



M1 Piccadilly, Store Street,
Manchester

Noise Assessment

For Piccadilly Wharf Ltd.

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1. INTRODUCTION

Hydrock Consultants have been appointed to provide acoustic consultancy services for the construction of a ground plus 14 storey residential development with associated amenities.

A detailed review has been undertaken of relevant planning policies and industry guidance, and consultation has been undertaken with the Local Authority to inform a noise assessment of the proposed development.

The noise assessment for the proposed development is presented herein.

1.1 Site Description & Proposed Development

The site is currently derelict. To the north, the site is bordered by Store Street, with Wharf Close apartments beyond. To the east the site is bordered by Thomas Telford Basin residences and the Ashton Canal bridge. To the south, the site is bordered by Chapeltown Street residences. To the west, the site is bordered by commercial premises with Sparkle Street beyond.

The proposed development comprises 54 residential units over 14 storeys, with car and bike parking, , concierge located on the ground floor, and residents lounge and terrace located on Level 01.

1.2 Glossary of Technical Terms

This report is necessarily technical in nature. A glossary of technical terminology is therefore included in Appendix A to assist in interpreting the technical terminology used herein.

2. GUIDANCE AND STANDARDS

2.1 Consultation with Manchester City Council (MCC)

Prior to carrying out the noise survey, Hydrock contacted the Environmental Health Department at Manchester City Council (MCC). A response was received from Sue Jones confirming the proposed assessment methodology is acceptable.

2.2 Policy and Guidance

To assist in establishing an appropriate noise survey and assessment methodology, a detailed review of local and national policy and guidance has been undertaken. This is outlined in Appendix C.

The following national policy and guidance documents have been considered:

- National Planning Policy Framework (NPPF);
- Noise Policy Statement for England (NPSE);
- Manchester City Council Planning & Noise Technical Guidance, 2015 (MCCPNTG);
- BS 4142:2014 + A1 2019 - Methods for rating and assessing commercial and industrial sound (BS4142);
- Department of Transport Technical Memorandum: Calculation of Road Traffic Noise, 1975 (CRTN);
- World Health Organisation (WHO) 1999: Guidelines for Community Noise, and;
- BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings.

3. EXISTING NOISE ENVIRONMENT

3.1 Previous Noise Survey

A previous noise survey has been undertaken nearby the proposed development by Hann Tucker Associates (report reference 26756/NIA1). Due to the current COVID-19 restrictions, and limited access to the development site, the noise survey undertaken by Hann Tucker has been used in this assessment to corroborate the noise levels measured.

The Hann Tucker Associates noise survey was undertaken on Store Street between 12:00 hours on Wednesday 16 October to 09:00 hours on Wednesday 23 October 2019.

3.1.1 Measurement Locations

Monitoring was undertaken at the positions indicated on Figure 1 below.

Figure 1 Previous Noise Survey Measurement Locations



3.1.2 Results Summary

The results presented in the Hann Tucker Associates Noise Impact Assessment are shown in **Table 1**.

Table 1: Previous Noise Survey Results

Position	Daytime (07:00 – 23:00)		Night-time (23:00 – 07:00)		
	L _{Aeq,16hr} (dB)	L _{A90} (dB)	L _{Aeq,8hr} (dB)	L _{A90} (dB)	L _{AFmax,5min} (dB)
ML1	70	42	67	40	83
ML2	62	46	56	43	71

3.2 Noise Survey

3.2.1 Survey Overview

Attended monitoring was undertaken at the site on Monday 8th March 2021 between 11:00 – 14:00, and on Tuesday 9th March 2021 between 06:00 – 07:00.

Noise measurements were made using Class 1, integrating sound level meter. The microphone was positioned vertically on a tripod at least 1.2m above the ground and at least 3m from the road. The sound level meter was calibrated to a reference level of 94 dB at 1kHz both prior to, and on completion of, the noise survey. No significant drift in calibration was noted during the survey (≤ 0.5 dB).

All noise monitoring took place during conducive conditions, with wind speeds less than 5ms⁻¹ and no significant precipitation.

