

Sovereign Industrial Estate, Huyton, Liverpool, L36 6AW

Noise Assessment

784-B048969



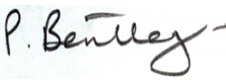
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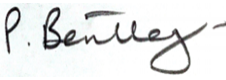
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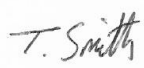
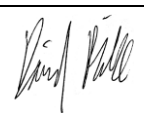
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Appendix A: Glossary of Terminology

1.0 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This report presents the findings of a noise assessment to support a planning application for the partial demolition and refurbishment of existing warehouses and erection of a new mixed commercial/industrial development at Sovereign Industrial Estate, Huyton. A description of the existing noise environment in and around the site is provided.

A list of acoustic terminology and abbreviations used in this report is provided in Appendix A and Report Conditions are presented in Appendix B.

1.2 LEGISLATIVE CONTEXT

This report is intended to provide information relevant to the local planning authority and their consultees in support of a planning application for the above proposed development. Policy guidance with respect to noise is found in the National Planning Policy Framework (NPPF), published in September 2023. With regard to noise and planning, the NPPF contains the following statement at paragraph 174:

“174 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...”

“185. 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 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...”

“187. 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.

188. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”

Practice Guidance (PPG): Noise provides further guidance with regard to the assessment of noise within the context of Planning Policy. The overall aim of this guidance is, tying in with the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England (NPSE), is to, 'identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.'

A summary of the effects of noise exposure associated with both noise generating developments and noise sensitive developments is presented within the PPG and repeated below in Table 1.1.

Table 1.1: NPPG Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No Specific Measures Required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No Specific Measures Required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

The NPPF, NPSE and PPG do not, however, present absolute noise level criteria which define SOAEL, LOAEL and NOEL which is applicable to all sources of noise in all situations. Therefore, within the context of the Proposed Development, national planning policy and appropriate guidance documents including ‘BS 8233 – Guidance on Sound Insulation and Noise Reduction for Buildings’ (2014) and ‘BS 4142: 2014 Methods for Rating and Assessing Industrial and Commercial Sound’. Section 2.0 presents the noise level criteria used as a basis of this assessment.

The PPG also states that neither the NPSE nor the NPPF (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of the proposed development.

1.3 ACOUSTIC CONSULTANTS’ QUALIFICATIONS AND PROFESSIONAL MEMBERSHIPS

The lead project Acoustic Consultant is Travis Smith. The report has been checked by David Fink and verified by Nigel Mann. Relevant qualifications, membership and experience are summarised in Table 1.2 below.

Table 1.2: Acoustic Consultants’ Qualifications & Experience

Name	Education	Experience in Undertaking Noise Assessments (Start date of working in noise & acoustics)	Attained Associate Membership of the Institute of Acoustics (date)	Attained Membership of the Institute of Acoustics (date)
Travis Smith	BSc 2022	Jul 2022	-	-
David Fink	BEng 2016	Mar 2017	Jul 2017	-
Nigel Mann	BSc 1997 MSc 1999 PgDip 2001	Nov 1998	Nov 2001	Jul 2005

2.0 ASSESSMENT CRITERIA

2.1 NATIONAL PLANNING PRACTICE GUIDANCE

In order to enable the assessment of the proposed development in terms of LOAEL and SOAEL, Table 2.1 presents equivalent noise levels and associated actions with the target noise level criteria identified. The noise level criteria detailed below have been derived from standards and design guidance:

- BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings – Code of practice'
- BS4142:2014 'Method for rating industrial and commercial sound'
- World Health Organisations (1999) Guidelines for community noise
- IEMA 'Guidelines for Environmental Noise Impact Assessment' (2014)

Table 2.1: Noise Level Criteria and Actions

Effect Level	Noise Sources	Noise Level Criteria	Justification for Effect Level- Action Required
No Observed Adverse Effect Level (NOAEL)	Fixed plant and equipment located externally or internally with louvered ventilation grilles	Difference between Rating Level ($L_{A,r,T}$) dB and existing background level $L_{A90,T}$ dB is less than or equal to 0dB	Justification for Effect Level: Below low impact threshold in BS4142:2014 Action Required: None
	Absolute internal noise criteria for the following noise sources with windows closed: - Road traffic noise - Goods vehicle deliveries including arrival and departure of vehicles and unloading of vehicles. - Service yard noise including forklift truck movements. - Car Parks	Noise levels are below: <i>Living Rooms:</i> 35 $dB L_{Aeq,16hours}$ <i>Kitchens, Dining Rooms, and Studies:</i> 40 $dB L_{Aeq,16hours}$ <i>Bedrooms Rooms:</i> 35 $dB L_{Aeq,16hours}$ 30 $dB L_{Aeq,8hr}$ $L_{AFmax,2min}$ noise levels do not exceed: 45 $dB L_{AFmax}$ based on 10th highest $L_{AFmax,2min}$ sample)	Justification for Effect Level: Less than threshold values in Table 4 in BS8233:2014 and Table 1 in World Health Organisation (1999) Guidelines on Community Noise Action Required: None
	Change in noise levels for the following noise sources: - Road traffic noise - Goods vehicle deliveries including arrival and departure of vehicles and unloading of vehicles. - Service yard noise including forklift truck movements. - Car Parks	Increase in ambient $L_{Aeq,T}$ due to contribution from proposed development of ≤ 1 dB.	Justification for Effect Level: Within negligible short-term impact classification range in Table 7.14 in IEMA 2014 guidance Guidelines for Environmental Noise Impact Assessment Action Required: None
Lowest Observed Adverse Effect Level (LOAEL)	Fixed plant and equipment located externally or internally with louvered ventilation grilles	Difference between Rating Level ($L_{A,r,T}$) dB and existing background sound level $L_{A90,T}$ dB is between 1-4dB.	Justification for Effect Level: Within less likely for adverse or significant adverse impact to occur low impact threshold in BS4142:2014 Action Required: Mitigate and reduce to a minimum the exceedance over 0dB above background threshold

