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ACOUSTIC
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Noise Impact Assessment

**Pontardawe Arts Centre
Pontardawe**

Reference: 9627/PL/LN

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Pontardawe Arts Centre
Pontardawe



Client:

Childs Sulzmann Architects

Document Control

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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 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.

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1. Introduction

Childs Sulzmann Architects appointed Acoustic Consultants Limited to undertake a noise survey to determine the impact that noise associated with the proposed cinema has on the nearby dwellings.

The report has been produced to determine the impact of both break out noise from the cinema itself and from the proposed plant for planning.

The noise impact assessment has been undertaken in accordance with Planning Policy Wales, TAN11, the 'Good Practice Guide on The Control of Noise from Pubs and Clubs' and BS4142.

The author of this report is an Associate Member of the Institute of Acoustics, has over two years' experience in the field of noise and is considered suitably qualified to undertake this noise impact assessment. This report has been checked by a Member of the Institute of Acoustics (MIOA) and Director of the company with over 13 years' experience in the industry.

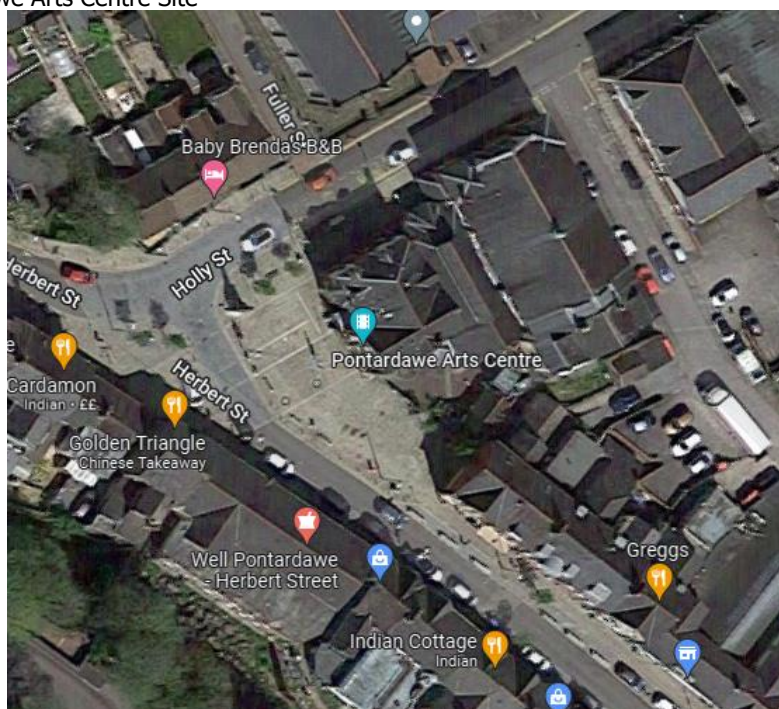
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2. The Site

Pontardawe Arts Centre is located on Herbert Street in Pontardawe, set in a mixed-use area the site is surrounded by both commercial and residential properties. Immediately to the east of the premises and to the south on Herbert Street lie a small number of commercial premises with residential dwellings above on the first floors. These are deemed to be the nearest NSRs at a minimum distance of 1 meter. To the north lie a row of terraced residential dwellings, these are separated from the proposed site by approximately 30 metres at the closest boundary points. The main source of noise at the site is road traffic from Herbert Street to the immediate south and west.

The figure below provides a google image of the Pontardawe Arts Centre, with the surrounding properties also noted.