3.2.2 Survey Procedure

Noise monitoring was undertaken at a Monitoring Location (ML) considered to be representative of the development. Attended monitoring was undertaken to the northwest of the site boundary, adjacent to Store Street. This location was selected to characterise road traffic noise from Store Street and the rest of the surrounding local road network. The noise monitoring location is shown on Figure 2.

Measurements undertaken on Monday 8th March 2021 between 11:00 – 14:00 are in accordance with Department of Transport Technical Memorandum: Calculation of Road Traffic Noise, 1975 (CRTN). Measurements were also undertaken on Tuesday 9th March 2021 between 06:00 – 07:00, as this was deemed to represent worst-case night-time noise levels.

Observations made during the survey and a review of audio recordings made during unattended measurements, identified the following significant noise sources contributing to the noise climate at the site:

Road Traffic: Road Traffic noise from Store Street was dominant at the measurement location throughout the measurement period.

Other Sources: Movements and activities from the construction sites and vehicles to the northeast of the site were noted.

3.2.3 Noise Survey Results

Average daytime and night-time levels have been derived from the measurements in accordance with CRTN. **Table 2** presents the derived daytime and night-time levels, and the levels measured between 06:00 – 07:00.

Measured daytime maxima have been included as a reference and for completeness.

Table 2: Measured Noise Levels

Time Period	Noise Level, $L_{Aeq,T}$ dB	Typical L_{AFmax} dB
0700 - 2300	65	77
0600 – 0700	66	-

*derived in accordance with CRTN.

The full results of the noise survey are shown in Appendix C.

Figure 2 Monitoring Location



3.3 Summary

Daytime and night-time $L_{Aeq,T}$ and L_{AFMax} levels derived from the CRTN and Daytime and night-time $L_{A90,T}$ taken from the previous Hann Tucker noise survey have been used in this noise assessment to ensure the assessment is robust.

When compared with the results of the survey previously undertaken by Hann Tucker Associates, the more recent survey is 5-6dB quieter during the daytime, and 1-2dB quieter at night time. This is likely due to Covid-19 restrictions at the time of survey reducing traffic and other activities in the area.

In order to ensure a robust assessment, the results of Hann Tucker Associates' survey have been used for the assessment.

4. NOISE ASSESSMENT

The noise assessment is based on the Proposed Site Plans and Elevations provided by 5plus Architects, dated 01/06/2021.

4.1 Construction Phase Assessment

4.1.1 Noise from Earthworks and Construction Activities

During the construction phase, any works carried out at the Proposed Development has the potential to generate noise that may propagate beyond the Site boundary.

At this stage, detailed information pertaining to site specific earthworks and construction activities are not known. Activities at the Site, which could give rise to potential noise impacts typically include (but are not limited to):

- Site preparation i.e. ground excavation, levelling of ground, trenching, trench filling, unloading, levelling of hardcore and compact filling; and,
- Construction of the Proposed Development including piling, fabrication processes e.g., planning, sanding, routing, cutting, drilling and laying foundations.

The contractor undertaking the enabling and construction works is not yet known. However, it is considered that the enabling and construction works are likely to be restricted to standard daytime working hours, i.e. between 0800 and 1700 Monday to Friday, 0900 to 1200 on a Saturday, with no work on Sundays or Bank Holidays. The appropriate noise impact threshold category has been determined for each nearby sensitive receptor, based on measured daytime ambient noise levels, in accordance with 'The ABC Method' provided in BS5228-1 as detailed in Table 3 below.

Table 3: Thresholds of Significant Impacts at Residential Receptors in Accordance with the 'ABC' Method of BS5228-1

Assessment Category Threshold Value	Threshold Value, dB		
	Category A *1	Category B *2	Category C *3
Weekday Daytime (07:00 to 19:00) and Saturdays (07:00 to 10:00)	65	70	75
*1 Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value.			
*2 Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.			
*3 Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are more than this value.			

Table 4 below identifies the appropriate category value in order to determine whether a significant noise impact has occurred, at the existing sensitive receptors (ESRs), during earthworks and construction.

