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PROPOSED RESIDENTIAL AT NEW PENNSYLVANIA PUBLIC HOUSE, CARDIFF – NOISE ASSESSMENT

NOISE ASSESSMENT REPORT

OCTOBER 2022

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POWELL DOBSON

PROPOSED RESIDENTIAL DEVELOPMENT AT NEW PENNSYLVANIA PUBLIC HOUSE, CARDIFF – NOISE ASSESSMENT

NOISE ASSESSMENT REPORT

OCTOBER 2022

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EXECUTIVE SUMMARY

Wardell Armstrong LLP has carried out a noise assessment to accompany a planning application for a proposed residential development comprising houses and related infrastructure on land at New Pennsylvania Public House, Llanedeyrn, Cardiff.

The assessment considered the impact of existing noise upon proposed noise sensitive areas within the proposed development.

As a result of the assessment, noise from Glenwood Church Centre is not considered to be an issue for the development.

The assessment has found that the majority of the development will require no noise mitigation to achieve guideline noise levels. However, a 1.8m high close boarded fence will be required along the garden boundaries closest to Circle Way West, a busy road running along the western side of the site.

The results of the assessment indicate that façade mitigation would be required for some noise sensitive rooms closest to and facing Circle Way West. The mitigation would comprise standard thermal double glazing, together with an alternative means of ventilation. Alternative ventilation is proposed to allow windows to be closed as required by the occupant, whilst maintaining adequate ventilation.

The resulting noise levels will all be in accordance with guidance and policy and there are no planning or technical reasons why this application should be refused on noise grounds.

1 INTRODUCTION

1.1.1 Wardell Armstrong LLP (WA) was instructed by Powell Dobson to prepare a noise assessment report to accompany a planning application for a residential development on land at New Pennsylvania Public House, Llanedeyrn.

1.1.2 The proposed layout is shown on Drawing number CA12481-001.

1.1.3 The site is located off Circle Way West and Brynfedw, Llanedeyrn and is currently occupied by the disused New Pennsylvania public house building and car park. Circle Way runs to the west and north of the site with Brynfedw running to the east. To the south of the site there is a cul-de-sac off Brynfedw and a large, wooded area. Beyond Circle Way to the north of the site the Glenwood Church Centre is located.

1.1.4 This report assesses the noise impacts upon the site from Circle Way West, Brynfedw and the Glenwood Church Centre. The report includes recommendations for noise mitigation measures as appropriate.

2 ASSESSMENT METHODOLOGY

2.1 Consultation and Scope of Works

2.1.1 Prior to undertaking any works on the noise assessment, the proposed methodology was issued to the Shared Regulatory Services which is responsible for environmental queries submitted to Cardiff Council. The methodology was issued on the 22nd July 2022. No response was received.

2.1.2 When planning the survey, it was decided that the main sources of noise which would need to be considered within the assessment would be:

- Circle Way West
- Brynfedw
- Glenwood Church Centre

2.2 Noise Survey

2.2.1 As part of this assessment, Wardell Armstrong LLP has carried out noise measurements in order to establish the existing noise levels at the development site. This is discussed further in section 3 of this report.

2.3 Assessment Methodology

2.3.1 An assessment is required to consider any potential noise impact at the site. The potential impacts of the existing sources of noise on the proposed residential area have been assessed with reference to;

- Planning Policy Wales, 2021 (PPW);
- Technical Advice Note 11: Noise (TAN11)
- British Standard 8233: 2014 Guidance on sound insulation and noise reduction for buildings (BS8233);
- British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS4142);
- Calculation of Road Traffic Noise, 1988 (CRTN);

2.3.2 Further details of Legislation, Policy and Guidance documents is found in Appendix A.

3 BASELINE CONDITIONS

3.1 Noise Survey

3.1.1 Between the 12th September and the 15th September 2022, Wardell Armstrong LLP carried out a noise survey at the proposed development site.

3.1.2 Noise measurements were carried out at two monitoring locations (MLs) considered to be representative of the proposed receptors nearest to each individual noise source at the site, as detailed in Table 1 below. The MLs are also shown on drawing CA12481-001.

