Acoustic Associates
PETERBOROUGH

Proposed Residential Development on Land at 58 Bridge Road, Long Sutton

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1 OBJECTIVES

1.1 To carry out a *noise assessment of a proposed residential development on land at 58 Bridge Road, Long Sutton, in accordance with the National Policy Planning Framework (NPPF – Reference 1) , the Noise Policy Statement for England (NPSE – Reference 2) , the National Policy Planning Guidance (NPPG – Reference 3) and following guidance in Planning & Noise: Professional Practice Guidance on Planning & Noise: New Residential Development (ProPG – Reference 4).

1.2 To recommend solutions to any problems identified by the assessment.

2 CONCLUSIONS

2.1 The ProPG initial site noise risk assessment for the site is classified as *"low risk"* for most of the site area of the development site (measurement location A) and "*low-to-medium risk*" at the north of the site (location of Plots 1 & 2). With the principles of 'good acoustic design' adopted, the residents within the dwellings and in amenity areas will be adequately protected from both road traffic and commercial/industrial noise.

2.2 Provided noise mitigation measures that fall within the principles of 'good acoustic design', as listed in section 3 are implemented, the overall impact on future residents is assessed as being no worse than "*Lowest Observed Adverse Effect Level*", using terminology from the National Planning Policy Guidance. This is considered acceptable.

3 RECOMMENDATIONS

3.1 This report should be used in support of the outline Planning Application for the Proposed Residential Development on Bridge Road, Long Sutton.

3.2 "Good acoustic design' principles should be adopted when designing the dwellings, i.e.

- Gardens should be shielded from traffic and industrial / commercial sources by dwellings (this has already been adopted in the proposed layout).
- Gardens should be surrounded by 1.8 m high close-boarded timber fences.
- Double glazing fitted with compression seals should be built into all bedrooms and living rooms. A glazing specification is given below which would achieve satisfactory internal noise levels. The windows should achieve a minimum sound reduction index or 33 dB Rw.

*** see Appendix 1 for a Glossary of Terms**

- The noise level in bedrooms and living rooms behind the most exposed façades, i.e. northern, eastern and western façade of Plots 1 & 2 and eastern façade of Plots 3 & 4, will be excessive with natural ventilation provided by the opening of windows. Alternative means of ventilation, e.g. systems 3 or 4 in accordance with The Approved Document F (ADF) (Reference 11), should be used in those rooms in order to achieve acceptable indoor noise levels without the need for opening windows.
- The residential buildings must comply with the 2022 Approved Document O (Reference 12), "Overheating". A Level 1 assessment in accordance with the Acoustics, Ventilation & Overheating Guidance (Reference 7) shows that opening windows as a means of naturally controlling overheating is acceptable for most areas, apart from the northernmost façades (Plots 1 & 2). A Level 2 assessment and alternative means of ventilation should be considered when designing these dwellings.
- If rooms are mechanically ventilated then the system chosen must comply with the Approved Document F (Reference 5). Alternatively, a 'whole house' ventilation system could be used.
- The full planning application for the proposed site should be accompanied by an Acoustic Design Statement that demonstrates how the adverse impacts of noise will be mitigated and minimised in the finished development.

3.3 The opening hours of the industrial rental units should be restricted to:

7am-7pm Monday to Friday;

7am-1pm Saturday.

3.4 Any fixed plant for the rented units should be positioned on the eastern façade of the building, shielded from the residential site. The noise emissions from any fixed plant should be restricted to a cumulative sound power level of 85 dB(A). If units exceeding that level are to be used or multiple pieces of fixed plan per unit are planned, then further mitigation should be investigated, e.g. strategic placement, enclosures, etc.

3.5 The cavity brick walls of the industrial building should be acoustically upgraded by adding steel cladding to the outside with a minimum layer of 50 mm mineral wool between the cladding and brickwork.

4 BACKGROUND

A residential development is proposed on land adjacent to 58 Bridge Road in Long Sutton. The proposal comprises of 7 detached houses and 2 semi-detached dwellings. The site is located on an existing Tears Recovery Vehicle yard. Acoustic Associates (Peterborough) were asked to undertake a noise assessment of the proposed development and this report document the results of that assessment.

Colin Parker Masonry have planning permission for the conversion of the industrial yard. The westernmost buildings will be demolished and the remaining workshop building will be divided into 9 separate units for rental. The units will be rented for light industrial manufacturing and possibly storage. No hour restrictions are set down in the planning approval, however, Colin Parker Masonry (CPM) consider restricting opening hours to 7am-7pm weekdays and 7am-1pm on Saturday to be reasonable. Any heavy traffic on the converted industrial site will be restricted to the middle yard, i.e. shielded from the proposed residential site by the workshop building. Up to around 6 van or HGV movements are predicted per day. The main carpark for the units will be to the Northern end of the Existing Building, with space for 8 cars along west side of the proposed new estate road. Any fixed plant for the rented units would be positioned along the eastern wall, shielded from the residential site.

The residential site is bounded by Bridge Road to the north, an existing residential area to the west with the Bridge Road Industrial Estate further west and the industrial premises directly adjacent to the east, as described above. There is also a petrol station with a car wash positioned on the other side of Bridge Road, approximately 30m north of the proposed site.

The residential area adjacent to the west of the proposed site has received planning approval in 2017. The application was supported by a noise assessment report prepared by Spectrum Acoustic Consultants (Reference 8). The findings of that report are used to supplement this noise assessment.

The location of the site is shown in Figure 1 and a sketch plan view of the proposed development in shown in Figure 2.

Figure 1 – Location map

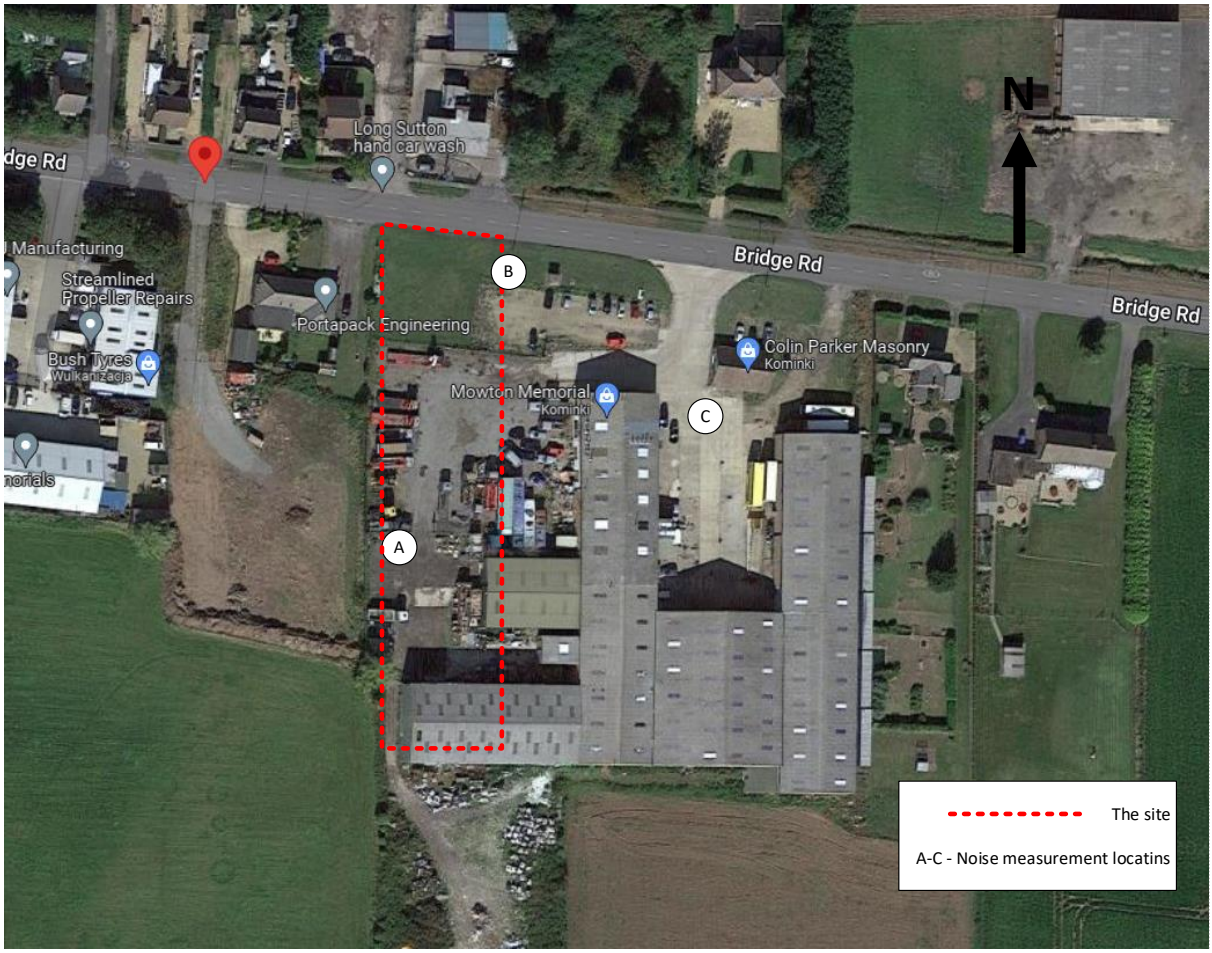
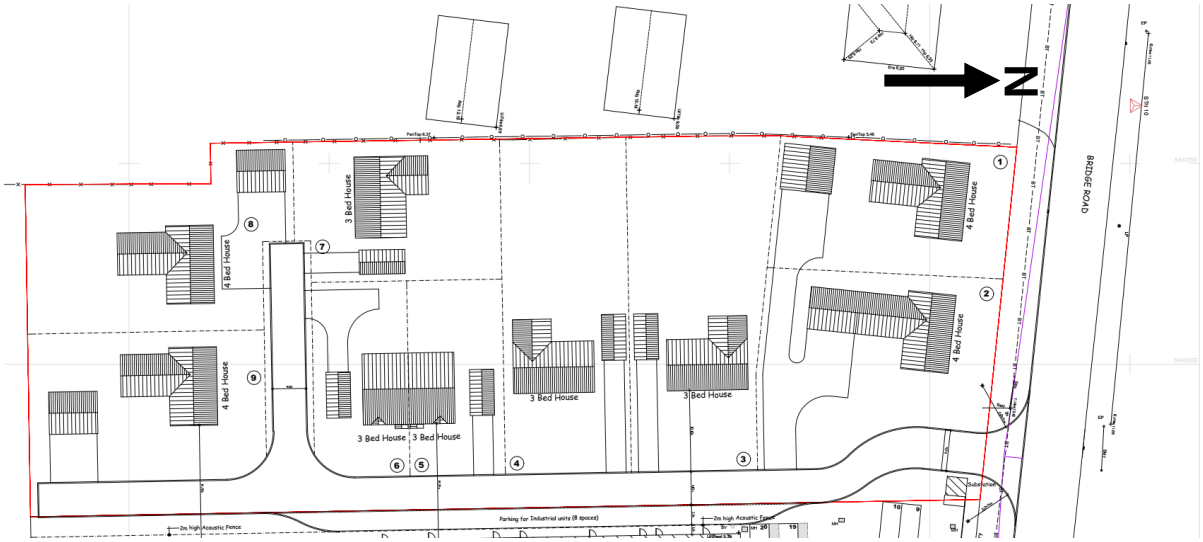


