



20/30 Greyfriars Road, Reading

Noise Impact Assessment

On behalf of **McKay Securities Plc.**



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Contents

1	Introduction	5
1.2	Scope of Report.....	6
1.3	Acoustic Terminology	6
2	Site Location and Description	7
2.1	Site Location	7
2.2	Site Description	7
3	Policy, Standards, Guidance and Criteria	8
3.1	Local Authority Consultation.....	8
3.2	National Policy	8
3.3	Standards	10
3.4	Guidance	12
3.5	Proposed Assessment Criteria	12
4	Environmental Sound Survey	13
4.1	General	13
4.2	Measurement Positions	13
4.3	Instrumentation	14
4.4	Data Recorded	14
4.5	Meteorological Conditions	14
4.6	Results.....	15
4.7	Environmental Noise Climate	15
5	Suitability of Site for Residential Development	16
5.1	Purpose of Assessment	16
5.2	Noise Sensitive Receptors	16
5.3	Assessment Assumptions	17
5.4	Calculation Procedure	17
5.5	Acoustic Feature Correction and Screening	18
5.6	Preliminary Assessment Results	18
5.7	Context and Mitigating Factors.....	19
5.8	Mitigation	19
5.9	Uncertainty	20
5.10	Assessment Summary	21
6	Conclusions	22

Figures

Figure 1: Site Location.....	7
Figure 2: Measurement Positions.....	13
Figure 3: Receptor Location	16
Figure B.1: Photographs of MP1	24

Figure B.2: Photographs of MP2	25
Figure B.3: Photographs of MP3	26
Figure C.1: MP1 Results Time-History	27
Figure C.2: MP2 Results Time-History	27
Figure C.3: MP3 Results Time-History	28

Tables

Table 3.1: BS 8233 Desirable Internal Ambient Noise Levels for Dwellings.....	11
Table 3.2: Proposed LOAEL and SOAEL	12
Table 4.1: Instrumentation.....	14
Table 4.2: Measured and Calculated Noise Survey Results.....	15
Table 5.1: Noise Levels Associated with Deliveries.....	18
Table 5.2: BS4142:2014+A1:2019 Preliminary Assessment Results	19
Table 5.3: Sound Reduction Indices Associated with Secondary Glazing.....	20
Table A.1: Glossary of Acoustic Terminology	23
Table D.1: Weather Information for BS4142:2014 Manned Survey.....	29
Table D.2: BS4142:2014 Measurement Instrumentation	29

Appendices

Appendix A	Glossary of Acoustic Terminology
Appendix B	Photographs of Noise Monitoring Equipment
Appendix C	Sound Time History Graphs
Appendix D	BS4142:2014+A1:2014 Survey Methodology
Appendix E	BS4142:2014+A1:2019 Delivery Noise Impact Calculations
Appendix F	Noise Break-In Calculations

1 Introduction

- 1.1.1 Stantec UK Ltd. has been commissioned by McKay Securities to undertake a noise impact assessment for a prior approval application for the change of use from B1 (office) to C3 (residential) at 20/30 Greyfriars Road, Reading.
- 1.1.2 Peter Brett Associates LLP (PBA, now Stantec) previously undertook an environmental sound survey at the proposed development in January and March 2017 and subsequent noise impact assessment report (titled Noise Survey Report, reference Ac001, dated February 2017) to support a prior approval application to Reading Borough Council (Planning Application No. 170229, dated 10th February 2017). The application was approved in April 2017.
- 1.1.3 Following expiration of consent, the noise impact assessment report was resubmitted to support a new prior approval application (Planning Application No. 200211, dated 07th February 2020). Following submission, the below comments were received from the Environmental Health Department at Reading Borough Council:

"I have reviewed this assessment and am concerned about the impact of noise from the activities taking place in the Sainsburys service yard. It is common for residents to make nuisance complaints about noise from such activities as they tend to be noise that causes significant sleep disturbance – engine idling and revving, trolleys wheeling, banging and crashing of unloading and loading activities, staff talking etc.

I appreciate that secondary glazing has been proposed for this façade however it is my view that due to the high risk of an impact on amenity from the service yard during sensitive hours of the night, and the potential impact on the business activities should noise complaints be made, further assessment is required. I would suggest that either no bedrooms are included on the façade overlooking the service yard, or a more detailed attended noise survey is carried out to measure and characterise the noise from activities in the service yard to either confirm that the proposed mitigation is acceptable or to propose further mitigation. This should be combined with gathering of information on timings of activities that take place in the service yard.

I recommend refusal until this further assessment has been carried out."

- 1.1.4 In response to these comments, the previous report undertaken by PBA has been updated to include an assessment of the impact of noise on the proposed development associated with deliveries within the adjacent service yard area.
- 1.1.5 It should be noted that, as the planning permission sought is for prior approval, only the impact of noise from commercial operations requires consideration. The assessment of transportation noise or other non-industrial/ commercial sources incident on the proposed development have not been considered as they are beyond the scope of this report.
- 1.1.6 At the time of completing the assessment, the UK Government has restricted non-essential travel in response to the COVID-19 Pandemic. Stantec have implemented a Pandemic Response Plan COVID-19 to manage the issues in order to keep our people safe whilst maintaining our services for our clients. This includes social distancing that puts restrictions on non-essential domestic travel and gatherings in public places. The use of alternative data sources has therefore been carefully considered to avoid the need to undertake site surveys. In addition, there is concern that environmental data collated during this lockdown period would be considered un-representative due to the reduction in transportation (and other activities). For these reasons, it is considered that the use of library source level calculations would provide a more robust assessment than the use of on-site measurements, within the current climate. This approach has been agreed with the EHO.

- 1.1.7 Therefore, the assessment has been based on library source level calculations and has been undertaken in accordance with BS4142:2014+A1:2019, whilst having regard for the results of the environmental sound survey undertaken in 2017.

1.2 Scope of Report

- 1.2.1 The scope of this report is as follows:

- To present the results of environmental sound surveys undertaken by PBA in 2017.
- To assess the suitability of the site for residential development, based on the results of the previous survey and library data for similar operations.
- To undertake a noise impact assessment associated with deliveries in the adjacent service yard at the proposed development, in accordance with BS4142:2014+A1:2019.
- To suggest mitigation measures, if necessary, to minimise any noise impact identified.

1.3 Acoustic Terminology

- 1.3.1 An explanation of the acoustic terminology used in this report is included in **Appendix A**.

2 Site Location and Description

2.1 Site Location

- 2.1.1 20 Greyfriars Road is located on the corner of Greyfriars Road and Garrard Street in Reading, Berkshire, RG1 1PE. The building is indicated on **Figure 1** below.

Figure 1: Site Location



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2.2 Site Description

- 2.2.1 20 Greyfriars Road is a 5-storey office building. Buildings within the vicinity of 20 Greyfriars Road comprise a mix of commercial and residential uses.
- 2.2.2 The closest residential properties to the site are located on Vachel Road approximately 25 m to the west of the site. A supermarket delivery service yard area is immediately adjacent to the site to the south.