Table 1: Summary of Noise Monitoring Locations

Location	Location Description	Monitored Source	Time Period Monitored	
			Start	End
ML1	North-western boundary of New Pennsylvania, approximately 7m from Circle Way West	Circle Way West	1408 (12/9)	1744 (13/9)
ML2	Eastern boundary of New Pennsylvania, approximately 4m from Brynfedw	Brynfedw	1747 (13/9)	1000 (15/09)

3.1.3 Noise measurements were made using one Class 1, integrating sound level meter. The sound level meter was calibrated to a reference level of 94dB at 1kHz both before, and on completion of, the noise survey. No drift in the calibration over 0.5dB during the survey was noted.

3.1.4 Monitoring was undertaken during dry and calm weather conditions.

3.1.5 For the purpose of this assessment daytime hours are taken to be 0700 to 2300 hours and night-time hours to be 2300 to 0700 hours.

3.1.6 A-weighted[1] L_{eq}[2] L_{90}[3] and maximum noise levels were measured to comply with the requirements of BS8233 and BS4142. A-weighted and L_{10}[4] noise levels, together with minimum sound pressure levels, were also measured to provide additional information. The measured noise levels are set out in full in Appendix B.

3.1.7 Partially attended noise monitoring allowed observations and detailed notes to be made of the significant noise sources which contribute to each of the measured levels.

[1] A' Weighting — An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions

[2] L_{eq} — Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.

[3] L_{90} — The noise level which is exceeded for 90% of the measurement period.

[4] L_{10} — The noise level which is exceeded for 10% of the measurement period.

The observations identified the following:

Road Noise: Noise from Circle Way West was dominant throughout the surveys with noise from occasional traffic on Brynfedw.

Glenwood Church Centre: No noise was audible from the Glenwood Church Centre located across Circle Way West. This will not be considered further in the assessment.

Other: No other source of noise was observed while on site.

3.2 Noise Levels

3.2.1 The measured noise levels at ML1 and ML2 have been divided into daytime (0700-2300 hours) and night-time (2300-0700 hours) categories and arithmetically averaged to give one noise level for daytime and one for night-time at each ML. The periods of higher recorded wind speeds, which might have affected the measured results, have been removed from the assessment.

3.2.2 The overall measured levels at ML1 and ML2 are shown below in Table 2.

Table 2: Measured Daytime and Night-time

Monitoring Location	Time Period	Measured Noise Level (Figures in dB L_{Aeq})
ML1	Daytime (0700-2300)	58.1
	Night-time (2300-0700)	46.1
ML2	Daytime (0700-2300)	53.2
	Night-time (2300-0700)	42.3

3.2.3 Maximum noise guideline levels should not be exceeded more than 10 times in a night, therefore the 10th highest maximum noise level measured at ML1 and ML2 during the night-time will be used within the assessment. These are summarised in Table 3.

Table 3: Summary of the Maximum Night-time (Figures in dB L_{Afmax})

Monitoring Location	10th Highest Measured Maximum Measured Noise Levels
ML1	68.2
ML2	63.8

3.2.4 These measured levels have been used to determine the noise impact and appropriate mitigation required to achieve internal noise guideline levels at the proposed development and existing sensitive receptors.

4 NOISE IMPACT ASSESSMENT

4.1.1 The measured levels have been used to assess the potential impact of existing sources of noise on proposed receptors, and of the impact of construction noise upon existing noise sensitive receptors.

4.2 Assessment of TAN 11 Noise Exposure Categories

4.2.1 The results show that during the daytime, the eastern area of the site nearest to Pennsylvania Public House falls within category A of TAN 11 and the western area nearest to Circle Way West falls within category B. During the night-time conditions are the same with the eastern area of the site falling within category A while the western side remains in category B.

4.2.2 Advice for proposed development within Category A states that noise need not be considered as a factor in granting planning permission.

4.2.3 Advice for proposed developments that fall within Category B states that noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.

4.2.4 Therefore, further calculations have been undertaken to determine the indoor and outdoor levels at the development during the daytime and night-time.

4.3 BS8233 Assessment of Daytime Noise Levels in Outdoor Living Areas

4.3.1 Table 2 shows that during the daytime, noise levels affecting the development site would be between 53 and 58dB$L_{Aeq,16hour}$ within the site. The BS8233 upper guidance level of 55dB$L_{Aeq,16hour}$ will be exceeded in outdoor living areas in the western parts of the site closest to Circle Way West. Therefore, some mitigation is required to secure suitable external noise levels in garden areas of the proposed development. Mitigation measures are covered in Section 5 of this report.

