



Land off East Street, Reading

Plant noise impact assessment

5628.16

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Revision A



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2 Summary

- 2.1 This report has been prepared in response to Planning Condition no. 24 of Planning Application 181849 for the development of purpose built residential accommodation at Land off East Street, Reading.
- 2.2 Condition 24 requires the specific noise level from the proposed plant not to exceed a level 10 dB below the measured background sound level.
- 2.3 Background sound levels have been measured at a position considered representative of the identified noise-sensitive receptors.
- 2.4 Plant details have been identified by the mechanical engineers.
- 2.5 Noise emission from the proposed plant has been determined and noise propagation modelled with proprietary software CadnaA.
- 2.6 The potential noise impact is calculated and rated in accordance with BS 4142.
- 2.7 Noise mitigation measures including an attenuated louvre and in-duct attenuator are required to achieve the limits indicated by the Planning Condition.
- 2.8 The acoustic specification for the required noise mitigation measures are detailed in Section 7.
- 2.9 Based on the proposed mitigation measures, the rated plant sound impact is calculated to be 12 dB below the background sound level.
- 2.10 It is calculated that the current proposals achieve the Planning Condition requirements.

4 Introduction

- 4.1 A development consisting of student residential accommodation has been proposed at Land off East Street, Reading; the site location is shown in Figure 1, the building location is shown in Figure 2.
- 4.2 Apex Acoustics has been commissioned to undertake an assessment of the noise from mechanical plant associated with the development in support of a Planning Condition.
- 4.3 The scope of our instruction includes:
- Use of previously measured background noise levels;
 - Analysis of proposed source noise levels, using manufacturers' data provided by the client;
 - Calculate noise propagation using proprietary noise modelling software to the noise-sensitive receptors and assess the impact in accordance with BS 4142: 2014;
 - Advise on a scheme for noise mitigation to satisfy the Planning Condition noise limit;
- 4.4 This report presents the evaluation of the potential noise impact from plant associated with the proposed development on the identified worst affected noise-sensitive receptor (NSR), to address a Planning Condition.
- 4.5 The NSR are identified as the residential properties to the north and west of the proposed site.
- 4.6 This assessment is based on the proposed plant details identified by the mechanical engineers.
- 4.7 The potential noise impact from the sources identified is calculated and rated according to the BS 4142 methodology, Reference 1.