Figure 2 – Proposed dwelling layout



5 POLICY, GUIDANCE AND STANDARDS

5.1 National Planning Policy Framework (NPPF – Reference 1)

5.1.1 The NPPF states that planning policies and decisions should prevent

> [1] *"….new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of …. noise pollution"*

5.1.2 It states further:-

> [2]*"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> > *a) mitigate and reduce to a minimum potential [3]adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
> >
> > *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;……*

5.2 Noise Policy Statement for England (NPSE – Reference 2) and National Planning Policy Guidance (NPPG – Reference 3)

The NPSE has stated that the impact of noise be classified according to an "effect level" (shown in column 3 below). The NPPG has clarified what this effect level below means in terms of its perception by people at receptors and what action should be taken (columns 1 and 4 in Table 1 below).

[1] Para 174 – item e)
[2] Para 185
[3] It refers to the Noise Policy Statement for England in order to explain what it means by "adverse impact" (see section 5.2).

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 – NPPG noise exposure hierarchy

5.3 Professional Practice Guidance on Planning & Noise: New Residential Development (ProPG - Reference 4)

This document was produced by noise professionals to offer them guidance on noise management within the planning system in England. It recommends a 2-stage approach to managing for noise:

5.3.1 ProPG: Stage 1 – Initial Site Noise Risk Assessment

5.3.1.1 The aim of this stage is to provide an indication of the likely risk of adverse effects due to noise from developing a site. Using measurement and/or prediction, indicative future noise levels on a site are estimated.

5.3.1.2 The following excerpt shows the potential effect associated with likely site noise levels for daytime and night-time.

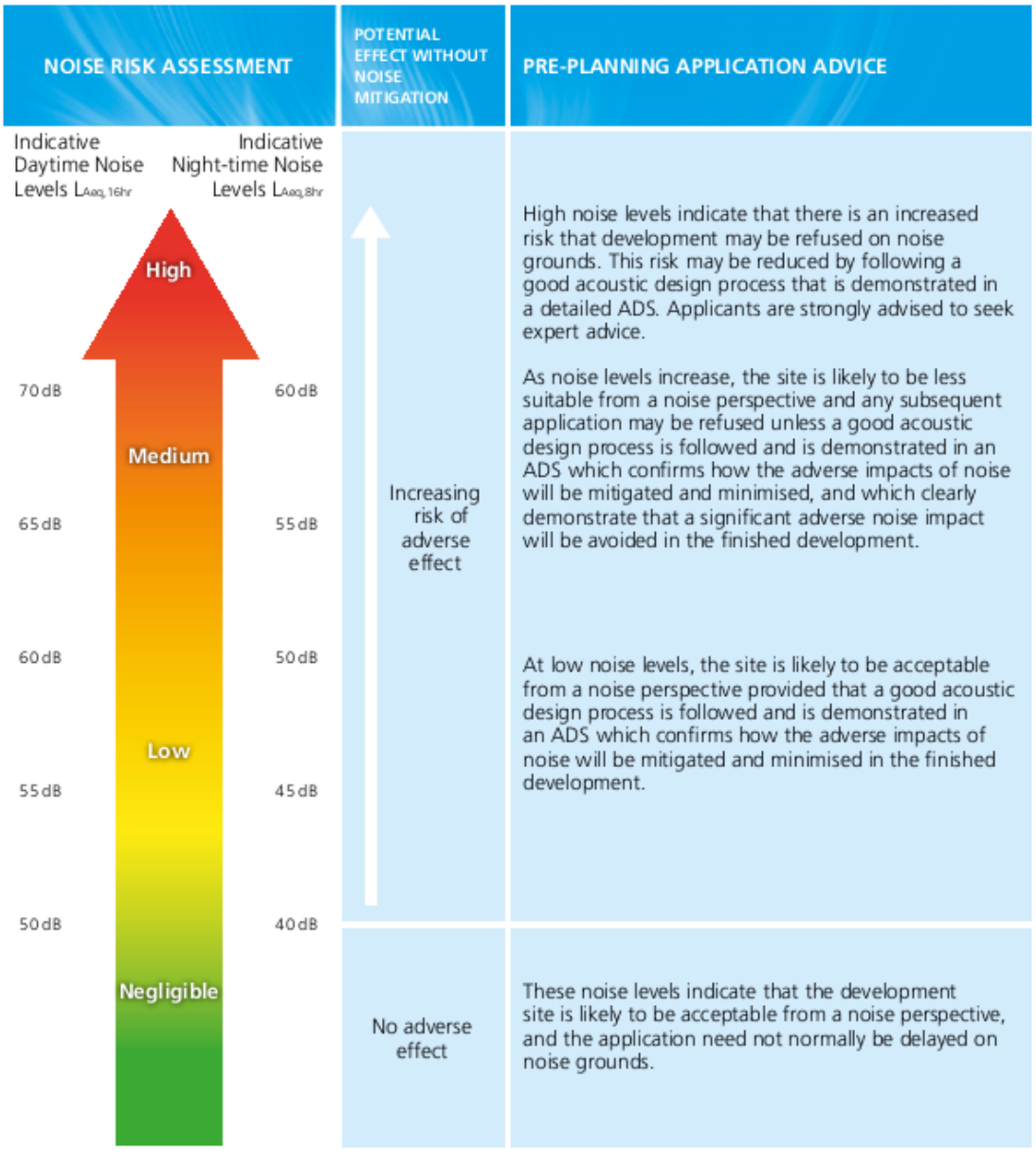


Figure 1. Stage 1– Initial Site Noise Risk Assessment

5.3.1.3 It must be noted that the initial assessment of noise risk is not the basis for the eventual recommendation of approval. Its aim is to give an early assessment of site suitability for residential development and the extent of the acoustic issues to be faced. The higher the risk the more important it is that good acoustic design is followed for the development.

5.3.2 ProPG: Stage 2 – Full Assessment

There are 4 stages to a full assessment and these are briefly described below.

5.3.2.1 Element 1 - Good Acoustic Design Process

Provide an integrated solution whereby development avoids “unreasonable” and prevents “unacceptable” acoustic conditions. In particular the following should be considered: -

- Check the feasibility of relocating or reducing noise levels from relevant sources.
- Consider options for planning the site or building layout.
- Consider the orientation of proposed building(s).
- Select construction types and methods for meeting building performance requirements.
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.
- Assess the viability of alternative solutions.
- Assess external amenity area noise.

5.3.2.2 Element 2 – Internal noise level Guidelines

Seek to achieve recommended noise levels inside noise sensitive rooms in new residential development. The following excerpt from the document shows the recommended internal noise levels that should ideally be achieved.

Activity	Location	Noise criteria	
		07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,F}$

Table 2 – ProPG Internal Noise Level Guidelines

Note 1: Figure 2 - Note 4 in ProPG states that in most circumstances the maximum noise level $L_{Amax,F}$ should not exceed 10 times per night.