4.4 Assessment of Daytime Noise Levels in Living Rooms and Bedrooms

4.4.1 The daytime noise levels in noise sensitive rooms of the proposed dwellings have been assessed in accordance with the accepted criteria for living rooms and bedrooms during the day. The acceptable daytime noise level within living rooms and bedrooms is 35dB $L_{Aeq,16hour}$.

4.4.2 Before internal noise levels can be calculated 3dB(A) must be added to the freefield measured levels to allow for the reflection of noise from the proposed housing façades when the buildings are in place.

4.4.3 As the detailed design is not yet available, in order to assess the worst-case scenario, it has been assumed that dwellings could be located at the site boundaries directly adjacent to the noise sources. The noise levels at the site boundaries have been calculated together with the level of attenuation required to achieve 35dB L_{Aeq} in the living rooms and bedrooms during the daytime. The noise levels at facades of properties adjacent to and facing the noise sources have been summarised in Table 4.

Table 4: Façade Noise Level at the Development and Level of Attenuation Required to Achieve the Internal Daytime Guideline Noise Level (Figures in dB(A))

Monitoring Location	Noise Level at the Closest Façades of the Development	Level of Attenuation Needed to Achieve Noise Guideline Level in Living Room and Bedroom Areas
ML1	61.1	26.1
ML2	56.2	21.2

4.5 Assessment of Night-Time Noise Levels in Bedrooms

4.5.1 In accordance with the accepted criteria, the acceptable night-time noise level within bedroom areas is 30 dB $L_{Aeq, 8hour}$. Individual noise events should not normally exceed 45dB $L_{Amax,f}$.

4.5.2 As the detailed design is not yet available, in order to assess the worst-case scenario, it has been assumed that dwellings could be located at the site boundaries directly adjacent to the noise sources. The noise levels at the site boundaries have been calculated together with the level of attenuation required to achieve 30dB $L_{Aeq, 8hour}$ and 45dB $L_{Amax,f}$ in the bedrooms during the night-time period. The noise levels at facades of properties closest to and facing the noise sources have been summarised in Table 5.

Table 5: Façade Noise Level at the Development Level of Attenuation Required to Achieve the Internal Night-time Guideline Noise Level (Figures in dB(A))

Facades	Noise Level at the Closest Façades of the Development (L_{Aeq})	Maximum Noise Level at the Closest Façades of the Development ($L_{Amax,f}$)	Level of Attenuation Needed to Achieve the Noise Guideline Levels in Bedrooms
ML1	49.1	74.9	29.9

ML2	45.3	75.2	30.2

5 MITIGATION MEASURES

5.1.1 The results of the noise survey indicate that some noise sensitive rooms and outdoor living areas in the western parts of the site will require mitigation due to traffic noise.

5.1.2 Noise from Glenwood Church Centre will not affect proposed residential receptors and no mitigation will be required for this.

5.1.3 This section of the report determines the appropriate mitigation which is required to provide a good standard of amenity in proposed noise sensitive areas from existing and proposed noise sources.

5.2 Assessment of External Noise Levels

5.2.1 The measured noise levels, as detailed in Table 2 of this report, indicate that mitigation measures will be required to ensure that outdoor living areas achieve the recommended outdoor noise guidance value.

5.2.2 Noise levels in outdoor living areas that are nearest to and facing Circle Way West would exceed the recommended guideline level of 55dB$L_{Aeq,16hour}$ for external areas. Some mitigation will therefore be required.

5.2.3 In order to achieve the external noise guidelines levels in the western part of the site gardens could be located on the screened side of dwellings furthest from the road. Alternatively gardens directly adjacent to the western site boundary could achieve the guideline noise levels with a 1.8m high close board fence on the western boundary of the gardens.

5.3 Assessment of Internal Noise Levels

5.3.1 In the absence of design details for the building facades, it has been assumed that the glazing to noise sensitive rooms would comprise about 25% of the facade area. To calculate the overall attenuation provided by this percentage of glazing in a brick or block facade, a non-uniform partition calculation can be used.