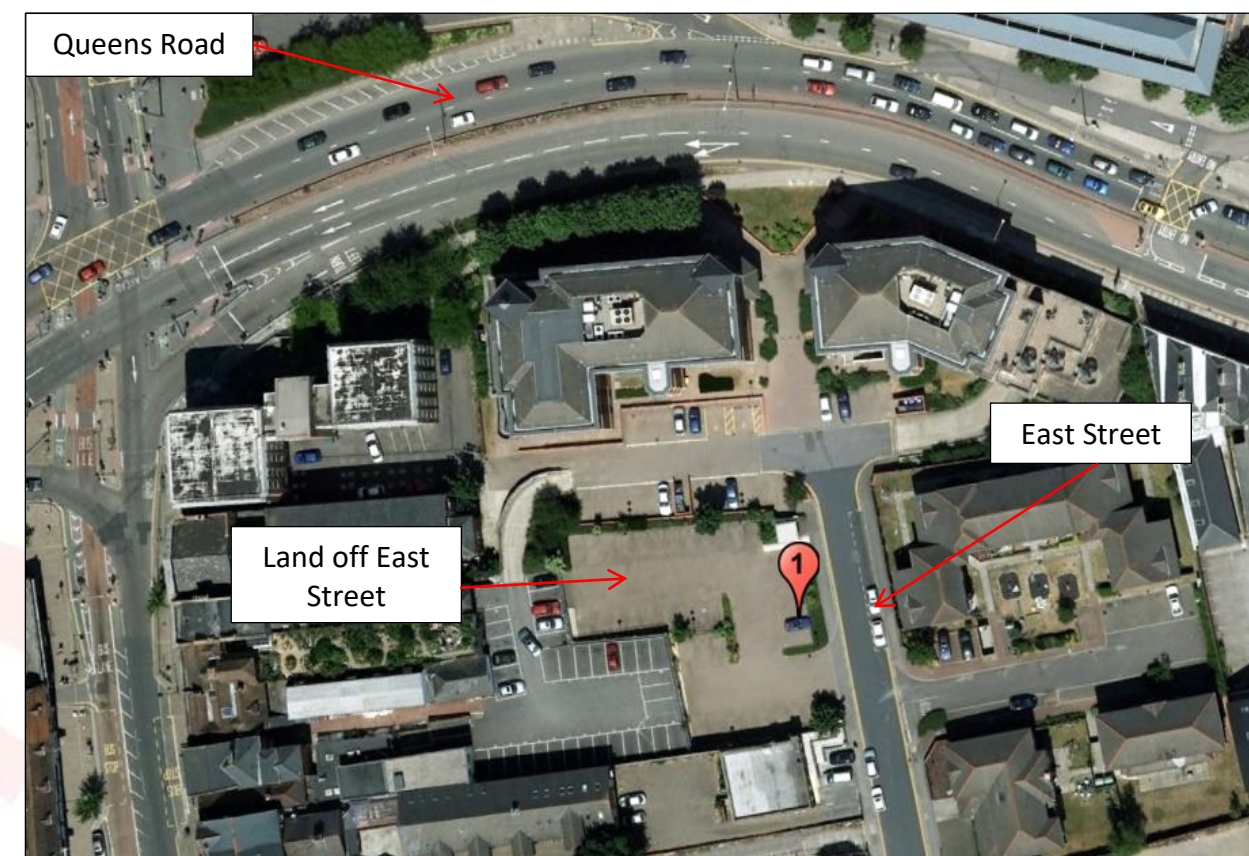


Figure 1: Proposed site location and measurement position

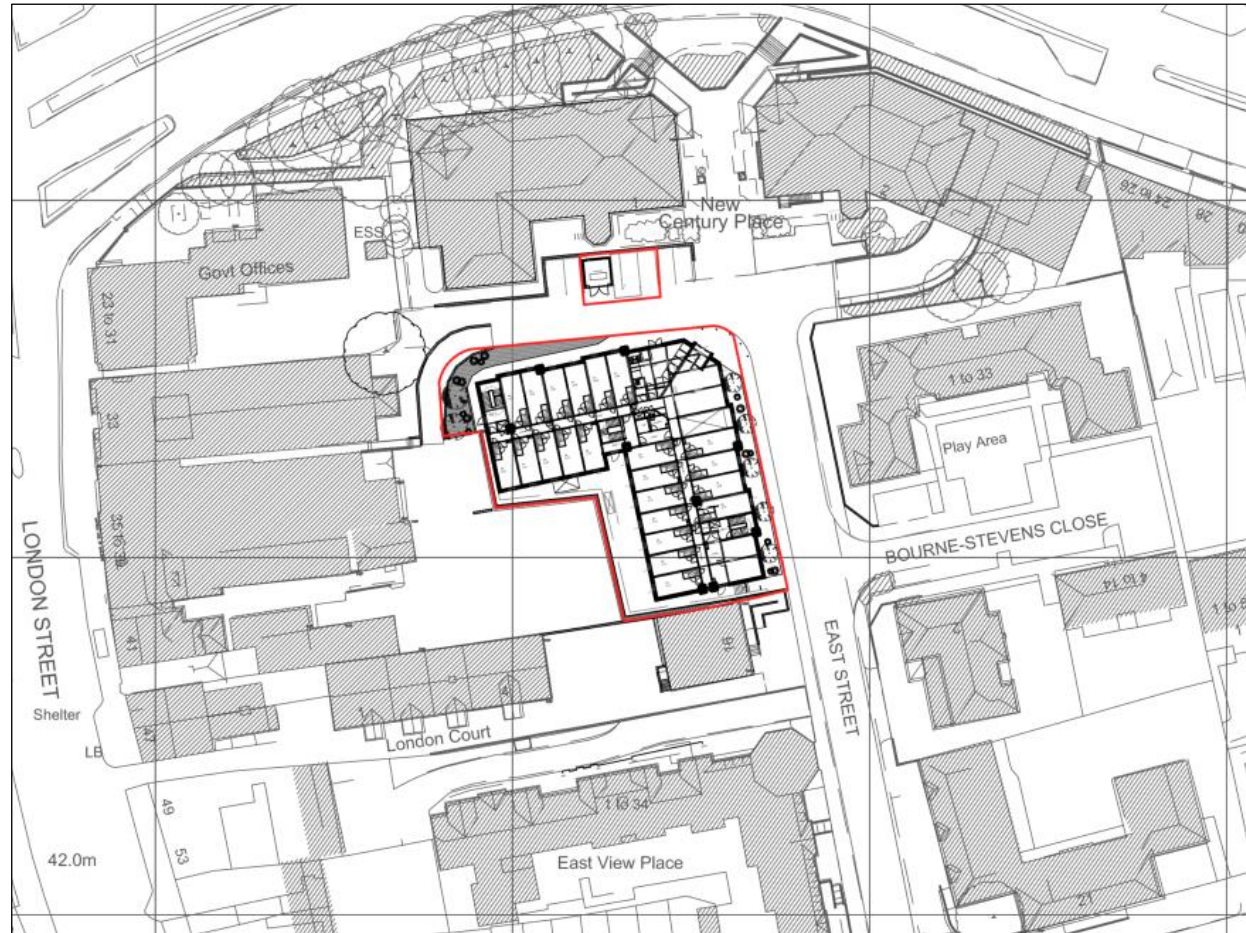


Figure 2: Proposed building location plan

5 Planning condition

Planning Condition 24 associated with Application ref. 181849 for this development is shown in Figure 3.

24. No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by the Local Planning Authority. The assessment shall be carried out in accordance with BS4141:2014 methodology. The predicted specific sound level ($L_{Aeq,TR}$) (with reference to BS:4142) as measured at a point 1 metre external to the nearest noise-sensitive facade (nearest habitable room window) shall be at least 10dB below the pre-existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation. The predicted rating level, $L_{Ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to sensitive facades shall not exceed the pre-existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation. The plant shall thereafter only be installed and operated in accordance with the assessment.

Figure 3: Planning Condition 24 from Decision Notice ref: 181849

6 Existing acoustic environment

- 6.1 The existing sound environment was measured between 16:43 hrs on 21st September and 11:16 hrs on the 22nd September 2016.
- 6.2 The microphone was located 3.5 metres above ground level and away from other reflecting surfaces, such that the measurements are considered free-field.