Effect Level	Noise Sources	Noise Level Criteria	Justification for Effect Level- Action Required
	Absolute internal noise criteria for the following noise sources with windows closed: - Road traffic noise - Goods vehicle deliveries including arrival and departure of vehicles and unloading of vehicles. - Service yard noise including forklift truck movements. - Car Parks	Noise levels are between: <i>Living Rooms:</i> 35-40 dBL_{Aeq,16hours} <i>Kitchens, Dining Rooms, and Studies:</i> 40-45 dBL_{Aeq,16hours} <i>Bedrooms Rooms:</i> 35-40 dBL_{Aeq,16hours} 30-35dB L_{Aeq,8hr} - L_{AFmax,2min} noise levels do not exceed 45dB L_{AFmax} based on 10th highest L_{AFmax,2min} sample)	Justification for Effect Level: Exceed threshold guidelines in Table 4 of BS8233:2014 and World Health Organisation (1999) Guidelines on Community Noise by no greater than 5dB to achieve <i>reasonable internal conditions</i> as defined by Note 7 to Table 1 in BS8233:2014 Action Required: Mitigate and reduce to a minimum the exceedance over the threshold
	Change in noise levels for the following noise sources: - Road traffic noise - Goods vehicle deliveries including arrival and departure of vehicles and unloading of vehicles. - Service yard noise including forklift truck movements. - Car Parks	Increase in ambient L_{Aeq,T} due to contribution from proposed development of 1.0-2.9dB.	Justification for Effect Level: Within minor short-term impact classification range in Table 7.14 in IEMA 2014 guidance Guidelines for Environmental Noise Impact Assessment Action Required: Additional mitigation required to achieve effect of LOAEL or less.
Significant Observed Adverse Effect Level (SOAEL)	Fixed plant and equipment located externally or internally with louvered ventilation grilles	Difference between Rating Level (L_{Ar,T}) dB and existing background sound level L_{A90,T} dB is between 5-9dB.	Justification for Effect Level: Within adverse impact threshold in BS4142:2014. Action Required Additional mitigation required to achieve effect of LOAEL or less.
	Absolute internal noise criteria for the following noise sources with windows closed: - Road traffic noise - Goods vehicle deliveries including arrival and departure of vehicles and unloading of vehicles. - Service yard noise including forklift truck movements. - Car Parks	Noise levels are between: <i>Living Rooms:</i> 40-45 dBL_{Aeq,16hours} <i>Kitchens, Dining Rooms, and Studies:</i> 45-50 dBL_{Aeq,16hours} <i>Bedrooms Rooms:</i> 40-45 dBL_{Aeq,16hours} 35-40dB L_{Aeq,8hr} 45-55dB L_{AFmax,2min} based on 10th highest L_{AFmax,2min} sample)	Justification for Effect Level: Exceeds BS8233:2014 L_{Aeq,T} reasonable criteria by 5dB or exceeds L_{AFmax,2min} (10th highest sample) Action Required: Additional mitigation required to achieve effect of LOAEL or less.

Effect Level	Noise Sources	Noise Level Criteria	Justification for Effect Level- Action Required
	Change in noise levels for the following noise sources: - Road traffic noise - Goods vehicle deliveries including arrival and departure of vehicles and unloading of vehicles. - Service yard noise including forklift truck movements. - Car Parks	Increase in ambient $L_{Aeq,T}$ due to contribution from proposed development of 3.0-4.9dB.	Justification for Effect Level: Within moderate short-term impact classification range in Table 7.14 in IEMA 2014 guidance Guidelines for Environmental Noise Impact Assessment Action Required: Additional mitigation required to achieve effect of LOAEL or less.
	Fixed plant and equipment located externally or internally with louvered ventilation grilles	Difference between Rating Level ($L_{Ar,T}$) dB and existing background sound level $L_{A90,T}$ dB is equal to or greater than 10dB	Justification for Effect Level: Within significant adverse impact threshold in BS4142:2014 Action Required: Additional mitigation required to achieve effect of LOAEL or less.
Unacceptable Observed Adverse Effect Level (UOAE)	Absolute internal noise criteria for the following noise sources with windows closed: - Road traffic noise - Goods vehicle deliveries including arrival and departure of vehicles and unloading of vehicles. - Service yard noise including forklift truck movements. - Car Parks	Noise levels exceed: <i>Living Rooms:</i> 45 dBL_{Aeq,16hours} <i>Kitchens, Dining Rooms, and Studies:</i> 50 dBL_{Aeq,16hours} <i>Bedrooms Rooms:</i> 45 dBL_{Aeq,16hours} 40dB $L_{Aeq,8hr}$ $L_{AFmax,2min}$ noise levels exceeds 55dB L_{AFmax} based on 10th highest $L_{AFmax,2min}$ sample)	Justification for Effect Level: Exceeds BS8233:2014 $L_{Aeq,T}$ reasonable criteria by 10dB or exceeds $L_{AFmax,2min}$ (10 th highest sample) by 10dB or more. Action Required: Additional mitigation required to achieve effect of LOAEL or less.
	Change in noise levels for the following noise sources: - Road traffic noise - Goods vehicle deliveries including arrival and departure of vehicles and unloading of vehicles. - Service yard noise including forklift truck movements. - Car Parks	Increase in ambient $L_{Aeq,T}$ due to contribution from proposed development of ≥ 5.0 dB.	Justification for Effect Level: Within major short-term impact classification range in Table 7.14 in IEMA 2014 guidance Guidelines for Environmental Noise Impact Assessment. Action Required: Additional mitigation required to achieve effect of LOAEL or less.

3.0 ASSESSMENT METHODOLOGY

3.1 NOISE MODELLING METHODOLOGY

Three-dimensional noise modelling has been undertaken based on the monitoring data to predict noise levels at a number of locations both horizontally and vertically. CADNA noise modelling software has been used. This model is based on ISO 9613-2 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically. The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data and model settings as given in the table below have been used.

Table 3.1: Modelling Parameters Sources and Input Data

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground levels – around site	Ordnance Survey	LIDAR 2m DTM
Building heights – around site	Tetra Tech Observations	8 m height for two storey residential properties, and 4 m for Bungalows.
Receptor positions	Tetra Tech	1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties. 1.5 m height for model grid and monitoring locations for validation.
Proposed Plans	AEW Architects	Drawing Title: Proposed Site Plan Drawing No: 13579-AEW-XX-XX-DR-A-0503 Rev. A Dated: 05/04/2024

It is acknowledged that a number of the values of parameters chosen will affect the overall noise levels presented in this report. However, it should be noted that the values used, as identified above, are worst-case.

3.2 MODEL INPUT DATA

3.2.1 Demolition and Construction Noise

Information regarding noise emissions from equipment used during the demolition and construction phases has been obtained from Annex C of BS 5228-1:2009 + A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. This annex presents a range of current sound level data on typical site equipment and common site activities.

This data is obtained by field measurements for items of plant in actual use on construction and open sites in the UK. Levels quoted in the database are based on an average (logarithmic) of measured sound levels, and where appropriate have been derived from more than one model of similarly sized plant. The results are presented below. All sound pressure levels are standardised to 10 metres.

The items of plant and associated noise levels shown in Table 3.2 and Table 3.3 below have been used for the purposes of this assessment and consider the range of typical activities likely to be employed during the demolition phase and construction phase of the proposed development.