5.3.2 The calculation combines the different degrees of attenuation of the wall element and the window element. A facade element comprising solid brick or blockwork, will attenuate by 50-55dB (BS8233: Table E1.A) whereas standard double glazing will attenuate road traffic noise by 26-29dB(A) (BRE Digest 379 ”Double glazing for heat and sound insulation”). The overall noise attenuation provided by this combination is, therefore, between 32.0dB(A) and 35.0dB(A).

5.3.3 The noise attenuation requirements for proposed noise sensitive rooms nearest to the noise sources are summarised in Table 4 and 5. With windows open for ventilation purposes, the attenuation provided by the façade will be approximately 13dB(A). The majority of the dwellings across the site will achieve internal noise guideline levels even with windows open. However, in dwellings closest to and facing Circle Way West, this would potentially allow the internal noise guideline level to be exceeded in some noise sensitive rooms closest to them.

5.3.4 Living rooms and bedrooms facing the road could achieve internal daytime and night-time noise guideline levels with windows closed with standard thermal double glazing. In those rooms that will not achieve internal noise guideline levels with windows open, alternative ventilation will be required.

5.4 Acoustic Ventilation Requirements

5.4.1 It is recommended that the acoustic ventilation proposed at the site should, as a minimum, comply with Building Regulations 2022 Approved Document F1 Means of Ventilation and British Standard BS5925 1991: "Code of Practice for Ventilation Principles and Designing for Natural Ventilation". Acoustic ventilation is only recommended for noise sensitive rooms, which are bedrooms and living rooms.

5.4.2 The implementation of the recommended glazing together with appropriate acoustic ventilation should ensure that the required internal daytime and night-time noise guidelines are achieved.

5.4.3 The façades of the majority of the properties further into the site will be protected by the buildings themselves and/or be screened by other buildings. Therefore, windows will be able to be opened for ventilation and acoustic ventilation may not be required for these plots. The requirement for acoustic ventilation can be confirmed on a plot-by-plot basis, before commencement of the development.

6 CONCLUSIONS

6.1.1 Wardell Armstrong has carried out a noise assessment for a proposed residential development on land at Pennsylvania Public House on Circle Way West, Llanedeyrn, Cardiff. The report has been prepared to accompany a planning application for the proposed development.

6.1.2 An assessment has been carried out to consider the potential impact of noise on the proposed development and of the construction phase of the site upon the existing residential receptors.

6.1.3 Noise from the adjacent Glenwood Church Centre is not considered to be an issue for the development.

6.1.4 The results of a noise survey indicate that the dominant source of noise affecting the development site is traffic on Circle Way West.

6.1.5 The majority of the site will require no internal or external mitigation. Properties in the western part of the site nearest to Circle Way West could have their gardens located further away from the road, on the screened side of the dwellings. Alternatively, gardens directly adjacent to the western site boundary could achieve the outdoor living area guideline noise levels by having a 1.8m high close board fence built between the gardens and the road.

6.1.6 In order to achieve the recommended internal noise guideline levels, standard thermal double glazing will be required in some noise sensitive rooms which are closest to the roads. An alternative means of ventilation such as trickle vents, or similar, would be required to allow the windows to remain closed when the occupant so chooses.

6.1.7 With the implementation of the proposed mitigation measures, there are no planning or technical reasons with regard to noise why the proposed development should not go ahead.

APPENDICES

Appendix A

Legislation, Policy and Guidance

Policy, Standards and Guidance

Appendix A

Planning Policy Wales

Planning Policy Wales (PPW) is the current planning policy guidance within Wales. The planning guidance defines the primary objective of the document in paragraph 1.2 as follows:

> *'…to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales…'*

In particular reference to noise Paragraph 6.7.3 of the PPW states:

> *'Problematic forms of sound are generally experienced as noise pollution and can affect amenity and be prejudicial to health or a nuisance. Noise action plans drawn up by public bodies aim to prevent and reduce noise levels where necessary and preserve soundscape quality where it is good. Noise levels used to identify priority areas contained in noise actions plans are usually set quite high in order to focus resources on the most polluted areas and noise must meet a number of tests before it qualifies as a statutory nuisance. Lower levels of noise however, can still be annoying or disruptive and impact on amenity and as such should be protected through the planning process wherever necessary.'*

Planning Guidance (Wales): Technical Advice Note (Wales) 11 (TAN11)

Tan 11 states that

> *"Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions."*

British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings

British Standard 8233 "Guidance on sound insulation and noise reduction for buildings" 2014, suggests the following guideline noise levels and states that they are based on guidelines issued by the World Health Organisation;

- 35 dB $L_{Aeq\ (16\ hour)}$ during the day time in noise sensitive rooms
- 30 dB $L_{Aeq\ (8\ hour)}$ during the night time in bedrooms
- 45 dB $L_{Amax,F}$ during the night time in bedrooms
- 50 dB $L_{Aeq\ (16\ hour)}$ desirable external noise levels for amenity space such as

gardens and patios

- 55 dB $L_{Aeq\ (16\ hour)}$ upper guideline value which would be acceptable in noisier environments.