Table 4: Appropriate Category Value for Existing Sensitive Receptors

Description of Receptor	Representative Monitoring Location	Average Measured Daytime Level, dB L _{Aeq, T}	Rounded Daytime Level to the Nearest 5 dB(A)	Appropriate Category Value, according to BS5228-1	Significant Noise Impact Threshold, dB L _{Aeq, T}
Thomas Telford Basin Residences	ML1	65	65	B	70

The earthworks and construction phase activities have the potential to generate short-term increases in noise levels. The levels of noise received at the receptors closest to the Proposed Development would depend on the sound power levels of equipment used, the distance to the properties, the presence of screening or reflective surfaces and the ability of the intervening ground to absorb propagating noise.

Furthermore, the distance to the noise sensitive receptors could vary over the course of the construction period, depending on where earthworks or construction activities are taking place within the Site. Given the potentially small distances between activities and existing residential dwellings, noise levels at the receptors may occur above those detail in Table 4. Therefore, it is recommended that mitigation measures be put in to place in order to avoid and/or reduce potential impacts where possible. Further, detail is provided in the Mitigation Section of this report.

4.1.2 Vibration from Earthworks and Construction Activities

Damage to buildings associated with groundborne vibration is uncommon, and although vibration may be noticeable, there is little evidence to suggest that cosmetic damage can occur, such as a crack in plaster, unless the magnitude of the vibration is extremely high. The most likely impact, where elevated levels of vibration do occur, during the earthworks and construction phases of development, is associated with perceptibility i.e. potential annoyance.

Where groundborne vibration is of a relatively continuous nature, there is a greater likelihood of structural damage occurring, compared to transient vibration; for example, that caused by transiting vehicles or piling. The only current national guidance document which provides a methodology for predicting levels of vibration from construction activities is BS5228- 2. The prediction method provided relates specifically to percussive, or vibratory, rolling and piling only.

Therefore, it is not possible to accurately predict levels of vibration during the Site preparation and the construction phase of Development. However, vibration impacts during Site activities other than piling are uncommon. As such, to control the impact of vibration during Site preparation and construction of a Development, limits relating to the perceptibility of vibration are typically set.

As stated in BS5228-2 and as generally accepted, the threshold of vibration perception for humans is typically in the Peak Particle Velocity (PPV) range of 0.14 mms⁻¹ to 0.3mms⁻¹, which forms the basis of the recommend maximum permitted vibration levels of 1 mms⁻¹ PPV within occupied residential dwellings.

BS5228-2 also sets out the distances (based on historical field measurements) at which certain activities could give rise to a just perceptible level of vibration. These distances are presented in Table 5 below.

Table 5: Distance at which Vibration may be Just Perceptible

Construction Activity	Distance from Activity at which Vibration may be Just Perceptible, metres
Excavation	10 – 15
Heavy Vehicles (e.g. Dump Trucks)	5 – 10
Hydraulic Breaker	15 – 20
Rotary Piling	20 – 30

The nearest ESRs to the proposed construction works, would vary depending upon the part of the Proposed Development under construction. As a worst-case scenario, earthworks and construction works may potentially take place at a distance of 10m from the occupied residential property to the south and east of the site.

It is unlikely that vibration due to the operation of construction machinery would be perceptible the earthworks and construction period. If any perceptible vibration occurs at ESRs, this would likely be transient in nature and only and for a very limited period(s), and is unlikely to exceed the maximum permitted vibration level of 1mms-1 PPV within occupied dwellings, as recommended by BS5228-2.

No specific vibration mitigation measures are considered to be required, unless high risk construction techniques are employed, such as percussive piling. Notwithstanding, methods of best practice should be implemented with regards to minimising potential vibration levels generated during the earthworks and construction period.

4.2 Daytime Noise Levels in Outdoor Amenity Areas

The proposed development features a number of small private balconies on the 2nd and 10th to 14th Floors, a communal terrace area at 1st floor level, and a private terrace at rooftop level.

The daytime ambient noise levels predicted at ground floor level at the site are 65 dB $L_{Aeq,16hour}$. This indicates that it is likely noise levels on balconies will be within recommended upper guideline level of 55dB recommended by BS8233.