- 6.3 Data was recorded in octave bands at 1 second intervals throughout the measurement period.
- 6.4 During the measurements no precipitation occurred and the temperature and wind speeds measured complied with the requirements of BS 7445.
- 6.5 The measurement position is shown in Figure 1.
- 6.6 The most significant sound source was road traffic noise.
- 6.7 Other sound sources included temporary construction work.
- 6.8 The equipment used is listed in Table 1.

Equipment	Model	Serial no.
Sound Level Meter	NTi XL2	A2A-05832-E0
Calibrator	Larson Davis CAL 200	9462

Table 1: Equipment used

- 6.9 Both meter and calibrator have current calibration certificates traceable to national standards. The sound level meter has been calibrated within the last two years and calibrator has been calibrated within the last year in accordance with the guidance of BS 4142; calibration certificates are available on request.
- 6.10 The equipment was field-calibrated before and after the measurements with no significant drift in sensitivity noted.
- 6.11 The distribution of the measured daytime and night time $L_{A90,15min}$ levels are shown in Figure 4 and Figure 5 respectively.
- 6.12 Measured background $L_{A90,15 min}$ considered representative of typical daytime and night time levels are shown in Table 2.

Assessment period	Background level, $L_{A90, 15 min}$ / dB
Daytime	49
Night time	41