In addition, for internal noise levels it states;

> *"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."*

Furthermore, with regard to external noise, the Standard states;

> *"However, it is also recognised 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 the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited".*

Good Practice Guide on the Control of Noise from Pubs and Clubs, March 2003

The good practice guide provides guidance for the assessment of noise affecting noise-sensitive properties, from the public and private use of public houses and other similar premises. The main noise sources considered are music, singing, public address systems, children's play areas, beer gardens, people in general, car parks and access roads, deliveries, collections, materials handling, plant and machinery and skittle alleys.

The guidance states that there should be an attempt to ensure that:

> *"for premises where entertainment takes place on a regular basis, music and associated sources should not be audible inside noise-sensitive property at any time"*
>
> and
>
> *"for premises where entertainment takes place less frequently, music and associated sources should not be audible inside noise-sensitive property between 23:00 and 07:00 hours"*

The guidance also suggests some mitigation measures for the control of noise from pubs, such as the following:

- The determination of an appropriate level of sound insulation based on realistic source and receptor levels;
- Automatic door closers;
- The provision of well-sealed acoustic doors on emergency exits;
- The provision of sound insulated windows;
- Where possible, plant and machinery should be positioned in a way that the building structure provides as much screening as possible for nearby noise sensitive properties; and
- Regular maintenance should be carried out on all plant and machinery to ensure noise disturbance from such sources is kept to a minimum.

