



ACOUSTIC CONSULTANTS LTD
noise and acoustic specialists since 1987

Noise Impact Assessment

Ysgol Gymraeg Ystalyfera - AGP

Reference: 8331/AGP/BL

Client:	Planning Consultant:	Acoustic Consultant:
		

Document Control

Version	Revision Description	Date	Author:	Reviewed by:
1.0	--	05/05/20	Blake Lucas	Daniel Oldaker
2.0	Updated layout plan	19/08/20	Blake Lucas	Daniel Oldaker

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above. The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

The report limits itself to addressing solely on the external noise aspects as included in this report. We provide advice only in relation to noise and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment. It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.



Table of Contents

1.	Introduction	4
2.	The Site & Development	5
3.	Planning & Noise	7
4.	Noise Modelling	12
5.	Noise Impact Assessment	17
6.	Noise Management Plan	18
7.	Summary & Conclusions	19
8.	Appendix 1 – Glossary of Acoustic Terminology	20



1. Introduction

Andrew Scott appointed Acoustic Consultants Limited to undertake a noise impact assessment for the proposed AGP at Ysgol Gymraeg, Ystalyfera in support of a planning application.

This report addresses the noise impact of the AGP (2G Hockey Pitch) on the existing sensitive receivers around the site and provides outline mitigation measures as appropriate.

The noise impact assessment has been undertaken in accordance with the guidance in the Planning Policy Wales (PPW), Technical Advice Note 11 (TAN11), British Standard 8233:2014 and WHO1999. The report also considers the guidance within the Sport England Design Guidance Note 'Artificial Grass Pitch (AGP) Acoustics – Planning Implications'.

The author of this report is a Member of the Institute of Acoustics (MIOA) with over 13 years' experience in the field of noise and acoustics, whom as such is considered suitably qualified to undertake a noise assessment.

2. The Site & Development

The development site is located on the existing Ysgol Gymraeg Ystalyfera school playing fields. The development comprises of an Artificial Grass Pitch (AGP). The site is being redeveloped and this is part of the Phase 3 development works. One of the earlier phases included the construction of a 2 storey block facing the Afon Twch under planning permission P2016/1090.

We have been advised that the AGP (2G Hockey Pitch) will be used by both the school and Community (out of hours up until 10pm and on weekends). Figure 1 provides the google site location:

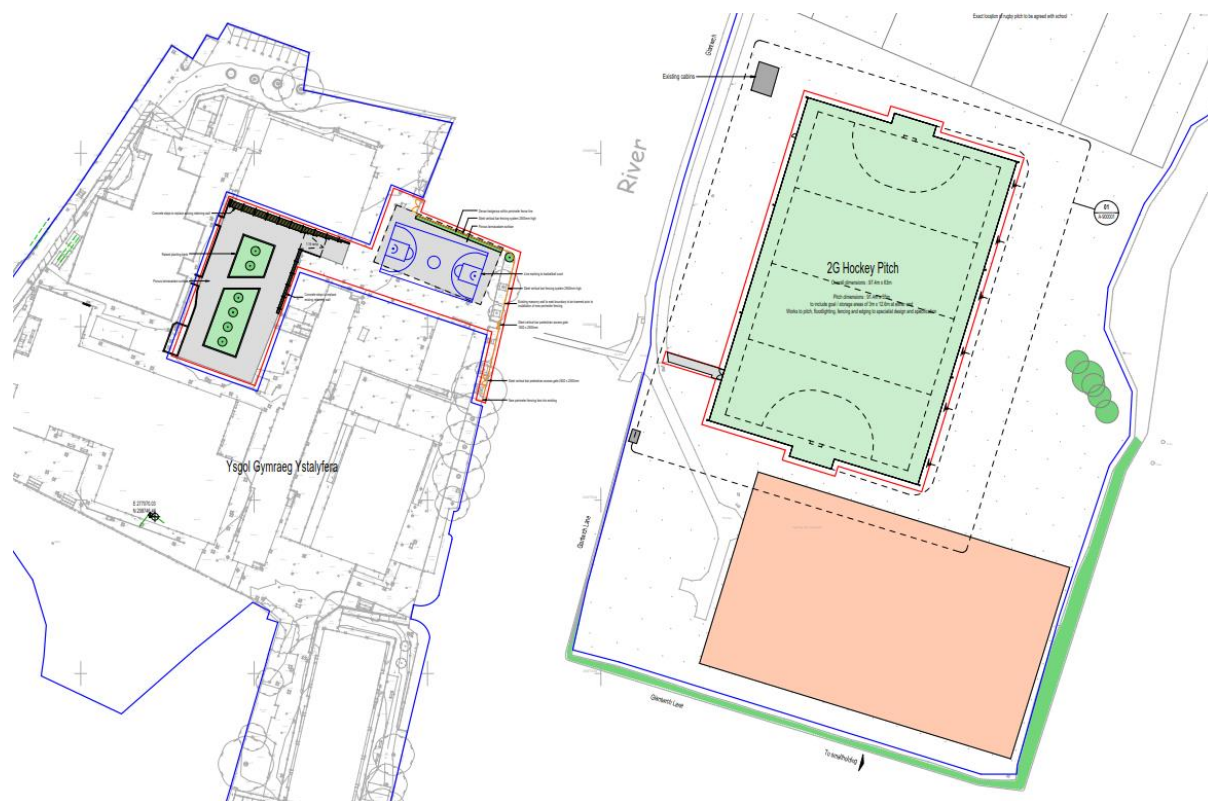
Figure 1: Site location plan



The proposed AGP site layout is as follows:



Figure 2: AGP Site layout plan





3. Planning & Noise

The following section outlines what are considered to be the more relevant criteria for the proposed development.

3.1. Planning Policy Wales

Planning Policy Wales (PPW) Edition 10 dated December 2018 sets out the land use planning policies of the Welsh Government. Section 1 states:

"1.1 Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. PPW, the TANs1, MTANs2 and policy clarification letters comprise national planning policy."

The most relevant statements for noise are provided in Section 6.7 and summarised below:

"6.7.1 Clean air and an appropriate soundscape, contribute to a positive experience of place as well as being necessary for public health, amenity and well-being. They are indicators of local environmental quality and integral qualities of place which should be protected through preventative or proactive action through the planning system. Conversely, air, noise and light pollution can have negative effects on people, biodiversity and the resilience of ecosystems and should be reduced as far as possible."

6.7.6 In proposing new development, planning authorities and developers must, therefore:

- address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
- not create areas of poor air quality or inappropriate soundscape; and*
- seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes."*

6.7.7 To assist decision making it will be important that the most appropriate level of information is provided and it may be necessary for a technical air quality and noise assessment to be undertaken by a suitably qualified and competent person on behalf of the developer."



6.7.14 Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur. In circumstances where impacts are unacceptable, for example where adequate mitigation is unlikely to be sufficient to safeguard local amenity in terms of air quality and the acoustic environment it will be appropriate to refuse permission. Location of Commercial, Industrial and other Potentially Polluting Development

6.7.17 The location of potentially polluting development adjacent to sensitive receptors will be unacceptable where health and amenity impacts cannot be minimised through appropriate design and mitigation measures. It is the overall expectation that levels of pollution should be reduced as far as possible and for this reason the location of potentially polluting development should be taken into account as part of overall strategies in development plans to ensure it can be appropriately located and maximum environmental benefits can be gained through measures such as green infrastructure.

6.7.21 Regard should be paid to current air quality and noise levels and the quality of the existing soundscape and account taken of any relevant local air quality action plan, noise action plan and/ or local or regional air quality strategy as part of development strategies and proposals in development plans and before determining planning applications. Soundscapes and Compatibility of Uses"

PPW does not provide any quantifiable criteria and directs you to the Technical Advice Notes (TAN 11).

3.2. Technical Advice Note (Wales) 11 – Noise

The relevant planning criteria for a proposed school development is provided in Technical Advice Note (Wales) 11 entitled "Noise" which was published in October 1997. The document introduction states that

"3. This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

4. Local authorities should adopt a corporate approach and ensure close co-operation between planning and environmental health departments when considering noise and noise generating developments."

The school is considered both a noise generating development and a noise sensitive development.



TAN 11 states the following in relation to noise generating developments:

"8. 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.

9. Noise characteristics and levels can vary substantially according to their source and the type of activity involved. In the case of industrial development, for example, the character of the noise should be taken into account as well as its level. Sudden impulses, irregular noise or noise which contains a distinguishable continuous tone will require special consideration. In addition to noise from aircraft landing and taking off, noise from aerodromes is likely to result from engine testing as well as ground movements. The impact of noise from sport, recreation and entertainment will depend to a large extent on frequency of use and the design of facilities. Advice on assessing noise and on factors to consider in relation to the major noise sources including roads, railways, airports, industrial and recreational noise and their measurement is given in Annex B."

TAN 11 states the following in relation to Noise-sensitive development:

"10. Local planning authorities should consider whether proposals for new noise-sensitive development would be incompatible with existing activities, taking into account the likely level of noise exposure at the time of the application and any increase that may reasonably be expected in the foreseeable future. Such development should not normally be permitted in areas which are, or are expected to become, subject to unacceptably high levels of noise and should not normally be permitted where high levels of noise will continue throughout the night."