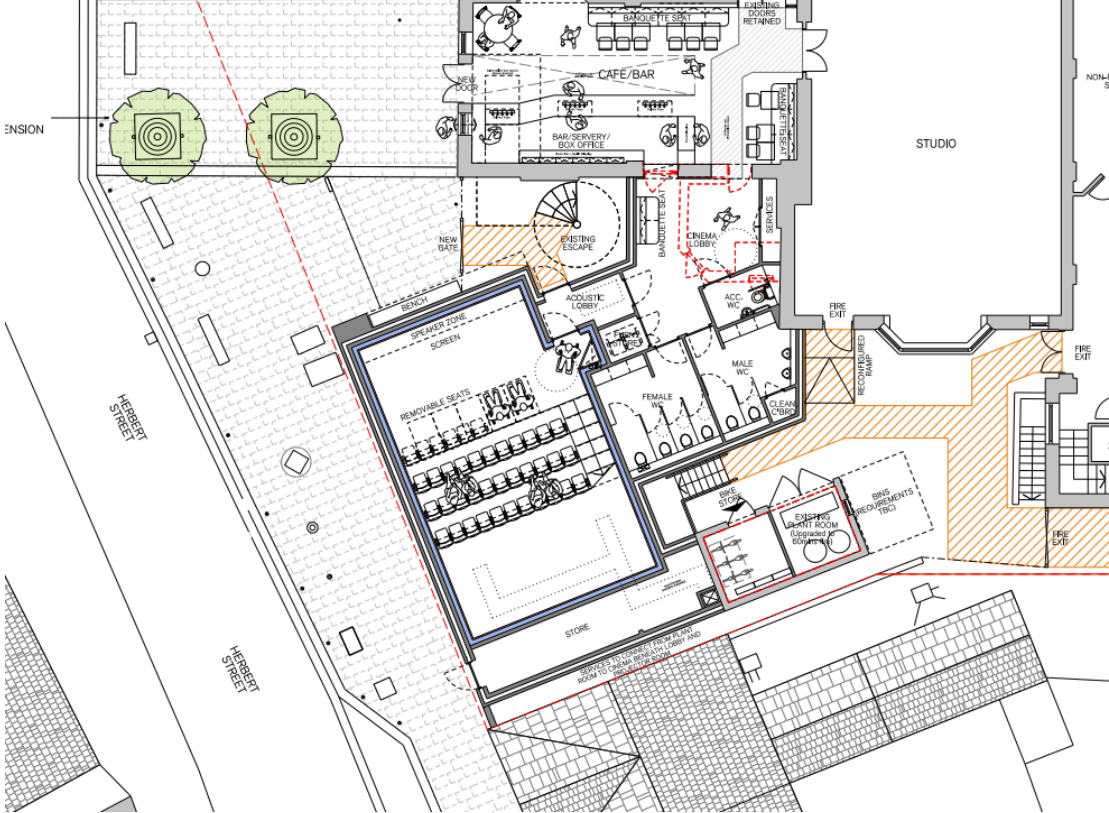
Figure 1: Pontardawe Arts Centre Site



The figure below shows the proposed cinema site layout and the details of the development associated with the cinema.

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Figure 2: Pontardawe Arts Centre Proposed Cinema



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3. Planning and Noise

3.1. Planning Policy Wales

Planning Policy Wales (PPW) Edition 11 dated February 2021 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 affecting a residential use 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."

6.7.4 The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.

6.7.5 In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments. Air Quality and soundscape influence choice of location and distribution of development and it will be important to consider the relationship of proposed development to existing development and its surrounding area and its potential to exacerbate or create poor air quality or inappropriate soundscapes. The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change.

In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable.

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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.

6.7.8 Good design, for example setting back buildings from roads to avoid canyon effects and using best practice in terms of acoustic design to ensure the appropriate and intended acoustic environment of completed developments should be incorporated at an early consideration in the design and planning process. Other mitigation measures must be capable of being effectively implemented for their intended purpose, and could include those related to:

- traffic management and road safety;*
- ensuring progress towards a shift to low or zero emissions means of road transport, such as electrical charging points;*
- supporting low or zero emissions public transport;*
- providing active travel infrastructure; and*
- incorporating green infrastructure, where it can improve air quality by removing air pollution and aiding its dispersal, reduce real or perceived noise levels by absorbing and scattering noise and introducing natural sounds to soften man-made noise, provide areas of relative tranquillity, and reduce exposure by putting a buffer between sources of pollution and receptors.*

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.

6.7.19 The health imperative of good air quality and appropriate soundscapes in contributing to the overall character and quality of places and the health and well-being of people and wildlife should be fully recognised.

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It will not be appropriate to locate sensitive uses, such as hospitals, schools, care homes and housing adjacent to busy roads or other transport routes, where there are no connectivity benefits to be gained and where health and amenity impacts associated with increased exposure of people to pollution will be unacceptable. Whilst some uses may be appropriate with the aid of good design air quality and soundscape considerations can be overriding factors, especially for sensitive uses, if they cannot be adequately mitigated and impacts minimised.

6.7.20 Where sensitive developments need to be located close to existing transportation infrastructure for sustainable movement and access they should be designed, as far as practicable, to limit harmful substances and noise levels within and around those developments both now and in the future. This may include employing the principles of good acoustic design and the inclusion of active travel or travel management measures as part of development proposals. Such development, however, should preferably be located away from existing sources of significant noise, which may include aircraft noise or roads, particularly new roads or those with programmed route improvements.

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

6.7.24 The potential impacts of noise pollution arising from existing development, be this commercial, industrial, transport related or cultural venues (such as music venues, theatres or arts centres), must be fully considered to ensure the effects on new development can be adequately controlled to safeguard amenity and any necessary measures and controls should be incorporated as part of the proposed new development. This will help to prevent the risk of restrictions or possible closure of existing premises or adverse impacts on transport infrastructure due to noise and other complaints from occupiers of new developments. It will be important that the most appropriate level of information is provided and assessment undertaken."

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

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3.2. Technical Advice Note (Wales) - Noise

Planning Policy Wales (PPW) Edition 11 dated February 2021 sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes.

The relevant planning criteria for proposed residential development is in Technical Advice Note (Wales) 11 entitled "Noise" which was published in October 1997. The introduction states: *"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"*.

Paragraph 8, under the section entitled 'Noise generating development' within TAN11 states:

"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."

With paragraph 9 continuing:

"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."

TAN11 does not provide assessment criteria in relation to industrial noise on its own. Instead, it directs the reader to British Standard 4142.

4. Assessment Criteria

The following sections identifies the most relevant criteria for assessing the noise impact of a scheme which generates plant and music noise.