Appendix B

Noise monitoring Results

Appendix B

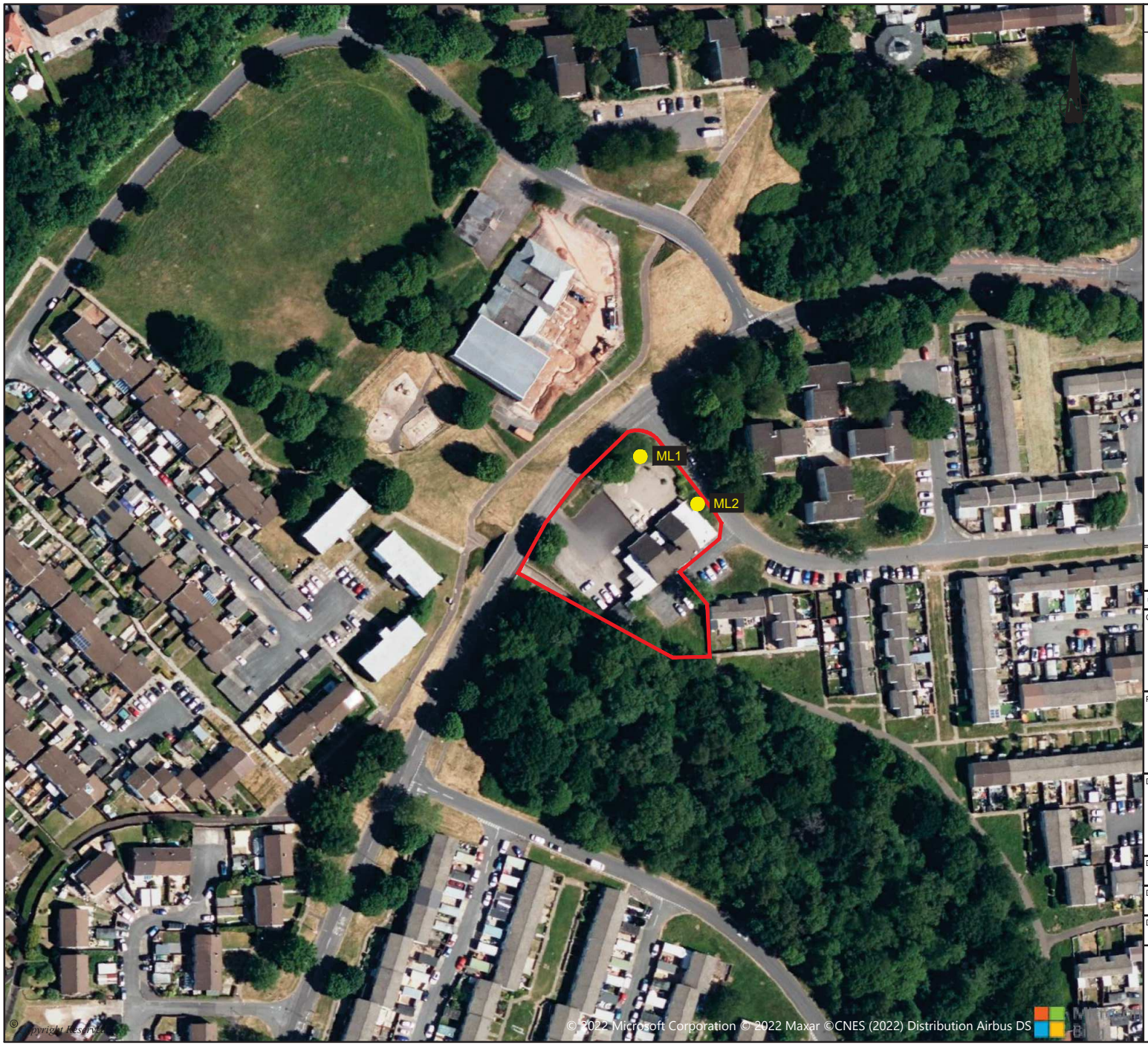
Noise Monitoring Results

Monitoring Location 1 – Northern point of site, adjacent to Circle Way West						
Time	**L_{Aeq} (dB)**	**$L_{A\ min}$ (dB)**	**$L_{A\ max}$ (dB)**	**L_{A90} (dB)**	**L_{A10} (dB)**	**Comments**
12/09/2022 – Daytime (1408-2300)						
1400-1500	60.1	33.2	83.5	42.6	62.8	
1500-1600	59.2	32.9	75.9	43.8	63.0	
1600-1700	58.1	32.3	70.9	40.4	62.4	
1700-1800	58.6	32.4	75.0	40.7	62.8	
1800-1900	60.5	32.5	87.7	40.3	62.5	Unattended
1900-2000	55.7	33.8	69.4	38.1	60.4	
2000-2100	54.3	31.0	76.0	34.0	58.5	
2100-2200	52.3	31.9	73.5	34.0	55.9	
2200-2300	49.4	29.4	69.3	33.5	51.0	
12/09/2022 – Night time (2300-0700)						
2300-2315	49.6	29.0	66.2	31.4	50.6	
2315-2330	47.2	30.3	71.9	31.4	40.7	
2330-2345	46.2	28.4	63.9	30.3	44.4	
2345-0000	45.4	29.8	64.0	30.9	41.3	
0000-0015	40.0	28.9	58.7	30.8	34.9	
0015-0030	41.9	29.4	64.0	31.5	38.4	
0030-0045	45.2	30.2	64.7	31.2	38.8	
0045-0100	42.9	30.1	61.7	32.1	40.5	
0100-0115	43.4	29.5	66.1	31.5	37.2	
0115-0130	40.3	31.3	60.4	32.4	39.8	
0130-0145	42.5	31.8	57.8	34.3	44.9	
0145-0200	43.1	32.8	61.0	34.6	44.9	
0200-0215	41.8	32.7	57.4	34.5	44.2	
0215-0230	40.9	33.6	52.6	34.8	43.6	
0230-0245	48.2	35.6	68.3	37.7	48.9	
0245-0300	44.6	34.3	61.4	36.4	45.6	
0300-0315	44.1	36.3	53.8	38.7	47.1	Unattended
0315-0330	45.5	35.1	65.6	38.4	46.9	
0330-0345	46.7	33.5	61.8	35.9	48.2	
0345-0400	44.0	34.9	68.2	36.0	42.0	
0400-0415	46.8	34.7	66.1	37.3	46.3	
0415-0430	44.4	35.3	60.9	37.4	46.9	
0430-0445	47.9	34.7	68.3	36.2	48.8	
0445-0500	43.6	33.6	61.6	34.5	43.7	
0500-0515	51.0	35.6	69.3	37.9	52.5	
0515-0530	46.5	36.6	62.7	38.0	46.4	
0530-0545	50.4	37.5	65.5	38.6	52.3	
0545-0600	49.8	37.4	68.7	38.5	50.4	
0600-0615	51.6	37.8	70.9	39.1	52.4	
0615-0630	52.8	38.9	69.1	40.9	55.8	
0630-0645	53.2	40.1	71.4	41.9	55.5	
0645-0700	54.9	41.7	71.3	43.1	59.2	
13/09/2022 – Daytime (0700-1700)						
0700-0800	57.3	42.2	69.8	45.1	62.0	
0800-0900	63.2	45.3	76.8	53.4	66.4	
0900-1000	59.7	42.7	74.6	47.1	63.5	Unattended
1000-1100	58.8	42.6	74.8	46.2	63.3	
1100-1200	58.0	40.5	73.8	44.0	62.1	