3 Policy, Standards, Guidance and Criteria

3.1 Local Authority Consultation

- 3.1.1 The Environmental Health Department at Reading Borough Council was contacted to discuss and agree the survey and assessment methodology.
- 3.1.2 It was agreed that, considering issues regarding the likely reduction in sound climate and health and safety considerations during the COVID-19 lockdown, the assessment of the impact of noise associated with deliveries to the adjacent service yard area could be undertaken based on library source level calculations in accordance with BS4142:2014+A1:2019.

3.2 National Policy

National Planning Policy Framework

- 3.2.1 The revised NPPF was published in February 2019 and sets out the government's planning policies for England and how these are expected to be applied. With respect to noise, Paragraph 170 states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by: ...

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans".

- 3.2.2 Paragraph 180 of the NPPF states that:

"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 and living conditions, as well as the potential sensitivity of the wider area to impacts that could arise from the development. In doing so, they should:

a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life.

b) Identify and protect tranquil areas which may have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

- 3.2.3 The NPPF goes on to advise, in Paragraph 182, that:

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

Noise Policy Statement for England

- 3.2.4 The NPSE was published in March 2010. The document seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. It also sets out the long-term vision of Government noise policy in Paragraph 1.6:

"To promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

- 3.2.5 The NPSE clarifies that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and noise effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

- 3.2.6 The first two aims of the NPSE (paragraph 2.20) follow established concepts from toxicology that are applied to noise impacts, for example, by the World Health Organisation. They are:

- NOEL – No Observed Effect Level is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise; and
- LOAEL – Lowest Observed Adverse Effect Level is the level above which adverse effects on health and quality of life can be detected.

- 3.2.7 The NPSE extends these to the concept of a significant observed adverse effect level (paragraph 2.21):

- SOAEL – Significant Observed Adverse Effect Level is the level above which significant adverse effects on health and quality of life occur.

- 3.2.8 The NPSE notes in paragraph 2.22:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times."

Planning Practice Guidance

- 3.2.9 The Government's Planning Practice Guidance (PPG) was published in March 2014 (updated in July 2019) and provides guidance on the effects of noise exposure, relating these to people's perception of noise, and linking them to the NOEL and, as exposure increases, the LOAEL and SOAEL.

- 3.2.10 As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

- 3.2.11 The LOAEL is described in PPG (Paragraph: 005 Reference ID: 30-005-20190722) as the level above which *"noise starts to cause small changes in behaviour and/or attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise)."*

- 3.2.12 PPG identifies the SOAEL (Paragraph: 005 Reference ID: 30-005-20190722) as the level above which *"noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect"*

occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused."

The Town and Country Planning (General Permitted Development) (England) (Amendment) Order 2016

3.2.13 The Town and Country Planning (General Permitted Development) (England) (Amendment) Order 2016, which came into force on the 6th April 2016, lists a number of amendments to be included with respect to change of use of offices to dwelling/ houses, including the insertion of:

- *"O.2 – (1) Development under Class O is permitted subject to the condition that before beginning the development, the developer must apply to the local planning authority for a determination as to whether the prior approval of the authority will be required as to-*
- *a) Transport and highways impact of the development.*
- *b) Contamination risks on the site.*
- *c) Flooding risks on the site; and*
- *d) Impact of noise from commercial premises on the intended occupiers of the development."*

3.2.14 In accordance with the above, a noise impact assessment is required to demonstrate only that the adjacent commercial uses will not have an impact on the development, in relation to noise (requirement d). Reference will be made to the following standards and guidance in undertaking this assessment.

3.3 Standards

British Standard 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'

3.3.1 BS 8233, in relation to this development, sets out desirable guideline values in habitable rooms, such as living rooms and bedrooms.

3.3.2 The guideline values relate to steady external noise without a specific character, previously termed 'anonymous noise'. According to the standard, noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate. Examples of noise with a character may include tonal/intermittent plant noise emissions, music playback, and workshop noise. Examples of external steady noise sources may include environmental noise sources such as busy road traffic.

3.3.3 The desirable internal ambient noise levels for dwellings are presented in **Table 3.1**.

Table 3.1: BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	Desirable Internal Ambient Noise Level	
		07:00 to 23:00 hours	23:00 to 07:00 hours
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$
*Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,f}$, depending on the character and number of events per night. Sporadic noise events could require separate values.			
Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative source of ventilation that does not compromise the façade insulation or the resulting noise levels.			
Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved.			
*A selection of the available notes			

BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

- 3.3.4 BS4142:2014+A1:2019 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in the standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.
- 3.3.5 The standard is used to determine the rating levels for sources of sound of an industrial and/or commercial nature and the ambient, background and residual sound levels at outdoor locations. These levels could be used for the purposes of investigating complaints; assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and assessing sound at proposed new dwellings or premises used for residential purposes. However, the determination of noise amounting to a nuisance is beyond the scope of the standard.
- 3.3.6 The procedure contained in BS4142 assesses the significance of sound which depends upon the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs/will occur.
- 3.3.7 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level and considering the following:
- Typically, the greater this difference, the greater the magnitude of the impact.
 - A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
 - The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

3.3.8 Where the initial estimate of the impact needs to be modified due to the context, the following factors should be considered:

- The absolute level of sound.
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:
 - Façade insulation treatment.
 - Ventilation and/or cooling that will reduce the need to have windows open to provide rapid or purge ventilation; and
 - Acoustic screening.

3.3.9 The impact of noise associated with the operation of the proposed development has been assessed in accordance with the above standard.

3.4 Guidance

World Health Organisation Guidelines for Community Noise, 1999

3.4.1 The World Health Organisation (WHO) Guidelines for Community Noise (1999) also sets out guidance on suitable internal and external noise levels in and around residential properties. The following internal noise levels are recommended by the WHO:

- 35 dB $L_{Aeq,T}$ in living rooms over a 16-hour day; and
- 30 dB $L_{Aeq,T}$ in bedrooms during the 8-hour night.

3.4.2 With respect to the night-time maximum noise levels, the WHO guidelines state:

“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night.”

3.5 Proposed Assessment Criteria

3.5.1 The impact of noise associated with deliveries occurring in the adjacent supermarket service yard area will be assessed in accordance with BS4142:2014+A1:2019.

3.5.2 In line with the NPSE, **Table 3.2** details the proposed LOAEL and SOAEL for the assessment of deliveries occurring in the adjacent supermarket service yard area.

Table 3.2: Proposed LOAEL and SOAEL

Effect Level	Difference Between Rating Level ($L_{A1,T,r}$) and Background Sound Level ($L_{A90,T}$), dB
LOAEL	+5
SOAEL	+10

4 Environmental Sound Survey

4.1 General

- 4.1.1 In order to quantify the existing sound climate at the site an environmental sound survey was undertaken over a period of 24 hours commencing at 11:00 on Monday 31st January 2017 using two unattended noise monitors.
- 4.1.2 An additional survey was undertaken for a period of 24 hours commencing at 15:00 on Thursday 23rd March 2017 using a single unattended sound level meter.

4.2 Measurement Positions

- 4.2.1 Measurements were made using three unattended sound level meters positioned as indicated on the following figure.