4.1. Fixed Plant Noise

For industrial noise, such as fixed plant, the most relevant guidance is provided within British Standard 4142:2014+A1:2019. The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound upon people who might be inside or outside a dwelling or other premise used for residential purposes.

The principle is that of establishing the 'difference' between the 'rating sound level' and the 'background sound level'. The 'rating sound level' is derived from the 'specific sound level' of the source. The latter is determined over a period of 1 hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Section 9 entitled 'Rating Level' states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."

An acoustic character correction should be added to the 'specific sound level' if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies, dependent on the prominence of the character of the noise source at the assessment location.

In Section 11 of the Standard, 'Assessment of the Impacts', it states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following."

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *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."*

As such, where the assessment difference is 0 dB or less, the impact is likely to be low, depending on the context.

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4.2. Music Noise

For music noise there is no defined criteria. We have followed the method of draft publication, the Institute of Acoustics document "Good Practice Guide on the Control of Noise from Pubs and Clubs" was published as a draft in March 2003. This document addresses amplified music and the more relevant extracts are as follows:

"2. SCOPE

- *This document provides guidance for the assessment and control of noise affecting noise-sensitive properties, from the public and private use of public houses, clubs, hotels, discotheques, restaurants, cafes, community or village halls and other similar premises. The main noise sources considered are music; singing; public address (PA) 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. Noise arising from live sporting events held at such premises is not covered by this document.*
- *Music, singing and speech, both amplified and non-amplified, are common sources of noise disturbance arising from the premises listed in 2.1 above. As far as these sources are concerned, the purpose of developing the objective noise criteria mentioned in 2.3, should be to 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. In the absence of the objective criteria mentioned in 2.3, what is "regular" should be determined on a local basis to reflect local expectations and should be incorporated by local authorities in the planning and enforcement policies (see Section 4); 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. For other times, appropriate criteria need to be developed which balance the rights of those seeking and providing entertainment with those who may be disturbed by the noise.*

For the purposes of this document, noise may be considered not audible or inaudible when it is at a low enough level such that it is not recognisable as emanating from the source in question and it does not alter the perception of the ambient noise environment that would prevail in the absence of the source in question. A more simplistic explanation of the term "inaudible" is given in Appendix "B". It will depend on elements such as the persons hearing capabilities and on the ambient noise levels at the time. It is usually also dependent on the low frequency components of the amplified music.

We would advise that the music/cinema noise level is at least 10dB lower than the typical $L_{Aeq}(15min)$

5. Baseline Noise Monitoring

Noise monitoring exercises were undertaken at the site between the 6th of May and Monday the 9th of May 2022. The exercise consisted of an unattended to get the typical noise levels of the nearest noise sensitive receivers.

5.1. Monitoring Equipment

Sound Pressure Levels were measured using a Class 1 Sound Level Meter with a half-inch condenser microphone using the "fast" setting. The equipment is checked regularly using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2017 "General requirements for the competence of testing and calibration laboratories"; in accordance with British Standard EN 10012:2003 "Measurement management systems. Requirements for measurement processes and measuring equipment"; and traceable to the National Standards.

This equipment was checked and calibrated as noted below and the certificates are available for inspection.

Table 1: Monitoring Equipment

Equipment Description / Manufacturer / Type	Serial number	Date of calibration	Calibration Certification Number
SLM, NTI, XL2	A2A-11041-E0	12/07/2021	UK-21-061
Pre-Amp, NTI, MA220	1822	12/07/2021	UK-21-061
Microphone, NTI, MC230A	9583	12/07/2021	UK-21-061
Calibrator, Larson Davis, CAL200	18273	15/12/2021	39760

The measuring systems were checked for calibration before and after the tests. No drift exceeding 0.5 dB was detected on the system, which has no effect on the measured data.

5.2. Monitoring Procedure and Observations

The survey was completed over a weekend, 6th-9th May. This monitoring location was chosen as a representative location of the general ambient noise climate to the NSRs at the site. The monitoring location was stationed on the fire escape of the existing building to the north of the site in a free-field position. The microphone was mounted on a tripod and positioned approximately 4 metres above the ground. The sound level meter was set to record 15-minute runs. The ambient noise in the monitoring location consisted of road traffic.

The figure below provides the monitoring location. The monitoring position was carried out in a free-field position with the microphone mounted on a tripod at least 4 above the ground.

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Figure 34: Monitoring Location



5.3. Weather Conditions

During the monitoring conditions were clear, dry, and calm. The weather conditions are not expected to have adversely affected the measured data.