TAN 11 does not provide any noise limiting criteria for both external noise affecting a school and activities associated with a school affecting nearby noise sensitive receivers.

3.3. World Health Organisation 'Guidelines for Community Noise'

The World Health Organisation 'Guidelines for Community Noise' published in 1999 gives the following description of community noise.

"Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from all sources except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic, industries, construction and public work, and the neighbourhood. Typical neighbourhood noise comes from premises and installations related to the catering trade (restaurant, cafeterias, discotheques, etc.); from live or recorded music; sport events including motor sports; playgrounds; car parks; and domestic animals such as barking dogs."

This includes "sport events" and, as such, the use of AGP sites. For noise levels internally and externally to dwellings it states:

"In Dwellings. The effect of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 LAeq for continuous noise and 45 L_{Amax} for single sound events. Lower noise levels may be disturbing depending on the nature of the noise source. At night-time, outside sound levels about 1 metre from façades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedrooms open. This value was obtained by assuming the noise reduction from outside to inside with the window open is 15 dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB LAeq. The maximum sound pressure level should be measured with the sound pressure meter set at "fast"."

Based on the same methodology used to determine the night time noise level (with a 15 dB(A) for an open window) outside a residential property, the daytime noise level about 1 metre from façades of living spaces should not exceed 50 dB LAeq.

Table 4.1 of the document provides guidelines for community noise in specific environments, suggesting noise levels at which adverse health and annoyance effects are likely. The relevant noise criteria are as follows:

Table 1: WHO Noise Criteria

Specific Environment	Critical Health Effect	L _{eq(T)} dB(A)
Outdoor living area	Serious annoyance, daytime and evening	55
	Moderate annoyance, daytime and evening	50
Dwelling indoors	Speech intelligibility & moderate annoyance, daytime & evening	35

We would suggest the more stringent target noise level of 50 dB LAeq (1 hour) is more suitable for the more sensitive evening time.

The equivalent noise level is determined over a specific time period. The World Health Organisation guidelines for residential development are typically equivalent noise levels calculated over a 16-hour daytime period. In our opinion, an AGP 16-hour assessment period may not truly reflect the noise impact as it takes into account times of use and non-use. We would propose an alternative, more stringent but appropriate assessment time period of one hour, LAeq (1 hour), as this is the typical time period for a community sports session on an AGP.

According to the WHO guidance, moderate annoyance is caused by noise levels exceeding 50 LAeq(T) dB externally and 35 LAeq(T) dB internally.



Therefore, where noise levels from the proposed development do not exceed 50 $L_{Aeq(T)}$ dB externally and 35 $L_{Aeq(T)}$ dB internally, the effect is low in terms of planning, and will have no adverse effect. The noise level of the AGP may be noticeable but not intrusive and will not create areas of inappropriate soundscape, this is considered acceptable in planning terms.

It should be noted the WHO criteria was reviewed in a report by the National Physical Laboratory (reference CMAM16) which states: *"Exceedance of the WHO guideline values does not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher levels of noise exposure are reached."*

4. Noise Modelling

The modelling has been undertaken using noise mapping software Cadna:A by DataKustik. This uses the calculation method of ISO 9613 to predict noise levels. The modelling process is as follows:

4.1. Noise Levels of a Typical AGP Use

Noise levels were measured at nine sports sessions on four separate AGPs. The measurements included football, hockey and rugby, with men, women and children participating in different sessions. The purpose of the measurements was to determine a 'typical' noise level for an AGP sports session.

Measurements were undertaken behind the goal line and to the side-line at the halfway line. It was found that noise levels at the halfway line were generally higher than behind the goal.

Noise levels from sporting activity were generally determined by person's voices. This is except for hockey where the balls hitting the backboard of the goal and perimeter boards of the pitch are the main noise sources. The pitch surface is primarily for football and can be used for rugby, it is not suitable for hockey and is not expected to be used for hockey. The following table summarises the measurement data undertaken.

Table 2: Summary of Measured Noise Levels

AGP Activity	L _{Aeq} (1 hour) dB
Rugby training on one half of the pitch with approximately 20 players and football training on the other half with approximately 20 players.	60
8 a-side training match on one half of the pitch only with the other half unused.	56
Football training for a single club of approximately 22 players. The start of the session involved heading drills before the full pitch was used to play an 11 a-side game.	56
Ladies Hockey Club training involving stick drills, passing etc., with multiple balls per team and therefore a lot of impact noise from stick on ball. Approximately 30 players on the pitch.	56
Ladies Hockey Club undertaking defence/attack drills on different halves of the pitch. Single ball used per team with less stick on ball impacts than previous training. Approximately 30 players on the pitch.	58
Men's 6 a-side social football match using half the pitch and hockey goals (12 players).	51
Under sixteen football training with the pitch divided into four quarters and a total of approximately fifty players.	58
Two adult football games using half the pitch each with a total of 28 players.	56
Two 8 a-side adult football games using half the pitch each with a total of 32 players.	56



From the measurement data, a typical free-field noise level of 58 dB L_{Aeq} (1 hour) at a distance of 10 metres from the side-line at the halfway line has been determined as representative for noise from an AGP.