Note 2: Section 2.3.3 of ProPG states the following with respect to the reduction of noise due to the building envelope *“the acoustic performance of the building envelope will be reduced in the event windows are opened for ventilation or cooling purposes, typically reducing the insulation to no more than 10 to 15 dB(A)”.*

Note 7: *Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has*

been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form

5.3.2.3 Element 3 – External Amenity Area Noise Assessment

The acoustic environment of external amenity areas that are an intrinsic part of the overall design assessment should always be assessed and noise levels should ideally not be above the range 50-55 dB $L_{Aeq,16hours}$. However the following follow-up advice should be noted

"In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

5.3.2.4 Element 4 – Assessment of Other Relevant Issues

At this stage the following should be addressed:

- compliance with relevant national and local policy
- magnitude and extent of compliance with ProPG
- likely occupants of the development
- acoustic design v unintended adverse consequences
- acoustic design v wider planning objectives

5.4 British Standard BS 4142:2014 (Reference 6)

5.4.1 BS 4142 is a standard which describes a method for assessing whether the 'specific noise' from an industrial source is likely to give rise to complaints from residents of the adjacent dwellings. The 'specific noise' levels are determined outside dwellings. The specific noise level is determined for reference time periods of 1-hour for the daytime (7am to 11pm) and 15 minutes for the night time. Tonal or impulsive characteristics of a noise are likely to increase the scope for complaints and this is taken into account by adding a value to the specific noise source level to obtain the 'rating level'. The value may be between 0 and 15 dB depending on objective and

subjective measures detailed in the standard. The following table detail the values added for the subjective method.

Characteristics of noise	Noise at receptor	Value to add to specific noise level for rating level
Noise has tonal characteristics	Just perceptible	+2 dB
	Clearly perceptible	+4 dB
	Highly perceptible	+6 dB
Noise has impulsive characteristics	Just perceptible	+3 dB
	Clearly perceptible	+6 dB
	Highly perceptible	+9 dB
Other - characteristics that are neither tonal nor impulsive but are readily distinctive against the residual acoustic environment,	-	+ 3 dB
Intermittency	If intermittency is readily distinctive in the residual acoustic environment	+3 dB

Table 3 – BS 4142 – Corrections to noise to calculate rating level – subjective method

5.4.2 BS 4142 requires that the rating level of a noise is compared with the existing background noise ($L_{A90,T}$). Guidance given in the standard states the following regarding the difference between the rating Level and the background noise.

- A difference of 0 dB is indicative of a *"minor impact*";
- A difference of +5 dB is indicative of an *"adverse impact";*
- A difference of +10 dB is indicative of a *"significant adverse impact" .*

5.5 Acoustics Ventilation and Overheating: Residential Design Guide (AVOG -Reference 7)

Acoustics design considerations for dwellings may impact on the ventilation and thermal comfort of the inhabitants e.g., closing windows to prevent noise ingress may mean that alternative means are needed to provide fresh air to inhabitants and to prevent overheating. The AVOG design guide details good practice to achieve satisfactory thermal and acoustic comfort for residents. It currently addresses noise from transport sources.

In summary an assessment for a dwelling will consist of the following:

- Based on the estimates of noise levels at the façades, advise on glazing specifications to achieve suitable internal noise levels;
- Advise the design team on the options for a ventilation strategy team (System 1,2,3 or 4 from Document F of the Building Regulations);
- Assess the effects of the ventilation strategy chosen and advise accordingly to prevent noise ingress. This advice could be on measures allowing natural (windows vents or open windows) or other methods such as mechanical ventilation;
- Assess the risk of overheating based on input from thermal modelling in a 2 stage assessment. Stage 1 determines whether open windows will suffice to mitigate against overheating. If so, there is no further assessment required for overheating as open windows will suffice;
- If a Stage 2 assessment is required, then, with input from the design team, advise on measures to achieve acceptable noise levels while preventing overheating. These could be measures to allow natural input (e.g., plenum windows) or physical measures such as cooling fans. If the latter, then noise emissions must be limited to avoid disturbance.

6 NOISE ASSESSMENT

6.1 Noise measurements

Noise monitoring equipment was set up on the site at location A (See Figure 1). Noise was continuously monitored throughout the period from 09:46 hours on Thursday 4th August 2022 to 12:06 hours on Tuesday 9th August 2022. The noise monitoring location was in free-field conditions at a height of 1.5 metres above ground level. Noise measurements were carried out in 1-minute and 5-minute intervals simultaneously. Appendix 2 gives details of the noise instrumentation.

Additionally, attended noise monitoring was carried out at Location B, around 8 m from Bridge Road and at Location C, on the yard between industrial buildings. Location B was chosen to measure noise from road traffic as well as specific noise from the car wash. Location C was chosen to measure the noise level associated with activities at the Tears Recovery, Colin Parker Masonry and Portapack sites.

6.2 Computer noise model of the site and surrounding area

A computer model of the site and surrounding area was created using iNoise 2022.1 software (Reference 9), which complies with ISO9613-2 outdoor noise propagation methodologies (Reference 10). to calculate noise levels given a topographical model of the site. The model was calibrated with the noise measurements taken on site as well as from Acoustic Associates noise database. The model includes existing sources such as Bridge Road traffic, the car wash station and vehicle traffic at Tears Recovery. The model also includes future sources associated with the 9 rented units. The computer model also includes the following noise sources:

A. Bridge Road traffic – line source, sound power level per unit length (L_w') = 79 dB(A)/m day, 74 dB(A)/m night.

B. Miscellaneous existing sources on Tears Recovery / CPM / Portapack yard (HGV, van & bus traffic) – line source, sound power level per unit length (L_w') = 87 dB(A)/m daytime only

C. Future HGV movements – moving point source, sound power level of 106 dB L_{wA}, 1 movement per hour, 20 mph speed. No movements at night.

D. Future van movements – moving point source, sound power level of 89 dB L_{wA}, 2 movement per hour, 20 mph speed. No movements at night.

E. Northern car park - moving point source, sound power level of 89 dB L_{wA}, 18 movements per hour, 20 mph speed. No movements at night.

F. Eastern 8 car parking area - moving point source, sound power level of 80 dB L_{wA}, 8 movements per hour, 20 mph speed. No movements at night.

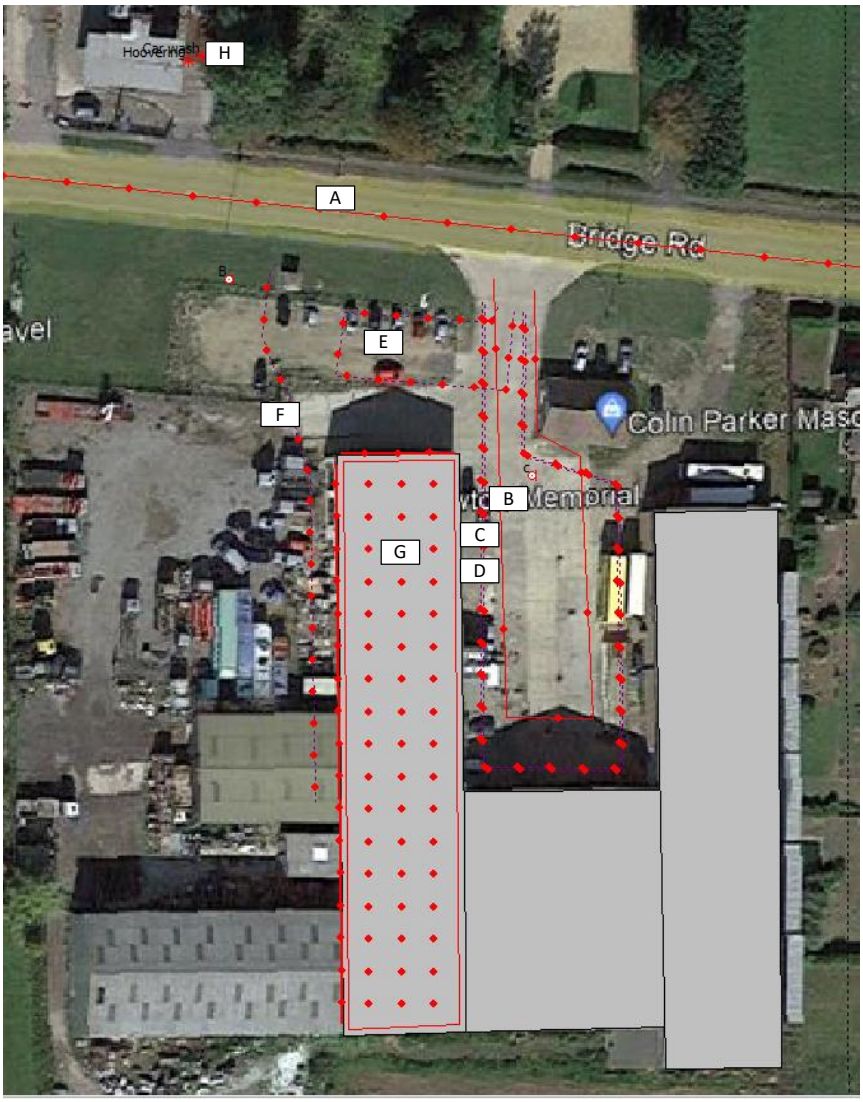
G. Industrial building façades (walls and roof) – area sources. Indoor noise level LpA = 70 dB, sound reduction index of façade Rw = 25 dB, sound power level per unit area of area source (LwA"): 39 dB(A)/m^2.