Table 2: Representative typical background sound levels at P1

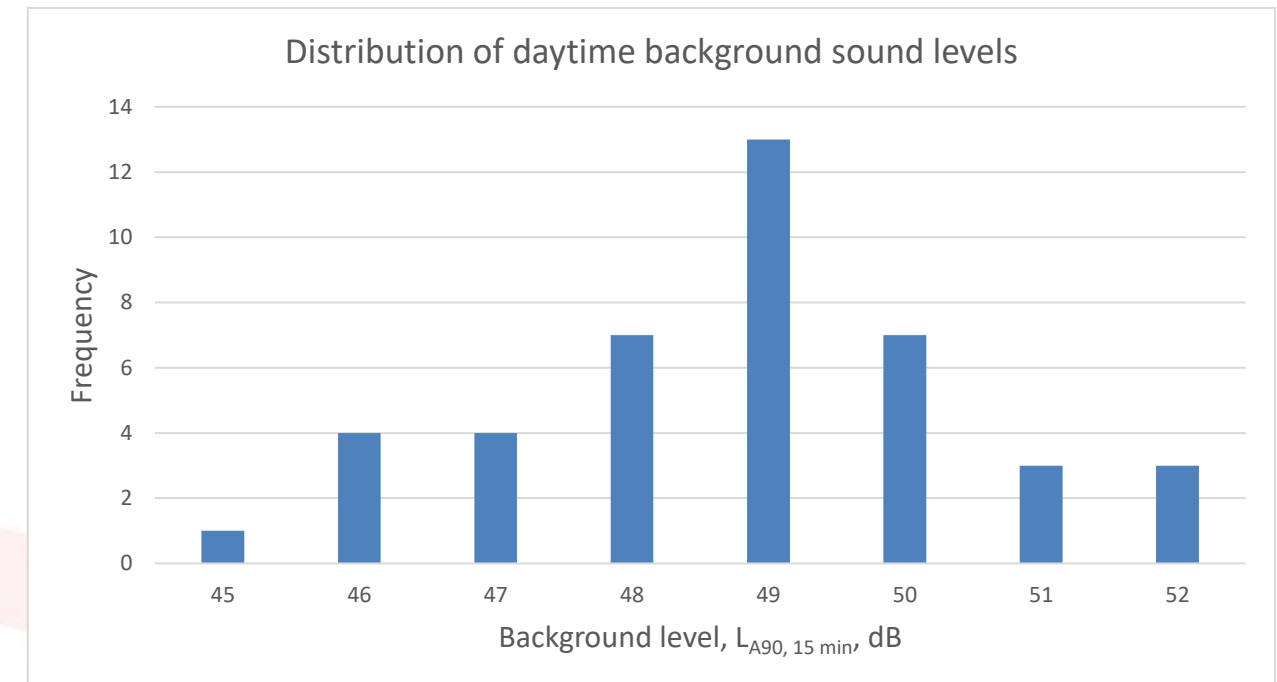


Figure 4: Daytime distribution of $L_{A90,15min}$

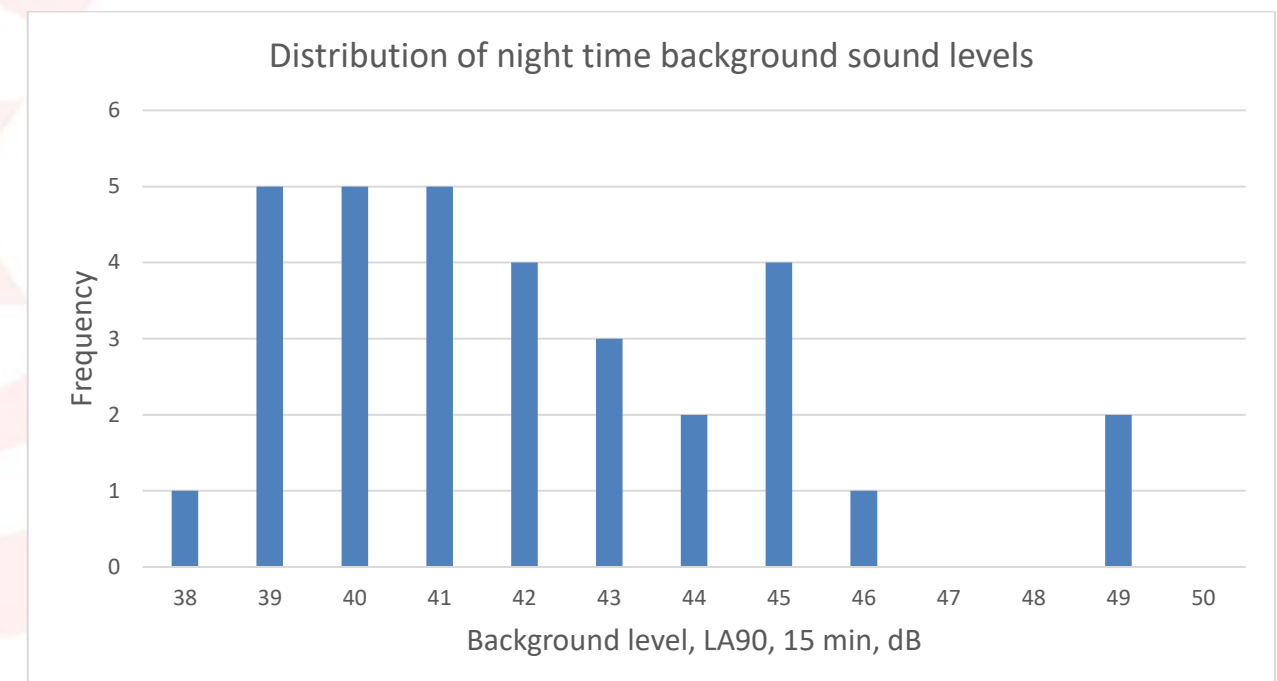


Figure 5: Night time distribution of $L_{A90,15min}$

7 Noise sources

7.1 Proposed plant and associated noise levels

7.2 The mechanical plant mainly serves the basement communal spaces, and is assessed based on plant details supplied by the mechanical engineers.