Noise levels within the proposed covered communal terrace, located on the 1st floor, and private balconies and terraces may be above the recommended upper guideline level of 55 dB in some areas of the space.

BS8233 recognises that guideline values are not achievable in all situations, stating:

“... it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as convenience of living in the locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve lowest practicable levels in the external amenity spaces, but should not be prohibited.

Other locations such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate...”

4.3 Daytime Noise Levels in Living Rooms and Bedrooms

The minimum composite sound reduction required of facades, in order to achieve appropriate internal daytime noise levels, in accordance with BS8233, is summarised in **Table 6**.

Table 6: Daytime Façade Noise Levels at the Proposed Development and Required Attenuation

Proposed Receptors	Daytime Façade Level, $L_{Aeq, T}$ dB	Minimum Composite Sound Reduction of Façade, D_w , dB
All rooms within the development	70	35

4.4 Night-time Noise Levels in Bedrooms

The level of façade noise attenuation required to achieve appropriate internal night-time noise levels, in accordance with BS8233, is summarised in **Table 7**.

Table 7: Night-time Façade Noise Levels at the Proposed Development and Required Attenuation

Proposed Receptors	Night-time Façade Level, $L_{Aeq, 8hr}$ dB	Maximum Night- time Façade Noise Level, L_{AFmax} dB	Required Composite Sound Reduction of Façades, D_w , dB
All rooms within the development	67	83	38

4.5 Noise from Proposed Fixed Plant

At this stage, detailed information relating to any proposed fixed plant and/or building services is unavailable, guideline noise limits have been formulated based on the existing noise environment, in accordance with current guidance.

With reference to BS4142, the atmospheric noise emissions limits have been determined for any proposed fixed building services plant (with the exception of emergency plant i.e. back-up generators).

Noise associated with the development shall be controlled to the guideline levels outlined in **Table 8**, where possible when assessed in accordance with BS4142, at the nearest noise sensitive receptor, including the sensitive receptors within the proposed development that are not served by the plant. The limits correspond to the 5 dB below the average background noise levels measured at ML1 taken the previous Noise Assessment.

Table 8: Guideline Atmospheric Plant Noise Emission Limits

Period	Atmospheric Plant Noise Emission Limit (dB, $L_{Ar,t}$)
Daytime (07:00 to 23:00 hrs)	37
Night-time (23:00 to 07:00 hrs)	35

The magnitude of impact depends upon the context and not only upon the comparison of rating and background noise levels, therefore these levels are intended to provide a guideline. Proposals should be reviewed by Hydrock during technical design.

As detailed information relating to fixed plant is unknown, Hydrock highlight that provisions for the selection of low noise equipment, silencers, enclosures, screens and other acoustic attenuation measures should be made where necessary.

5. NOISE MITIGATION MEASURES

5.1 Construction Phase

In order to reduce the potential impact of noise generated by the construction phase of the proposed Development, at existing receptor locations in the immediate vicinity of the Site, mitigation measures would be required. Best working practice would be implemented during each phase of the earthworks and construction works at the Site. The construction works would follow the guidelines in BS5228-1 and the guidance in BRE Controlling particles, vapour and noise pollution from construction sites, Parts 1 to 5, 2003. The following measures would be put in place to minimise noise emissions and implemented via a Construction Environmental Management Plan (CEMP):

- When works are taking place within close proximity to the sensitive receptors identified, the screening of noise sources via the erection of temporary screens would be employed;
- All machinery would be regularly maintained to control noise emissions, with particular emphasis on lubrication of bearings and the integrity of silencers;
- Site staff would be made aware that they are working adjacent to a sensitive area and avoid all unnecessary noise due to misuse of tools and equipment, unnecessary shouting and radios;
- As far as possible, the avoidance of two noisy operations occurring simultaneously in close proximity to the same sensitive receptor;
- Adherence to any time limits imposed on noisy works by the local authority;
- Implement set working hours during the week and at weekends;
- Ensure engines are turned off when possible;
- Should earthworks and construction activities need to be carried out during night-time hours, the local authority may include a planning condition that requests advance notice and details of any night working to be provided; and
- Construction noise monitoring should be considered at the site boundaries, due to the close proximity to residential buildings. Hydrock are capable of providing continuous noise, vibration and dust monitoring during the construction phase of the development.