Table 3.2: Mobile Plant Demolition Phase

Equipment	BS 5228-1:2009 Annex C Ref.	Octave Band Sound Pressure Levels (Hz) at 10m								Model Input L _{Aeq,1hour} at 10m dB
		63	125	250	500	1K	2K	4K	8K	
Breaker mounted on wheeled backhoe	C.1.1	79	82	81	82	86	86	86	85	92
Tracked excavator (loading dump truck)	C.1.10	82	78	82	81	81	78	72	64	85
Gas cutter	C.1.18	72	72	69	72	73	72	71	71	79
Wheeled backhoe loader (idling)	C.2.9	60	53	49	52	51	48	43	33	55

Table 3.3: Mobile Plant Construction Phase

Equipment	BS 5228-1:2009 Annex C Ref.	Octave Band Sound Pressure Levels (Hz)								Model Input L _{Aeq,1hour} at 10m dB
		63	125	250	500	1K	2K	4K	8K	
Hand-held gas cutter	C.3.35	74	76	66	58	56	56	55	55	65
Tracked excavator	C.4.17	81	72	68	68	66	64	60	55	71
Concrete mixer truck (discharging) & concrete pump (pumping)	C.4.28	79	80	73	72	69	68	59	53	75
Poker vibrator	C.4.34	62	70	70	64	62	61	59	56	69
Tower crane	C.4.48	82	77	80	76	66	66	56	50	76
Core drill (electric)	C.4.69	75	74	75	72	74	75	80	80	85
Angle grinder (grinding steel)	C.4.93	57	51	52	60	70	77	73	73	80

3.2.2 Operational Noise

The model inputs representing operational noise can be found in the tables below for L_{Aeq} and L_{AFMax} . Previous Tetra Tech measurements of a similar, representative nature have been used throughout which has informed the assessments found in Section 5.0.

Table 3.4: Operational Noise Sources

Description	Type of Source	Source	Sound Pressure Level (dB)
			Daytime $L_{Aeq,1hour}$ / Night-time $L_{Aeq,15 mins}$
HGV Unloading	Point	Previous Tetra Tech Measurements	73.8 / 76.3 at 3m
Electric Forklift	Point	Previous Tetra Tech Measurements	73.4 / 73.4 at 3m
HGV Movement	Line	Previous Tetra Tech Measurements	41.9 / 57.0 at 3m
Car Park	Area	Previous Tetra Tech Measurements	54.0 / 54.0 at 1m

3.3 SENSITIVE RECEPTORS

Table 3.5 below summarises receptor locations that have been selected to represent worst-case sensitive receptors with respect to direct noise from the site. Façades of the nearest noise sensitive properties to the development site have been represented. The locations of the receptors are shown in Figure 3.1 below.

Table 3.5: Existing Receptor Locations

Ref.	Description	Type of Use	Height (m) Daytime / Night-time
R01	98 Logwood Road	Residential	1.5/4.0
R02	9 Holland Grove	Residential	1.5/4.0
R03	20 Rudgate Road	Residential	1.5/4.0
R04	Newsham Road	Residential	1.5/4.0
R05	24 Newsham Road	Residential	1.5/4.0
R06	10 Newsham Road	Residential	1.5/4.0
R07	59 Bridgewater Way	Residential	1.5/4.0
R08	66 Bridgewater Way	Residential	1.5/4.0
R09	62 Bridgewater Way	Residential	1.5/4.0
R10	46 Bridgewater Way	Residential	1.5/4.0
R11	34 Bridgewater Way	Residential	1.5/4.0
R12	White House – 91-92 Cronton Road	Residential	1.5/4.0
R13	3 Whitefield Lane	Residential	1.5/4.0
R14	Cronton Road	Residential	1.5/4.0
R15	2 Cronton Road	Residential	1.5/4.0
R16	1 Sevenoak Grove	Residential	1.5/4.0

Figure 3.1: Sensitive Receptor Locations



4.0 NOISE SURVEY

A monitoring survey was undertaken from 28th May 2021 to 2nd June 2021 to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels. Equipment used during the survey included:

<i>Rion NL-52</i>	<i>Environmental Noise Analyser</i>	<i>s/n</i>	<i>620858</i>
<i>Rion NL-52</i>	<i>Environmental Noise Analyser</i>	<i>s/n</i>	<i>219904</i>
<i>Rion NL-52</i>	<i>Environmental Noise Analyser</i>	<i>s/n</i>	<i>732146</i>
<i>Rion NL-52</i>	<i>Environmental Noise Analyser</i>	<i>s/n</i>	<i>1176464</i>
<i>Rion NC-75</i>	<i>Sound Calibrator</i>	<i>s/n</i>	<i>35270131</i>

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice, a drift of +0.8 dB was observed. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

Attended short term (ST) measurements were undertaken at five locations during day, evening and night-time periods with three additional long -term (LT) locations being measured unattended over a 121-hour period. The raw data collected from the long-term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 The Description and Measurement of Environmental Noise: Guide to quantities and procedures. Weather conditions during the survey period were observed as being dry. Anemometer readings confirmed that wind speeds were less than 5 ms⁻¹ at all times during the survey, with a predominant north-eastern wind direction during the survey.

Table 4.1 Noise Monitoring Locations

Ref	Description
LT1	North-western boundary of the site
LT2	Western boundary of the site
LT3	Southern boundary of the site
ST1	North-west of the site, Logwood Road
ST2	West of the site, Hastings Drive
ST3	North-west of the site, Rudgate Road
ST4	West of the site, Bridgewater Way
ST5	South-east of the site, adjacent to public house car park

Figure 4.1: Noise Monitoring Locations



4.1 NOISE SURVEY RESULTS

The dominant noise sources found in the area include frequent aircraft, road traffic noise from B1112, A134 and The Avenue. Other contributions to the ambient noise environment consist of birdsong/insect noise (crickets) and trees rustling in the wind.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the L_{A10} index (i.e. the level exceeded for 10% of the measurement period). For the long-term (LT) locations, the presented $L_{Aeq,T}$ and $L_{A10,T}$ are average noise levels whilst the L_{A90} is the modal noise level of each 5-minute measurement over the stated survey period.

Table 4.2: Meteorological Conditions During the Survey

Survey Location	Date & Time	Temperature (°C)	Wind Speed (m/s)	Wind Direction	Cloud Cover (Oktas)	Dominant Noise Source
Day ST1	01/06/2021 14:26	24	1 – 2	N	2	Road traffic noise A5080, Logwood Road
Day ST2	01/06/2021 15:09	24	1 – 2	W	2	Road traffic noise A5080
Day ST3	01/06/2021 15:54	25	1 – 2	E	2	Road traffic noise Rudgate Road
Day ST4	01/06/2021 16:14	24	1 – 2	NE	2	Road traffic noise A5080, M57
Day ST5	02/06/2021 09:36	22	1 – 2	NE	1	Road traffic noise A5080, M57
Evening ST1	01/06/2021 18:57	21	0 – 1	W	3	Road traffic noise A5080, Logwood Road, M57
Evening ST2	01/06/2021 19:17	21	0 – 1	E	3	Road traffic noise A5080, M57
Evening ST3	01/06/2021 19:37	21	0 – 1	E	2	Road traffic noise A5080, M57
Evening ST4	01/06/2021 19:58	21	0 – 1	SE	3	Road traffic noise A5080, M57
Evening ST5	01/06/2021 20:20	20	1 – 2	W	3	Road traffic noise A5080, M57, Wilson Road
Night ST1	01/06/2021 23:01	16	0 – 1	W	2	Road traffic noise A5080, Logwood Road
Night ST2	01/06/2021 23:21	15	0 – 1	NE	1	Road traffic noise A5080, M57
Night ST3	01/06/2021 23:41	15	0 – 1	NE	0	Road traffic noise A5080, M57
Night ST4	02/06/2021 00:01	15	0 – 1	NE	1	Road traffic noise A5080, M57
Night ST5	02/06/2021 00:22	15	0 – 1	NE	1	Road traffic noise A5080, M57

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in the following table. All values are sound pressure levels in dB (re: 2×10^{-5} Pa).