H. Car washing station – two point sources:

- pressure washer: L_{wA} = 91 dB, time corrected for 15% on-time usage within opening times (-8.2 dB);
- hoover: L_{wA} = 91 dB, time corrected for 5% on-time usage within opening times (-13.0 dB);

The location of the sources marked A-H are visible in the computer model view:

Figure 3 – Computer model view with marked noise source locations



7 RESULTS

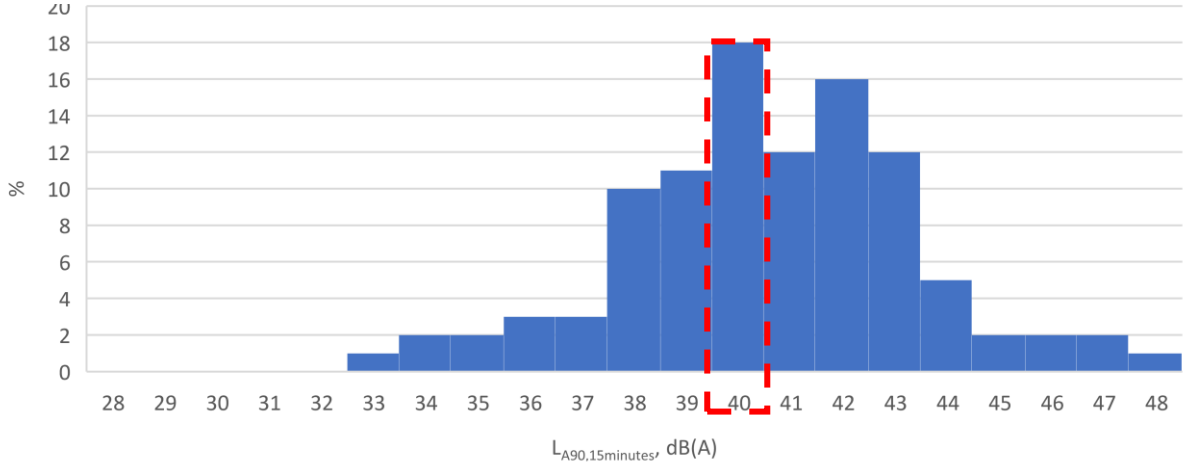
7.1 Measured noise levels

The results from the ambient noise monitoring are shown in Appendix 3 in graphical form. The graphs show the 'energy average' noise level ($L_{Aeq,T}$), maximum sound pressure level ($L_{Amax,T}$) and average background noise level ($L_{A90,T}$). From this data the 16-hour daytime and 8-hour night time data summaries are shown in **Błąd! Nie można odnaleźć źródła odwołania.**. The Table also shows the median background noise level ($L_{A90,15\ minutes}$) determined for the recommended opening hours of the industrial units (7am-7pm weekdays, 7am-1pm Saturday). The modal background noise level was derived from the histogram shown in Figure 4.

Ambient noise level $L_{Aeq,T}$, dB(A)		**Modal background noise level during industrial units opening hours $L_{A90,15minutes}$, dB(A)**
16 hours DAY	**8 hours NIGHT**	**DAY**
46.9	42.2	40

Table 4 – Noise monitoring at Location 1 results summary

Figure 4 – $L_{A90,15\ minute}$ histogram



The background noise measurements included existing noise of an industrial nature from the yard. It is however considered, that the existing industrial noise has transient and intermittent characteristics and therefore this noise is mostly dismissed in the statistical L_{A90} measurements. The results were compared with the Spectrum Acoustics Consultants measurements from 2017 at the directly adjacent land (Reference 8). The background levels measured by SAC were in

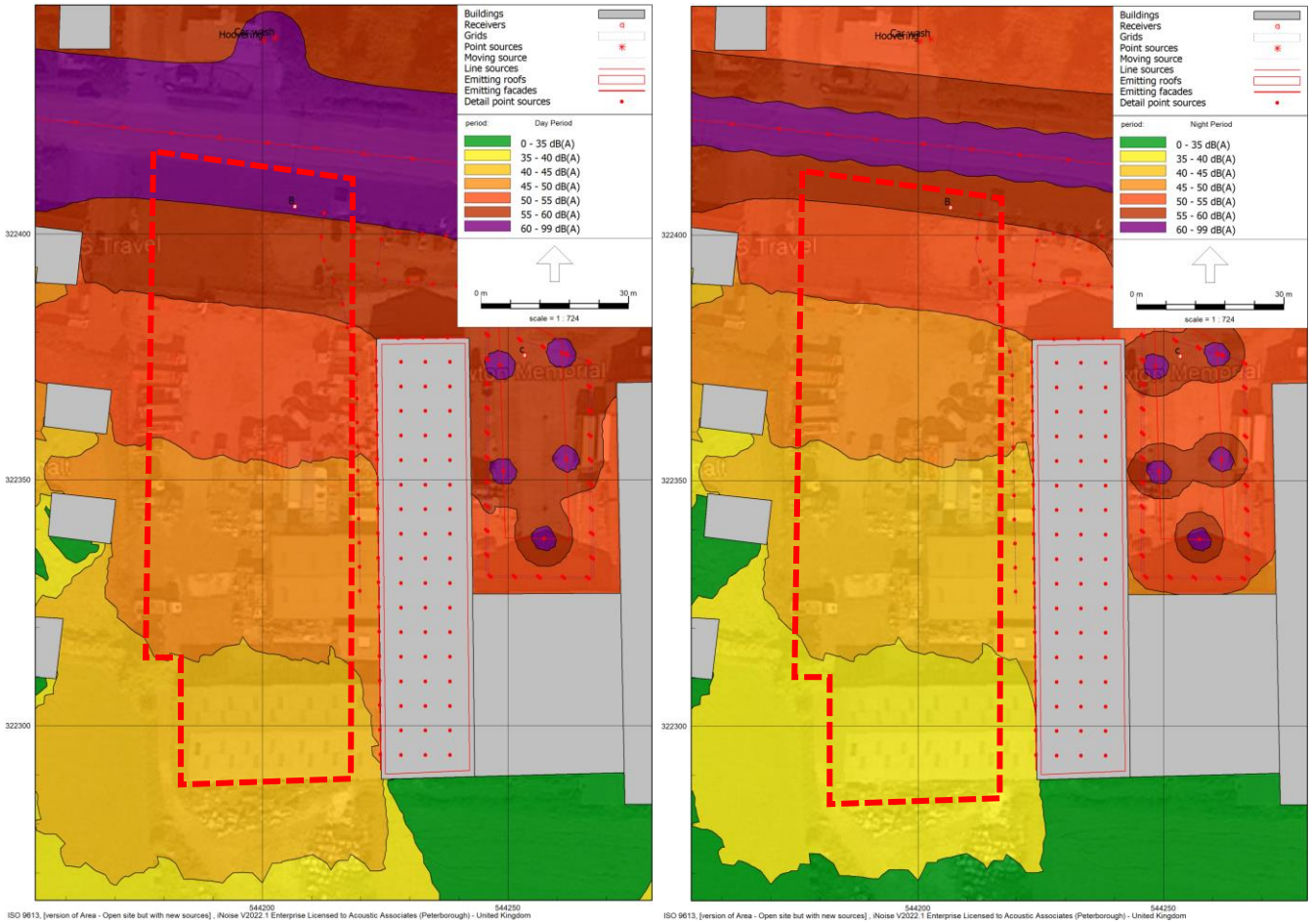
the range of 43-45 dB(A) during equivalent hours, i.e. higher than measured at Location A. It is therefore considered that the assumed background noise level is robust.

7.2 Predicted noise levels

Figure 5 shows noise contours across the open site for the daytime and night-time periods, respectively. It can be seen that the noise level ranges from 40-45 dB(A) at the south of the site to >60 dB(A) at the north during daytime and from 35-40 dB(A) at the south to 55-60 dB(A) at the north during night-time. The noise levels are mainly affected by road traffic on Bridge Road.

