dB R_W.

Glazing

Glazing data to be provided

Glazing to the SBUs is located in within the north elevation and comprises circa 1.5 m^2 panel close to the access door. The glazing shall have a minimum a sound insulation performance of 32 dB R_w.

Sectional Overhead Doors

Certificate from door supplier to be provided to demonstrate that doors capable of achieving requirements and have been installed correctly

There are two specifications for the Sectional Overhead Doors within the scheme:

- A 30 dB R_w unit is provided to all SBUs located within the Block 1. An additional three 30 dB R_w units are provided to SBU 3D, 3E and 3F which are in closest proximity to the habitable dwellings situated on Aines Street. The remaining SBU units are to be provided with lower specification 25dB R_w units.

Roof

The roof is currently understood to be a Rockwool Hardrock system. This is a lightweight single component system providing an acoustic sound insulation performance of 35dB R_w.

Doors

Doors are assumed to be a minimum 35dB R_w specification.

Certificate from door supplier to be provided to demonstrate that doors capable of achieving requirements and have been installed correctly

6. NOISE IMPACT PREDICTIONS

The scheme proposals have been considered in light of the following noise generating processes

1) Activities within the set-assembly area

2) Activities within the SBUs, when used as workshops

3) Stage Activities

6.1 Set Assembly Area & SBU Breakout

For the purposes of a conservative assessment, all SBU and Set-Assembly Areas have been considered as potential workshop areas.

For each unit considered, the walls, roof, door and sectional overhead door have each been considered as individual sources of noise and their breakouts have been assessed within CadnaA modelling software to predict noise level emissions across and incident upon the nearest residential receiver locations situated on Aines Street and Wenlock Way. A snapshot from the model is provided in **Figure 4**.

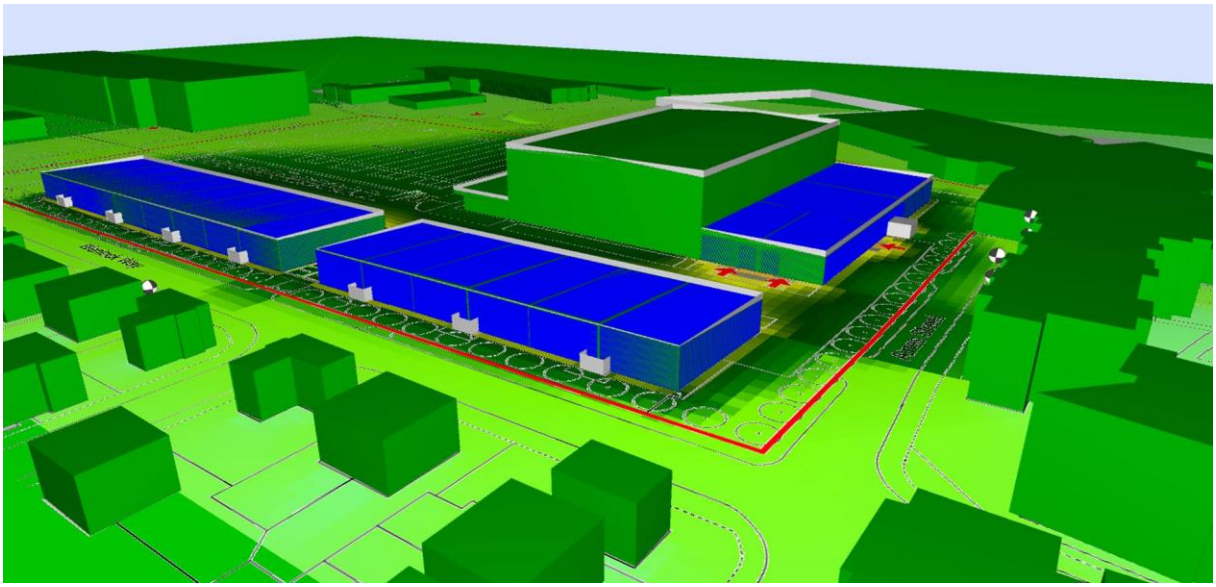


Figure 4: 3D Noise model snapshot – Showing development proposals from the junction of Aines St and Wenlock Way

6.1.1 Internal Levels

Measurements have been carried out within set-assembly areas in the existing Space Project to determine typical internal noise levels. Highest levels of noise were generated by fixed-base plant items (jigsaw / rip saw / mitre saw).

The highest noise generating device was the rip-saw with broadband maximum levels of 92 dB L_{Amax}. The spectrum of this plant item used in the assessment of break out noise is provided below in Table

5 and it should be observed that Table 5 values are now presented using the L_{eq} metric on the assumption that such levels of activity would be constant over the day (1-hour) or night-time (15-minute) assessment periods. This reasoning was explained to and accepted by Mr. Richard Knightley of the MCC Environmental Protection Team and though it was acknowledged however that in doing so presented somewhat of a worst-case assessment scenario.

Table 5: Internal noise spectrum for set-assembly areas used in the assessment

	Octave Band Centre Frequency (Hz)								Broadband Level dB $L_{Amax,F}$
	31.5	63	125	250	500	1k	2k	4k	
Set-Assembly Internal Noise Levels dB $L_{Aeq,T}$ (day / night)	57	62	67	76	80	87	88	84	92

6.1.2 Daytime Noise assessment

A generated noise map illustrating predicted break-out noise emissions is provided below in **Figure 5**. Based on the noise data obtained during the noise surveys the maximum noise criterion for noise breakout associated with set assembly and SBU units at the nearest noise sensitive houses is 37 dB L_{Aeq} during the day time. The noise levels at the nearest properties on Aines Street and Wenlock Way have been calculated to be less than 37 dB on Aines St and Wenlock Way and comply with the MCC daytime criterion.



Figure 5: Noise Map (Ground Floor) Showing Site-Wide Levels due to SBU and Set-Assembly Noise Outbreak

Table 6: Calculation summary for SBU and Set-Assembly daytime noise breakout at worst case receiver location.

Worst Case Area	Predicted Nosie Level dB $L_{Aeq, 1hour}$	MCC Daytime Noise Criterion dB L_{Aeq}	Comment
Aines St Apartments	37	37	Complies with MCC criterion

6.1.3 Predictions of Night-time Noise Levels and assessment

Following discussions with Mr Graeme Souter of the MCC Environmental Protection Team and subsequent clarifications from the client, it is accepted that night time use during the hours of 2300-0700 will be rare and in general terms SBUs would be considered to be unoccupied. However, to permit 24-flexibiltiy, and considering that daytime predicted values for 100% of SBUs in operation during the daytime exceed the MCC night-time criterion of 33dB L_{Aeq} by 4dB, a night-time assessment of a potential "scenario" is presented to show that reduced levels of SBU use during night-time periods would be acceptable. Internal levels are assumed to be consistent with those relied upon for daytime assessments.

The assessment presented herein considers the cumulative impact of the nearest SBU in each block with respect to the most sensitive receivers at the Aines St location (SBU 1B, S2 and 3F as depicted in **Figure** 1). The assessment also includes the Set-Assembly area on the basis that the building or dismantling of sets areas could feasibly occur over a night-time period. The results of the assessment are summarised in **Table 7**.