4.2. Noise Modelling Methodology

The measured AGP noise emission data has been used to generate a noise map of the site, in order to predict the noise level at the nearby noise-sensitive residential properties.

The assessment is based on the noise modelling methodology using an area source covering the playing surface as the noise source. The area source is at a height of 1.5 metres representative of head height.

To validate the modelling methodology, we have created a noise map of one of the sites where AGP noise was measured (Coombe Dingle in Bristol). The noise map in Figure 3 shows the noise propagation of an area source created from thirty moving point sources. The second noise map (Figure 4) shows the noise propagation of thirty individual point sources spread across the playing surface.

Figure 3: Noise model using an area source

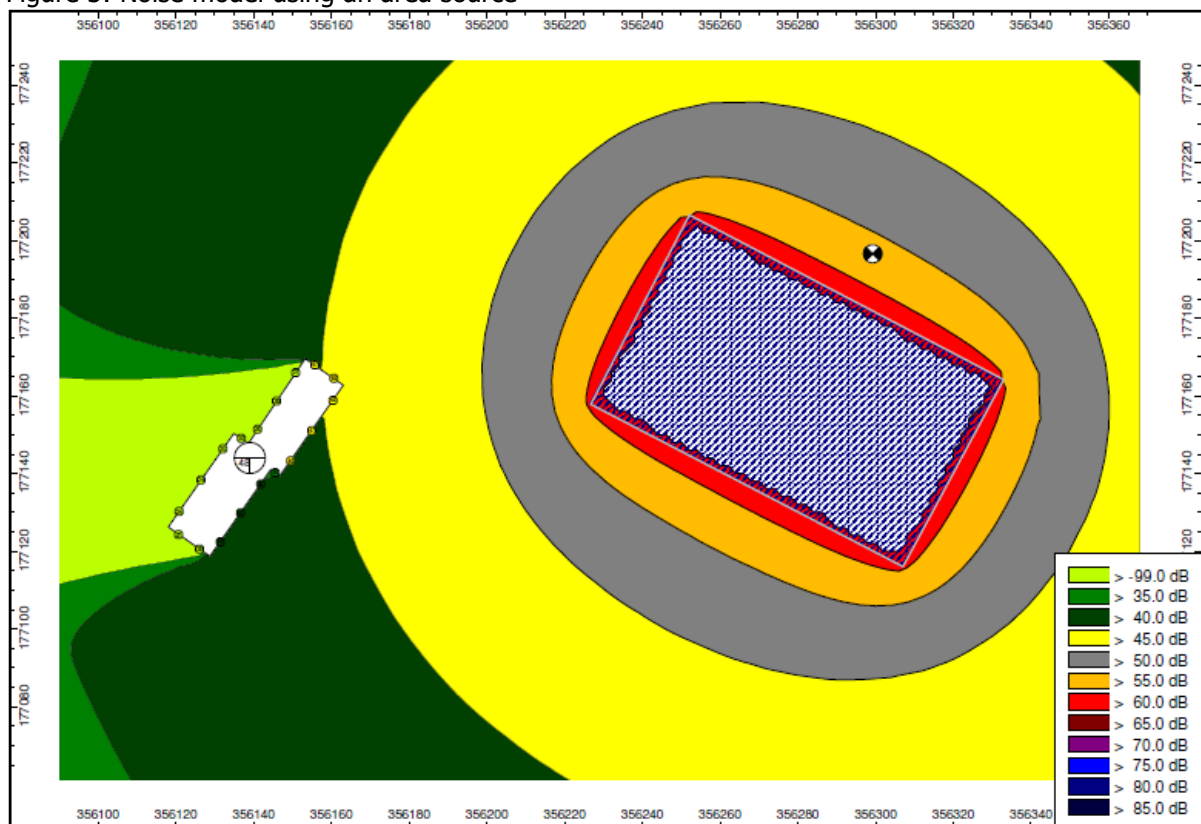
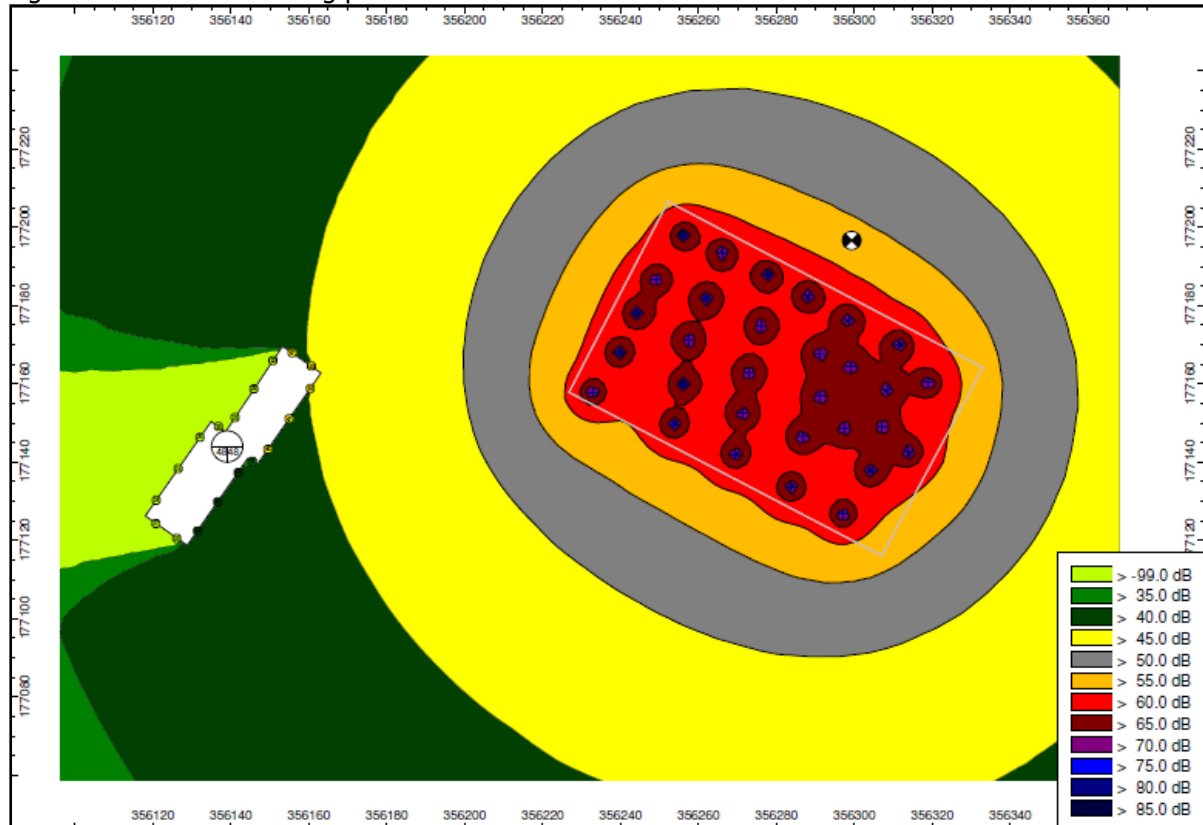