7.3 The location of the all the units have been taken from the mechanical engineers' drawings, Reference 2.

7.4 The proposed plant is understood to comprise of that summarised in Table 3, the locations of the plant are shown in Table 4: Plant locations.

Plant	Manufacturer	Model	No. proposed
Air handling unit (AHU)	Nuaire	XBC(75-85)	1
Condenser (OU)	Toshiba	RAV GP801	3
		RAV GP561	2
		RAV GP1100	1

Table 3: Proposed plant

Plant	Model	Location
AHU	XBC(75-85)	Ground floor refuse store to northern façade
OU1 (dinner party)	RAV GP801	West end of Level 4
OU2 (library)	RAV GP801	West end of Level 4
OU3 (lounge)	RAV GP1100	West end of Level 4
OU4 (cinema)	RAV GP561	South end of Level 4
OU5 (reception)	RAV GP561	West end of Level 4
OU6 (comms room)	RAV GP801	West end of Level 4

Table 4: Plant locations

7.5 Manufacturer supplied noise levels are shown in Table 5.

Plant	Data type	dB(A)	Single-octave band centre frequency (Hz)						
			Linear noise levels (dB)						
			63	125	250	500	1k	2k	4k
OU RAV GP801	L _w	65	-	-	-	-	-	-	-
OU RAV GP561	L _w	65	-	-	-	-	-	-	-
OU RAV GP1100	L _w	67	-	-	-	-	-	-	-
AHU Discharge	L _w	86	77	79	86	81	83	78	74
AHU Breakout	L _w	63	67	62	71	56	50	45	49
AHU Intake	L _w	86	74	75	86	76	72	69	66

Table 5: Manufacturers noise levels

7.6 The in-duct attenuator and louvre insertion losses proposed and used in the calculations are shown in Table 6.

Attenuator / louvre.	Single-octave band centre frequency (Hz)						
	In-duct attenuator insertion losses (dB)						
	63	125	250	500	1k	2k	4k
AHU Intake attenuator	3	6	13	22	28	28	16
AHU Discharge louvre	5	6	7	12	18	21	16

Table 6: Proposed in-duct attenuator and louvre minimum insertion loss

7.7 The following products are capable of achieving the proposed attenuated discharge louvre performance:

- [Tek Single Bank Acoustic Louvre](#)
- [Allaway Acoustics AL3015](#)

7.8 Refuse room reverberant sound pressure levels are calculated using the following equation:

$$L_{p(rev)} = L_w + 10 \log_{10} \left(\frac{4}{A} \right)$$

Where L_w is the unit sound power level (dB) and A is the room equivalent absorption area (m²).

7.9 The doors to the refuse store are understood to be standard louvres i.e. with no specific attenuating acoustic performance.

7.10 Operation times

7.11 All plant is assumed to operate continuously during the daytime 1-hour assessment period.

7.12 During the night-time, the cooling/ heating and ventilation requirements to the basement spaces are expected to be lower. Hence, it is assumed that only the dinner party, comms room and cinema outdoor condensing units will operate during the night-time 15-minute assessment period.

8 Assessment results

8.1 Noise transmission and propagation

8.2 Noise transmission and propagation is modelled to the NSR based on the noise source data detailed, using proprietary software, CadnaA, Reference 3.