Table 7: Calculation summary for SBU and Set-Assembly night-time noise breakout at worst case receiver location.

Worst Case Area	Predicted Nosie Level dB $L_{Aeq, 1hour}$	MCC Daytime Noise Criterion dB L_{Aeq}	Comment
Aines St Apartments	33	33	Complies with MCC criterion

6.1.4 Discussion

The results of the day and night-time assessments indicate that noise breakout from the SBUs will meet MCC criteria for workshop type activates. In reality, the level of daytime impact is expected to be significantly lower on the basis that not all SBUs will operate as workshop type areas (SBUs are likely to function as a mix of office, storage and workshop spaces) and during the night-time period it is

unlikely, given the potential for turnaround of SBU tenants, that noise generating units would be constrained to these worst case locations in each block. However, and for the purposes of a workable condition, it is suggested that limiting night-time SBU use for **workshop activities** to 1 SBU per block would be reasonable. Non-workshop activities would not breach night-time requirements.

6.1.5 Additional SBU considerations

Further to the above recommended condition, discussions with Graeme Souter were also held in relation to the potential of noise arising from night-time vehicle movements, delivery-type activities and the opening of elements within SBUs. It was agreed that it was not possible to accurately assess such aspects as the level of activity falls outside the range of assessment by the traffic consultant, noise from low-speed vehicular movements would be of a lesser magnitude to those generated by existing levels of traffic on Wenlock Way, and the level of night-time SBU use is expected to be minor.

However, as the application is for 24-hour use, it was agreed that a management strategy would be implemented so tenants wishing to use the SBUs during night-time periods would be aware that they have an obligation to ensure to be considerate to neighbours in the surrounding area by, for example, switching off radios, promoting the use of quiet trolleys for movement of equipment etc. This has been discussed and agreed with the client who is happy with providing this documentation and monitoring SBU usage. A similar management strategy will be employed reminding tenants that any noise generating activities within SBUs require that doors and windows are closed.

6.2 Stage Activities

The Stage area is proposed to be flexible in use therefore can accommodate a variety of Film and TV scenarios, some of which may include the use of amplified TV recordings.

As such, amplified TV recordings have been considered as this is likely to generate the highest levels of noise. It has been determined from measurements at amplified music events and discussion with TV production experts that maximum internal noise levels at such events would be no more than L_{Aeq} 95 dB and L_{Amax} 110 dB and are considered worst case.

The level of external noise (L_2) immediately adjacent to a separating element due to a specific degree of internal noise (L_1) can be determined from the following equation:

$L_2 = L_1 – R_w - 6$

In the above expression, R_w is the sound insulation performance of the envelope element being assessed.

These levels are used to estimate the sound power of the elements within the acoustic model. Propagation effects are included within the model, and given the large dimensions of the Stage, must be treated as planar-sources of noise.

6.2.1 Lowest measured background noise levels

It is understood that any amplified TV recordings would finish by 22:00 hrs on any day of the week and as such the assessments have been carried out on this basis. The lowest measured background noise levels at the nearest noise sensitive premises on Aines Street measured before 22:00 hrs were captured on a Sunday evening between the hours of 21:00 and 22:00, with a minimum 15 minute noise level measured during this period of $L_{A90,15min}$ 44 dB.

6.2.2 Predicted Noise Levels from Amplified TV recordings

The calculated results from the noise modelling assessment are summarised below in **Table 8**. The results are based on the noise level at the worst affected apartments on Aines Street which are the second and third floor apartments. Values are presented for both the loudest 15-minute period as required by the pop-code in addition to the highest 100ms value (essentially the L_{max}) form data held on file.

Table 8: Predicted Stage Breakout Levels

Area	'Pop-code' criterion for 30 events per year dB L_{Aeq}	Predicted Maximum Noise Level from Amplified TV recordings dB L_{Aeq}		Comment
		Loudest 15 minute period dB $L_{Aeq,15mins}$	Loudest 100ms period dB $L_{Aeq,100ms}$	
Aines St – Third Floor Apartment	49	34	44	Compliant with 'pop code' criteria for 30 events per year

6.2.3 Comparison to Design Criteria

The results from the assessment indicates that assessment of the loudest 15-minute period during amplified TV recordings up to 22:00 in the evening would meet with 'Code of Practice on Environmental Noise Control at Concerts' (see Section 3.2) recommendations for 30 music events per calendar year by a comfortable margin. Further, assessment of the highest 100ms period is also observed to meet this criterion. As such, the impact arising from such use is considered acceptable.

7. MECHANICAL PLANT NOISE

It is a requirement that MEP noise levels be controlled in line with MCC guidance. The limit is set on the grounds of noise survey work undertaken to determine the level of ambient noise in the vicinity of the nearest noise sensitive receiver locations.

See Appendix C

7.1 Noise Emission Limits

The assessment of plant noise shall be in accordance with guidance in BS 4142 - 2014 'Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas'.

The general principle of the BS 4142 assessment criteria is that noise nuisance can be avoided provided there is no significant change in the prevailing background noise conditions at any surrounding noise sensitive premises once the new equipment is operational. The assessment criteria explicitly designate that where the noise rating level of the new plant is 10dB above the background noise level, there is likely to be significant adverse impact. A difference of 5dB is considered to result in adverse impact. Where the rating noise level of the plant is equal to or below background noise, there is likely to be low impact.

On this, and with meeting the MCC requirements in mind, the following limit based on the minimum measured background noise level of 38dB L_{A90} is applicable for the scheme and provided in **Table 9**. At this time, a night-time limit is considered sufficient on the basis that day-time external levels are controlled by nearby traffic and the level of MEP operation may be similar when running in 24-hour mode.

Table 9: Recommended MEP External Plant Limits

Area	Noise Limit dB $L_{Aeq,15mn}$
Properties on Aines St	33
Properties on Wenlock Way	33

7.2 Implications for design

The majority of the plant space is to be housed in a partially enclosed compound comprising solid fenced elements with open roof to the northern region of the site, adjacent to the Stage as shown in **Figure 6**. This arrangement provides significant distance and screening attenuation provision between source (plant space) and receiver (residential properties). Appropriate plant selection is therefore considered sufficient as a mitigation measure in order to achieve compliance with the design criterion. Typical AECOM selections (Appendix C) have been accounted for in the 3D prediction model, though confirmation of final selections will be made as the scheme develops.

The SBU spaces attached to the Stage will also require a small degree of plant, which cannot be housed in the aforementioned plant enclosure. The current proposal is to position the plant externally adjacent to SBU 1C (See **Figure 6**). It is likely that some form of attenuation be required to ensure that plant items do not cause issue during quiet periods of the day or night. Given the relatively small separating distance and unobstructed line of sight between the proposed compound and the apartments on Aines St, an enclosure is recommended and the design of which should limit openings in the direction of the timber yard only, to permit airflow around the enclosed units (see **Figure 7**).