5.2 Vibration from Earthworks and Construction

BS5228-2 indicates that mitigation might include the use of alternative methods, removal of obstructions, provision of cut-off trenches, reduction of energy input per blow, reduction of resistance to penetration.

As the construction programme and methodologies become more defined, earthworks and construction vibration would be reviewed and a detailed strategy for control would be devised and implemented via the CEMP, with possible construction vibration monitoring, where appropriate.

5.3 Operational Phase

The requirements indicate that reliance upon open windows, as a form of background ventilation, would result in the guideline internal noise levels for living rooms and bedrooms, as recommended in BS8233, to be exceeded.

Proposed dwellings in these areas will require the implementation of an alternative means of ventilation, to allow windows to remain closed, while retaining sufficient background ventilation. However, openable windows should be included to facilitate purge ventilation (i.e. removal of fumes/odours).

At this stage of the project, detailed information has not yet been developed regarding façade construction, ventilation strategy etc. The preliminary acoustic specifications contained herein are therefore subject to development during technical design, and should not be used for tender purposes.

The preliminary ventilation guidance outlined below is based on the understanding that the preferred approach, would be to include trickle ventilators and constant Mechanical Extract Ventilation (MEV) (Building Regulations Approved Document F - System 3).

When carrying out internal noise level predictions, the following assumptions have been made:

- Windows are closed, but trickle ventilators are operational i.e. open;
- A reverberation time of 0.5 seconds in habitable rooms;
- Size of windows/percentage of glazed façade area based on 5plus Architects' drawings;
- External walls will provide a sound reduction performance that is at least 5 dB higher than the specified glazing; and
- A single trickle ventilator (circa 2,500 mm²) per habitable room, where trickle ventilators are feasible.

Preliminary sound reduction performances for glazing and ventilators to habitable rooms, and example configurations are outlined in **Table 9** below.

Table 9: Preliminary acoustic specification for glazing and ventilators

Glazing Zone	Preliminary minimum sound reduction performance (dB)		Example configuration
	Glazing ($R_w + C_{tr}$)	Ventilator ($D_{n,e,w} + C_{tr}$)	
1	40	46	10mm / 12-16mm / 6mm standard thermal double glazing; and - Acoustic trickle ventilator or mechanical ventilation (MVHR).
2	31	38	4mm / 12-16mm / 4mm standard thermal double glazing; and - Acoustic trickle ventilator or mechanical ventilation (MVHR).

Glazing Zone 1 applies to the Store Street/northern façade, eastern façade, and western façade. Glazing Zone 2 applies to the southern facades. Both glazing zones are shown on the attached Site Plan in Appendix D.

6. CONCLUSIONS AND SUMMARY

This noise assessment has been carried out in support of the planning application for the construction of ground plus 14 storey residential development, with associated amenity spaces on Store Street, Manchester.

The noise assessment has been undertaken, with consideration given to the following:

- The impact of noise and vibration on existing sensitive receptors during the construction phase of the development;
- The impact of road traffic noise on the proposed development; and,
- Noise impacts associated with any proposed fixed plant and/or services associated with the development.

A noise survey has been carried out in order to establish the existing noise environment at the proposed development site, during the daytime and night time periods, in accordance with CRTN, and compared to levels previously recorded on a neighbouring site.

Calculations indicate that standard thermal double glazing and acoustic trickle ventilators or MVHR should provide sufficient attenuation of existing noise sources, during the daytime and night-time periods, to ensure that guideline internal noise levels are achieved within habitable rooms, in accordance with BS8233.

Atmospheric plant noise emission limits have been established based on the results of the noise survey. These are likely to be achieved with appropriate consideration for selection of low-noise plant and proprietary attenuation measures as appropriate during technical design.

Construction noise and/or vibration monitoring should be considered at the site boundaries, due to the close proximity to residential buildings. Hydrock are capable of providing continuous noise, vibration and dust monitoring during the construction phase of the development.