Table 4.3: Results of Baseline Noise Monitoring Survey (Average Levels)

Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T} (dB)	L _{Amax,T} (dB)	L _{Amin,T} (dB)	L _{A10,T} (dB)	L _{A90,T} (dB)
Weekday Daytime 07:00 - 23:00	49 Hours	28/05/2021 – 02/06/2021 11:20 – 12:05	LT1	54.7	89.7	34.8	54.4	50
Weekday Night-time 23:00 – 07:00	24 hours	28/05/2021 – 02/06/2021 23:00 - 07:00		53.5	89.7	33.3	52.7	42
Weekend Daytime 07:00 - 23:00	32 Hours	29/05/2021 – 30/05/2021 07:00 - 23:00		52.6	80.4	38.5	53.1	50
Weekend Night-time 23:00 – 07:00	16 hours	29/05/2021 – 30/05/2021 23:00 - 07:00		51.1	81.9	34.2	52.3	44
Weekday Daytime 07:00 - 23:00	49 Hours	28/05/2021 – 02/06/2021 10:43 – 11:18	LT2	50.1	82.5	32.3	49.4	46
Weekday Night-time 23:00 – 07:00	24 hours	28/05/2021 – 02/06/2021 23:00 - 07:00		46.7	72.9	31.6	46.6	42
Weekend Daytime 07:00 - 23:00	32 Hours	29/05/2021 – 30/05/2021 07:00 - 23:00		48.2	80.9	33.8	47.6	41
Weekend Night-time 23:00 – 07:00	16 hours	29/05/2021 – 30/05/2021 23:00 - 07:00		46.5	78.7	30.3	46.8	42
Weekday Daytime 07:00 - 23:00	49 Hours	28/05/2021 – 02/06/2021 10:13 – 10:58	LT3	66.7	102.7	41.8	69.8	60
Weekday Night-time 23:00 – 07:00	24 hours	28/05/2021 – 02/06/2021 23:00 - 07:00		61.5	97.2	36.6	61.2	46
Weekend Daytime 07:00 - 23:00	32 Hours	29/05/2021 – 30/05/2021 07:00 - 23:00		66.6	97.2	45.2	70.0	58
Weekend Night-time 23:00 – 07:00	16 hours	29/05/2021 – 30/05/2021 23:00 - 07:00		60.3	84.8	37.5	62.3	49
Daytime 07:00 - 19:00	15 Mins	01/06/2021 14:26	ST1	52.6	68.6	46.5	52.9	49.5
	15 Mins	01/06/2021 15:09	ST2	48.0	54.9	44.6	49.3	46.4
	15 Mins	01/06/2021 15:54	ST3	52.6	68.2	48.2	53.9	49.9
	15 Mins	01/06/2021 16:14	ST4	50.4	69.9	44.4	52.5	46.9
	20 Mins	02/06/2021 09:36	ST5	59.4	84.8	51.6	60.8	55.1
Evening 19:00 - 23:00	15 Mins	01/06/2021 18:57	ST1	52.4	71.9	45.8	53.7	48.6
	15 Mins	01/06/2021 19:17	ST2	52.1	71.7	40.8	56.1	44.4
	15 Mins	01/06/2021 19:37	ST3	53.2	72.8	46.2	56.0	48.9
	15 Mins	01/06/2021 19:58	ST4	52.5	80.9	41.7	54.2	44.7
	15 Mins	01/06/2021 20:20	ST5	56.4	81.1	49.5	57.9	52.3

Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T} (dB)	L _{Amax,T} (dB)	L _{Amin,T} (dB)	L _{A10,T} (dB)	L _{A90,T} (dB)
Night-time 23:00 - 07:00	15 Mins	01/06/2021 23:01	ST1	50.7	68.9	43.4	51.34	46.7
	15 Mins	01/06/2021 23:21	ST2	45.1	55.0	40.1	46.5	43.2
	15 Mins	01/06/2021 23:41	ST3	51.6	76.6	41.7	50.3	45.2
	15 Mins	02/06/2021 00:01	ST4	56.3	75.4	36.4	45.3	39.2
	15 Mins	02/06/2021 00:22	ST5	49.2	61.1	41.1	52.3	44.3

All values are sound pressure levels in dB re: 2x 10⁻⁵ Pa

4.2 REPRESENTATIVE BACKGROUND LEVELS

Using the data collected during the baseline survey, representative background noise levels have been derived for all receptor locations presented in Figure 4.1. Table 4.4 presents the representative background noise levels considered appropriate for the existing sensitive receptors within the area (the lower of the respective daytime and evening measurements have been used to represent daytime noise levels, where appropriate).

Table 4.4: Representative Background Noise Levels (All Receptors)

Receptors	Monitoring Location	Time Period	Representative Background Noise Level (L _{A90,T} dB)*
R01	ST1	Daytime (07:00 – 23:00)	49.0
		Night-time (23:00 – 07:00)	47.0
R02	LT1	Daytime (07:00 – 23:00)	50.0
		Night-time (23:00 – 07:00)	42.0
R03	ST3	Daytime (07:00 – 23:00)	49.0
		Night-time (23:00 – 07:00)	45.0
R04 & R05	ST2	Daytime (07:00 – 23:00)	44.0
		Night-time (23:00 – 07:00)	43.0
R06, R07 & R08	LT2	Daytime (07:00 – 23:00)	41.0
		Night-time (23:00 – 07:00)	42.0
R09, R10 & R11	ST4	Daytime (07:00 – 23:00)	45.0
		Night-time (23:00 – 07:00)	39.0
R12, R13, R14, R15 & R16	LT3	Daytime (07:00 – 23:00)	58.0
		Night-time (23:00 – 07:00)	46.0

*Lowest L_{A90,T} value selected from either Weekday or Weekend

The representative noise levels presented in Table 4.4 have been used to inform the assessment presented in Section 5.0.

5.0 ASSESSMENT OF EFFECTS

5.1 DEMOLITION & CONSTRUCTION PHASE

Noise levels from potential construction activity associated with the proposed development of the application site have been assessed in accordance with BS 5228 criteria which indicates if a significant effect is likely to occur at noise sensitive properties.

This assessment has been undertaken in order to establish the maximum external noise levels at neighbouring properties for the proposed demolition and construction activities of the site and whether typical plant and activities will be within these levels. In order to present a worst-case assessment, the model assumes that all sources will be operating simultaneously across the application site.

The table below shows predicted levels of construction noise at existing noise sensitive properties for comparison with the BS 5228-1 noise limit criteria of 75 dBA.