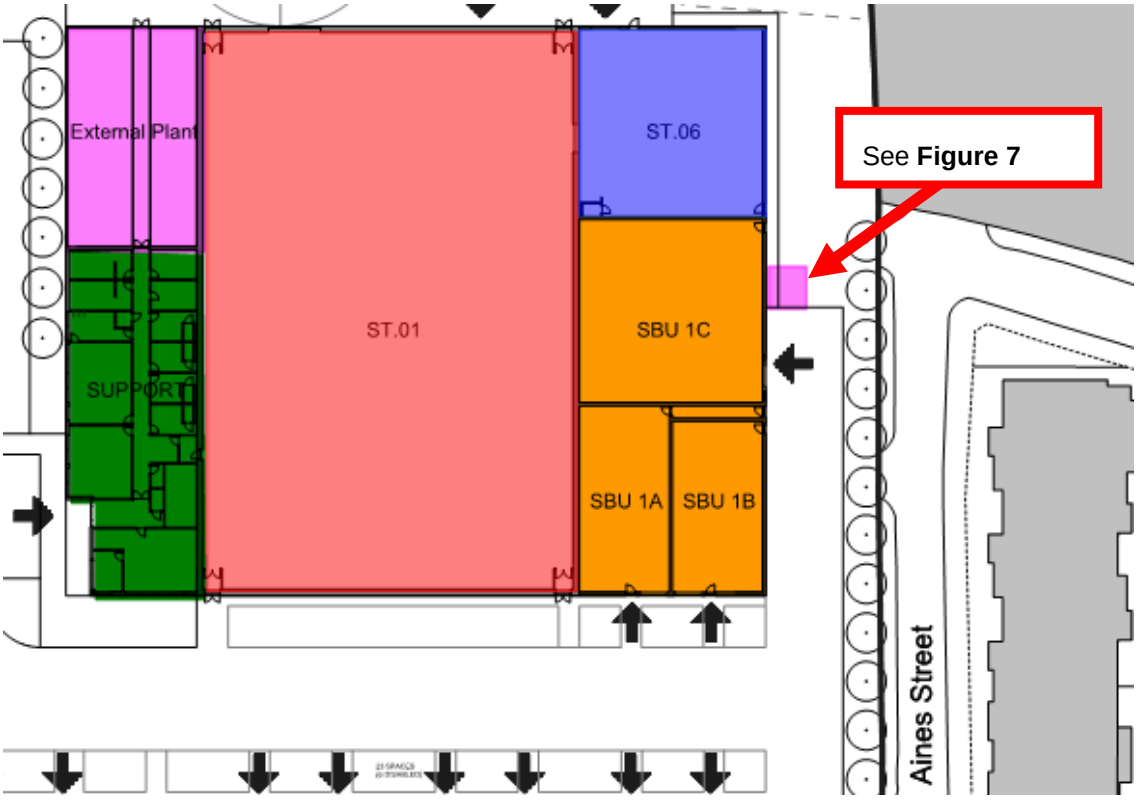


Figure 6: Plant spaces in the vicinity of the Stage Area

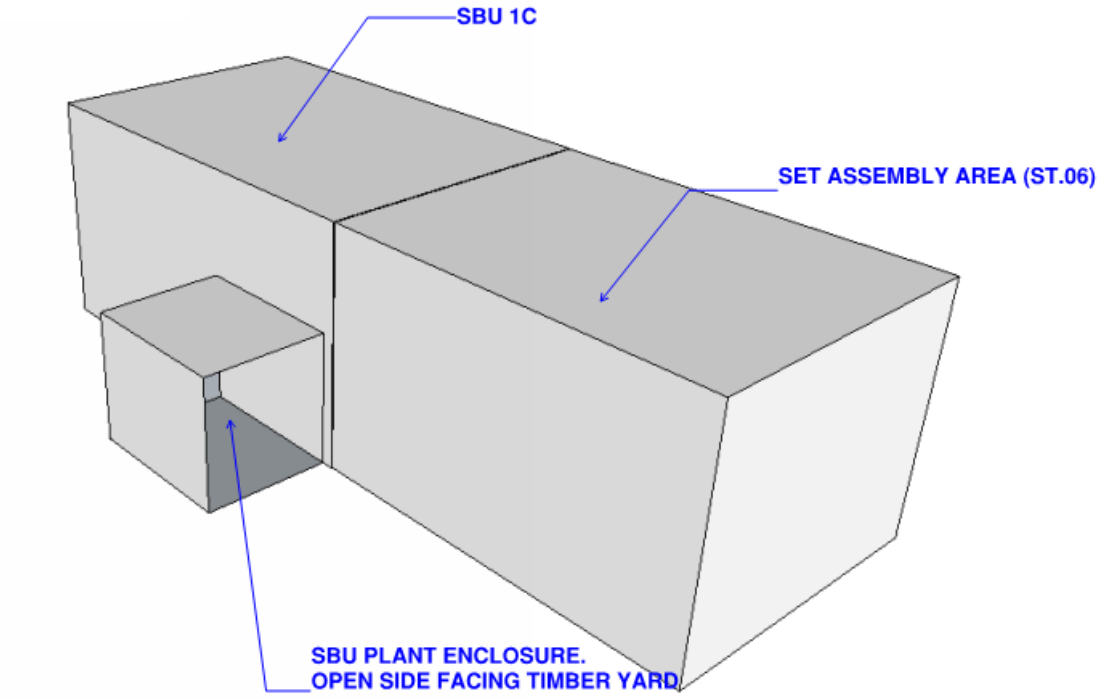


Figure 7: Sketch illustration of Plant enclosure for SBUs adjacent to Stage areas

To the south, there are small pockets of plant space intended for condenser type units serving the SBUs in addition to a central transformer, ring main and switch room.

With regards to the small regions of plant space adjacent to pairs of SBUs, these are intended to be condenser-type units positioned externally at ground level comprise a maximum of 14 units in total. It is expected however half of the condenser allowance would not be needed on the basis that approximately 50% would be used as storage space, and would therefore have no requirement for building services of this nature. For the purposes of a conservative assessment, the full condenser allowance has been assumed. Each pair of condensers are screened from the properties on Wenlock Way via a 3-sided enclosure abutting the SBUs with an open roof. The height of the enclosure systems are sufficient to screen the units from bedrooms on Wenlock way at 1st floor level.

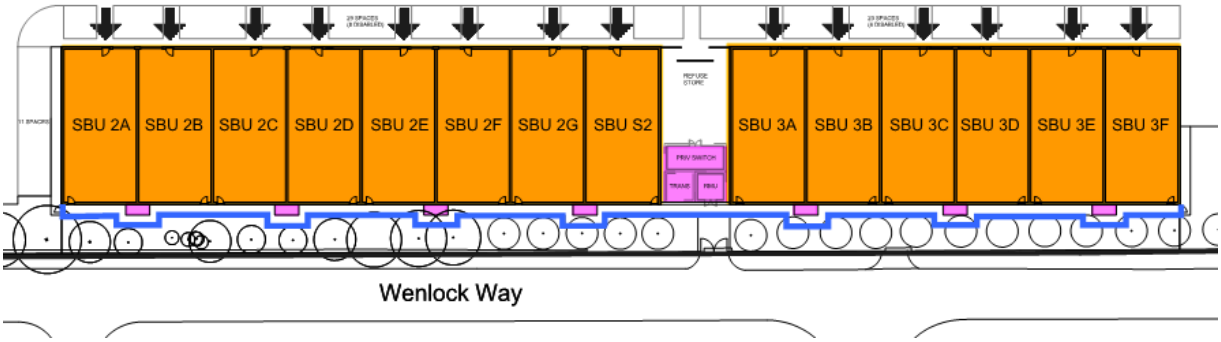


Figure 8 Plant spaces in the vicinity of the southern SBU areas

Using the typical plant selections provided by AECOM, predicted levels at the nearest properties on Wenlock Way and Aines St are comfortably below the 33dB design criterion. **Table 10** summarises the results from the 3D acoustic model. It can be seen that levels are low and comply with MCC criteria.