As demonstrated in this report, appropriate living conditions should can be achieved within proposed habitable rooms, with the implementation of a relatively standard glazing and ventilation scheme. Therefore, it is considered that there is no reason for refusal of planning permission, on acoustic grounds.

Appendix A Glossary of Technical Terms

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2 \times 10^{-5} \text{Pa}$).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the level exceeded for 90% of the time.
R_w	R_w is the single-number quantity which characterizes the sound insulating properties of a given material over a range of frequencies. This is typically measured in a laboratory in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	$D_{n,e,w}$ is the single number quantity which characterizes the airborne sound insulation performance across a given 'element' and is typically used to describe the acoustic performance of trickle ventilators etc.
C_{tr}	C_{tr} is a correction term applied to single-number sound insulation values (R_w , $D_{n,e,w}$ etc.) to afford additional weighting against low frequency performance.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and at least 3m from buildings.

Appendix B Policy and Guidance

National Planning Policy Framework (NPPF)

Published in February 2019, this document sets out the Government's planning policies for England and supersedes the previous version of the NPPF published in 2012. It makes the following reference to noise in the section entitled Conserving and enhancing the natural environment:

*"170. 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."

It also makes the following references to noise in the Section entitled Ground conditions and pollution:

"180. 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 life⁶⁰;

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.

60 See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)."

And

"182. 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 (NPSE)

Published in March 2010, the Noise Policy Statement for England (NPSE) sets out the long-term vision of Government noise policy as follows:

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

The NPSE identifies three observed effect levels, names "No Observed Effect Level" (NOEL), "Lowest Observed Adverse Effect Level" (LOAEL) and "Significant Observed Adverse Effect Level" (SOAEL).

The NPSE contains little detail on assessment methodologies and specific parameters at which the varying observed effect levels would occur in the context of a residential development.

BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings

As discussed above, there is no specific guidance contained within the Planning Condition and the NPSE. In lieu of this, the approach that is generally adopted when assessing environmental noise sources on residential developments is to undertake an assessment in accordance with BS 8233: 2014.

BS 8233 provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building. The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in the table below:

Activity	Location	Period	
		Daytime (07:00 to 23:00 hrs)	Night-time (23:00 to 07:00 hrs)
Resting	Living room	L _{Aeq,16hrs} 35 dB	-
Dining	Dining room/area	L _{Aeq,16hrs} 40 dB	-
Sleeping (daytime resting)	Bedroom	L _{Aeq,16hrs} 35 dB	L _{Aeq,8hrs} 30 dB

Whilst BS 8233:2014 recognises that a guideline value may be set in terms of SEL or L_{AFmax} for the assessment of regular individual noise events that can cause sleep disturbance during the night-time, a specific criterion is not stipulated. Accordingly, reference has been made in this assessment to the World Health Organisation (WHO) 1999: Guidelines for Community Noise below.

With respect to external amenity space such as gardens and patios it is stated that it is desirable that the noise level does not exceed 50 dB L_{Aeq,T}, with an upper guideline value of 55 dB L_{Aeq,T} which would be acceptable in noisier environments. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and locations adjoining the strategic transportation network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

World Health Organisation (WHO) 1999: Guidelines for Community Noise

As with the 'good' and 'reasonable' criteria in BS 8233, the LAFmax criterion in BS8233 is largely concordant with the World Health Organisation (WHO) guidance 1999: Guidelines for community noise. This document draws upon guidance from Vallet and Vernay, which states:

"For good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LAFmax more than 10-15 times per night"

BS 4142:2014 - Methods for rating and assessing commercial and industrial sound

BS 4142 describes methods for rating and assessing sound from industrial and manufacturing processes, fixed installations which comprise mechanical and electrical plant and equipment, the loading and unloading of goods and materials at industrial and/or commercial premises and mobile plant and vehicles that are an intrinsic part of the overall sound emanating from premises or processes.

The methods 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.

If appropriate, the specific sound level of the source ($L_{Aeq,T}$) is corrected, by the application of one or more corrections for acoustic features to give a 'rating' level ($L_{Ar,Tr}$). The Standard effectively compares and rates the difference between the rating level of the sound and the prevailing background sound level ($L_{A90,T}$). Comparing the rating level with the background sound level, BS 4142 states:

"Typically, the greater this difference, the greater the magnitude of impact. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context."