Figure 5 – Noise contours across the open site

Daytime Night-time

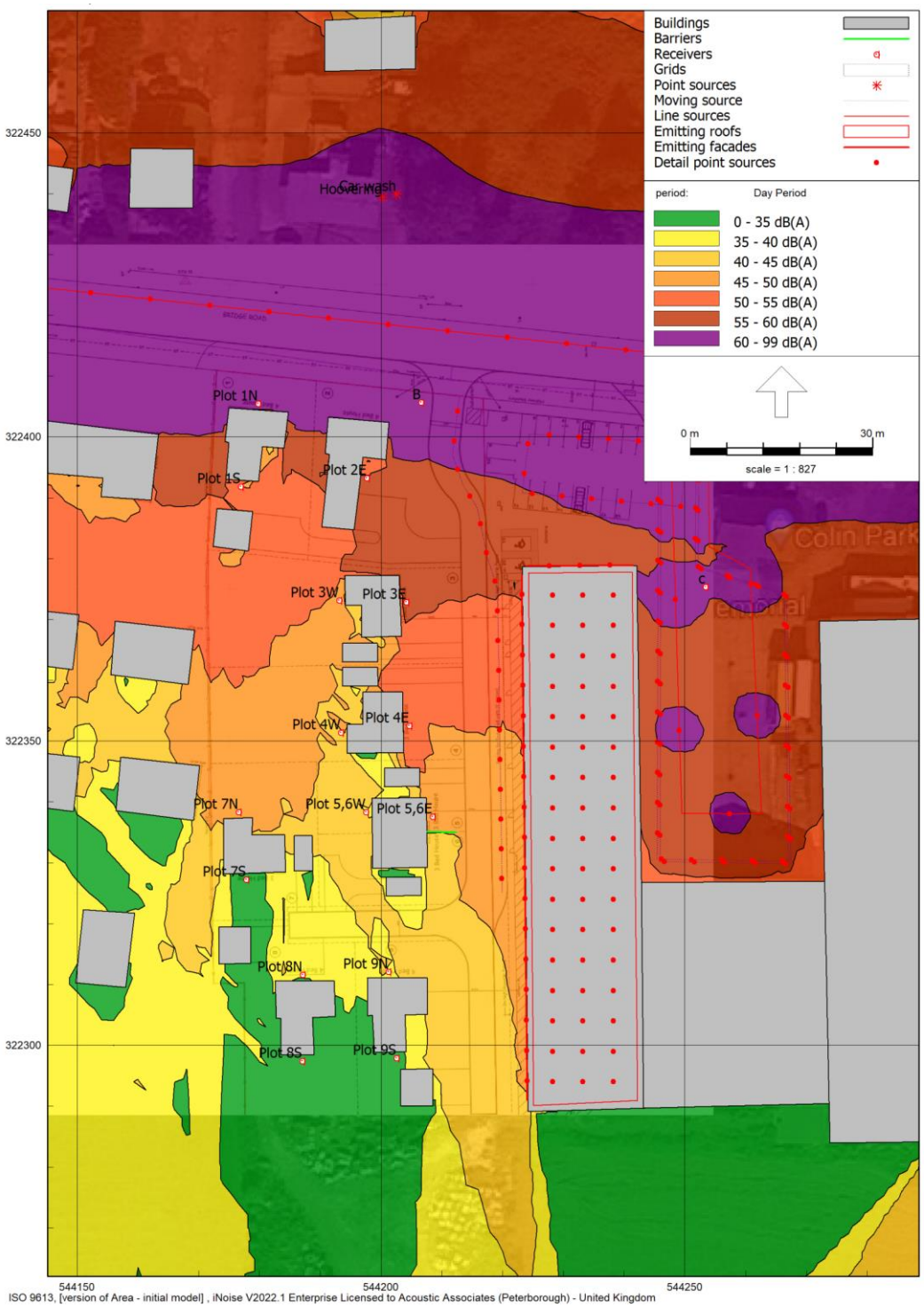


Contour height: 1.5 m above the ground

Figures 6-7 show cumulative noise contours for all sources for the daytime and night-time periods, respectively, with the proposed dwellings. It can be seen that the predicted noise levels in amenity areas do not exceed 55 dB(A), with the exception of part of Plot 2, where the noise

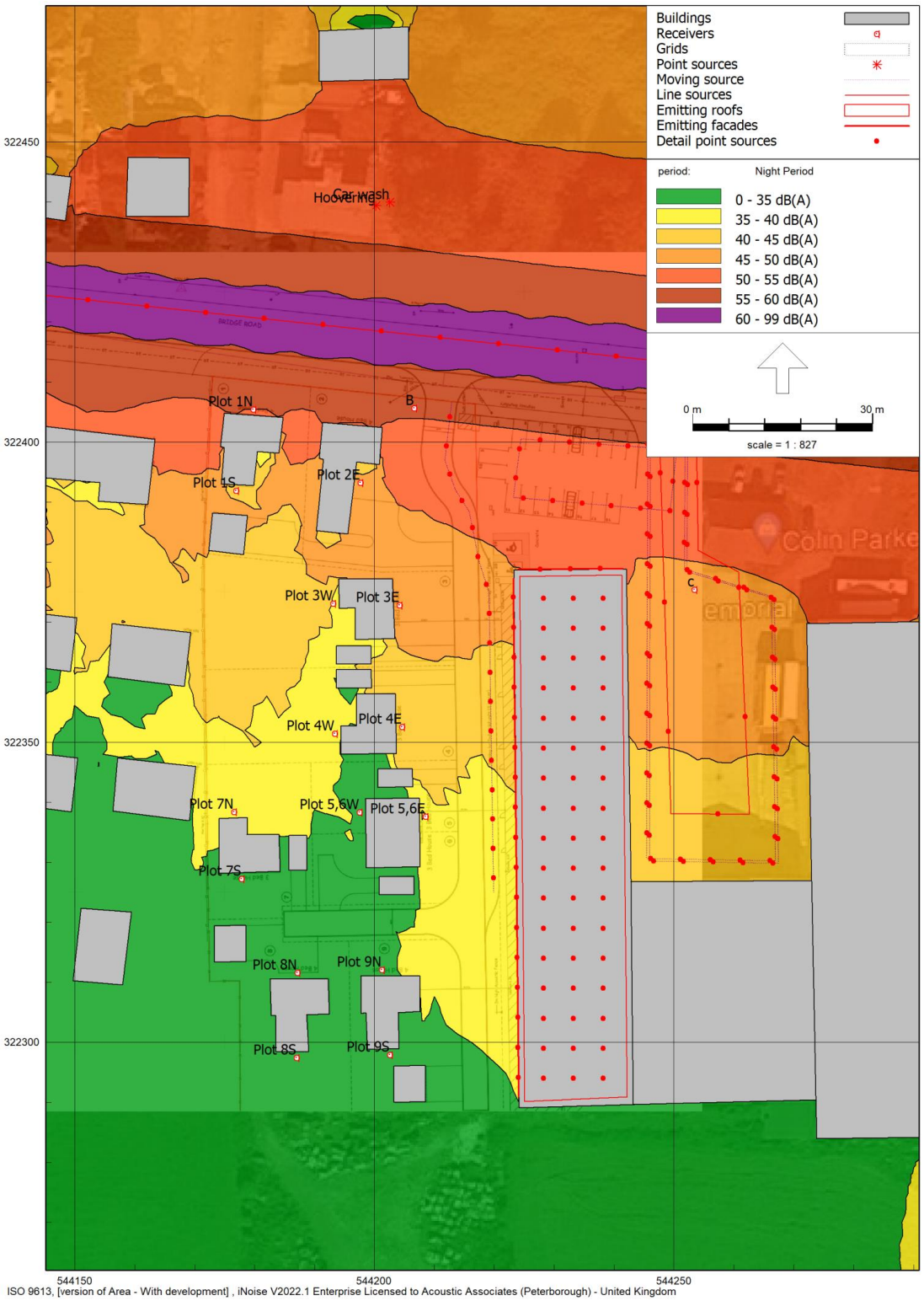
level is in the range of 55-60 dB(A). Surrounding the gardens with 1.8 m high close boarded timber fences will mitigate the noise level below 55 dB(A), which is considered acceptable in accordance with ProPG & BS 8233 guidance.