Table 10 Summary of external plant noise predictions

Area	Criteria dB $L_{Aeq,T}$	Predicted Level dB L_{Aeq}	Comment
Aines St – Ground Floor Apartment	37 Daytime 33 Night-time	21	Compliant
Aines St – First Floor Apartment		21	Compliant
Aines St – Second Floor Apartment		22	Compliant
Aines St – Third Floor Apartment		22	Compliant
Wenlock Way – Ground Floor		28	Compliant
Wenlock Way – First Floor		31	Compliant

8. CUMULATIVE NOISE IMPACT

8.1 Cumulative Impact

The cumulative case, with plant and noise generating workshop activities occurring simultaneously has also been assessed. This, in essence, is a summation of predicted values from Section 6 and Section 7.

The results of the assessment are summarised in **Table 11** for the observed worst case location (Aines St) and a noise map generated from the model is provided in **Figure 9**.



Figure 9: Noise Map showing noise breakout from all Plant, Set-Assembly & SBU Areas (Ground Floor Level)

Table 11 Summary of Predicted Cumulative Noise Values

Area	Criteria dB $L_{Aeq,T}$	Predicted Level dB L_{Aeq}	Comment
Aines St	37 Daytime	37	Compliant
	33 Night-time	33	Compliant

8.2 Discussion

With reference to the values provided in **Table 11**, predicted levels of breakout noise at the worst-case receiver location (Aines St) do not exceed 37dB L_{Aeq} during the day or 33dB L_{Aeq} during the night and are therefore are compliant with the required MCC daytime criterion. The analysis confirms that the levels can be met in the most onerous (though unlikely) configuration whereby all SBU's and Set-

Assembly Areas are carrying out workshop based activities. A more likely use-pattern where a portion of SBU's would be used as workshop-type spaces, would lessen the level of impact than reported herein.

9. CONCLUSION

Hoare Lea Acoustics have undertaken an acoustic assessment for the proposed Outerspace Project development in Gorton, Manchester. A detailed environmental noise survey has been carried out around the site and a noise egress assessment undertaken in accordance with the latest British Standards and Manchester City Council requirements.

The findings of this assessment conclude the following:

- Internal noise breakout from the set-assembly and SBU area will be controlled to acceptable levels provided the façade elements meet the minimum sound insulation specifications detailed herein.
- Noise break-out from amplified TV recordings meets the noise levels at the in line with the pop code for 30 events per year on any week day.
- Limits have been set for MEP services based on an assessment of current proposals. Assuming barrier screening can be provided, emission levels are capable of compliance with Manchester City Council criteria.
- Cumulative levels for all sources of noise have been considered and result in compliance with MCC criteria.

Given the above, it is our opinion that the noise generating aspects of the scheme would not be of detriment to the planning submission on the grounds of noise.

APPENDIX A: GLOSSARY OF ACOUSTICAL TERMS USED

Decibel (dB)

The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithm is taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Octave and Third Octave Bands

The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies. An 'A' weighted value would be written as dB(A).

$L_{eq,T}$

The $L_{eq,T}$ is a parameter defined as the equivalent continuous sound pressure level. Over a defined time period 'T', it is the sound pressure level equivalent to the acoustic energy of the fluctuating sound signal. The $L_{eq,T}$ can be seen to be an "average" sound pressure level over a given time period (although it is not an arithmetic average). Typically the $L_{eq,T}$ will be an 'A' weighted noise level in dB(A). It is commonly used to describe all types of environmental noise sources.

$L_{90,T}$

The $L_{90,T}$ is a parameter defined as the sound pressure level exceeded for 90% of the measurement period 'T'. It is a statistical parameter and can not be directly combined to other acoustic parameters. It is generally used to describe the prevailing background noise level or underlying noise level.

$L_{max,T}$

The $L_{max,T}$ is a parameter defined as the maximum sound pressure level that occurred during the time period 'T'. It is commonly used to describe the highest noise level that occurred during an event such

as a vehicle pass-by.

Sound Reduction Index, R

This is defined mathematically as ten times the common logarithm (to base 10) of the ratio of the incident sound power on the building element under test to the transmitted sound power level. It is used to commonly describe the sound insulation of building products. The sound reduction index, is a laboratory measured value. The field measured value would be denoted as R'. There is often a significant difference between the R and R' values due to flanking noise and site workmanship. It is measured in decibels.

APPENDIX B: ENVIRONMENTAL NOISE SURVEY DATA

Figure 10: Results from Blue Solo Logger Position with periods of demolition work and high wind speeds removed (1)