Figure 4: Noise model using point sources



As can be seen from the two maps, there is no significant difference in the noise propagation. As such, it is our opinion that an area source is suitable for noise modelling of AGPs.

4.3. AGP Noise Emission Predictions

A noise model has been generated of the development site. The AGP location and surrounding area has been determined from the layout in Figure 2 above.

The ground of the playing fields is considered to be 'soft' (i.e. grass) for the purposes of the assessment. Roads and car parks are considered to be 'hard' surfaces, where a ground absorption of zero has been assumed.

Residential and non-residential buildings in the vicinity of the playing fields have been built within the model and the heights of these buildings has been based of google maps.

The noise from an AGP is primarily from voice. The noise source is at a height of 1.5 metres above the ground (approximately head height).

The topography of the site and surrounding area is assumed to be flat.

No barriers have been included in the model.



The noise map in the figure below shows noise emission from the AGP predicted at ground floor level (1.5 metres above the ground), which is typical of a 'daytime' habitable room in a house and external amenity areas.

Within the daytime model it is assumed both pitches are operating continuously. Within the evening model it is assumed only the AGP is operating.

Figure 5: Daytime AGP Noise Model, $L_{Aeq}(1hr)$

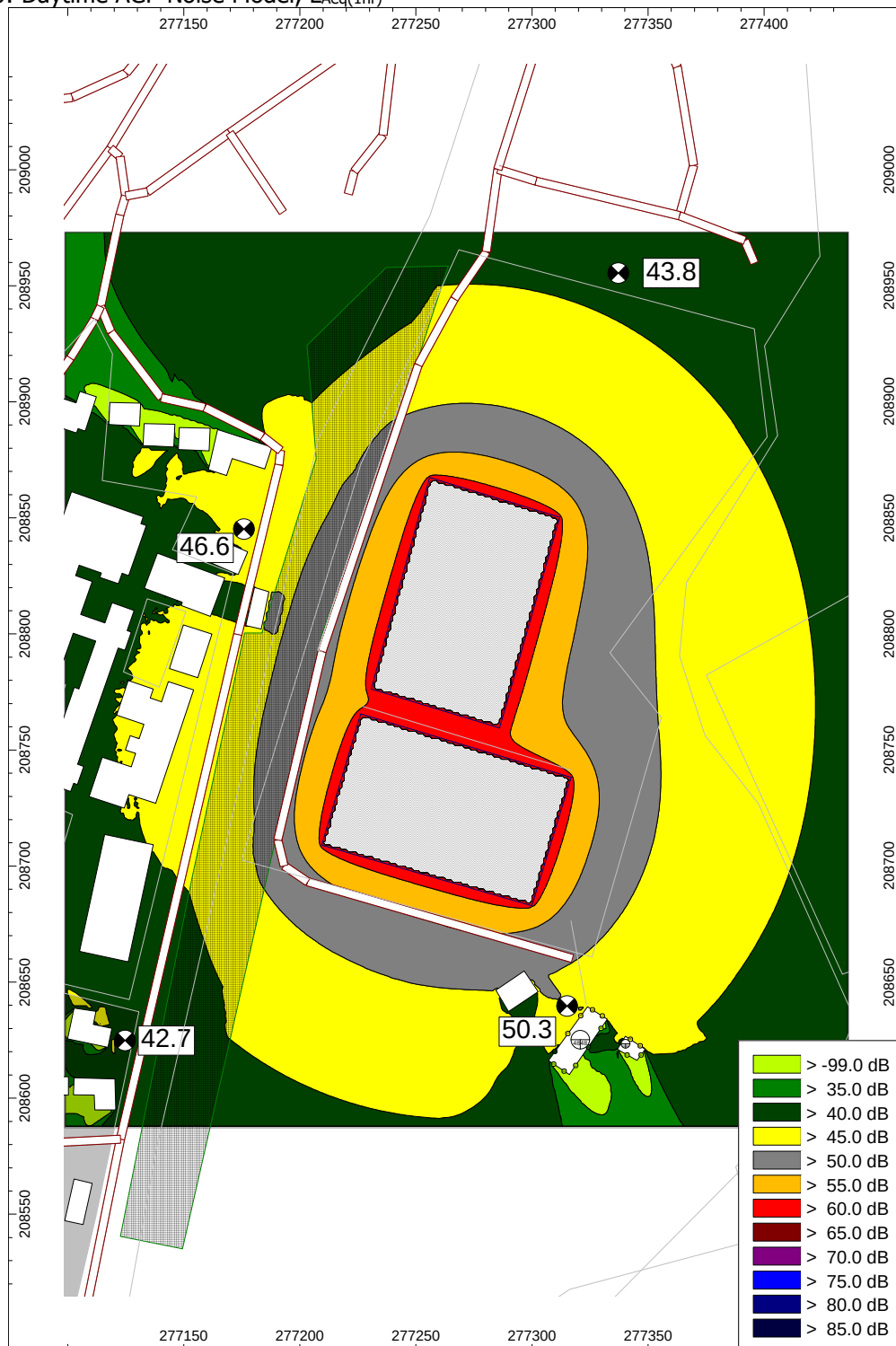
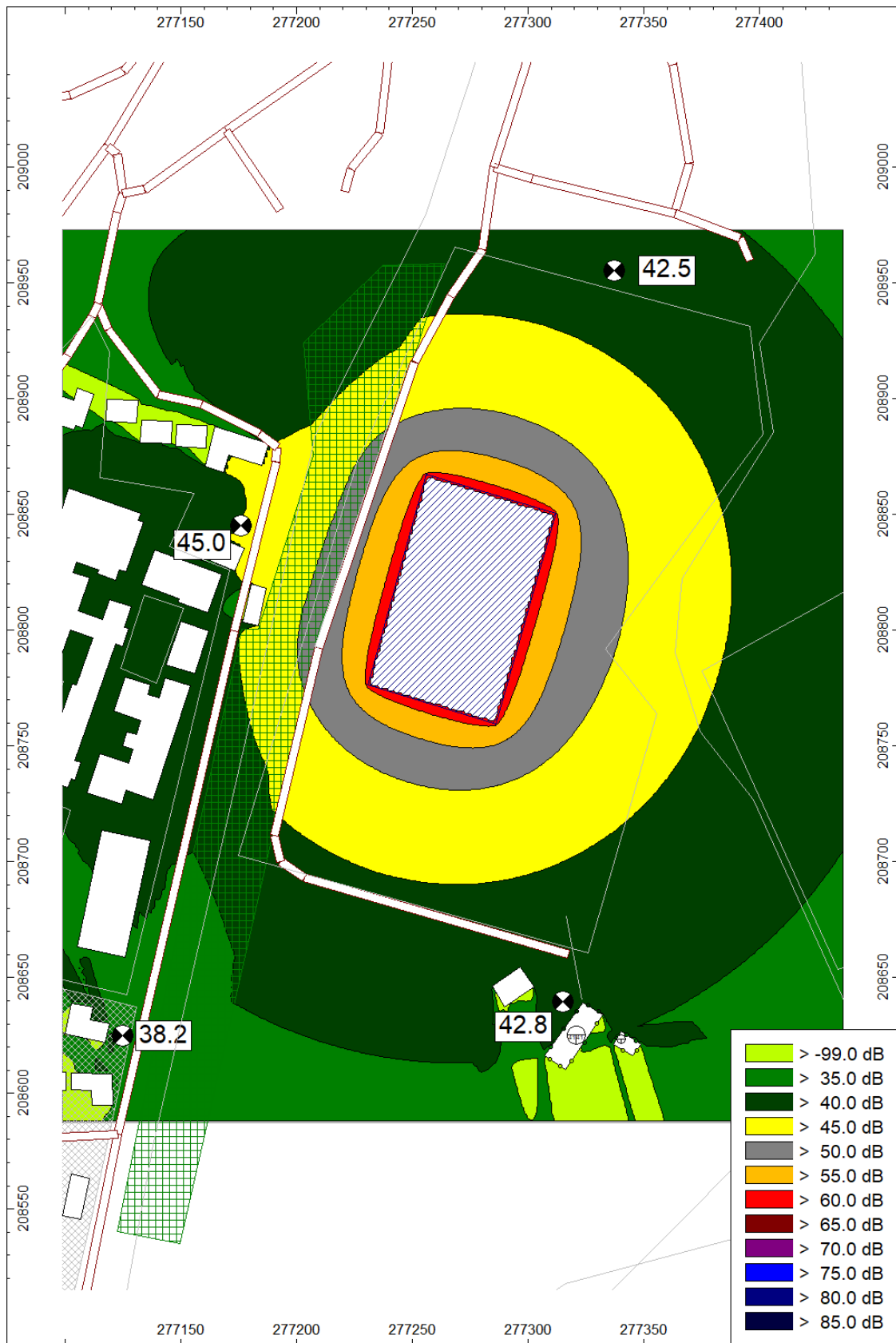