Figure 2: Measurement Positions



Courtesy of EPR Architects

- 4.2.2 Descriptions of the positions are given below, and photographs of the monitoring equipment are presented in the attached **Appendix B**.
- P1 - The sound level meter microphone was fixed to a pole extended to a distance of 1 m from the 1st floor façade facing Greyfriars Road. Measurements at this position were therefore made under façade incident conditions. The purpose of this position was to quantify noise incident on the building from road traffic sources and other sources, as well as the background noise levels at sensitivities within the vicinity of the site.

- P2 - The sound level meter microphone was fixed to a pole extended to a distance of 1m over the edge of the small section of 4th floor roof facing Garrard Street. Measurements at this position were therefore made under façade incident conditions. The purpose of this position was to quantify noise incident on the building from road traffic sources and other sources, as well as the background noise levels at sensitivities within the vicinity of the site.
- P3 – The sound level meter microphone was fixed to the end of a pole protruding 1 m from a first-floor window that overlooked the service yard. Measurements at this position were therefore made under façade incident conditions. The purpose of this position was to quantify noise incident on the building from the service yard.

4.3 Instrumentation

4.3.1 The instrumentation used during the survey is presented in **Table 4.1** below.

Table 4.1: Instrumentation

Description	Manufacturer	Type	Serial Number	Calibration Date*
Sound Level Analyser	NTi Audio	XL2-TA	A2A-11096-E0	06/04/2016
Sound Level Analyser	NTi Audio	XL2-TA	A2A-11051-E0	14/04/2016
Acoustic Calibrator	NTi Audio	CAL200	12405	10/10/2016

* Calibration date correct at time of survey.

- 4.3.2 The sound level analyser microphones were fitted with weather-proof windshields throughout the duration of the noise survey.
- 4.3.3 The survey instrumentation, methodology and reporting of results was carried out following guidance contained within British Standard 7445-1:2003 - '*Description and measurement of environmental noise - Part 1: Guide to quantities and procedures*'. The sound level analysers presented in the above table conform to the Type 1 specification as given in BS EN 61672-1:2003 - '*Electroacoustics - Sound level meters - Part 1: Specifications*'. The calibrator presented in the above table conforms to the Class 1 specification as specified in IEC 60942:2003 - '*Electroacoustics - Sound calibrators*'.
- 4.3.4 The noise measurement equipment was calibrated before and after the survey to ensure a consistent and acceptable level of accuracy is maintained. No significant drift (greater than 0.2dB) was noted to have occurred.

4.4 Data Recorded

- 4.4.1 Sound data was recorded in all relevant indices, including L_{Aeq} , L_{A10} , L_{A90} , and $L_{AMax,F}$. Octave band data for each of the above indices was also recorded, the filters for which met the requirements of BS EN 61260:1996, Class 1.
- 4.4.2 Sound data was recorded over consecutive 15-minute periods during the unattended measurements. All indices and octave band spectra were recorded. Audio recordings were also made throughout the duration of the survey.

4.5 Meteorological Conditions

- 4.5.1 During the survey on 31st January 2017, temperatures were cold to mild, ranging between 8 °C and 12 °C during the day, and between 6 °C and 8 °C during night. Wind speeds were generally low, being on average between 1 m/s and 5 m/s.

- 4.5.2 Some water was noted on the ground at the commencement of the survey due a rain shower earlier in the morning. Weather reports also note that there were periods of rain on the second day of the survey. As such, skies were predominantly heavily overcast throughout the survey.
- 4.5.3 During the survey on 23rd March 2017, temperatures were cold to mild, ranging between 10 °C and 12 °C during the day, and between 6 °C and 7 °C during night. Wind speeds were generally low, being on average between 1 m/s and 6 m/s. The ground was dry at the start and end of the survey and no precipitation was noted from meteorological data providers. Skies ranged from clear to partially cloudy.

4.6 Results

- 4.6.1 The attached **Appendix C** presents the results of the noise survey in time-history format in terms of L_{Aeq} , L_{Amax} and L_{A90} for each of the measurement positions.
- 4.6.2 The following table presents a summary of the measured ambient (L_{Aeq}), transient (L_{AFmax}) and background (L_{A90}) noise levels at the site.

Table 4.2: Measured and Calculated Noise Survey Results

Location	Day (07:00 – 23:00)		Night (23:00 – 07:00)		
	$L_{Aeq,T}$	L_{A90} (lowest)	$L_{Aeq,T}$	L_{A90} (lowest)	L_{AFmax} (10 th Highest)
P1	70.7 dB	50.4 dB	60.6 dB	47.5 dB	77.6 dB
P2	67.2 dB	53.0 dB	53.8 dB	44.2 dB	68.2 dB
P3	63.4 dB	55.7 dB	62.3 dB	53.4 dB	84.4 dB

4.7 Environmental Noise Climate

- 4.7.1 The principle environmental noise source within the vicinity of the site is traffic using roads within the vicinity of the site. Traffic on the A329 also contributed to the noise climate at the site, as this was visible by looking along Vachel Road.
- 4.7.2 A construction site was located on the opposite side of Garrard Street from 20 Greyfriars Road. There was no obvious activity taking place on the construction site at the commencement of the survey, however if activity took place during the survey this may have contributed to the noise climate, in particular measurements made on Garrard Street.
- 4.7.3 A supermarket delivery service yard is also located adjacent to the southern boundary of the site.