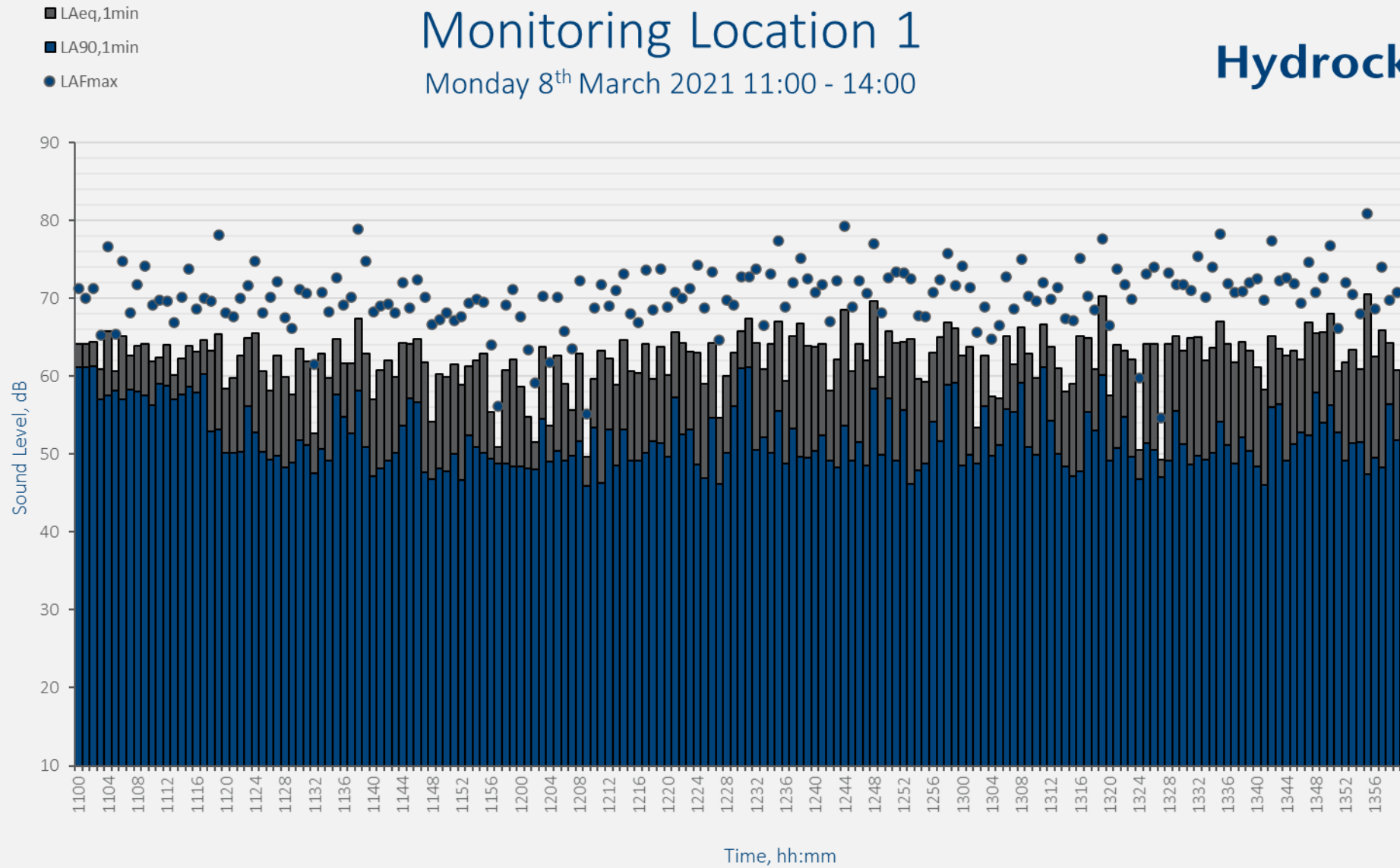
A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context."

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."