Figure 6: Evening AGP Noise Model, $L_{Aeq}(1hr)$



5. Noise Impact Assessment

The noise modelling above has demonstrated that the following noise levels will be met at the existing receivers around the site whilst the AGP is in use. The table below provides the predicted level and comparison with WHO criteria noted in Section 3.3 above.

Table 3: Comparison with British Standard 8233:2014 at Worst Case Receiver

Location	Predicted Level $L_{Aeq(1hr)}$ dB	Within WHO
Dwellings off Glantwrch to South	43	YES
Dwellings off Glantwrch to North	43	
Dwellings off Glan Yr Afon to North West	45	
Dwellings off Glan Yr Afon to South West	38	

The proposed criteria for noise from the AGP is to not exceed a noise level of 50 dB L_{Aeq} (1 hour) at nearby noise sensitive properties.

The highest predicted noise level at the amenity areas of the existing residential property is 45 dB L_{Aeq} (1 hour) which is within the proposed criterion derived from WHO1999 as being the threshold for the onset of moderate community annoyance.

The highest predicted noise level at the façade of the existing residential property is 45 dB L_{Aeq} (1 hour). The World Health Organisation provides a sound reduction through an open window of 15 dB(A) which results in the highest predicted internal equivalent noise level of 33 dB L_{Aeq} (1 hour). The World Health Organisation guidance states “*To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB L_{Aeq}* ” therefore the WHO internal criteria is also achieved.

On the basis of the above, the proposals are considered acceptable in terms of noise impact on existing properties.



6. Noise Management Plan

The assessment undertaken in this report considers noise levels against relevant criteria to avoid an adverse effect on nearby residential properties.

In addition to the level of noise, it is also important to consider the content. From past experience, we have found that where complaints have been made it is often due to anti-social behaviour such as swearing. Anti-social behaviour is not necessarily related to the noise level and is something that cannot effectively be 'engineered out'.

As such, it is proposed that a noise management plan is implemented as part of the development.

The noise management plan should include a method of informing the users that swearing and anti-social behaviour is unacceptable and that the centre reserves the right to dismiss users from the pitch and ban future use if this is the case.

It is advised that neighbours are given a facility to report excessive noise or anti-social behaviour directly to the operator. This will allow the complaint to be investigated and addressed quickly.