Table 2: Weather conditions during site survey

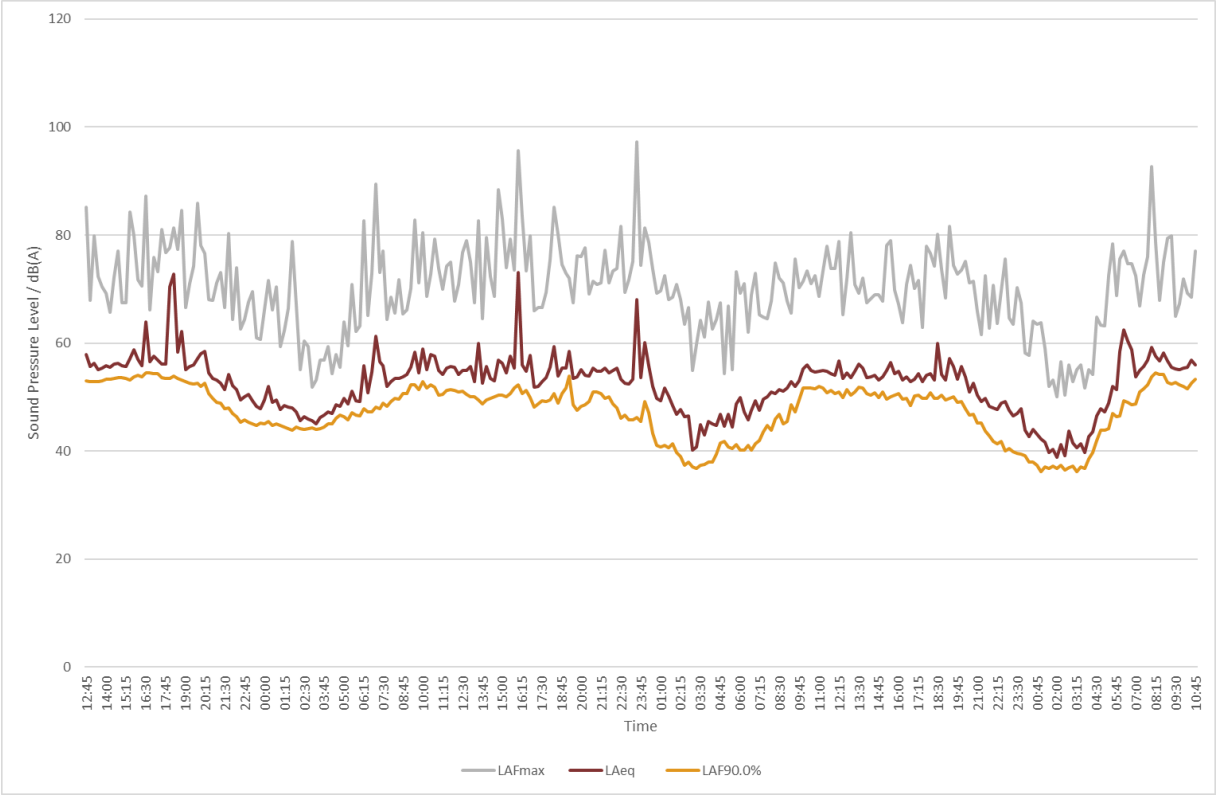
Survey	Wind Speed (m/s)	Average Air Temperature (°C)	Cloud Cover (%)
Long Term	< 8	~ 14	~ 85

5.4. Measured Noise Levels

The main noise source affecting the baseline noise monitoring location was road traffic noise from the road to the south west of the proposed development site. Chart 1 below provides the measured noise level over the measurement period which was considered typical of the worst case facade in this situation.

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Chart 1: Baseline Noise Levels



The measured baseline sound levels from the overnight survey are presented below, consisting of the equivalent L_{Aeq} levels and background noise levels (L_{A90}), we have summarised the data into the table below.

Table 3: Summarised Baseline Noise Levels

Time Period	LAeq,15minute		LA90,15minute	
	Range	Typical	Range	Typical
Daytime (07:00 – 23:00)	48-76	55	40-55	50
Evening (19:00 – 23:00)	48-61	55	40-54	49
Night time (23:00-07:00)	39-68	47	36-49	37
Friday & Saturday (23:00-01:00)	48-68	50	41-49	49

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6. Operational Noise Limits

Plant units associated with the proposed development have the potential to operate 24 hours a day. As such, we have provided plant noise limits over the 24-hour period based on the monitoring data obtained above, and British Standard 4142:2014+A1:2019.

For the Cinema we have assumed the films will stop at 1am.

Based on the above baseline noise levels, and guidance documents when the cinema is in use we would advise cinema noise (fixed plant and film noise) does not exceed the following noise limits at the nearest noise sensitive receivers

These limits should be determined as the free-field level at the façade of the development or existing sensitive receivers:

Table 4: Plant Noise Rating Level Limits (free-field)

Noise Source	Time Period	Noise Limits
Fixed Plant	Daytime (07:00 to 19:00 hrs)	49 dB L _{Ar} (1 hour) *
	Night Time (23:00 to 07:00 hrs)	37 dB L _{Ar} (15 min) *
Cinema	Daytime (07:00 to 23:00 hrs)	45 dB L _{Aeq} (1 hour)
	Night Time (23:00 to 01:00 hrs)	40 dB L _{Aeq} (15 min)

* The Rating Level of fixed plant noise is to include an acoustic feature correction as applicable in accordance with Section 9 of BS4142:2014 for any tonality, impulsivity, intermittency or other sound characteristics.

7. Cinema Noise Emission Predictions

7.1. Operational Noise Levels

Cinema noise levels will vary. For the basis of our predictions we have used the following operational noise levels. In most cases the noise levels will be lower than noted, the levels below are based on louder periods of film.