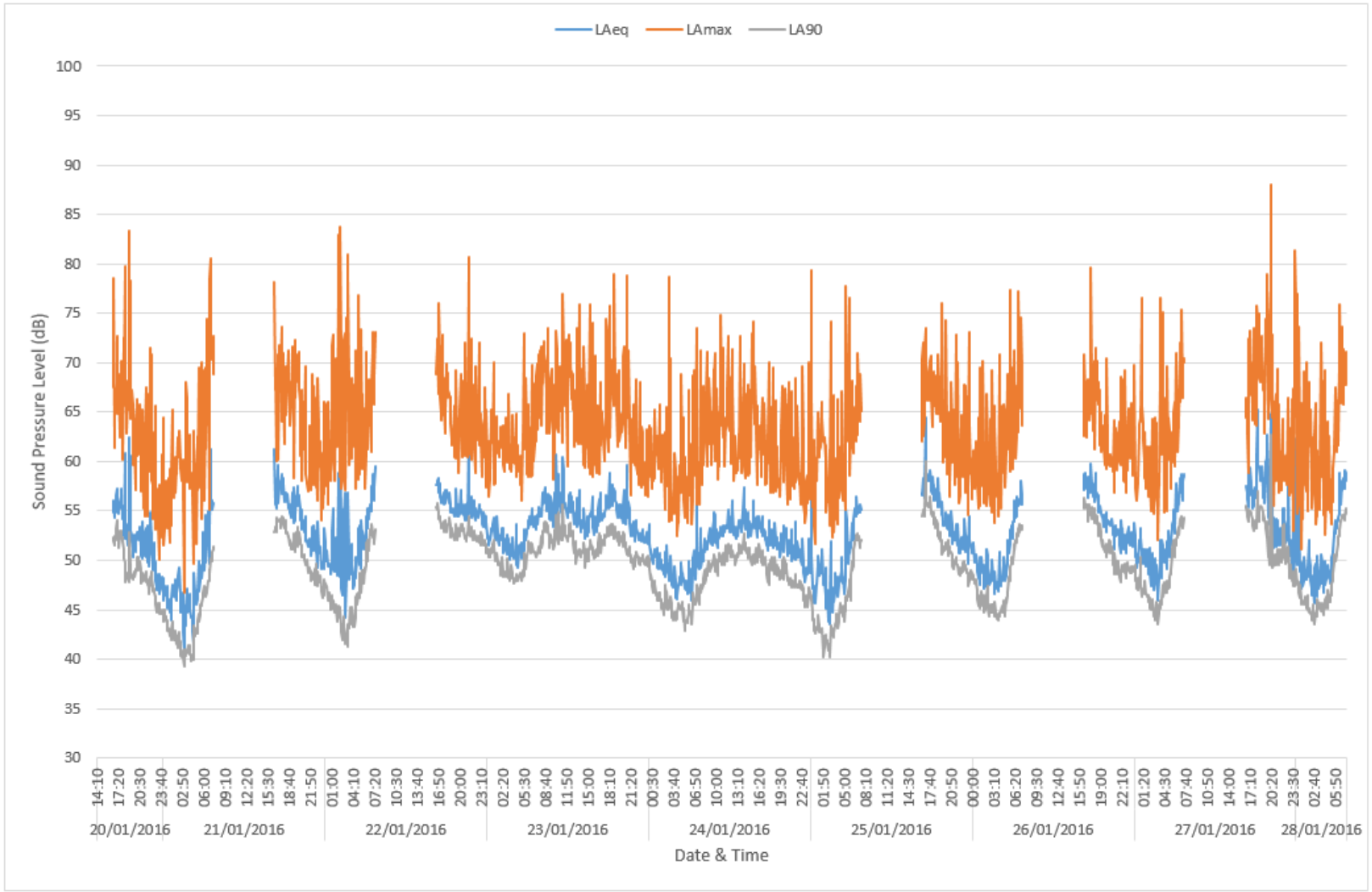


Figure 11: Results from Blue Solo Logger Position with periods of demolition work and high wind speeds removed (2)

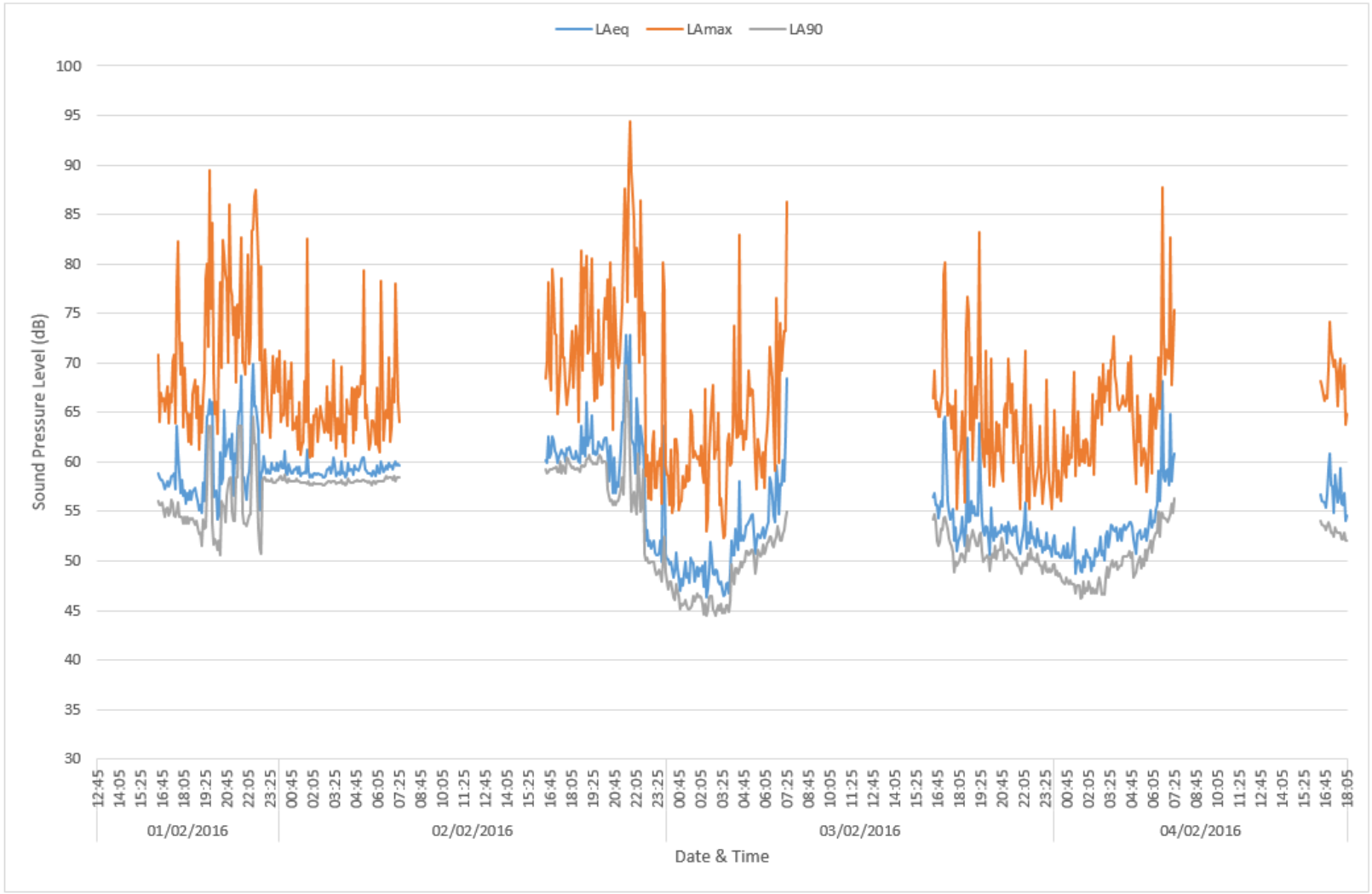


Figure 12: Results from Blue Solo Logger Position with periods of demolition work and high wind speeds removed (3)