It is important that complaints are investigated swiftly, that action is taken where necessary and that the complainant is kept informed of progress, especially where it is not possible to address or resolve complaints straight away.

Staff at the site should have a written action plan to deal with complaints. This would include the ability to warn or ban user groups from the pitches. A log of complaints should also be kept.

It is also advised that all perimeter fencing to the AGP is fixed to the support posts with a neoprene isolator installed to fully isolate the panels from the posts. This measure greatly reduces the 'rattling' associated with ball impacts on metal fencing.



7. Summary & Conclusions

Andrew Scott appointed Acoustic Consultants Limited to undertake a noise impact assessment for the proposed AGP at Ysgol Gymraeg, Ystalyfera in support of a planning application.

This report addresses the noise impact of the AGP on the existing sensitive receivers around the site and provides outline mitigation measures as appropriate.

The noise impact assessment has been undertaken in accordance with the guidance in the Planning Policy Wales (PPW), Technical Advice Note 11 (TAN11), British Standard 8233:2014 and WHO1999. The report also considers the guidance within the Sport England Design Guidance Note 'Artificial Grass Pitch (AGP) Acoustics – Planning Implications'.

The assessment demonstrates that the highest predicted noise level at the amenity areas of the existing residential property is 45 dB L_{Aeq} (1 hour) which is within the proposed criterion derived from WHO1999 as being the threshold for the onset of moderate community annoyance.

The highest predicted noise level at the façade of the existing residential property is 45 dB L_{Aeq} (1 hour). The World Health Organisation provides a sound reduction through an open window of 15 dB(A) which results in the highest predicted internal equivalent noise level of 33 dB L_{Aeq} (1 hour). The World Health Organisation guidance states "*To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB L_{Aeq}* " therefore the WHO internal criteria is also achieved.

On the basis of the above, the proposals are considered acceptable in terms of noise impact on existing properties and the impact is low in terms of the relevant guidance documents and Planning Policy Wales.



8. Appendix 1 – Glossary of Acoustic Terminology

A-weighted sound pressure p_A – value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network

A-weighted sound pressure level, L_{pA} – quantity of A-weighted sound pressure given by the following formula in decibels (dBA)

$$L_{pA} = 10 \log_{10} (p_A/p_0)^2$$

where:

p_A is the A-weighted sound pressure in pascals (Pa);
 p_0 is the reference sound pressure (20 μ Pa)

Background sound level, $L_{A90,T}$ – A-weighted sound pressure level that is exceeded by the residual sound assessment location for 90% of a given time interval, T, measured using weighting F and quoted to the nearest whole number of decibels

Break-in - noise transmission into a structure from outside.

Decibel (dB) – The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{Aeq,T} = 10 \log_{10} \left\{ (1/T) \int_{t_1}^{t_2} [p_A(t)^2/p_0^2] dt \right\} \quad (1)$$

where:

p_0 is the reference sound pressure (20 μ Pa); and

$p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

Façade level – sound pressure level 1 m in front of the façade. Façade level measurements of L_{pA} are typically 1 dB to 3 dB higher than corresponding free-field measurements because of the reflection from the façade.



Free-field level – sound pressure level away from reflecting surfaces. Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Octave and Third Octave Bands – The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

Sound pressure level – Sound pressure level is stated on many of the charts. It is the amplitude of the acoustic pressure fluctuations in a sound wave, fundamentally measured in Pascals (Pa), typically from 20 micro-Pascals to 100 Pascals, but commonly simplified onto the decibel scale.

Sound reduction index, R – laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_S = L_{Aeq,Tr}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .

Structure-borne noise – audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements

Rating level, $L_{Ar,Tr}$ – Specific sound level plus any adjustment for the characteristic features of the sound.

Reverberation Time, T – The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level, once the noise source has stopped. It is measured in seconds. Often a 60 dB decay cannot be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60 dB drop assuming a constant decay rate. Common parameters are T20 (time taken for a 20 dB decay multiplied by three) and T30 (time taken for a 30 dB decay multiplied by two).

Vibration Dose Value, VDV – measure of the total vibration experienced over a specified period of time.



Estimated Vibration Dose Value, $eVDV$ – estimation of the total vibration experienced over a specified period of time. This is usually based on the number of events and shortened measurement data.

Weighted sound reduction index, R_w – Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory (see BS EN ISO 717-1).



ACOUSTIC CONSULTANTS LTD
noise and acoustic specialists since 1987

Head Office: 194 West Street, Bedminster, Bristol, BS3 3NB

T: 0117 986 2956

www.acoustic-ltd.co.uk

Bristol | Swansea | Manchester

Incorporated in the UK as Acoustic Consultants Limited. Registered Office: 194 West St, Bristol, BS3 3NB Registered No: 8544901