Table 5: Typical 15min Internal Equivalent Noise Levels, dB $L_{eq}(15min)$

Octave Band (Hz)	A'	63	125	250	500	1k	2k	4k	8k
$L_{eq, 15min}$ (dB)	101	95	95	95	95	95	95	95	95

7.2. Building Fabric Constructions

Noise emission predictions have been undertaken based on following external fabric constructions.

7.2.1. External Walls

The construction of the external wall has been provided by the architect and is as follows:

- 100mm fairfaced blockwork with external skin
- 130mm cavity with full fill insulation
- 140mm medium density blockwork
- Dryline 92 S 10 'C' Studs
- 92mm Isover Acoustic Insulation
- 2 x 15mm Gyproc Soundbloc

This construction has been modelled in Insul and predicted to achieve the following octave band sound reduction indices:

Table 6: Sound Reduction of Cavity Wall

Octave Band (Hz)	63	125	250	500	1k	2k	4k	R_w
R (dB)	55	55	56	64	68	69	78	66

7.2.2. Roof

The construction of the roof has been provided as the architect and is as follows:

- Green roof
- Warm roof insulation
- Plywood deck
- 200x50 C24 Joists at 400mm C-C
- MF ceiling with 2x 15mm Gyproc Soundbloc (assumed 300mm cavity).
- Ecophon Focus Ds Akutex FT acoustic lay in grid

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This construction has been modelled in Insul and predicted to achieve the following octave band sound reduction indices:

Table 7: Sound Reduction of Roof

Octave Band (Hz)	63	125	250	500	1k	2k	4k	R _w
R (dB)	17	42	47	52	54	53	59	54

7.3. Ventilation

It will not possible to ventilate the Cinema via open windows without adversely affecting the dwellings. As such the cinema will be ventilated via attenuated mechanical means. The sound level difference outside to inside of the ventilation system should be designed to ensure the impact at the dwellings is not adversely affected. This will be completed at the detailed design stage.

7.4. Noise Modelling

To predict noise emissions from the proposed clubhouse, noise modelling has been undertaken using computer modelling package Cadna:A by DataKustik and representative noise level data measured at similar sites. The software predicts industrial noise in accordance with ISO9613. The modelling parameters within Cadna:A are as follows:

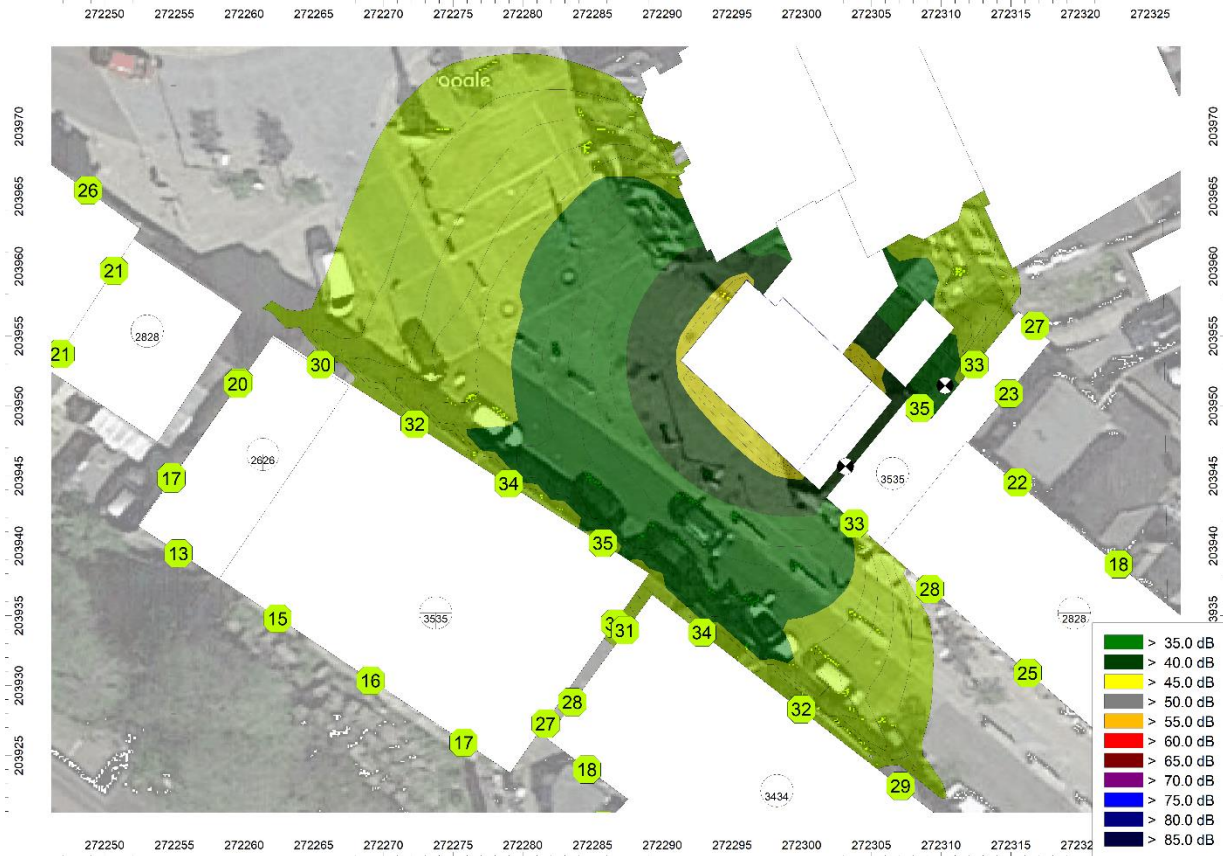
- All buildings are considered reflective and third order reflections have been calculated.
- The ground surrounding the site has been modelled as reflective.
- The site layout follows the drawing in Figure 2 of this report.
- The internal noise levels are determined from the data above.
- The noise map is predicted for a 1m by 1m grid at a height of 4.5 meters above the ground.
- Noise levels on the building façade are the highest levels determined at first floor level.