8.3 This models noise propagation outdoors according to ISO 9613, Reference 4.

8.4 The model parameters and assumptions are summarised in Appendix B.

8.5 Daytime and night-time noise levels are calculated and illustrated in Figure 6 and Figure 7.

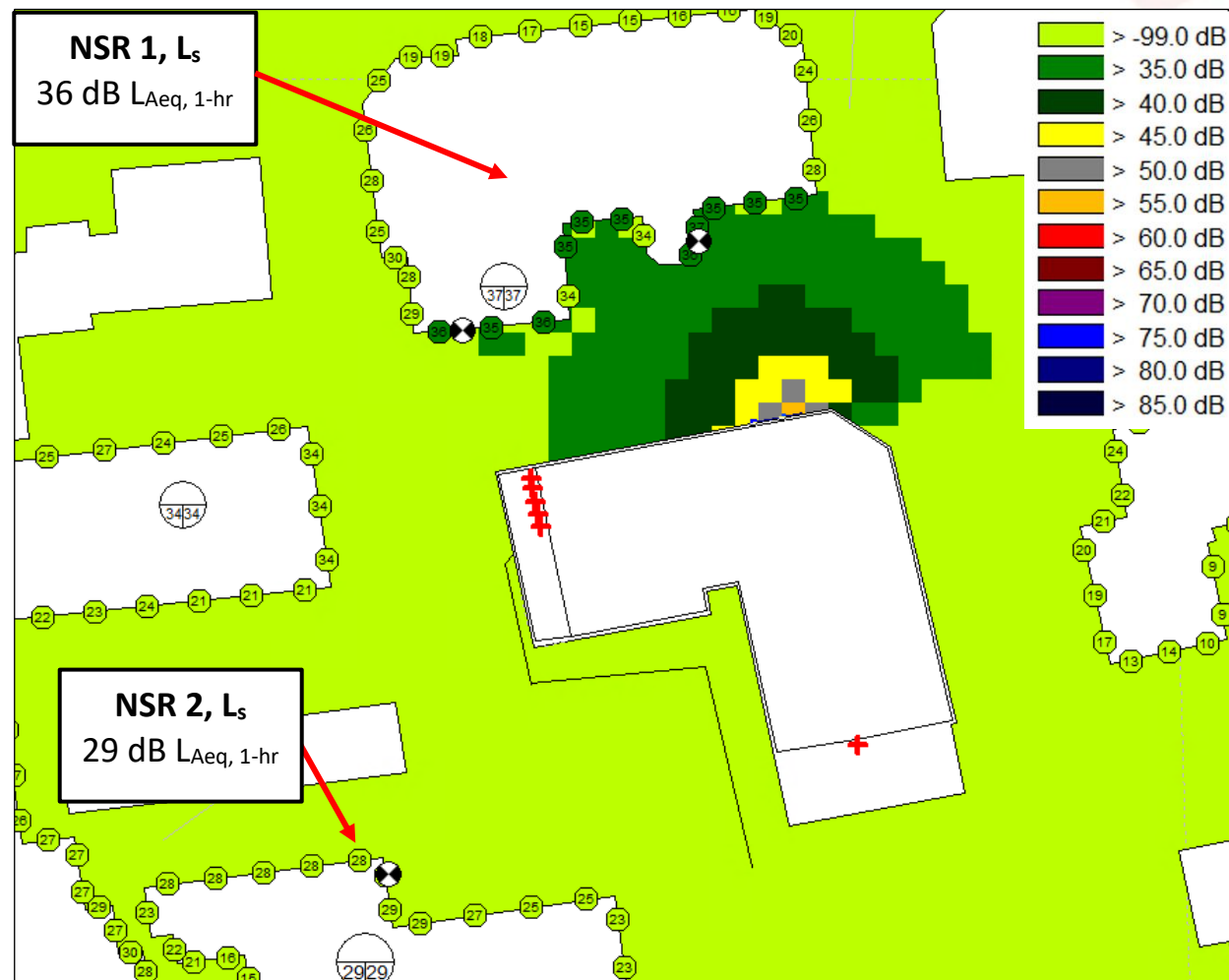


Figure 6: Daytime noise contours at a height of 4 m

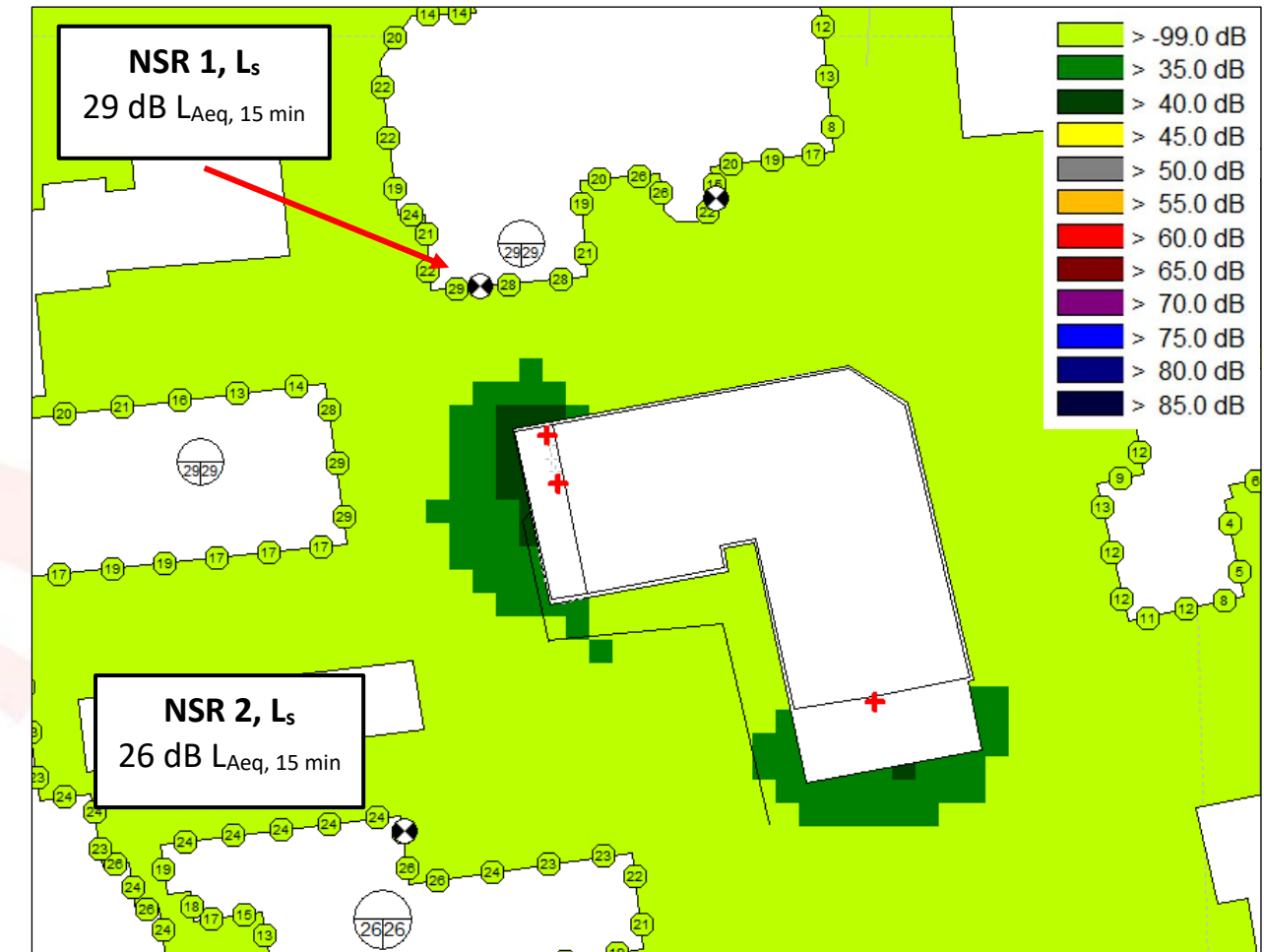


Figure 7: Night-time noise contours at a height of 13 m

8.6 An assessment of the plant noise impact following the guidance of BS 4142 is shown in Table 7.

Parameter	Daytime assessment	Night-time assessment	Relevant clause of BS 4142	Commentary
Background sound level	49 dB $L_{A90, 15\text{-min}}$	41 dB $L_{A90, 15\text{-min}}$	8.1.2 8.1.4	Considered representative of the assessment period based on statistical analysis detailed in Section 6.
Specific sound level L_s , due to all sources for the required assessment interval	37 dB $L_{Aeq, 1\text{-hr}}$	29 dB $L_{Aeq, 15\text{-min}}$	7.3.6 7.3.7	The calculated L_s contours across the site due to all sources during the assessment period are shown in Figure 6 and Figure 7; the L_s assessed is the highest calculated level at NSR 1. L_s is considered as separate component parts and then the total L_s for the assessment reference interval is calculated
Acoustic feature correction	0 dB	0 dB	9.2	A subjective assessment to determine acoustic features is undertaken; as the planning condition requirements are for the plant noise levels to be ≥ 10 dB below the background noise levels, the following penalties are considered applicable: • Tonality – 0 dB; • Impulsivity – 0 dB; • Intermittency – 0 dB; • Other – 0 dB;
Rating level, $L_{A,Tr}$	37 dB	29 dB		
Uncertainty of assessment			10	The background data was obtained over a 24-hr period, accounting for the changing acoustic environment. Uncertainty in the calculated impact has been reduced by the use of a calculation method in accordance with ISO 9613-2. The excess of the background sound level over the $L_{A,Tr}$ is large and hence the risk of adverse impact on nearby residents due to uncertainty is reduced.
Excess of $L_{A,Tr}$ over background sound level	-12 dB	-12 dB	11	The assessment results indicate the likelihood of a low impact.