Figure 6 - Noise contours - all sources, daytime



Contour height: 1.5 m above the ground

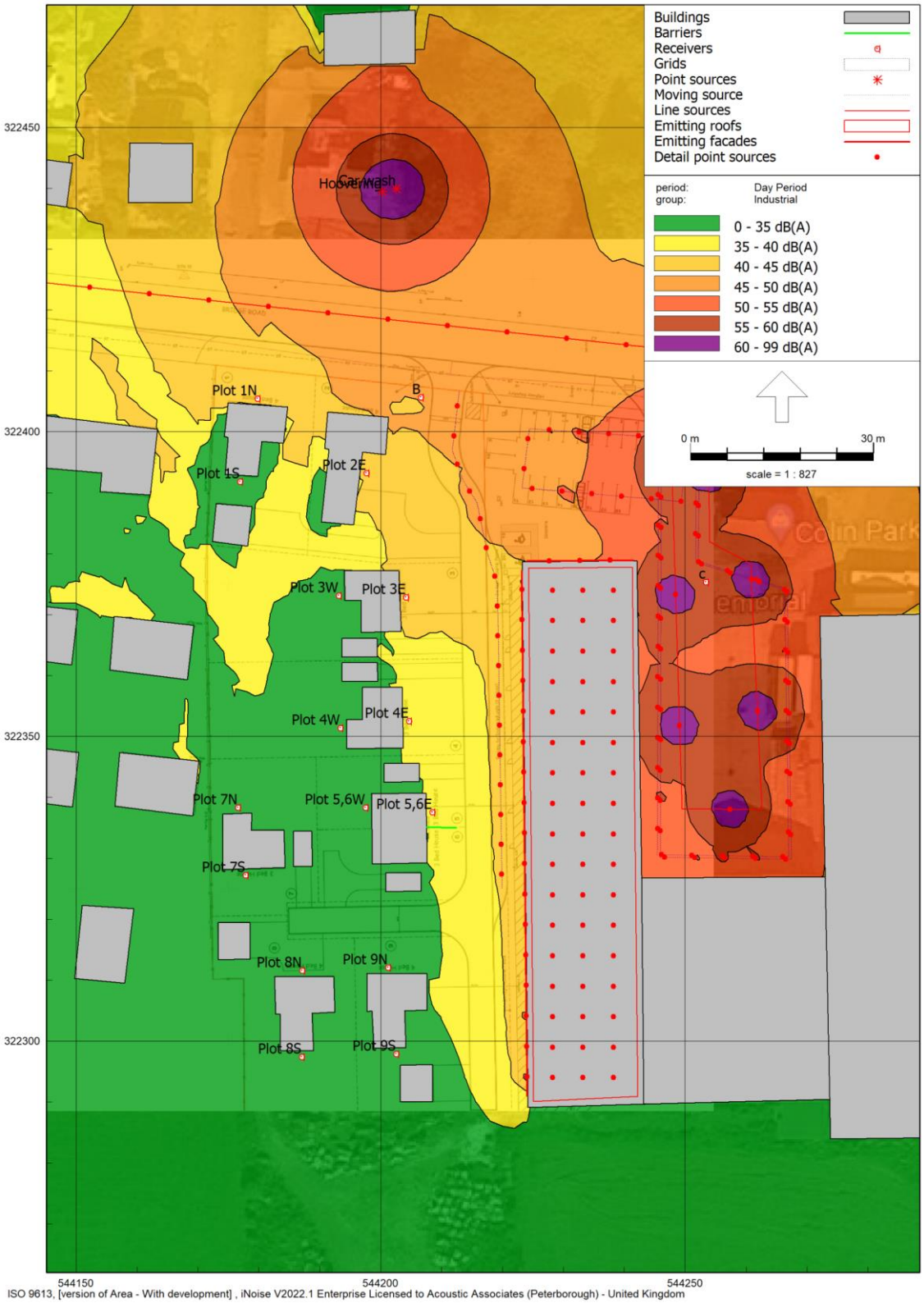
Figure 7 - Noise contours - all sources, night-time



Contour height: 1.5 m above the ground

Figure 8 shows daytime noise contours from existing and future industrial noise sources only.

Figure 8 Noise contours – only industrial/commercial sources, daytime



Contour height: 1.5 m above the ground

Table 5 shows the predicted incident noise levels at specific locations in front of building facade. The receiver positions are visible in the noise maps in Figures 5-7.

Receiver (see Figures 3 & 4)	Height	Daytime noise level, $L_{Aeq,16\ hour}$, dB(A) (all sources)	Night time noise level, $L_{Aeq,8\ hours}$, dB(A) (all sources)	Daytime noise level $L_{Aeq,1\ hour}$, dB(A) (industrial sources only)
Plot 1N_A	1,5	59,4	54,4	38,4
Plot 1N_B	4,5	59,5	54,5	38,8
Plot 1S_A	1,5	47,1	42,1	21,5
Plot 1S_B	4,5	45	40	22,6
Plot 2E_A	1,5	50,7	46	36,5
Plot 2E_B	4,5	51,1	46,4	37
Plot 3E_A	1,5	50,9	46	37,6
Plot 3E_B	4,5	51,3	46,4	38,2
Plot 3W_A	1,5	44,8	39,8	20,4
Plot 3W_B	4,5	46	41	21,4
Plot 4E_A	1,5	47,6	42,5	34,6
Plot 4E_B	4,5	47,5	42,4	34,8
Plot 4W_A	1,5	40,3	35,3	21,4
Plot 4W_B	4,5	42,5	37,5	26
Plot 5,6E_	1,5	44,1	38,9	34
Plot 5,6E_	4,5	44,7	39,6	34,5
Plot 5,6W_	1,5	37,2	32,1	25,4
Plot 5,6W_	4,5	39,7	34,6	26,5
Plot 7N_A	1,5	42,5	37,5	26,8
Plot 7N_B	4,5	43,9	38,9	28,4
Plot 7S_A	1,5	31,1	26,5	23
Plot 7S_B	4,5	31,2	26,7	23,7
Plot 8N_A	1,5	33,3	28,6	24,7
Plot 8N_B	4,5	36,9	32,1	25,8
Plot 8S_A	1,5	27,9	23,2	19,1
Plot 8S_B	4,5	28,3	23,7	20,3
Plot 9N_A	1,5	36,7	31,8	28,8
Plot 9N_B	4,5	38,6	33,7	29,3
Plot 9S_A	1,5	31,9	27,6	28,8
Plot 9S_B	4,5	31,2	26,6	27,4

Table 5 – Predicted façade noise levels

Table 5 shows noise levels incident on the dwelling façades for all sources as well as just for industrial sources. Tables 6-8 document the assessment results at the three receiver locations mostly affected by industrial noise. The assessment is in accordance with BS 4142.

Term	Level	Comments
Location: Plot 1N, 4.5 m		
Period: DAY		
Specific noise level $L_{Aeq,T}$ dB(A) at reception point	38.8	See Table 5
Penalty dB	+5	+2 dB added for "just perceptible" tonality, +3 dB added for just perceptible impulsivity (see Table 2)
Rating Level $\mathbf{L_{Ar,Tr}}$ dB(A)	44	Specific noise level + penalty
Background noise L_{A90} dB(A)	40	See Table 4
Exceedance over absolute limit	+4	"low impact" depending on context
Context		Noise from washing station on Bridge Road. Dwelling façades require noise insulation from road traffic noise, which will also mitigate against the noise from the station.
Noise impact, including context	"Low impact"	-
Uncertainty	Medium	Car wash station usage varies from day to day, therefore noise impact may vary

Table 6 – BS 4142 Assessment Plot 1N.

Term	Level	Comments
Location: Plot 3E, 4.5 m		
Period: DAY		
Specific noise level $L_{Aeq,T}$ dB(A) at reception point	38.2	See Table 5
Penalty dB	+5	+2 dB added for "just perceptible" tonality, +3 dB added for just perceptible impulsivity (see Table 2)
Rating Level $\mathbf{L_{Ar,Tr}}$ dB(A)	43	Specific noise level + penalty
Background noise L_{A90} dB(A)	40	See Table 4
Exceedance over absolute limit	+3	"low impact" depending on context
Context		Noise mostly from assumed traffic associated with the rented units. Noise present only during daytime hours.
Noise impact, including context	"Low impact"	-
Uncertainty	Medium	Predictions based on broad assumptions in terms of on-site traffic.

Table 7 – BS 4142 Assessment Plot 3E.

Term	Level	Comments
Location: Plot 4E, 4.5 m		
Period: DAY		
Specific noise level $L_{Aeq,T}$ dB(A) at reception point	34.8	See Table 5
Penalty dB	+5	+2 dB added for "just perceptible" tonality, +3 dB added for just perceptible impulsivity (see Table 2)
Rating Level $\mathbf{L_{Ar,Tr}}$ dB(A)	40	Specific noise level + penalty
Background noise L_{A90} dB(A)	40	See Table 4
Exceedance over absolute limit	+0	"low impact" depending on context
Context		Noise mostly from assumed traffic associated with the rented units. Noise present only during daytime hours.
Noise impact, including context	"Low impact"	-
Uncertainty	Medium	Predictions based on broad assumptions in terms of on-site traffic.

Table 8 – BS 4142 Assessment Plot 3E.

7.3 ProPG - Initial site noise risk assessment

Given the results shown in Figure 5 (noise contours across the open site), the noise risk assessment in accordance with the ProPG Stage 1 would be classified as follows :

- "Low / Medium" in the daytime and night-time at the northern end of the site (Plots 1 & 2);
- "Low" in the daytime and night-time at the rest of the site.

This means that *"At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development."*

7.4 Overheating

The following excerpt from AVOG details the thresholds for using windows a means of controlling overheating.

Table 3-2 Guidance for Level 1 site risk assessment of noise from transport noise sources [Note 1] relating to overheating condition

Risk category for Level 1 assessment [Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
$L_{Aeq,\ T}$ [Note 3] during 07:00 - 23:00 / $L_{Aeq,\ 8hr}$ during 23:00 - 07:00 High: 65 dB / 55 dB Medium: 60 dB / 50 dB Low: 55 dB / 50 dB Negligible: 50 dB / 45 dB	Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

Note 4 Refer also to references [1, 17, 18, 22] for further guidance regarding individual noise events. Where 78dB LAFmax is normally exceeded during the night-time period (23:00-07:00), a Level 2 assessment is recommended.

7.4.1 As can be seen in Figures 6 & 7 as well as Table 5, for most rooms, apart from W, N and E façades of Plots 1 & 2, opening windows as a means of controlling overheating would be considered acceptable. For Plots 1 & 2, a Level 2 assessment should be considered in the dwelling design.

7.5 NPSE & NPPG Assessment

Using the noise impact criteria from the Noise Policy Statement for England (NPSE) and the National Policy Planning Guidance (NPPG), the assessment carried out shows that provided the noise mitigation measures documented in Section 3 are implemented, the noise impact on the nearest noise sensitive receptors is likely to be at a level for *"Lowest Observed Adverse Effect"*. This is deemed to be an acceptable noise situation.