7.5. Predicted Noise Levels

A colour graded noise map of the noise levels generated from the proposals is provided below:

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Figure 5: Noise map of cinema noise



The predicted noise level emissions at the NSRs are 35 dB $L_{Aeq(T)}$ at the worst case windows to the east and south.

7.6. Cinema Noise Assessment

The following table gives overall change in noise level and IEMA classification at the most noise sensitive location based on the proposed cinema and predicted noise levels above. These were found to be dwellings located to the east and south of the proposed pitch.

Table 8: Change in noise levels

Time	Baseline dB $L_{Aeq(15min)}$	Predicted dB $L_{Aeq(15min)}$	Difference	Impact
Daytime (07:00-23:00)	55	35	-20	Negligible
Night (23:00-01:00)	50		-15	Negligible

On the basis of the IOA guidelines the proposals result in a negligible impact on the NSRs to the east and south of the proposed cinema.

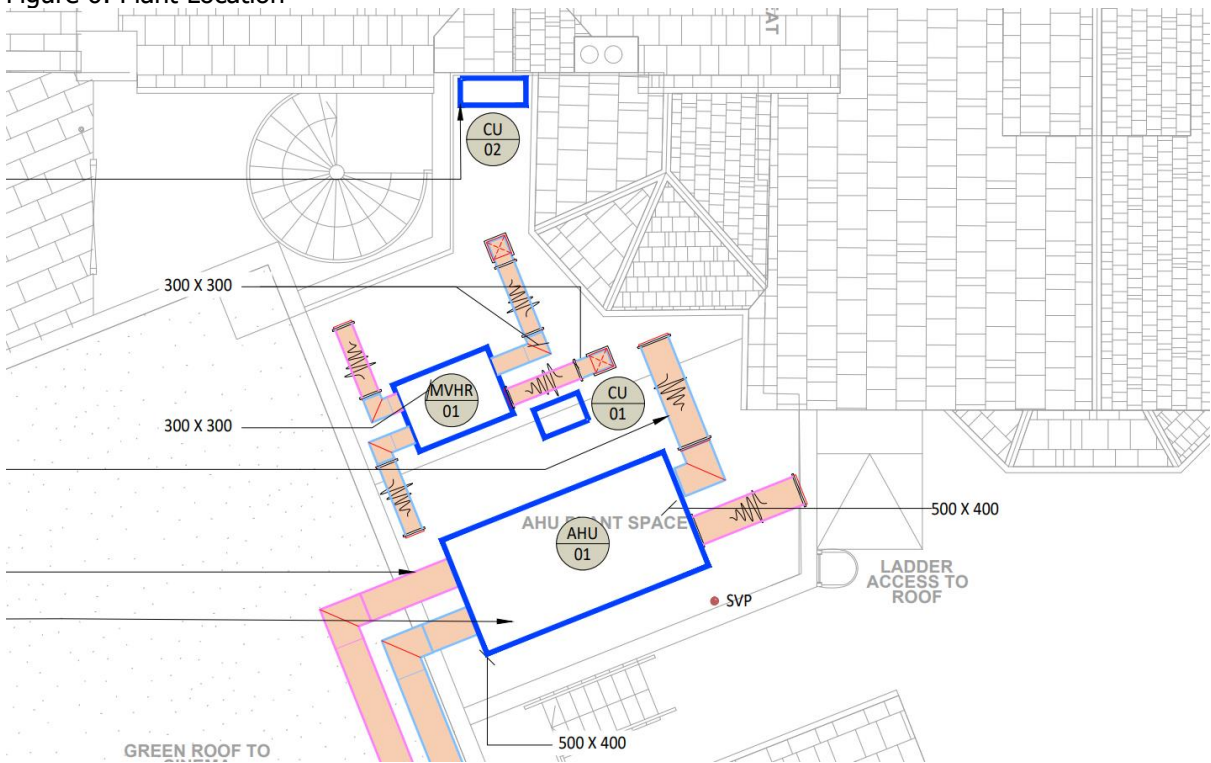
As such the internal noise egress is easily acceptable and meets the aims of Planning Policy Wales by avoiding significant adverse impact.