Table 7: BS 4142 assessment results, based on current proposals

9 Conclusion

- 9.1 Based on the current development proposals it is calculated that the requirements of the Planning Condition are met.
- 9.2 Noise control measures are proposed to minimise the potential for adverse impacts and satisfy the aims of the Planning Condition.
- 9.3 Considering the context of the existing acoustic environment the assessment result indicates the likelihood of a low impact, on the basis of implementing the proposed noise control measures. This impact is considered to be a LOAEL / SOAEL in alignment with the NPPF and NPSE aims.

10 References

- 1 BS 4142 2014: A1+2019, Method for rating and assessing industrial and commercial sound.
- 2 Mechanical engineers drawings: Mechanical Services Ventilation Services Layout – Level 04 2397-CDCE-04-RD-M-57-0001, Clark Degana Consulting Engineers
- 3 CadnaA environmental noise modelling software, version 2017, Datakustik GmbH.
- 4 ISO 9613: Acoustics - Attenuation of sound during propagation outdoors.
- 5 Architects drawings: 18053 001 Location Plan, 18053 050 B Proposed Level 0 Floor Plan, 16033 3011 Q Proposed Level 1 Floor Plan, 16033 3012 K Proposed Level 2 Floor Plan, 16033 3013 P Proposed Level 3 Floor Plan, 18053 4020 B Proposed Elevations, 18053 4021 B Proposed Elevations, 18053 4022 B Proposed Elevations, GDL Architecture.

Appendix A Noise exposure hierarchy

Planning Practice Guidance - Noise				Significant adverse effect Adverse effect Low Impact An initial estimate of the impact of the specific sound may be obtained by subtracting the measured background sound level from the rating level. Typically, the greater this difference, the greater the magnitude of impact + 10 dB + 5 dB 0 dB
Noise	Example of outcomes	Increasing effect level	Action	
Present and very distributive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent	
Present and distributive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid	
Significant Observed Adverse Effect Level (SOAEL)				
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum	
Lowest Observed Adverse Effect Level (LOAEL)				
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required	
No Observed Adverse Effect Level (NOAEL)				
Not present	No effect	No Observed Effect	No specific measures required	
No Observed Effect Level (NOEL)				

Table 8: PPG-N Noise Exposure Hierarchy and BS 4142 initial estimate of impact

Appendix B Noise transmission and propagation

B.1 Noise transmission and propagation is modelled using proprietary software, CadnaA. This models noise propagation outdoors according to ISO 9613. The parameters used, source of data and details are described in Table 9.

Parameter	Source	Details
Model dimensions	Google Earth	British Transverse Mercator coordinates
Site location and layout	Architects' drawings	Architects' drawings, Reference 5
Topography – within site	Site observations and Google Street view	Modelled with no changes in topography
Topography – Outside of site	Site observations and Google Street view	Modelled with no changes in topography
Building heights – proposed buildings	Drawings	Architects' drawings
Building heights – outside of site	Site observations and Google Street view	3 m per storey + 3 m roof (residential properties)
Receptor positions	Site observations and Google Street view	On the NSR façade closest to the source at a height representative of the greatest impact
Building and barrier absorption coefficient	ISO 9613-2	0.21 to represent a reflection loss of 1 dB
G, Ground factor	ISO 9613-2	Hard ground, G = 0; Porous ground, G = 1 (locally on model)
Max. order of reflections	Apex Acoustics	Three

Table 9: Modelling parameters and assumptions

- C.2 This can be verified by searching the Institute of Acoustics' list of Members, available here, with the surname of the consultant.
<http://www.ioa.org.uk/membership-check>
- C.3 Apex Acoustics is a member of the Association of Noise Consultants (ANC). The ANC is a trade organisation which seeks to raise the standards of acoustic consultancy and as such there are barriers to entry to ensure member's competency.
- C.4 This report has been completed by an appropriately qualified and experienced acoustic consultant.

Appendix C Professional qualifications and competence

C.1 All Apex Acoustics consultants work under the close supervision of a member who holds qualification in acoustics and is a member of the IOA.