Table 5.1: Demolition & Construction Noise Assessment Results (Fixed Limits Assessment)

Ref	Description	Construction Noise Level (dBA)	Criteria (dBA)	Within Recommended Fixed Noise Limit?
R01	98 Logwood Road	41.2	75.0	Yes
R02	9 Holland Grove	40.9	75.0	Yes
R03	20 Rudgate Road	53.1	75.0	Yes
R04	Newsham Road	40.8	75.0	Yes
R05	24 Newsham Road	49.6	75.0	Yes
R06	10 Newsham Road	48.6	75.0	Yes
R07	59 Bridgewater Way	54.5	75.0	Yes
R08	66 Bridgewater Way	59.2	75.0	Yes
R09	62 Bridgewater Way	66.8	75.0	Yes
R10	46 Bridgewater Way	62	75.0	Yes
R11	34 Bridgewater Way	58.3	75.0	Yes
R12	White House – 91-92 Cronton Road	60.3	75.0	Yes
R13	3 Whitefield Lane	61.2	75.0	Yes
R14	Cronton Road	61.5	75.0	Yes
R15	2 Cronton Road	70.7	75.0	Yes
R16	1 Sevenoak Grove	65.3	75.0	Yes

All values are sound pressure levels in dB re: 2x 10⁻⁵ Pa.

* Not impacted by demolition and construction phase of the development

The results indicate that the noise levels at the façades of the existing noise sensitive properties would be within the recommended criteria. Noise levels within the fixed limit criteria are likely to result in internal conditions where conversation would not be difficult.

In practice, demolition and construction noise levels and resulting impacts are likely to vary during the separate phases depending upon the location of work sites, activities and plant in operation and proximity to sensitive receptors. Given the nature of the area and the scale of works, it is not expected that significant

effects would occur for prolonged and continuous periods of time. However, specific mitigation measures will assist in further identifying and minimising noise impacts, examples of best practice measures are:

Wherever possible noise will be controlled at source.

- Avoid unnecessary revving of engines and switch off equipment when not required;
- Keep internal haul routes well maintained and avoid steep gradients;
- Use rubber linings in, for example, chutes and dumpers to reduce impact noise;
- Minimize drop height of materials;
- Start up plant and vehicles sequentially rather than all together.
- Leaflet drops at all existing houses likely to be affected by noisy construction activities notifying them of works in advance and detailing the nature and their likely duration works;
- Careful selection of working methods and programme;
- Selection of quietest working equipment available (e.g. electric/battery powered equipment which is generally quieter than petrol/diesel powered equipment);
- Positioning equipment behind physical barriers, i.e. existing features, hoarding, etc., or provision of lined and sealed acoustic covers for equipment that could potentially contribute to a noise nuisance;
- Positioning of noise generating equipment, such as any blending plant in areas which minimise noise as far as practicable;
- Directing plant noise emissions, including exhausts or engines away from sensitive locations;
- Ensuring that regularly maintained and appropriately silenced equipment is used;
- Shutting down equipment when not in use, i.e. maintain a 'no idling policy';
- Handling all materials in a manner which minimises noise;
- Switch all audible warning systems to the minimum setting required by the Health and Safety Executive;
- Employ best practices and follow guidance of British Standard 5228 – Parts 1 and 2.

The plant and activities to be employed on the site will be reviewed to ensure that they are the quietest available for the required purpose; this is in accordance with best practicable means.

5.2 OPERATIONAL PHASE

5.2.1 Building Services Plant Noise Assessment

This assessment has been undertaken in order to establish the maximum permissible external noise levels from the proposed building services plant (BSP). This includes 15 indicative sources of roof mounted plant refer to Table 5.2 below for their calculated sound pressure level. The assessment compares the predicted noise levels from the BSP with the existing measured average daytime and night-time background noise L_{A90} at the closest existing residential receptors.

Table 5.2: Proposed Emission Limits for BSP as Modelled

BSP Location	Noise Emission Limit for each individual BSP– Sound Pressure Level (dB (A))	
	Daytime	Night-time
15 x Indicative Roof mounted BSP (roof mounted extract fans)	63.5 dB at 1m OR 53.9 dB at 3m	

To account for any uncertainty, a +3dB correction has been applied to the predicted noise level to create the 'Rating Level'. The calculated plant levels above have been done so with the aim of ensuring that the worst receptor location is 10 dB below the background levels. Table 5.3 shows the results of the assessment.

Table 5.3: BS 4142 Assessment

Location	Existing Measured Background L_{A90}		Specific noise level from plant		Noise rating level from plant (with +3 dB Correction)		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
R01	49	47	14	7	17	10	-32	-37
R02	50	42	15	8	18	11	-32	-31
R03	49	45	18	11	21	14	-28	-31
R04	44	43	11	7	14	10	-31	-33
R05	44	43	16	12	19	15	-25	-28
R06	41	42	19	13	22	16	-19	-26
R07	41	42	22	18	25	21	-16	-21
R08	41	42	24	18	27	21	-14	-22
R09	45	39	32	26	35	29	-10	-10
R10	45	39	29	23	32	26	-12	-13
R11	45	39	31	23	34	26	-11	-13
R12	58	46	28	21	31	24	-27	-23
R13	58	46	22	17	25	20	-33	-26
R14	58	46	23	16	26	19	-32	-27
R15	58	46	28	20	31	23	-27	-23
R16	58	46	27	20	30	23	-28	-23

All values are sound pressure levels in dBA re: 2×10^{-5} Pa. All calculations used to derive the above table (including averaging of background noise levels and predicted source noise levels) have been undertaken to 1 decimal place to avoid perpetuation of rounding errors. However, in accordance with BS4142 para 8.6 the levels are expressed as integers (with 0.5 dB being rounded up). This may mean that the arithmetic's in the above table may appear to be up to 1 dB incorrect due to this rounding.

The existing background noise levels ($L_{A90,T}$) during the daytime and night-time are dominated by road traffic noise. R09 is the nearest sensitive receptor and during both the daytime and night-time, plant levels have been calculated so that noise from the BSP of the proposed development is at least 10 dB below the measured existing background noise levels. All receptors are predicted to result in a No Observed Adverse Effect (NOAEL).

5.3 NOISE INTRUSION ASSESSMENT

The majority of HGV transport movements will occur during the daytime. Loading/unloading of the HGVs will be undertaken using a forklift on the concrete apron at the entrance to each warehouse unit. The proposed retail store has no marked HGV bay within the service yard, so an extra forklift has been modelled as a point source for the HGV unloading within this area, like the other warehouse units.

Internal noise levels at sensitive receptor locations, from all noise sources including HGVs, forklift and BSP have been assessed both with windows open, where a reduction from a partially open window of 15 dB has been used, and with windows closed where an assumption of glazing with a sound reduction of 30 dB has been used. Night-time noise levels are illustratively shown on Figure 5.1.