5 Suitability of Site for Residential Development

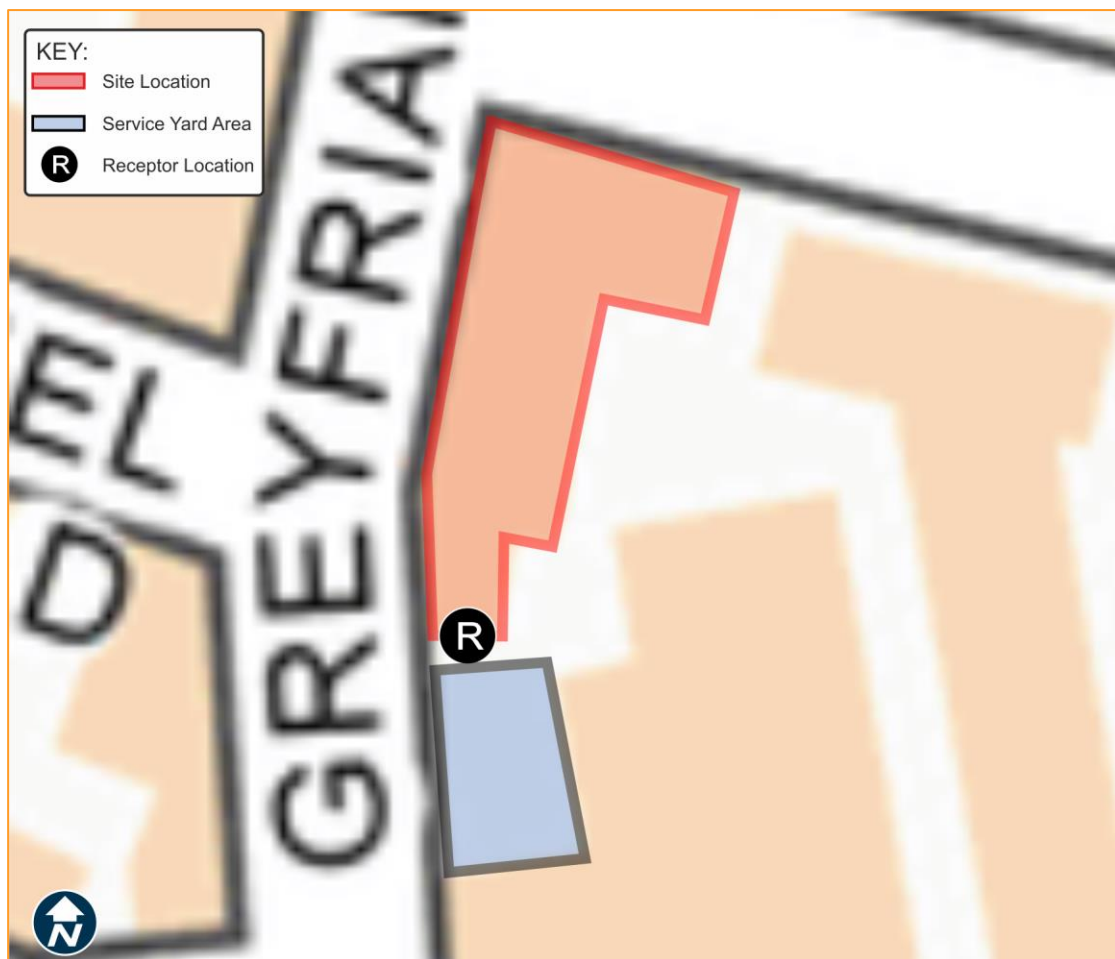
5.1 Purpose of Assessment

- 5.1.1 An assessment has been undertaken in general accordance with BS4142:2014+A1:2019 to determine the likely noise impact associated with the deliveries in the adjacent service yard. The likely noise impact associated with vehicle movements and loading/unloading activities have both been considered.
- 5.1.2 It should be noted that, as the planning permission sought is for prior approval, only the impact of noise from commercial operations requires consideration. The assessment of transportation noise or other non-industrial/ commercial sources incident on the proposed development have not been considered as they are beyond the scope of this report.

5.2 Noise Sensitive Receptors

- 5.2.1 The assessment has been undertaken at the nearest habitable rooms overlooking the service yard at the proposed development. **Figure 3** of the report illustrates the location of the service yard in relation to the proposed development.

Figure 3: Receptor Location



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5.3 Assessment Assumptions

5.3.1 The assessment is based on the following:

- All deliveries are made on site, within the service yard, to the rear of the supermarket building.
- Delivery vehicles would enter the site from the service yard entrance on Greyfriars Road from the south and would reverse into the service yard area.
- Delivery vehicles would depart the site and head north onto Greyfriars Road.
- Delivery vehicles would reverse into the unloading dock area. Stock would then be wheeled into the warehouse area without the use of a vehicle tail lift.
- In order to undertake a worst-case assessment, the assessment assumes that one delivery occurs during a one-hour period during the daytime assessment period (1 hour) and a 15-minute period during the night-time assessment period (15 minutes).

5.4 Calculation Procedure

5.4.1 Calculations have been undertaken to determine the rating sound levels associated with deliveries to the adjacent service yard.

5.4.2 Delivery activities generating noise at the proposed site associated with the operation of the proposed development are likely to include the following:

- Delivery vehicles arriving, parking and departing.
- Use of audible reversing alarms.
- General loading activities (e.g. loading/unloading of goods and operation of doors).

5.4.3 Stantec have previously undertaken measurements of delivery movements and loading/unloading activities at a similar development. Unless otherwise stated, sound levels are based on this library source level data. The survey methodology for obtaining these measurements can be found in **Appendix D**.

5.4.4 **Table 5.1** details the activities associated with the delivery operations at the supermarket service yard and the associated noise level. The number of events considered can be found in **Appendix E**.

Table 5.1: Noise Levels Associated with Deliveries

Measurement Description	Single Event Level, SEL (dB)	Source Level Measurement Distance (metres)
Lorry Arriving	68	1
Reversing Alarm	94	1
Air Brake	97	1
Lorry Door Slam	82	1
Opening/Closing Lorry Shutter	76	1
Locking/Unlocking Support Bars	88	4
Wheeling Cages Off Lorry	94	1
Wheeling Cages Away from Lorry	97	1
Wheeling Empty Cages to Lorry	92	3
Wheel Empty Cages into Lorry	93	3
Starting Lorry Engine	89	1
Lorry Driving Away	90	1

5.4.5 The specific sound level associated with vehicle movements and loading/unloading activities has been calculated by considering each noise generating activity as an individual sound event, which is then combined to obtain the associated specific sound level for the assessment period (one hour during the daytime period and 15 minutes during the night-time period).

5.5 Acoustic Feature Correction and Screening

5.5.1 Some sources can be considered to emit noise that is tonal, impulsive or intermittent in nature. For these sources, corrections have been applied (maximum of +6 dB for tonality, +9 dB for impulsivity and +3 dB for intermittency).

5.5.2 Based on the location of the individual sound sources and the location of the nearest habitable rooms at the proposed development, corrections for screening have also been considered. Screening has been considered for noise generating activities that occur within the vehicle and warehousing areas.

5.5.3 Full details of the acoustic feature and screening corrections applied to the assessment of vehicle movements and loading/unloading activities can be found in detailed calculations contained within **Appendix E**.

5.5.4 A +9 dB correction has been applied to the calculation of the noise impact of the use of a vehicle reversing alarm as the source tonality is considered to be highly perceptible and intermittent at the assessment location.

5.5.5 A +9 dB correction has been applied to the calculation of the noise impact of air brakes, as they are considered to be highly impulsive at the assessment location.

5.5.6 A +3 dB correction has been applied to the calculation of the noise impact of vehicle door slams, as they are considered to be intermittent at the assessment location.

5.6 Preliminary Assessment Results

5.6.1 **Table 5.2** presents the preliminary results of the BS4142:2014+A1:2019 assessment of vehicle movements and loading/unloading activities within the supermarket service yard area. Full calculations can be found in **Appendix E**.

Table 5.2: BS4142:2014+A1:2019 Preliminary Assessment Results

Description	Sound Level (dB)	
	Daytime (T = 1 hour)	Night-Time (T = 15 minutes)
Calculated Rating Level at Receptor (dB $L_{Ar,T}$)	52	58
Background Sound Level (dB $L_{A90,15minutes}$)	56	53
Excess of Rating over Background Sound Level (dB)	-4	+5
Assessment of Impact	Likely to be an indication of a low impact, depending on the context	Likely to be an indication of an adverse impact, depending on the context

5.7 Context and Mitigating Factors

5.7.1 The above assessment details the results of the initial numerical assessment of sound levels at the nearest noise sensitive receptor. It is important to recognise context in the assessment of the likely noise impact at the nearest noise sensitive receptors arising from deliveries to the proposed development.