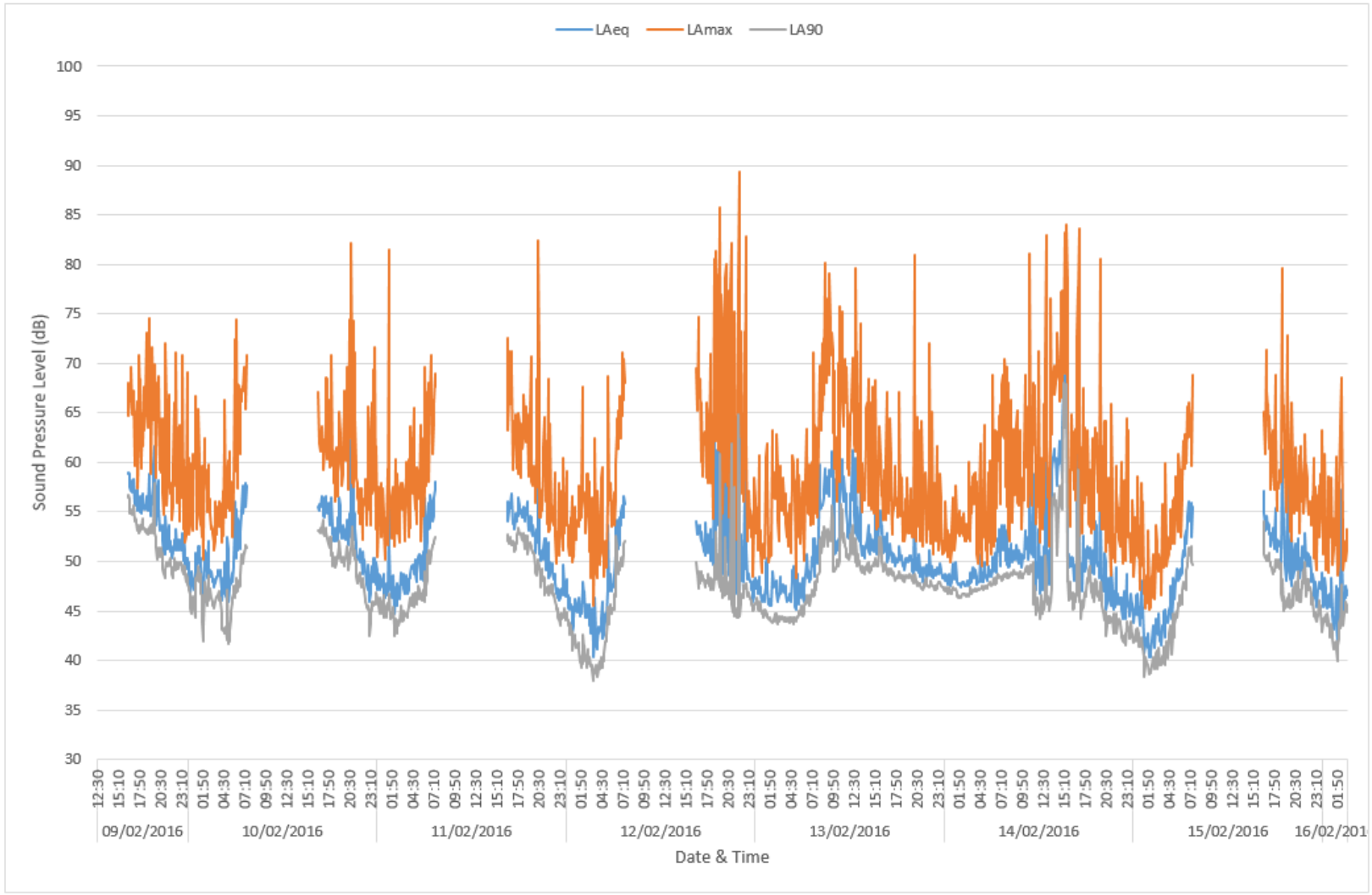


Figure 13: Results from SVAN Logger Position with periods of demolition work and high wind speeds removed (1)

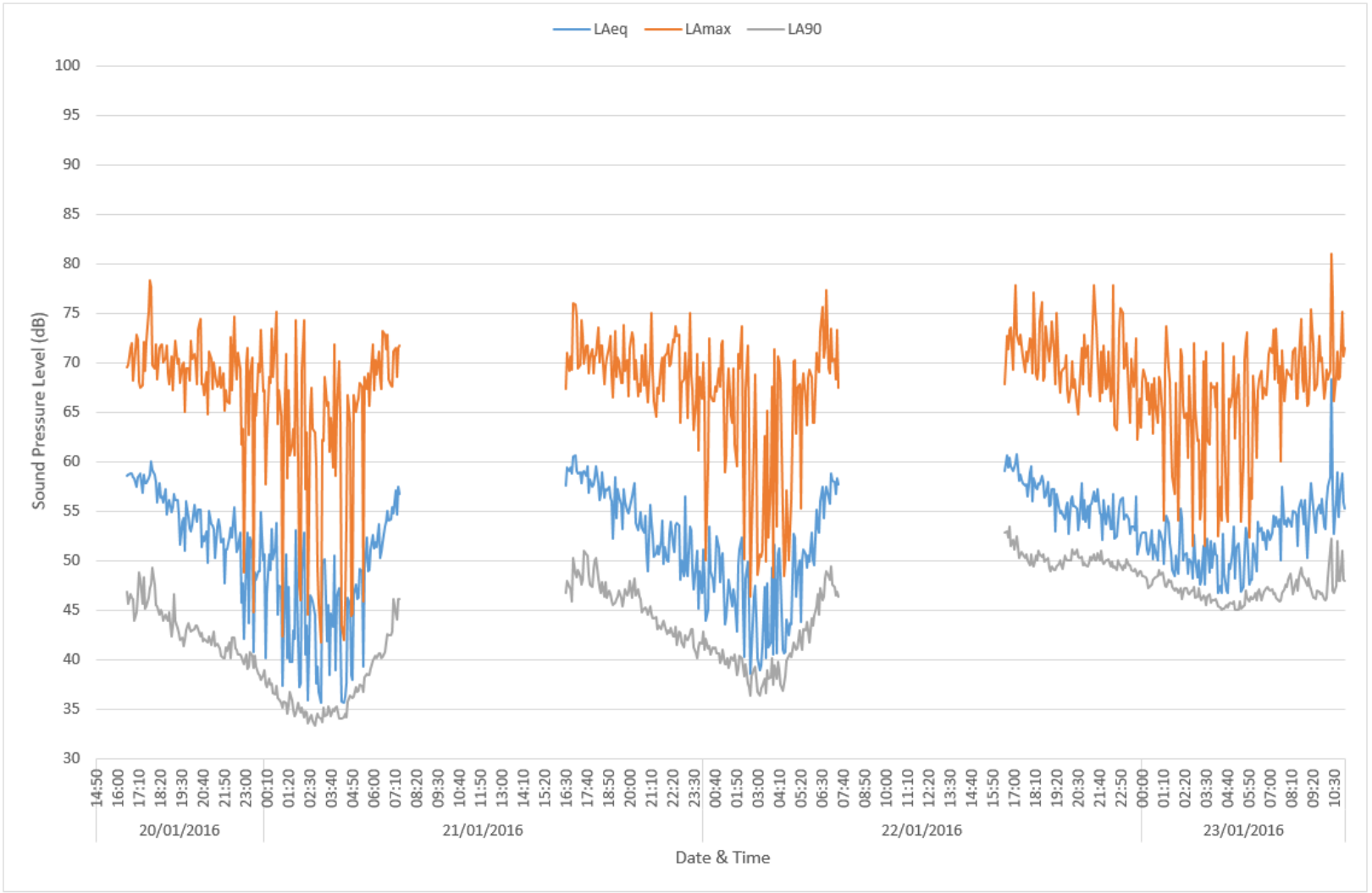


Figure 14: Results from SVAN Logger Position with periods of demolition work and high wind speeds removed (2)