Table 5.4: Daytime Noise Intrusion Levels $L_{Aeq,1hour}$

Location	External L_{Aeq}	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria L_{Aeq}
R01	24.9	9.9	0.0	35
R02	24.9	9.9	0.0	35
R03	27.8	12.8	0.0	35
R04	21.8	6.8	0.0	35
R05	25.7	10.7	0.0	35
R06	28.9	13.9	0.0	35
R07	30.2	15.2	0.2	35
R08	32.3	17.3	2.3	35
R09	36.9	21.9	6.9	35
R10	34.3	19.3	4.3	35
R11	35.0	20.0	5.0	35
R12	46.8	31.8	16.8	35
R13	45.7	30.7	15.7	35
R14	47.2	32.2	17.2	35
R15	52.0	37.0	22.0	35
R16	50.7	35.7	20.7	35

Predicted daytime noise levels are below the BS8233/WHO daytime $L_{Aeq,1hour}$ internal criterion of 35 dB(A) at the majority of the closest existing sensitive receptor locations with the exception of R15 and R16 with windows open scenario. This is principally due to HGV Unloading from the proposed warehouses.

Therefore, daytime noise levels at receptors R01-R14 are predicted to result in a No Observed Adverse Effect (NOAEL). The remaining receptors, R15 and R16 daytime noise levels are predicted to result in a Lowest Observed Adverse Effect (LOAEL), refer to Table 2.1 above.

Table 5.5: Night-time Noise Intrusion Levels $L_{Aeq,15min}$

Location	External L_{Aeq}	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria L_{Aeq}
R01	27.8	12.8	0.0	30
R02	27.6	12.6	0.0	30
R03	31.2	16.2	1.2	30
R04	26.4	11.4	0.0	30
R05	29.5	14.5	0.0	30
R06	32.2	17.2	2.2	30
R07	34.4	19.4	4.4	30
R08	37.9	22.9	7.9	30
R09	41.7	26.7	11.7	30
R10	37.7	22.7	7.7	30
R11	37.1	22.1	7.1	30
R12	52.9	37.9	22.9	30
R13	52	37.0	22.0	30
R14	52.7	37.7	22.7	30
R15	57.5	42.5	27.5	30
R16	56.5	41.5	26.5	30

Predicted night-time noise levels are above the BS8233/WHO night-time $L_{Aeq,15min}$ internal criterion of 30 dB(A) at the identified closest existing sensitive receptor locations R12 to R16. Noise levels at the worst exceeding receptors (R15 and R16) are predicted to fall within the Unacceptable Observed Adverse Effect (UOAE), and as such additional assessments to contextualise these levels have been undertaken in Section 5.4.

Table 5.6 below shows the noise intrusion assessment for night-time L_{Amax} levels. To determine the L_{Amax} experienced at a receptor from a singular event, the nearest location to site activity (R09) has been chosen to represent the worst-case night-time L_{Amax} levels.

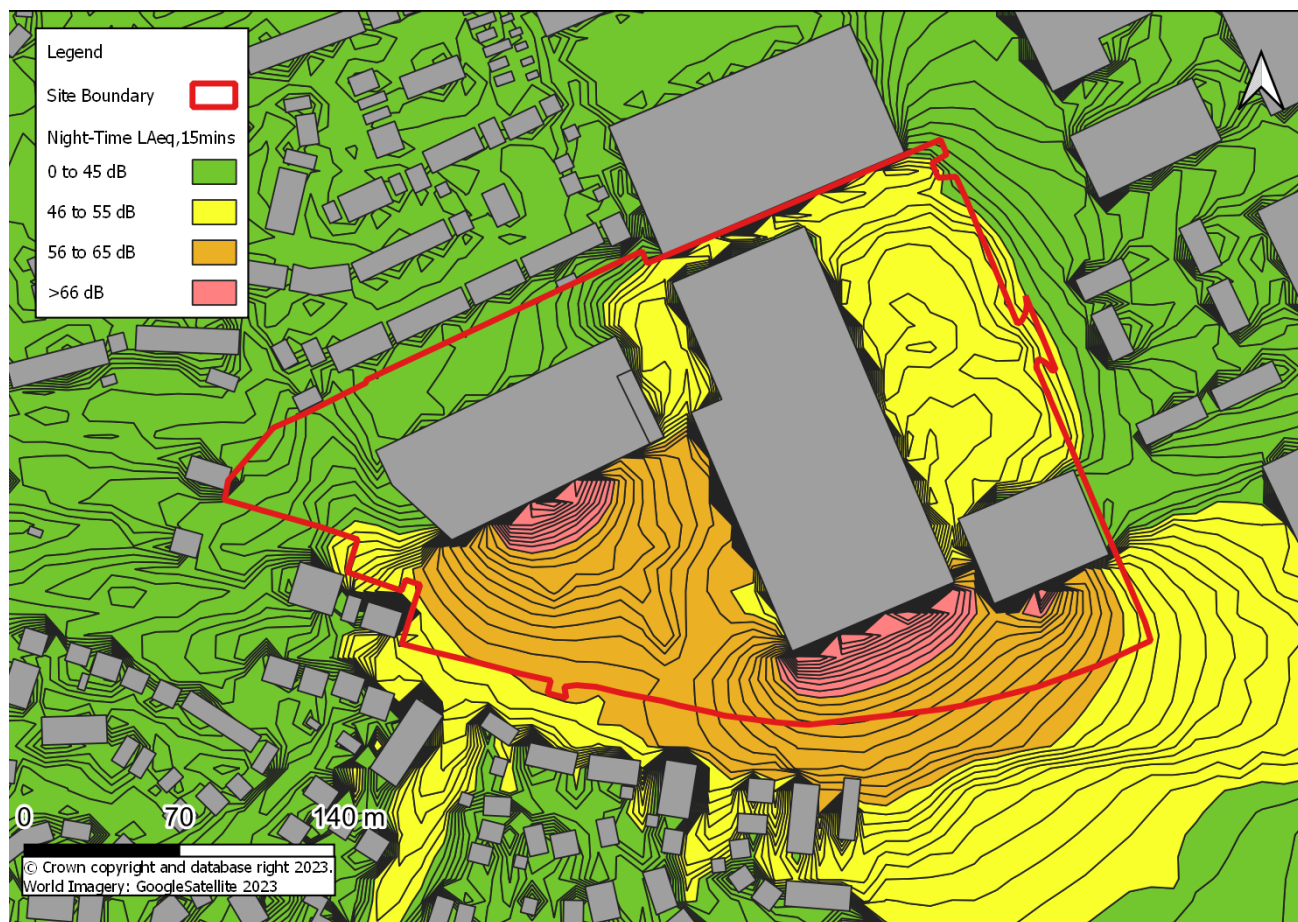
Table 5.6: Night-time Noise Intrusion Levels L_{Amax}

Location	External L_{Amax}	Internal L_{Amax} with windows open	Internal L_{Amax} with windows closed	Criteria L_{Amax}
R09	58.7	43.7	28.7	45

Predicted night-time L_{Amax} noise levels are predicted to be below the BS8233/WHO night-time L_{Amax} criterion of 45 dB(A) at the identified closest existing sensitive receptor location, R09. Night-time L_{Amax} noise levels at all receptors are predicted to fall within the Lowest Observed Adverse Effect (LOAEL).