5.7.2 The following factors should be taken into consideration:

- The absolute sound level.
- The character and level of the residual and specific sound levels; and
- The sensitivity of the receptor and use of mitigation measures.

Absolute Sound Levels

5.7.3 The calculated rating sound level at the nearest noise sensitive receptor is likely to be approximately 11 dB below the measured ambient sound level at Position 3 during the daytime period and is likely to be approximately 4 dB below the measured ambient sound level at Position 3 during the night-time period. Therefore, the rating sound level is not likely to significantly increase the existing ambient sound level.

Receptor Sensitivity

5.7.4 The assessment presented considers the lowest measured background sound level at Position 3 during the daytime and night-time period. It is therefore likely that the background sound level at the receptor could be higher than those used within the assessment. This would reduce the potential noise impact associated with vehicle movements and loading/unloading activities in the adjacent service yard.

5.7.5 As the assessment presented is considered worst case, loading/unloading activities may take less time than assumed. This would likely reduce the potential noise impact associated with delivery activities at the receptor.

5.8 Mitigation

5.8.1 For windows overlooking the service yard, it is proposed to retain the existing double glazing, and install a secondary glazed pane comprising a 10 mm pane with a cavity of 200 mm from the primary glazing, with acoustic absorption within the reveals.

5.8.2 Based on an informed review of available test data, **Table 5.3** presents the sound reduction indices expected to be achieved by the proposed glazing.

Table 5.3: Sound Reduction Indices Associated with Secondary Glazing

Glazing Type	Sound Reduction Index (dB) at Octave band with Centre Frequency (Hz)						
	125	250	500	1K	2K	4K	R' _w
Secondary Glazed Windows to Service Yard	36	52	49	55	64	73	54

- 5.8.3 Using the sound reduction indices as set out above, noise break in calculations have been undertaken to determine the likely internal noise levels in habitable rooms overlooking the service yard based on the measured sound levels at Position 3. Calculations have been undertaken in accordance with the procedure outlined in Paragraph 2.1 of Annex G of BS8233:2014. Details of the calculations can be found in **Appendix F**.
- 5.8.4 The results of the calculations indicate that using façade elements with acoustic performance set out above, internal noise levels are calculated to be significantly below the internal noise criteria set out in BS 8233 and WHO Guidelines.
- 5.8.5 Furthermore, as the calculated rating sound level during the daytime and night-time periods are likely to be below the measured sound levels at Position 3, internal noise levels associated with deliveries in the adjacent service yard are likely to be significantly below the internal noise criteria set out in BS 8233 and WHO Guidelines with the use of the proposed secondary glazing.
- 5.8.6 It is understood that the existing façade will be retained and will continue to be mechanically ventilated. As such, there is unlikely to be a requirement for openings within the façade to allow for background ventilation.
- 5.8.7 In addition, when considering the proposed secondary glazing and the measured-on site maximum sound levels during the night-time period at Position 3, internal maximum sound levels are likely to be 32 dB in dwellings overlooking the service yard. As such, internal maximum sound levels values are likely to fall well below the guidance outlined in BS 8233:2014.
- 5.8.8 Therefore, it is considered that, the implementation of secondary glazing in dwellings overlooking the supermarket service yard area is likely to provide a sufficient level of mitigation to allow residential use.

5.9 Uncertainty

- 5.9.1 Care has been taken to reduce uncertainty as far as reasonably possible. However, it should be recognised that in any environmental sound survey and assessment process uncertainty exists.

Measured Environmental Sound Levels

- 5.9.2 Uncertainty in the measured background and ambient sound levels can occur due to variation in temporary/non-representative meteorological conditions. It has therefore been assumed that all possible steps were taken to minimise the risk of meteorological conditions affecting the survey results. However, it should be recognised that there is a degree of uncertainty inherent in the baseline environmental sound data.

Calculation and Assessment Procedure

- 5.9.3 Uncertainty in measured source data for delivery activities can occur due to variation in temporary/non representative meteorological conditions. In this instance all possible steps were taken to minimise the risk of meteorological conditions affecting the measurements. Given the location of the measurements (i.e. 1-4 m from the source) the effect of meteorological conditions

is considered insignificant, however it should be recognised that there is a degree of uncertainty inherent in the measured source level data.

- 5.9.4 Considering issues regarding the likely reduction in sound climate and health and safety considerations during the COVID-19 lockdown, the assessment has been based on library source data. The data for delivery activities that form the basis of the assessment are based on activities considered representative of delivery activities that occur in the adjacent service yard area. Therefore, a degree of uncertainty is inherent in the source level data used. It is considered however that the delivery activities measured are a robust representation of the use of the service yard area.
- 5.9.5 The delivery activities considered in this assessment are based on typical information. Although the rating level is considered to be a reasonable calculation of noise levels associated with deliveries occurring within the supermarket service yard area it should be noted that the proposed mitigation is likely to provide a sufficient reduction to internal sound levels should the rating sound level be higher than calculated. Calculations indicate that an increase in the rating sound level of 10 dB is still likely to result in internal noise levels below BS8233:2014 and WHO Guidelines.

5.10 Assessment Summary

- 5.10.1 The initial assessment indicates that the level of impact associated with deliveries to the adjacent service yard area is likely to be of a level that is 'likely to be an indication of having a low impact, depending on the context' during the daytime period and is likely to be of a level that is 'likely to be an indication of having an adverse impact, depending on the context' during the night-time period.
- 5.10.2 When considering the context of the assessment and the mitigation proposed, it is considered that the assessment of impact can be modified to a level that is 'likely to be an indication of having a low impact, depending on the context' during the night-time period. It is therefore considered that deliveries to the adjacent service yard are likely to be of low impact at the receptor. Therefore, noise levels associated with the use of the adjacent service yard are likely to fall below the proposed LOAEL during daytime and night-time periods.

6 Conclusions

- 6.1.1 Stantec UK Ltd. has been commissioned by McKay Securities to undertake a noise impact assessment for a proposed prior approval application for the change of use from B1 (office) to C3 (residential) at 20/30 Greyfriars Road, Reading.
- 6.1.2 Peter Brett Associates LLP (PBA, now Stantec) previously undertook an environmental sound survey at the proposed development in January and March 2017 and subsequent noise impact assessment report (titled Noise Survey Report, reference Ac001, dated February 2017) to support a prior approval application to Reading Borough Council (Planning Application No. 170229, dated 10th February 2017). The application was approved in April 2017.
- 6.1.3 In response to these comments, the previous report undertaken by PBA has been updated to include an assessment of the impact of noise on the proposed development associated with deliveries within the adjacent service yard area. It was agreed that, considering issues regarding the likely reduction in sound climate and health and safety considerations during the COVID-19 lockdown, the assessment of the impact of noise associated with deliveries to the adjacent service yard area could be undertaken based on library source level calculations in accordance with BS4142:2014+A1:2019.
- 6.1.4 It should be noted that, as the planning permission sought is for prior approval, only the impact of noise from commercial operations requires consideration. The assessment of transportation noise or other non-industrial/ commercial sources incident on the proposed development have not been considered as they are beyond the scope of this report.
- 6.1.5 The initial assessment of deliveries to the adjacent service yard area indicates that the level of impact associated with deliveries to the adjacent service yard area is likely to be of a level that is 'likely to be an indication of having a low impact, depending on the context' during the daytime period and is likely to be of a level that is 'likely to be an indication of having an adverse impact, depending on the context' during the night-time period.
- 6.1.6 When considering the context of the assessment and the mitigation proposed, it is considered that the assessment of impact can be modified to a level that is 'likely to be an indication of having a low impact, depending on the context' during the night-time period. It is therefore considered that deliveries to the adjacent service yard are likely to be of low impact at the receptor.
- 6.1.7 Based on the results of the assessment, the site should be considered suitable for the proposed development, with respect to noise.