8 UNCERTAINTIES

- Computer predictions to ISO 9613-2 carry an uncertainty of +/- 3 dB, however in this case it would not affect the conclusions of this assessment.
- The ambient and background measurement uncertainty is low. The measurement period lasted for 6 days and the determined modal $L_{A90,15\ minute}$ was compared with previous measurement at an adjacent land and deemed to be robust.
- There are no known uncertainties which would significantly affect the conclusions or recommendations of this assessment.

REFERENCES

1. Ministry of Housing, Communities and Local Government. *National Policy Planning Framework ;*, 2021.
2. *Noise Policy Statement for England;* DEFRA, 2010.
3. DEFRA. *National Policy Planning Guidance (revised 2019)*.
4. ProPG working group. *ProPG: Planning & Noise: Professional Practice Guidance on Planning & Noise: New Residential Development;*, 2017.
5 *British Standard BS 8233, Guidance on sound insulation and noise reduction for buildings;* BSI, 2014.
6. *British Standard BS 4142:2014+A1:2019, Methods of rating and assessing industrial and commercial sound;* BSI, 2014, amended 2019.
7 *ANC + IOA. Acoustics Ventilation and Overheating Guide V1.1;, 2020.*
8 *Bridge Road, Long Sutton Planning Noise Impact Assessment*, Spectrum Acoustic Consultants report ref. DP136/17192/Rev. 0, 06.07.2017
9 DGMR Software. *iNoise V2022-1 Enterprise*.
10 *ISO 9613-2 Acoustics of sound during propagation outdoors, Part 2: General method of calculation;* ISO, 1996.
11 *Document F: Ventilation Regulations;* thenbs, 2010.
12 *Document O: Overheating*, 2021

Appendix 1 – Glossary of terms

Sound Pressure	The variation of ambient pressure that is detected by the ear as sound.
Noise	Unwanted sound
deciBel (dB)	Ten times the logarithm of the square of the ratio of the Sound Pressure to a reference pressure (20 micro-Pascal's).
Sound Pressure Level (Lp)	The decibel version of the Sound Pressure.
A-Weighting	A frequency weighting which simulates the response of the ear. An A-Weighted Sound Pressure Level is denoted by L_{pA} and has units of dB(A)
$L_{Aeq,T}$	The value of the A-weighted sound pressure level, in decibels [dB(A)], of a continuous steady sound that within a specified time interval (T), for example 16 hours, has the same mean-square sound pressure as a sound that varies with time. Therefore, the average over a 16 hour period would be denoted as $L_{Aeq,16h}$
$L_{Amax,T}$	The maximum A-Weighted sound pressure level that was encountered during the measurement period.
$L_{A90,T}$	The A-Weighted sound pressure level that is exceeded for 90% of the time (T). This is usually used a measure of background noise.
Free Field	Where noise can propagate freely without any reflections from buildings etc.
Octave Band	A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000
NPSE Critera	
NOEL	No Observed Effect Level
LOAEL	Lowest Observed Adverse Effect Level
SOAEL	Significant Observed Adverse Effect Level

BS 4142 Terms

T_r	The reference time interval over which an equivalent continuous A-weighted sound pressure is determined. Day time = 1 hour Night-time = 15 minutes
T_m	The measurement time interval over which measurements are taken.
Ambient Noise	Total sound in a given situation at a given time.
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.
Specific Noise Level	The dB $L_{Aeq,Tr}$ of the noise sources being assessed at a site.
Rating Level $L_{Ar,Tr}$	The specific noise level plus any correction (+5 dB) for the character of the noise, known as the Rating Level.
Assessment Level	Difference between Rating Level ($L_{Ar,T}$) and Background Noise ($L_{A90,T}$)
Sound Power Level (L_{WA})	The noise level from the source in terms of sound power, in dB(A).

Appendix 2 – Noise instrumentation

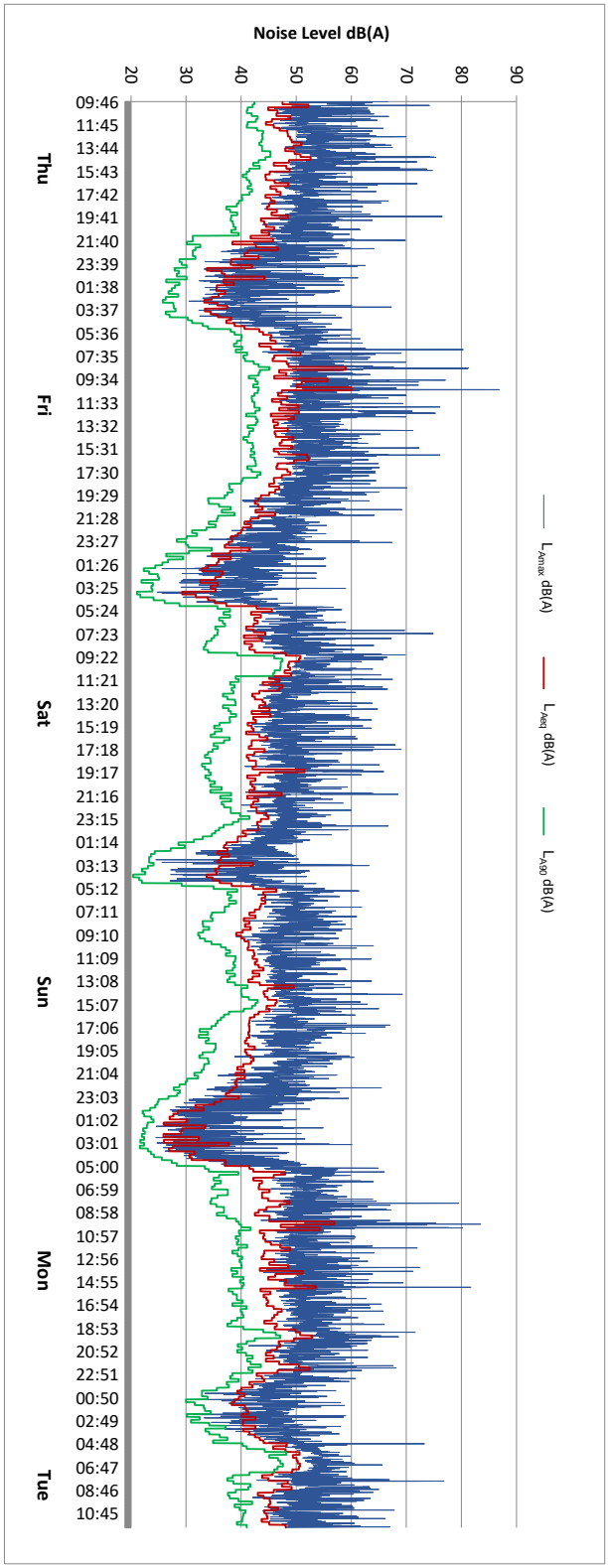
Type	Manufacturer	Description	Serial Number	Last Calibration Date	Calibration Certificate No.
Svan 957	Svantek	Sound level meter	27517	16/03/2022	1125184
GA 607	Castle	Sound level calibrator	039873	16/03/2022	1125186
Svan 945A	Svantek	Sound level meter	9485	13/05/2021	1112023
GA 607	Castle	Sound level calibrator	032942	23/06/2022	1129259
SV30A	Svantek	Sound level calibrator	7490	16/03/2022	1125183
Svan 971	Svantek	Sound level meter	34935	23/06/2022	1129258

The calibration of the instrumentation was checked at the start and end of the tests and there was no significant drift.

Appendix 3 – Location A noise measurement results

Weather:

Dry, mostly sunny. Temperatures from 19° to 22°C. Wind mainly from the West, wind speeds below s m/s. Humidity around 60-70%



Appendix 4 – Location B noise measurement results

A4.1 04/08/2022

Time	L_{AFmax} dB(A)	L_{Aeq} dB(A)	L_{A90F} dB(A)	Conditions
10:40	75	62.5	45.8	Started @ 10:40. Traffic dominant. Occasional jet washing, hoovering clearly audible from car wash. Jet washing audible at 10:49 - 10:52, 10:53 - 10:58 Jet washing and hoovering 10:59 - 11:03. Hoovering only 11:04 - 11:06. Traffic dominant 11:07 - 11:18 Noisy tractor passes by 11:15. Jet washing 11:18 - 11:20, 11:21 - 11:23 Hoovering and air hose use 11:24 - 11:31. From observations the car wash has 2 x jet washers, 2 x industrial hoovers and 2 x compressed air hoses. Opening hours are 7 days 8:30-late. Jet washing, hoovering and air hose audible 11:33 - 11:36. Hoovering 11:37-11:50. Jet washing 11:52-11:53, 11:56-12:00. Jet washing 12:03-12:19. Stopped monitoring at 12:40.
10:45	74.2	61.4	43.3	
10:50	73.3	62.7	48.9	
10:55	74.8	64.8	49	
11:00	73.5	63.5	51.3	
11:05	76.6	64	46.6	
11:10	79.5	63.2	45.5	
11:15	78.9	63.6	49.5	
11:20	82	63.6	47.8	
11:25	74.1	62.4	51.8	
11:30	77.2	62.6	50.9	
11:35	79.3	63.5	51.9	
11:40	75.1	62.1	49.9	
11:45	73.4	62.8	46.9	
11:50	74.5	61.1	43.1	
11:55	79.8	62.5	46.6	
12:00	74	62.3	52.7	
12:05	78.3	64.6	56.5	
12:10	80.1	64.7	54	
12:15	77.6	64.6	54.3	
12:20	80.2	66.3	55.3	
12:25	79.7	64.1	55.2	
12:30	77.2	63.7	51.8	
12:35	75.4	61.9	46.9	
Average	-	**63.4**	-	