For indicative purposes, the night-time $L_{Aeq,15min}$ noise contour plot (inclusive of all potential noise sources) is presented in Figure 5.1 below.

Figure 5.1: $L_{Aeq,15min}$ Night-Time Noise Contour Plot (4m)



5.4 CHANGE IN NOISE LEVEL ASSESSMENT

While exceedances have been predicted within the noise intrusion assessment above based on BS 8233:2014 criteria, these have been compared with existing ambient noise levels to determine contextual impact of proposed operations and determine the significance of operational noise with regard to the existing ambient noise environment.

The results of this assessment are presented within Tables 5.7 & 5.8.

Table 5.7: Daytime Change in Noise Level

Ref	Existing L _{Aeq} (Monitored)	Proposed L _{Aeq} (Modelled)	Combined L _{Aeq}	Contribution from Proposed Scheme
R01	52.4	24.9	52.4	0.0
R02	52.6	24.9	52.6	0.0
R03	52.6	27.8	52.6	0.0
R04	48.0	21.8	48.0	0.0
R05	48.0	25.7	48.0	0.0
R06	48.2	28.9	48.3	0.1
R07	48.2	30.2	48.3	0.1
R08	48.2	32.3	48.3	0.1
R09	50.4	36.9	50.6	0.2
R10	50.4	34.3	50.5	0.1
R11	50.4	35.0	50.5	0.1
R12	66.6	46.8	66.6	0.0
R13	66.6	45.7	66.6	0.0
R14	66.6	47.2	66.6	0.0
R15	66.6	52	66.7	0.1
R16	66.6	50.7	66.7	0.1

Table 5.7 shows that at nearby sensitive receptors, the largest contribution of noise from the proposed development on the existing L_{Aeq} levels is 0.2 dB at receptor location R09. Therefore, the daytime operations are predicted to result in a No Observed Adverse Effect Level (NOAEL).

Table 5.8: Night-time Change in Noise Level

Ref	Existing L _{Aeq} (Monitored)	Proposed L _{Aeq} (Modelled)	Combined L _{Aeq}	Contribution from Proposed Scheme
R01	50.7	27.8	50.7	0.0
R02	51.1	27.6	51.1	0.0
R03	51.6	31.2	51.6	0.0
R04	45.1	26.4	45.2	0.1
R05	45.1	29.5	45.2	0.1
R06	46.5	32.2	46.7	0.2
R07	46.5	34.4	46.8	0.3
R08	46.5	37.9	47.1	0.6
R09	56.3	41.7	56.4	0.1
R10	56.3	37.7	56.4	0.1
R11	56.3	37.1	56.4	0.1
R12	60.3	52.9	61.0	0.7
R13	60.3	52.0	60.9	0.6
R14	60.3	52.7	61.0	0.7
R15	60.3	57.5	62.1	1.8
R16	60.3	56.5	61.8	1.5

Table 5.8 shows that at nearby sensitive receptors, the largest contribution of noise from the proposed development on the existing night-time L_{Aeq} levels is 1.8 dB at R15. Therefore, the night-time operations are predicted to result in a No Observed Adverse Effect Level (NOAEL) to Lowest Observed Adverse Effect Level (LOAEL).

The change in noise level assessments demonstrate that the operation of the proposed development will not be significant.

The existing $L_{Aeq,T}$ daytime and night-time $L_{Aeq,T}$ and L_{Amax} values measured during the noise survey at R12-R16 indicate existing noise levels would not satisfy BS8233 criteria with a windows open scenario. Based upon this and the results within Tables 5.7 & 5.8 above, it is considered that the introduction of proposed operations would therefore have a negligible impact upon these dwellings.

Where a windows closed scenario is assessed, all receptors during the daytime and night-time are predicted to result in a No Observed Adverse Effect Level (NOAEL).