1200-1300	58.4	41.6	76.8	45.1	62.5	
1300-1400	59.0	41.3	73.0	44.9	63.6	
1400-1500	59.8	39.9	76.6	43.3	64.2	
1500-1600	60.9	40.5	73.0	47.2	64.9	
1600-1700	60.7	40.5	79.2	44.8	64.8	
Monitoring Location 2 – Eastern area of site, adjacent to Brynfedw						
Time	**L_{Aeq} (dB)**	**$L_{A\ min}$ (dB)**	**$L_{A\ max}$ (dB)**	**L_{A90} (dB)**	**L_{A10} (dB)**	**Comments**
13/09/2022 – Daytime (1800-2300)						
1800-1900	55.2	38.6	67.6	42.1	59.0	
1900-2000	54.6	37.4	65.5	40.9	58.9	
2000-2100	51.8	35.6	75.0	37.5	56.4	Unattended
2100-2200	49.4	35.5	68.1	37.0	53.5	
2200-2300	51.0	32.4	72.9	33.8	54.7	
13/09/2022 – Night time (2300-0700)						
2300-2315	47.9	33.3	66.5	34.5	51.4	
2315-2330	42.9	32.4	59.4	33.2	42.4	
2330-2345	44.0	32.3	59.4	33.2	46.7	
2345-0000	43.0	32.7	62.7	33.6	40.0	
0000-0015	44.7	31.4	62.9	32.2	44.5	
0015-0030	40.4	30.1	62.7	31.2	35.4	
0030-0045	42.6	30.2	60.3	31.3	39.6	
0045-0100	37.1	29.0	57.4	30.2	33.4	
0100-0115	45.3	29.3	65.7	31.3	42.6	
0115-0130	39.6	28.7	60.0	30.0	35.3	
0130-0145	35.0	28.6	51.4	30.2	35.0	
0145-0200	45.1	28.5	62.5	30.2	42.9	
0200-0215	38.5	27.7	61.1	30.2	35.7	
0215-0230	40.8	28.9	59.5	30.3	37.3	
0230-0245	38.3	30.2	60.6	30.9	34.0	
0245-0300	37.6	28.9	57.8	30.4	35.7	
0300-0315	43.9	31.4	65.8	32.5	42.6	Unattended
0315-0330	47.6	30.7	69.2	31.9	39.6	
0330-0345	42.0	30.9	60.7	32.0	39.8	
0345-0400	41.1	29.8	58.9	31.4	41.1	
0400-0415	37.6	30.9	57.9	32.6	37.3	
0415-0430	43.0	32.1	62.2	33.6	38.9	
0430-0445	41.7	32.6	62.7	33.9	41.1	
0445-0500	39.0	31.8	58.4	33.1	39.8	
0500-0515	43.5	33.2	59.3	34.3	43.5	
0515-0530	47.1	33.6	67.1	34.6	45.0	
0530-0545	48.6	35.2	66.4	36.3	52.4	
0545-0600	48.3	36.0	63.0	37.1	50.4	
0600-0615	48.0	36.9	63.8	38.0	50.5	
0615-0630	50.2	38.9	68.9	40.2	53.6	
0630-0645	52.8	39.0	72.2	41.1	54.3	
0645-0700	52.2	39.6	64.9	40.6	56.5	
14/09/2022 – Daytime (0700-2300)						
0700-0800	54.7	39.6	68.2	42.6	59.1	
0800-0900	57.5	41.1	70.1	45.7	61.0	
0900-1000	54.8	36.9	75.6	39.5	58.3	
1000-1100	52.2	35.8	69.4	38.5	56.7	
1100-1200	52.5	34.0	68.9	40.3	56.6	Unattended
1200-1300	52.2	33.0	66.5	36.9	56.4	
1300-1400	54.4	31.6	71.1	35.7	57.8	
1400-1500	54.8	31.5	74.9	39.7	57.5	