8. Plant Noise Assessment

8.1. Proposed Plant

The proposals include 2 Condenser units, a Mechanical Heat Recovery Unit and an Air Handling Unit all situated on top of the cinema lobby building. The location of the plant is provided in the figure below.

Figure 6: Plant Location



We have conducted the assessment as a worst-case basis from the supplied plant noise data (as noted below).

It should be noted that any changes to the following schedule, or changes to the location or layout of the plant units will affect the predicted levels at the receiver points around the site and, as such, would need reassessing.

8.1.1. Condensor Units

The Mitsubishi Electric condenser units are as noted below. The noise data for the condenser units is provided in the table below.

Table 9: CU Noise Data

Plant type	No.	Sound Power Level (dBA)
Mitsubishi Electric, PUZ-ZM140YKA2	2	70

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8.1.2. MVHR

The MVHR system is a Nuaire, XBOXER XBC+ 25 system. The manufacturers noise data for the MVHR is provided in the figure below. The intake, discharge and casing data that was used in the assessment is highlighted in yellow.

Figure 7: Sound Data for the MVHR as noted in Manufacturers Data

FAN SPEED	SOUND POWER LEVELS (db re 1 pW)	FREQUENCY (Hz)								SPHERICAL dBA@3m
		63	125	250	500	1K	2K	4K	8K	
100%	Induct Intake	77	71	69	71	66	62	54	53	37
	Induct Supply	82	83	78	82	72	72	68	70	
	Induct Discharge	83	84	78	81	72	72	70	71	
	Induct Extract	76	70	68	71	65	62	54	54	
	Casing Radiated	69	68	55	58	45	44	44	36	

8.1.3. Air Handling Unit

The cinema will have an internal air handling unit which will be ducted to roof above the cinema lobby supply and extract. The unit will comprise of a Barkell unit "AHU01" Project Reference "BK053892/B", with the following induct sound power levels atmospheric side.

The table also provides the attenuation that is required for both the inlet and the exhaust.

Table 10: AHU Noise Data Duct Sound Power Level, L_w dB

Fan	63	125	250	500	1000	2000	4000	8000
Inlet	72	72	79	74	69	66	63	56
Exhaust	65	64	72	70	71	68	63	56

The manufacturers also state the Casing break out for the unit is 44 dB L_{WA}.

8.2. Noise Control Measures

The following table provides the minimum attenuation needed for each item of plant, the supplier should confirm this attenuation is achievable:

Unit	63	125	250	500	1000	2000	4000	8000
Condenser Units	10 dB(A) reduction							
MVHR Casing	10 dB(A) reduction							
MVHR FAI, IL dB*	22.0	25.0	30.0	40.0	45.0	45.0	45.0	45.0
MVHR Exhaust, IL dB*	22.0	25.0	30.0	40.0	45.0	45.0	45.0	45.0
AHU FAI, IL dB*	10.0	16.0	28.0	46.0	50.0	50.0	40.0	22.0
AHU Exhaust, IL dB*	8.0	13.0	20.0	38.0	50.0	50.0	35.0	28.0

* Minimum insertion loss, when tested to relevant ISO.

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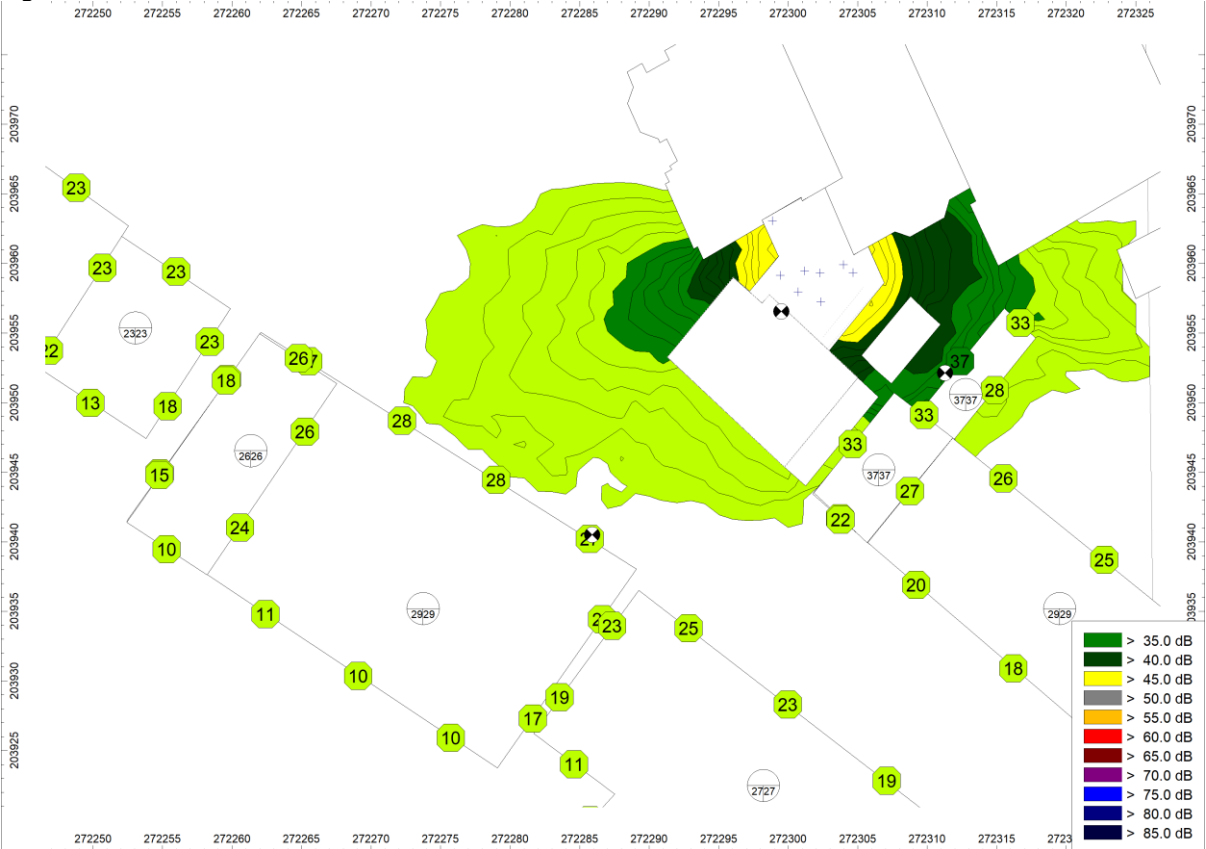
8.3. Noise Modelling