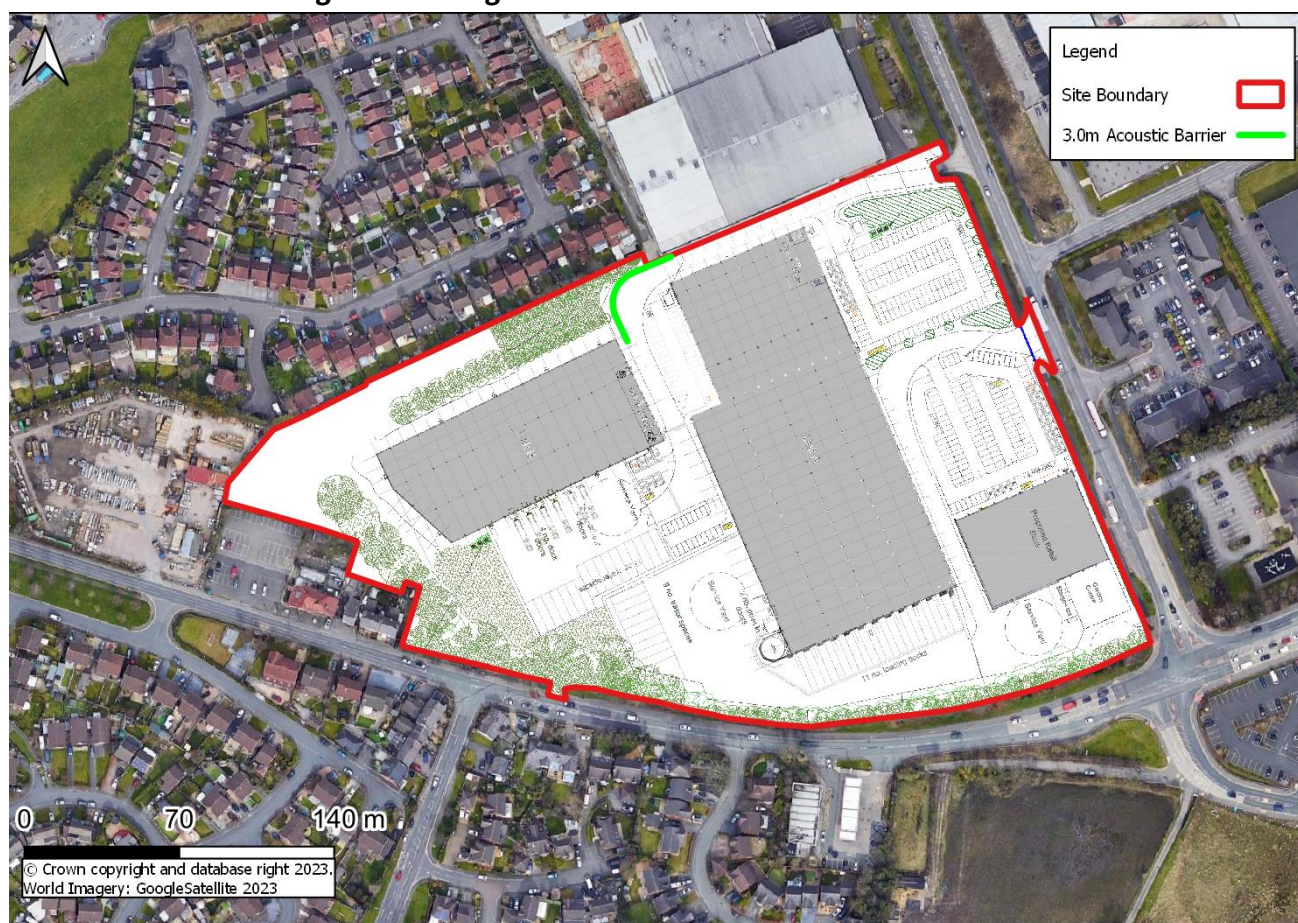
6.0 ADDITIONAL MITIGATION

Considering the results of the assessments presented above (and qualitative considerations based upon the introduction of a new HGV haul route), mitigation has been considered for the Proposed Development to reduce noise impacts at receptor locations R01-R10. Given that proposed operations are predicted to contribute to a negligible change in level or character of noise at R12-R16, no mitigation has been proposed within these areas.

Mitigation for the Proposed Development consists of a 3.0m high acoustic barrier along the northwestern boundary of the site, to prevent noise intrusion from HGV activities on the receptors along this boundary.

The acoustic barrier location is shown in Figure 6.1 below.

Figure 6.1: Mitigation Measures Acoustic Barrier Location



6.1 NOISE INTRUSION ASSESSMENT – WITH MITIGATION

Table 6.1 presents the difference between the background noise level and predicted Rating Level from the proposed development with mitigation in place.

Table 6.1: Daytime Noise Intrusion Levels $L_{Aeq,1hour}$ - With Mitigation

Location	External L_{Aeq}	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria L_{Aeq}
R01	24.8	9.8	0.0	35
R02	24.8	9.8	0.0	35
R03	27.6	12.6	0.0	35
R04	21.4	6.4	0.0	35
R05	25.6	10.6	0.0	35
R06	28.7	13.7	0.0	35
R07	29.9	14.9	0.0	35
R08	31.7	16.7	1.7	35
R09	35.7	20.7	5.7	35
R10	33.4	18.4	3.4	35
R11	34.9	19.9	4.9	35

Table 6.3: Night-time Noise Intrusion Levels $L_{Aeq,15min}$ - With Mitigation

Location	External L_{Aeq}	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria L_{Aeq}
R01	27.7	12.7	0.0	30
R02	27.5	12.5	0.0	30
R03	31	16.0	1.0	30
R04	26.3	11.3	0.0	30
R05	29.3	14.3	0.0	30
R06	32.1	17.1	2.1	30
R07	33.8	18.8	3.8	30
R08	34.6	19.6	4.6	30
R09	41.1	26.1	11.1	30
R10	37.2	22.2	7.2	30
R11	37.0	22.0	7.0	30

As demonstrated within Tables 6.2 and 6.3, daytime and night-time internal noise levels inclusive of mitigation are within the BS8233 criterion of 35 and 30dB L_{Aeq} respectively. As such, daytime and night-time average noise levels are predicted to fall within the Lowest Observed Adverse Effect (LOAEL).

Table 6.4: Night-time Noise Intrusion Levels L_{Amax} - With Mitigation

Location	External L_{Amax}	Internal L_{Amax} with windows open	Internal L_{Amax} with windows closed	Criteria L_{Amax}
R09	54.7	39.7	24.7	45

With mitigation, night-time L_{Amax} noise levels are predicted to be below the BS8233/WHO night-time L_{Amax} criterion of 45 dB(A) at the identified closest existing sensitive receptor location, R09. As such, night-time L_{Amax} noise levels at all receptors are predicted to fall within the Lowest Observed Adverse Effect (LOAEL).

7.0 CONCLUSIONS

This report presents the findings of a noise assessment to support a planning application for the partial demolition and refurbishment of existing warehouses and erection of a new mixed commercial/industrial development at Sovereign Industrial Estate, Huyton.

Demolition and Construction Phase

The results indicate that the noise levels at the façades of the existing noise sensitive properties will be below the BS 5228-1 noise limit criteria of 75 dBA.

Operational Phase

Using BS4142, building services plant limits have been set to ensure that the noise level from any building services plant is at least 10 dB below the measured existing background noise levels.

The existing $L_{Aeq,T}$ daytime and night-time values measured during the noise survey indicate existing noise levels would not satisfy the BS 8233 criteria with a windows open scenario and receptors are likely to have windows closed during the daytime and night-time periods to achieve internal noise levels within the BS 8233:2014 criteria. Therefore, the assessment was undertaken with a windows closed scenario.

It has been demonstrated that all combined operational noise levels (including forklift movements, HGV activities and building services plant) from all proposed noise sources associated with the Site are predicted to result in a No Observed Adverse Effect Level (NOAEL) during the daytime and night-time with a windows closed scenario at all receptors.

A change in noise level assessment also demonstrated that the proposed development would result in a No Observed Adverse Effect Level (NOAEL) to Lowest Observed Adverse Effect Level (LOAEL) at receptors R12-R16 despite exceedance of BS8233 criteria.

Despite compliance with relevant criteria at R01-R11, additional mitigation has been included to the north of the site in the form of a 3.0m acoustic barrier adjoining the HGV haul route, to prevent any qualitative impact due to the introduction of HGV movements in proximity to dwellings.

The NPPF provides test points against which the proposed development has been assessed. Considering these points, the following conclusions can be drawn:

NPPF paragraphs 185 (b), 187 and 188

Considering the existing use of the site and wider development site, it is not considered that any existing businesses wanting to develop would be restricted by the proposals.

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It has been predicted that on-site operational noise effects associated with the proposed development will be within the Lowest Observed Adverse Effect Level (LOAEL) for the two closest receptors and therefore the development will have a low impact in relation to noise.

APPENDICES

APPENDIX A – ACOUSTIC TERMINOLOGY AND ABBREVIATIONS

Acoustic Terminology

- dB** Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.
- dB(A)** Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result the single dBA value provides a good representation of how loud a sound is.
- L_{Aeq}** Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The $L_{Aeq, 07:00 - 23:00}$ for example, describes the equivalent continuous noise level over the 16-hour period between 7 am and 11 pm. During this time period the L_{pA} at any particular time is likely to have been either greater or lower than the $L_{Aeq, 07:00 - 23:00}$.
- L_{Amin}** The L_{Amin} is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.
- L_{Amax}** The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.
- L_n** Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say, 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the $L_{A10, 1 hr} = x$ dB.
- The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90} , the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.
- R_w** The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.

Abbreviations

CADNA – Computer Aided Noise Abatement
DMRB – Design Manual for Roads and Bridges
HGV – Heavy Goods Vehicle

PPG – Planning Practice Guidance
UDP – Unitary Development Plan
UKAS – United Kingdom Accreditation Service