1500-1600	57.4	36.0	83.4	45.2	59.0	
1600-1700	53.9	35.6	71.6	40.1	57.3	
1700-1800	53.9	34.6	70.2	40.3	57.7	
1800-1900	52.9	30.9	66.0	37.5	57.0	
1900-2000	52.4	31.1	63.1	37.8	56.8	
2000-2100	50.2	33.9	65.2	35.5	54.8	
2100-2200	49.5	31.1	64.4	33.6	54.4	
2200-2300	46.9	28.8	64.7	30.8	51.0	
14/09/2022 – Night time (2300-0700)						
2300-2315	44.8	28.6	63.6	29.9	45.6	
2315-2330	42.0	27.9	58.9	29.0	38.4	
2330-2345	48.7	27.8	71.6	28.8	49.8	
2345-0000	43.1	26.6	58.5	27.6	45.5	
0000-0015	42.4	26.1	60.3	26.8	38.3	
0015-0030	37.4	26.8	55.4	27.7	36.3	
0030-0045	38.7	26.5	58.4	27.3	31.9	
0045-0100	41.2	26.2	58.3	27.6	42.2	
0100-0115	47.5	25.7	65.8	26.7	49.8	
0115-0130	46.1	24.5	67.8	25.8	38.1	
0130-0145	37.0	25.6	56.3	26.8	35.1	
0145-0200	39.1	25.8	59.0	27.4	34.5	
0200-0215	29.5	24.9	37.5	26.3	32.0	
0215-0230	39.0	24.3	58.0	25.5	30.9	
0230-0245	36.8	23.6	58.4	25.1	29.9	
0245-0300	37.9	23.8	57.1	26.0	35.2	
0300-0315	27.3	23.3	34.4	25.0	29.5	Unattended
0315-0330	34.7	24.8	57.5	25.9	29.5	
0330-0345	38.7	25.9	58.6	26.5	33.0	
0345-0400	29.3	25.0	35.5	26.1	31.6	
0400-0415	38.1	25.4	56.2	26.4	35.9	
0415-0430	38.1	25.2	61.0	26.0	31.1	
0430-0445	42.5	25.6	57.9	26.4	44.7	
0445-0500	31.2	26.7	43.0	27.6	32.2	
0500-0515	41.5	27.9	57.0	28.9	38.3	
0515-0530	45.6	29.3	64.7	30.4	45.5	
0530-0545	45.3	31.0	62.4	32.2	47.1	
0545-0600	46.6	30.8	65.2	32.3	46.9	
0600-0615	49.5	32.7	65.3	34.7	54.0	
0615-0630	48.3	32.2	62.6	34.0	52.9	
0630-0645	50.0	36.7	63.8	38.0	54.6	
0645-0700	58.0	38.3	74.0	39.1	60.0	
15/09/2022 – Daytime (0700-1000)						
0700-0800	53.7	36.4	69.9	40.7	57.9	
0800-0900	56.9	37.0	68.4	45.4	60.4	Unattended
0900-1000	53.7	33.3	64.0	38.7	57.9	

DRAWINGS



DO NOT SCALE FROM THIS DRAWING

KEY

SITE BOUNDARY

ML1 MONITORING LOCATION

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D
A	FIRST ISSUE	07/10/22	SJB	IW	RP

CLIENT

POWELL DOBSON ARCHITECTS

PROJECT

PENNSYLVANIA

DRAWING TITLE

MONITORING LOCATION PLAN

DRG No.	REV	SUIT. CODE
CA12481-001	A	

DRG SIZE	SCALE	DATE
A3	1:1250	18--08-22

DRAWN BY	CHECKED BY	APPROVED BY
DR	IW	RP

wardell armstrong

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