Appendix A Glossary of Acoustic Terminology

Table A.1: Glossary of Acoustic Terminology

Parameter	Description
Acoustic Environment	Sound at the receiver from all sound sources as modified by the environment.
Ambient Sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. Comprises of the residual sound and the specific sound when present.
Ambient Sound Level ($L_a = L_{Aeq,T}$)	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
A-Weighted Decibel (dBA)	A decibel level that has been corrected for the A-Weighting curve.
A-Weighting	Octave band and 1/3 octave band filters that correlate to the response of the human hearing system to sound pressure levels at different frequencies.
Background Sound	The level of sound measured in the absence of extraneous noise sources.
Background Sound Level ($L_{A90,T}$)	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using a fast time-weighting and quoted to the nearest whole number of decibels.
Decibel (dB)	A logarithmic unit used to describe the ratio between the measured level and a reference level of 0 dB. The ratio can be sound pressure, intensity or power.
Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$)	Value of the time-averaged A-weighted sound pressure level, in decibels (dB), of a continuous steady sound for the duration of the specified time interval, T.
Façade Level	The sound pressure level at a distance of 1 metre from the façade
Fast Time Weighted	The speed at which the instrument responds to changes in amplitude of the measured signal. The response time of a fast time-weighted instrument is 0.125 seconds.
Free-Field Level	The sound pressure level measured away from any reflective surfaces.
Frequency (f)	The number of cycles of pressure fluctuations within a given period of time. Measured in Hertz.
Hertz (Hz)	The unit of frequency or pitch of a sound.
$L_{10,T}$	The noise level exceeded for 10 % for a given time interval, T. Generally used to describe traffic noise.
L_{Amax}	The maximum A-weighted level measured during a given time period.
Octave Band	Band of frequencies where the upper limit of the band is twice the frequency of the lower limit. E.g., the 1000 Hz band contains noise energy at all frequencies from 707 to 1414 Hz.
Percentile Level ($L_{AN,T}$)	The A-Weighted Sound Pressure Level which is exceeded for N% of the specified time interval. E.g., the $LA_{90,1hour}$ is the A-weighted sound level exceeded for 90% of 1 hour/
Reference Time Interval (T)	Specified interval over which the specific sound level is determined.
Sound Pressure	The difference between the pressure caused by a sound wave and the ambient pressure of the medium the sound wave is passing through. Measured in Pascals.
Sound Pressure Level (Lp)	The logarithm of the ratio of a given sound pressure (p) to the reference sound pressure (p_0). The reference value for sound pressure is 20 μ Pa.
Sound Sources	Sounds generated by nature or human activity.