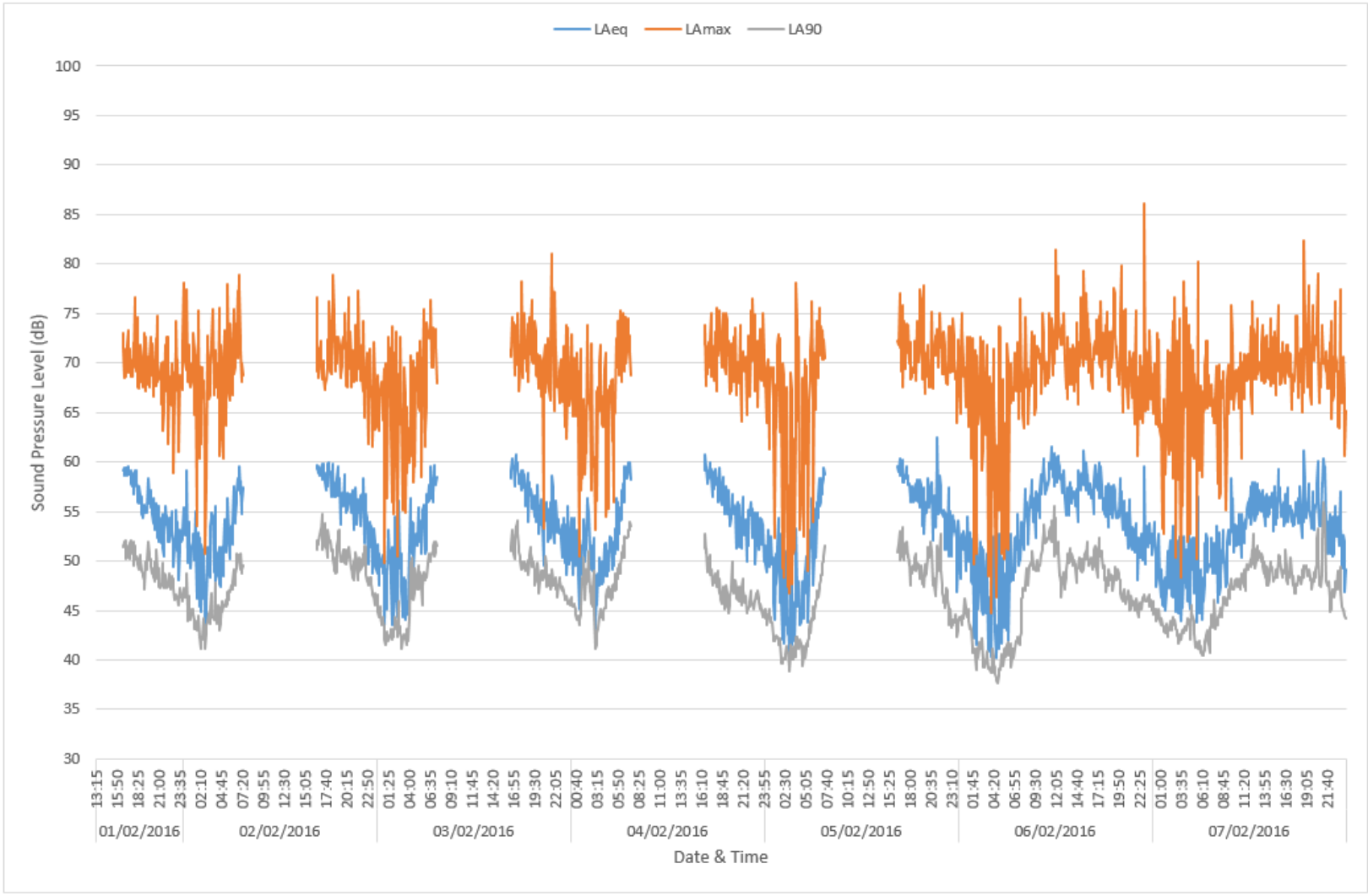
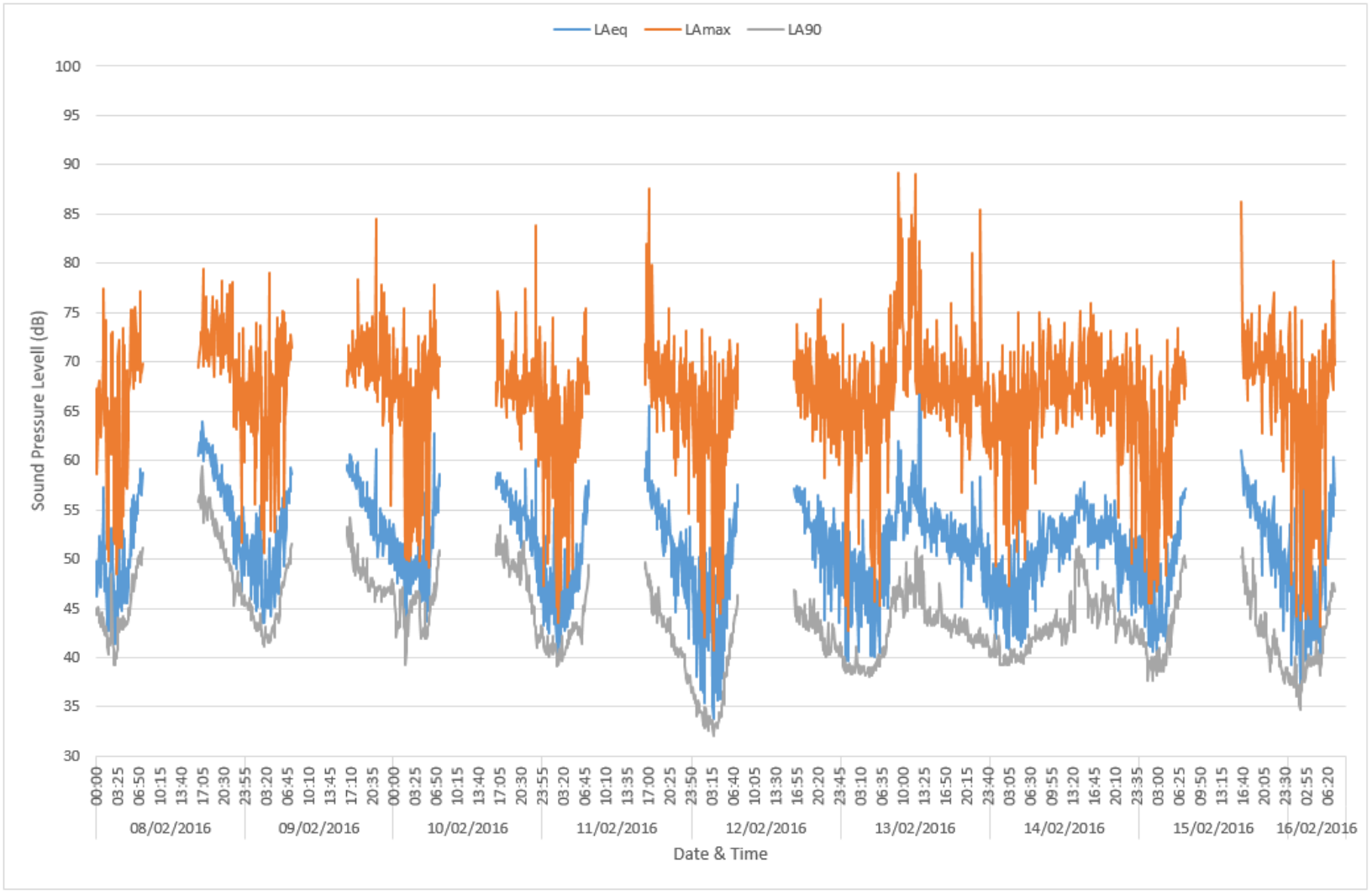