A4.2 09/08/2022

Time	L_{AFmax} dB(A)	L_{Aeq} dB(A)	L_{A90F} dB(A)	Conditions
09:30	79.7	64.3	41.8	Started @ 09:30 Traffic dominant. Jet washing audible 09:39-09:41 & 09:43-09:44, 09:51-09:52, 09:54-09:55, air hose use 09:56. Hoovering at 09:56-10:01.
09:35	74.3	61.4	41.4	
09:40	78.9	64.6	51	
09:45	72.4	61.4	42.6	
09:50	74.4	60.6	42.4	
09:57	56.3	50.4	46.9	Specific measurement of hoovering (no road traffic)
10:00	74.1	62.1	41	Re-started monitoring at 10:00. Traffic dominant, hoovering audible until 10:01. Jet washing 10:06-10:08, 10:11-10:13, traffic only between 10:15-10:35. Jet washing 10:36-10:38, 10:40-10:41, hoovering and some brief intermittent air hose audible 10:42-10:50. Traffic only 10:50 - 11:32, jet washing 11:33 - 11:34, 11:36-11:38. Stopped monitoring @ 12:30.
10:05	75.3	62	42.6	
10:10	77.4	62.7	40.8	
10:15	80.5	63.1	41.9	
10:20	77.7	61.2	38.6	
10:25	74.5	62.6	45.8	
10:30	73	60.7	39.6	
10:35	73.3	63.6	47.3	
10:40	80.2	64.5	50.9	
10:45	76.6	61	48.5	
10:50	79.4	63.2	43	
10:55	76.3	62.6	39.3	
11:00	73.7	62.6	45.2	
11:05	82	64	38.5	
11:10	77.4	62.4	35.9	
11:15	73.9	60.5	39.1	
11:20	72	59	39.2	
11:25	79.6	62.2	42.4	
11:30	76.8	64.6	44.2	
11:35	76.7	64.4	50.3	
11:40	76.6	63.3	50.9	
11:45	76.5	61.3	47.2	
11:50	78.5	63.9	42.2	
11:55	81	62.9	44.4	
12:00	75.8	63.1	42.4	
12:05	78.5	62.6	36.9	
12:10	72.6	59.6	37.2	
12:15	70.6	59.8	44.7	
12:20	79.6	61.2	39.2	
12:25	70.8	60.2	40.7	
Average 9:30-12:25	-	62.4	-	
12:51	67.8	60.6	51.3	Specific noise measurement of jet washing vehicle with one pressure washer dominant. Minimal distant traffic.

Appendix 5 – Location C noise measurement results

A5.1 04/08/2022

Time	L_{AFmax} dB(A)	L_{Aeq} dB(A)	L_{A90F} dB(A)	Conditions
10:45	68.6	54.8	40.9	Started @ 10:45 in 5 minute intervals. Traffic dominant. Occasional car wash jet washing/ hoovering audible Tears recovery vehicle enters site and parks in recovery yard (west) at 11:13. Double decker bus enters yard at 11:26 pulls forward towards portapack building and reverses turning bus around and parks with engine idling continuously from 11:26 - 12:19. Van enters site and parks next to reception at 11:29 making DHL delivery, drives away at 11:31. Van parks next to reception at 11:35 making delivery, drives away 11:37. Colin Parker Masonry (CPM) workers loading small van at 11:41 - 11:51 near to measurement position. Voices audible. Van exits west yard at 11:53. Car exits car park at 11:55. Portapack open hours are mon-fri 9-5. 3 x vehicles exit car park at 11:59 -12:01. Small CPM can leaves site at 12:02. Very large Tears recovery HGV enters east yard and reverses round to west recovery yard at 12:05-12:06, parks with engine idling between 12:06-12:30, detaches trailer then drives away. then Bus in east yard starts up at 12:07. Double decker bus reverse beeping (white noise) audible at 12:08-12:09 and parks with engine idling. Another double decker bus starts up 12:13. Stopped monitoring at 12:15.
10:50	67.3	54.8	45.6	
10:55	70	56.3	46.3	
11:00	71.3	57.3	46.5	
11:05	71.8	57.3	44.2	
11:10	71.8	56.6	42.3	
11:15	72.9	57.1	44.7	
11:20	72.1	55.7	43.2	
11:25	75.5	60.4	47.4	
11:30	72.4	58.6	53.2	
11:35	75.5	59.6	52.1	
11:40	70.6	56.6	51.5	
11:45	69.9	57	51.2	
11:50	69.2	55.7	50.7	
11:55	72.3	59	51.3	
12:00	81.9	64	52.1	
12:05	88.1	68.5	55.9	
12:10	75	65.9	54.9	
12:15	74	66.4	63.2	2 x buses idling in east yard, one pulls forward slightly and reverses slightly then one engine turns off. Includes distant traffic.
12:18	59.1	54.5	53.5	1 x bus idling in corner of east yard. Includes distant traffic.
12:21	58.6	56.6	55.5	2 x buses idling next to CPM reception, includes distant traffic and jet washing.
12:24	69.1	64.4	62.1	bus pulls forward driving round towards Portapack and parks engine idling. Includes distant traffic.
12:26	68.3	65	60.2	2 buses idling at approximately 18-20m away. Bus dominant.
12:27	65.7	62.4	57.6	bus reverses next to back of CPM reception. Bus dominant.

A5.2 09/08/2022

Time	L_{AFmax} dB(A)	L_{Aeq} dB(A)	L_{A90F} dB(A)	Conditions
09:35	69	54.7	41.7	Started @ 09:35 Traffic dominant and occasional noise from car wash site activities audible. LGV pulls into site and turns around next to meter position, then drives away 09:41, distant faint humming/whirring audible from inside Portapak engineering / Colin Parker Masonry building open fire exit door between 09:35-10:00, 10:20- 10:50 & 11:00 - 11:15. 2x cars enter east yard and park engines off at 09:48. Van parked near meter starts engine and leaves site at 09:58. (Portapack have a FLT parked inside double doors partially open. DPD van enters site parks next to meter making delivery at 10:40, drives away 10:41. Car enters site and parks next to meter engine off at 10:43, drives away at 10:50. Royal mail van delivery at 10:45, drives away at 10:48. Distant light aircraft 10:59. Light aircraft 11:03. Van enters east yard 11:06 parks opposite Portapak engineering, few light bangs audible from inside Portapack, van starts engine idling 11:15 drives away 11:17. 11:37 2 x Tears recovery vans enter car park, engine idling on one van, another Tears LGV enters site 11:40. Idling van drives away at 11:43. Tears HGV starts up engine at 11:43 in west yard, drives away 11:51, 1 Tears van and 1 x LGV enter site car park / west yard at 11:51 and park engines off. Tears recovery LGV starts engine at 11:56 and drives away at 11:58. One car exits car park 12:00 & another 12:03. Colin Parker HGV enters site and reverses round to rear west yard area 12:15-12:17 reverse beeping audible. Stopped monitoring @ 12:35.
09:40	75.7	62.7	45.6	
09:45	68.1	55.6	42.3	
09:50	68.4	53.6	41.4	
09:55	70.9	58.3	42.8	
10:00	69	55.3	40.3	
10:05	71.1	55.2	38.6	
10:10	77.9	57	39.8	
10:15	76.8	57.7	38.6	
10:20	70.3	54.7	37.8	
10:25	69.1	56	43.1	
10:30	67.1	53.9	38.5	
10:35	82.8	58.2	43	
10:40	81.1	59.9	44.6	
10:45	70.5	55.4	41.1	
10:50	74.2	57.5	41	
10:55	70.3	56.3	38.7	
11:00	69.1	56.3	42.4	
11:05	75.2	57.8	38.6	
11:10	71.4	55.7	37.3	
11:15	69.5	56	40.9	
11:20	66.1	52.5	37	
11:25	76.1	58	41.5	
11:30	72.2	57.5	41.3	
11:35	72.1	57.4	46.5	
11:40	72.3	60.8	43.3	
11:45	72	54.8	41.5	
11:50	81.7	65.6	37	
11:55	83.2	60.5	40.4	
12:00	73.8	57.1	40	
12:05	73.3	58	36.1	
12:10	68	53.5	35.5	
12:15	85.9	66.6	39.8	
12:20	74.3	56.9	36.9	
12:25	67.7	53.8	36.6	

Appendix 5 - Photographs of noise monitoring on site

Location A



Location B



Location C


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