Appendix B Photographs of Noise Monitoring Equipment

Figure B.1: Photographs of MP1



Figure B.2: Photographs of MP2

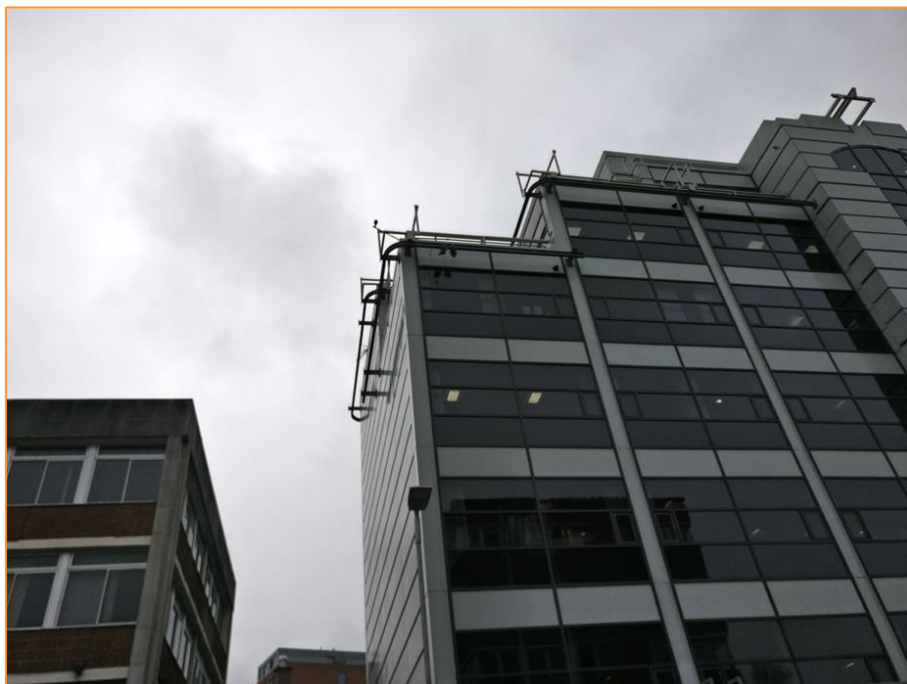


Figure B.3: Photographs of MP3



Appendix C Sound Time History Graphs

Figure C.1: MP1 Results Time-History

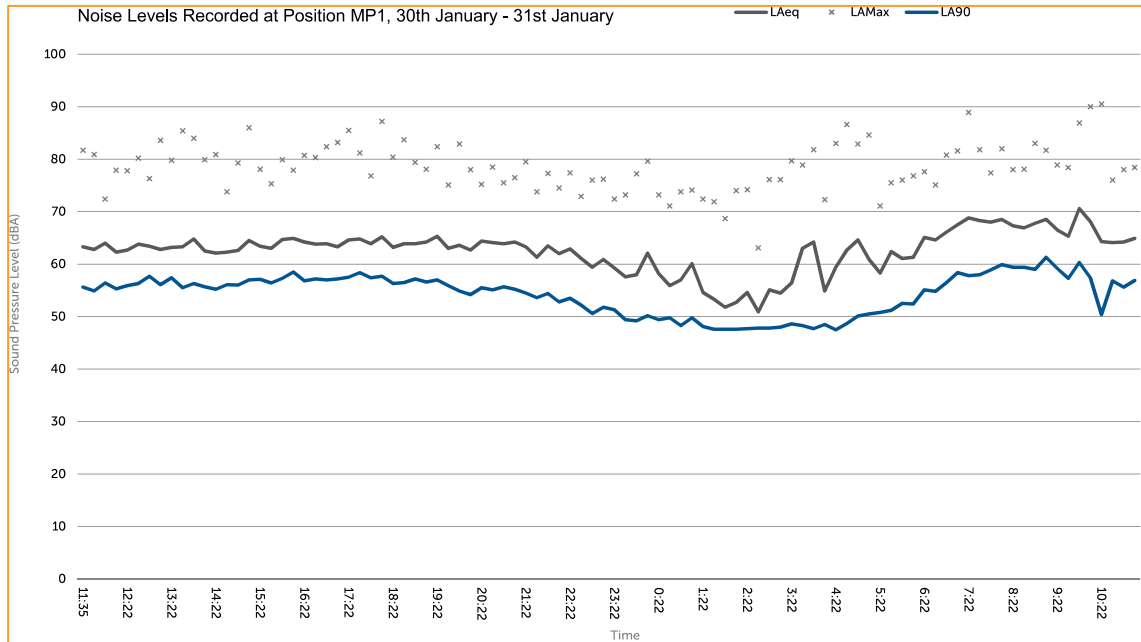


Figure C.2: MP2 Results Time-History

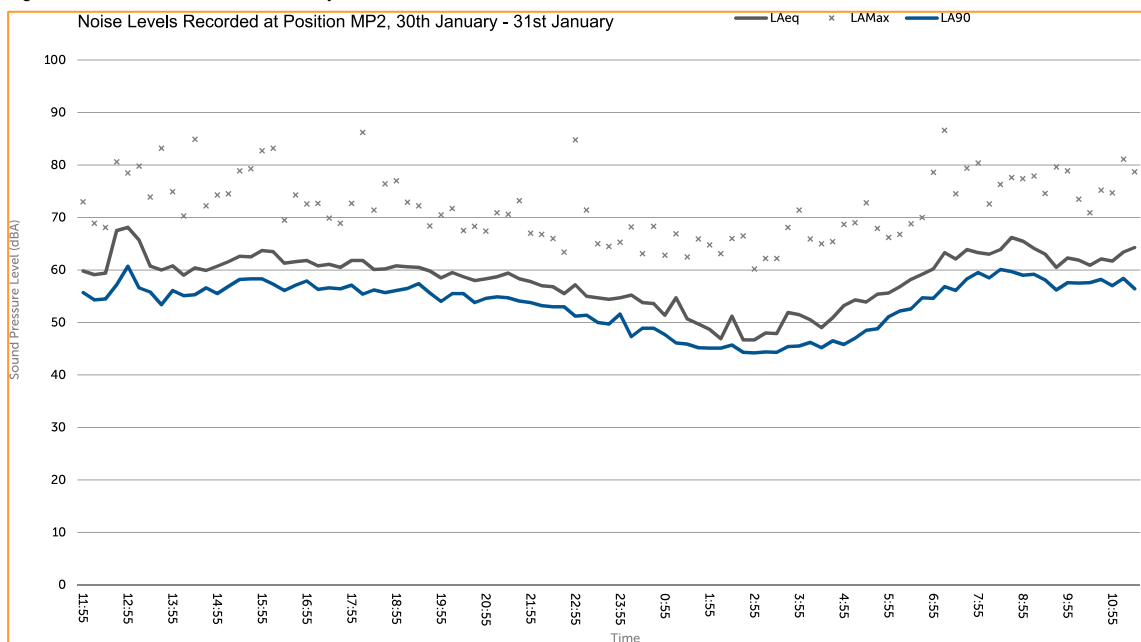
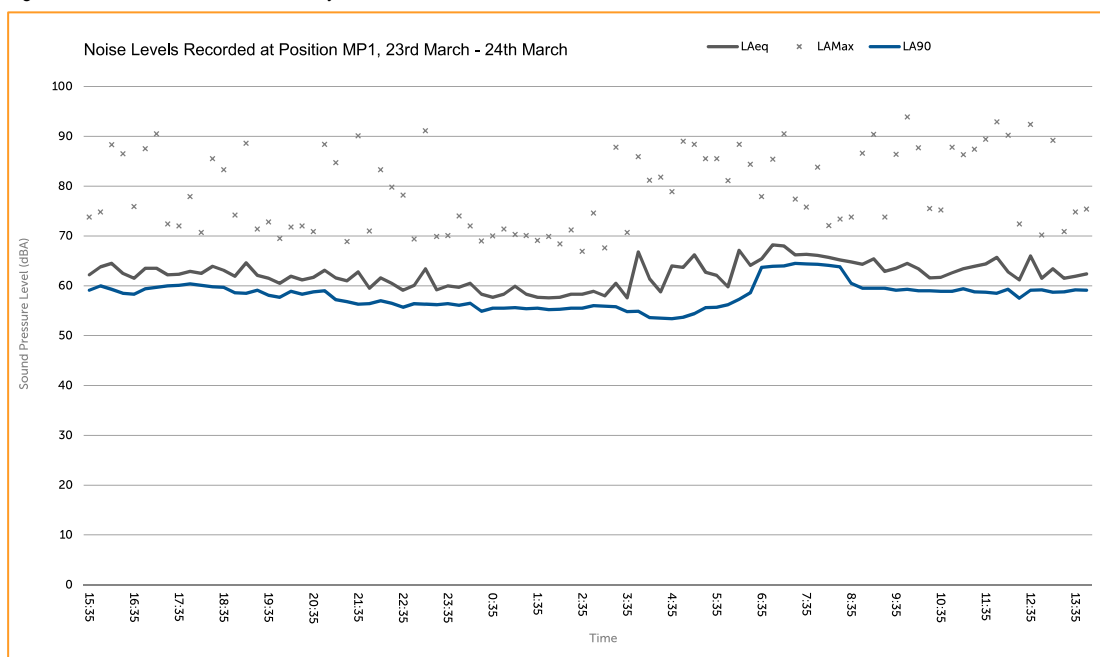


Figure C.3: MP3 Results Time-History



Appendix D BS4142:2014+A1:2014 Survey Methodology

- D.1.1 A manned sound survey was undertaken between 06:45 and 09:00 on Tuesday 16 August 2016 in order to obtain sound levels associated with HGV movements and loading/unloading activities.
- D.1.2 Ambient sound level measurements were taken approximately 1 - 4m away from each delivery activity. Residual sound level measurements were also taken before and after the delivery period.
- D.1.3 **Table D.1** outlines the weather information for the survey period.

Table D.1: Weather Information for BS4142:2014 Manned Survey

Description	Tuesday 16 August 2016 06:45 – 09:00 hours
Temperature (°C)	20
Precipitation (mm)	None
Cloud Cover (%)	5
Wind Speed (m/s)	1
Wind Description	Light Air
Wind Direction	NW

- D.1.4 For both sound surveys undertaken, background sound levels were measured in the absence of sound from the source under consideration. Measured background sound levels are considered representative of background sound levels at the proposed development.
- D.1.5 The A-weighted $L_{Aeq,T}$, $L_{A90,T}$ and L_{AFMax} levels were taken for each measurement.
- D.1.6 The sound level meter was fixed to a tripod at a height of 1.5 m above ground level. The microphone was fitted with the manufacturer's windshield.
- D.1.7 The instrumentation details for the survey undertaken can be found in **Table D.2**. Field calibrations were performed before and after the measurements with no significant fluctuations recorded (<0.5 dB).