Figure 15: Results from SVAN Logger Position with periods of demolition work and high wind speeds removed (3)

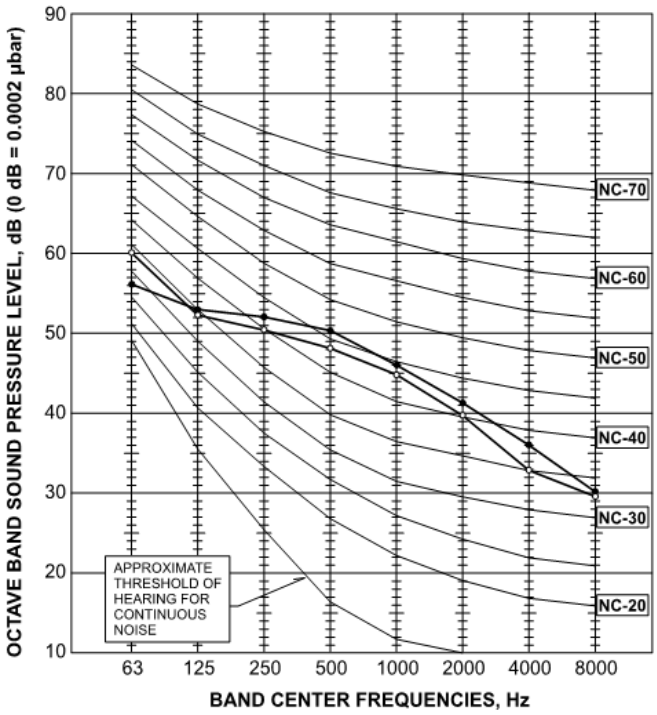


APPENDIX C: NOISE DATA FOR PLANT ITEMS

The following noise data for condenser units was provided by Mitsubishi Electric and was used in the modelling of the plant noise break out.

PUMY-P125VKM(-BS)
PUMY-P125YKM(-BS)

MODE	SPL(dB)	LINE
COOLING	50	○——○
HEATING	52	●——●



Bowkers to confirm that noise levels presented here are less than or equal to those presented. Test data for equipment installed should be supplied to MCC

PURY-EP▪YLM-A(1)(-BS)

	Capacity	200	250	300	350	400	450	500
Frequency(Hz)	63*	92.0	91.5	91.5	93.5	94.0	93.5	94.0
	125	87.0	88.5	87.0	89.5	89.5	89.5	91.0
	250	83.0	83.0	86.0	86.0	85.5	85.5	86.5
	500	80.5	81.5	84.5	84.5	84.5	84.5	85.5
	1000	77.0	77.0	79.5	80.0	80.5	79.5	80.0
	2000	72.5	75.0	76.0	75.5	76.0	76.5	77.5
	4000	68.5	71.0	75.5	74.0	73.0	74.5	76.5
	8000	61.5	65.0	69.0	68.5	65.5	67.5	69.5
	O.A.	82.5	83.5	86.0	86.0	86.0	86.0	87.0

The following noise data for the AHUs was provided by Aecom and was used in the modelling of the plant noise break out.

EasyAir HANDLING

TECHNICAL SCHEDULE

		Offer N°	0648-16
		Date	22-03-2016
		Unit model:	CTAE 300S
		Q.ty	1
Client		Air volume:	24120 m³/h
Reference		Revision:	00
Reference	AHU NO HEPA	Date:	22-03-2016

Octave band (Hz) - Octave band corrected Sound power level (dB)

AHU sound levels	Tot.dB(A)	125	250	500	1000	2000	4000	8000
Sound power level inlet (supply side)	49	64	49	29	28	26	29	28
Sound power level discharge (supply side)	85	84	80	80	80	77	75	72
Sound power level inlet (return side)	76	81	76	73	70	66	64	56
Sound power level discharge (return side)	59	72	57	40	43	42	46	53
Airborne power level	74	77	73	71	69	67	51	42
Calculated sound pressure level at 1 mt free field (62 dBA)								

APPENDIX D: SOUND REDUCTION PERFORMANCE DATA FOR CONSTRUCTION TYPES

Euroclad Elite System 53 cladding, provided by Euroclad:

Frequency f Hz	Sound Reduction Index, dB 1/1 Oct
50+ 63+ 80+	12.1
100 125 160	16.6
200 250 315	31.4
400 500 630	39.2
800 1000 1250	44.5
1600 2000 2500	50.1
3150 4000 5000	53.1
6300+ 8000+ 10000+	62.3

Kingspan Topdek KS1000TD roof deck, provided by Kingspan:

Sound Reduction Index (SRI)

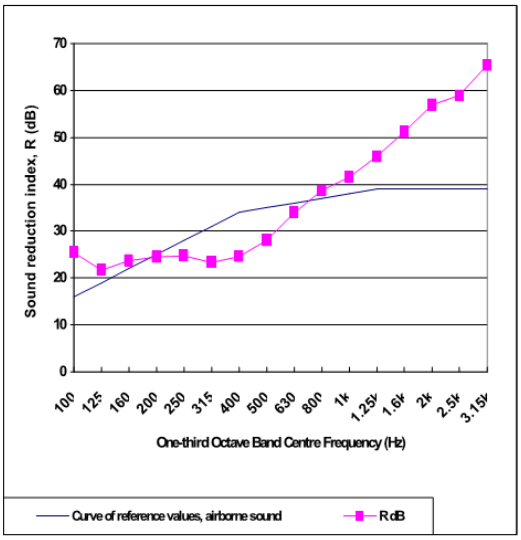
Hz*	125	250	500	1K	2K	4K
SRI (dB)	18	18	17	23	30	40

* Frequency

The KS1000 TD insulated roof panel has a single figure weighted sound reduction Rw = 23dB.

Rockwool Hardrock Single Ply Roof System, provided by Rockwool:

Freq. Hz	R dB
100	25.4
125	21.7
160	23.7
200	24.5
250	24.8
315	23.3
400	24.6
500	28.1
630	33.9
800	38.7
1k	41.5
1.25k	46
1.6k	51.1
2k	56.9
2.5k	58.9
3.15k	65.4
4k	67.6
5k	71.2



Weighted Sound Reduction Index: **Rw = 35dB**
Average Sound Reduction : **36.8 dB**

SAFE-door Soundsec 30, provided by PRP:

Soundsec Acoustic Door Test Data:

Frequency f [Hz]	R 1/3 octave [dB]	R 1/3 octave [dB]
50	21.9	43.7
63	23.6	45.7
80	24.3	30.1
100	25.6	40.0
125	24.5	48.4
160	26.2	52.3
200	29.1	50.2
250	29.1	51.9
315	28.8	52.1
400	29.1	50.4
500	29.6	53.6
630	28.4	56.3
800	26.1	60.5
1000	25.8	62.1
1250	27.4	63.5
1600	29.3	67.2
2000	37.8	78.4
2500	49.4	86.7
3150	61.6	83.1
4000	59.0	76.7
5000	58.4	65.7
Rw	**30**	**60**
C	**0**	**-1**
Ctr	**-2**	**-7**
Thickness (mm)	95	600
Door Type	Soundsec 30	Tandem Soundsec 30 and Soundroll 30