Appendix C Noise Survey Results

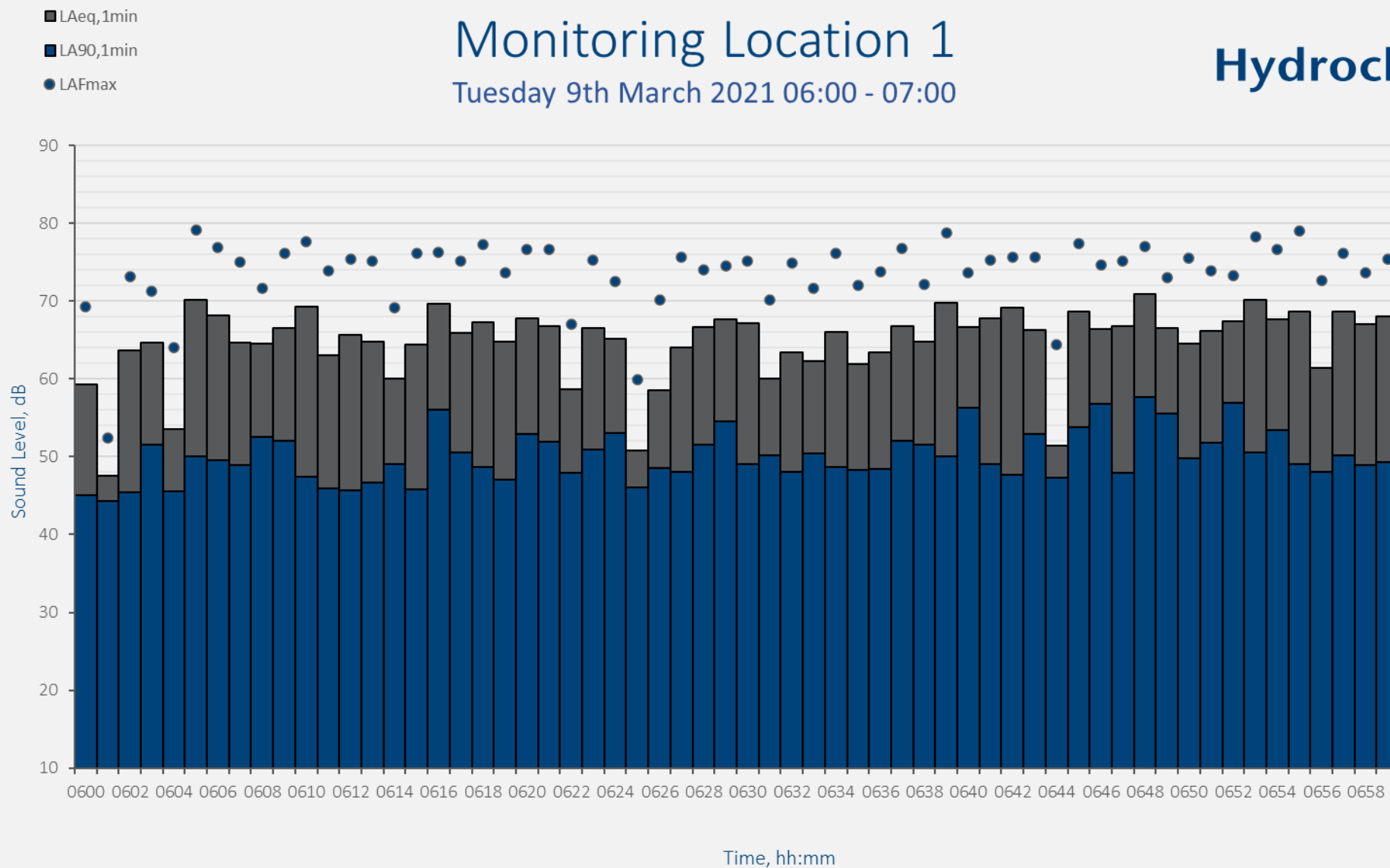
Monitoring Location 1

Monday 8th March 2021 11:00 - 14:00



Monitoring Location 1

Tuesday 9th March 2021 06:00 - 07:00



Appendix D Site Plan and Glazing Zones