Table D.2: BS4142:2014 Measurement Instrumentation

Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date
Sound Level Meter	Brüel & Kjær	2250	2626231	28/01/2016
Pre-amplifier		ZC0032	8125	
½" Pre-polarised microphone		4189	2621209	
Calibrator	Brüel & Kjær	4231	2389171	15/02/2016

Appendix E BS4142:2014+A1:2019 Delivery Noise Impact Calculations

BS4142 Assessment - Vehicle Movements and Loading/Unloading Daytime	Lorry Arriving	Reversing Alarm	Air Brake	Lorry Door Slam	Opening Lorry Shutter	Unlocking Support Bars	Wheeling Cages Off Lorry	Wheeling Cages Away from Lorry	Wheeling Empty Cages to Lorry	Wheel Cages into Lorry	Lock Support Bars	Closing Lorry Shutter	Lorry Door Slam	Starting Lorry Engine	Lorry Driving Way
Sound Exposure Level (SEL)	68	94	97	82	76	88	94	97	92	93	88	76	82	89	90
Source Measurement Distance	1	1	1	1	1	4	1	1	3	3	4	1	1	1	1
Number of Events	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Average Distance to Receptor (m)	7	7	14	14	19	15	15	19	19	15	15	19	14	14	7
Distance Loss	-17	-17	-23	-23	-26	-11	-24	-26	-16	-14	-11	-26	-23	-23	-17
Reflections	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acoustic Feature Correction	0	9	9	3	0	0	0	0	0	0	0	0	3	0	0
Acoustic Screening	0	0	0	0	-17	-17	-17	-17	-17	-17	-17	-17	0	0	0
Rating Level (dB L _{aeq,1hour})	15	50	47	26	-3	24	17	18	23	26	24	-3	26	30	37
Combined Rating Level (dB L _{aeq,1hour})	52														
Background Noise Level	56														
Comparison	-4														

BS4142 Assessment - Vehicle Movements and Loading/Unloading Night-Time	Lorry Arriving	Reversing Alarm	Air Brake	Lorry Door Slam	Opening Lorry Shutter	Unlocking Support Bars	Wheeling Cages Off Lorry	Wheeling Cages Away from Lorry	Wheeling Empty Cages to Lorry	Wheel Cages into Lorry	Lock Support Bars	Closing Lorry Shutter	Lorry Door Slam	Starting Lorry Engine	Lorry Driving Way
Sound Exposure Level (SEL)	68	94	97	82	76	88	94	97	92	93	88	76	82	89	90
Source Measurement Distance	1	1	1	1	1	4	1	1	3	3	4	1	1	1	1
Number of Events	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Average Distance to Receptor (m)	7	7	14	14	19	15	15	19	19	15	15	19	14	14	7
Distance Loss	-17	-17	-23	-23	-26	-11	-24	-26	-16	-14	-11	-26	-23	-23	-17
Reflections	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acoustic Feature Correction	0	9	9	3	0	0	0	0	0	0	0	0	3	0	0
Acoustic Screening	0	0	0	0	-17	-17	-17	-17	-17	-17	-17	-17	0	0	0
Rating Level (dB L _{aeq,1hour})	21	56	53	32	3	30	23	24	29	32	30	3	32	36	43
Combined Rating Level (dB L _{aeq,1hour})	58														
Background Noise Level	53														
Comparison	5														

Appendix F Noise Break-In Calculations

Daytime (07:00 – 23:00 hours)

Calculation Sheet										
Day Leq to Bedroom Day Leq										
		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Noise Source										
Noise Source - Day Leq										
Noise Levels		66.6	59.5	58.4	57.3	58.7	57.5	53.7	46.9	63.4 dBA
Composite SRI										
Facade Width (m)	3.0									
Facade Height (m)	2.5									
Main Element - EW-01										
SRI		-	37.0	42.0	52.0	60.0	63.0	68.0	-	Rw 54
Window Width (m)	1.0									
Window Height (m)	1.5									
No. of Windows (no)	2.0									
Glazed Element - GL-01										
SRI		-	36.0	52.0	49.0	55.0	64.0	73.0	-	Rw 54
		-	-36.57	-43.94	-50.54	-57.29	-63.37	-69.39	-	
10 log (S/A)										
Internal Receiver - Bedroom Day Leq										
		-	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-	
+3										
		-	3.0	3.0	3.0	3.0	3.0	3.0	-	
Internal Receiver Noise										
Internal Receiver Noise - Bedroom										
Day Leq										
Reverberant Field, LPrev		-	24.8	16.4	8.7	3.3	-4.0	-13.8	-	13 dBA

Night-Time (23:00 – 07:00 hours)

Calculation Sheet

Night Leq to Bedroom Night Leq

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>Noise Source</i>									
Noise Source - Night Leq									
Noise Levels		63.8	57.3	56.4	55.6	56.9	57.1	52.6	46.2 62.3 dBA
<i>Composite SRI</i>									
Facade Width (m)	3.0								
Facade Height (m)	2.5								
Main Element - EW-01									
SRI		-	37.0	42.0	52.0	60.0	63.0	68.0	- Rw 54
Window Width (m)	1.0								
Window Height (m)	1.5								
No. of Windows (no)	2.0								
Glazed Element - GL-01									
SRI		-	36.0	52.0	49.0	55.0	64.0	73.0	- Rw 54
		-	-36.57	-43.94	-50.54	-57.29	-63.37	-69.39	-
<i>10 log (S/A)</i>									
Internal Receiver - Bedroom Night Leq									
		-	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-
+3									
		-	3.0	3.0	3.0	3.0	3.0	3.0	-
<i>Internal Receiver Noise</i>									
Internal Receiver Noise - Bedroom Night Leq									
Reverberant Field, LPrev		-	22.6	14.4	7.0	1.5	-4.4	-14.9	- 11 dBA

Night-Time Maximum Sound Levels

Calculation Sheet

Night Max to Bedroom Night LMax

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<i>Noise Source</i>									
Noise Source - Night Max									
Noise Levels		87.0	76.7	78.2	78.6	79.3	77.0	77.0	72.7 84.4 dBA
<i>Composite SRI</i>									
Facade Width (m)	3.0								
Facade Height (m)	2.5								
Main Element - EW-01									
SRI		-	37.0	42.0	52.0	60.0	63.0	68.0	- Rw 54
Window Width (m)	1.0								
Window Height (m)	1.5								
No. of Windows (no)	2.0								
Glazed Element - GL-01									
SRI		-	36.0	52.0	49.0	55.0	64.0	73.0	- Rw 54
		-	-36.57	-43.94	-50.54	-57.29	-63.37	-69.39	-
<i>10 log (S/A)</i>									
Internal Receiver - Bedroom Night LMax									
		-	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-
+3									
		-	3.0	3.0	3.0	3.0	3.0	3.0	-
<i>Internal Receiver Noise</i>									
Internal Receiver Noise - Bedroom Night LMax									
Reverberant Field, LPrev		-	42.0	36.2	30.0	23.9	15.5	9.5	- 32.4 dBA