Noise emission prediction calculations have been carried out to predict noise levels at the for the sensitive receiver to the east and south west of the proposed cinema building. The plant noise emission from the building has been modelled in the noise modelling software Cadna:A by DataKustik. The parameters within the Cadna:A model are as follows, and are considered reasonable assumptions:

- The building heights on and around the site are based on architectural drawings, site observations and Google Earth images.
- The site and surrounding area are considered to be flat.
- The order of reflections is 3, and all buildings are reflective.
- The predictions are based on the plant models currently in use.
- The assessment considers that the plant units are constant during opening hours, as a worst-case scenario.
- Mitigation is as noted above.

The following noise map displays the predicted noise levels due to the assessed plant at the façade of the NSRs and within the adjacent gardens.

Figure 8: Predicted Noise Levels at NSR



The predicted cumulative level of plant noise from the plant is 37 dB $L_{Aeq,T}$ at the façade of the NSR.

8.4. Estimate of Impact

A British Standard 4142:2014 assessment of the impact of plant noise has been undertaken at the position of the sensitive receiver on the site.

8.4.1. Specific Sound Level

The predicted specific sound level of noise due to the plant is 37 dB $L_{Aeq,T}$ at the façade of the dwelling.

These are the levels determined at the noise-sensitive receiver without any character corrections applied.

8.4.2. Character Corrections

Character corrections should be added to the 'specific sound level' if it exhibits any *tonality, impulsivity, other specific characteristics and/or intermittency* at the assessment location. Based on our site visit and knowledge of such air handling units, corrections to be applied are as follows:

- Tonality –The manufacturer should ensure there is no tonality from their plant. No penalty correction applied.
- Impulsivity – The proposed units are not considered impulsive. No penalty correction.
- Intermittency – We have considered the plant to be running continuously during operational hours. No penalty correction applied.
- Other Sound Characteristics – We have not applied a correction for other characteristics.

8.5. Initial Estimate of Impact

Considering the data and information provided above, the British Standard 4142:2014 initial estimate at the sensitive receiver location is as follows.

Table 11: BS4142 initial estimate for NSR

Parameter	Daytime	Night-time
Background Level, $L_{A90, (T)}$	49 dB	37 dB
Specific Sound Level, $L_{Aeq, (T)}$	37 dB	37 dB
Character Correction	0 dB	0 dB
Rating Level, $L_{Ar, 15min}$	37 dB	37 dB
Excess of rating over background level	-12 dB	0 dB

This means that the plant rating noise level at the nearest noise sensitive receiver will result in an low impact at the receivers when assessed to British Standard 4142:2014+A1:2019.

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8.6. Context

British Standard 4142:2014 states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

8.6.1. Absolute Levels

1) Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

With regard to 'absolute levels', the most relevant guidance is British Standard 8233:2014. Section 7.7.2 Table 4 of the British Standard provides internal ambient noise levels for dwellings. The guideline states that internal noise levels should not exceed 30 dB L_{Aeq} (8 hr) at night and 35 dB L_{Aeq} (16 hr) during the day.

The internal level is approximately 15 dB quieter than the external free-field level (as stated by the WHO) allowing for the attenuation of a partially open window. Therefore, based on the predicted rating levels noted above, the internal absolute levels are as follows.

Table 12: Comparison with British Standard 4142:2014 at Worst Case Receiver

Time	Predicted External Level dB(A)	Open Window Correction dB(A)	Predicted Internal Level dB(A)	Within Criteria
Daytime	37	-15	22	YES
Night-time	37	-15	22	YES

As can be seen from the table above, the plant rating sound level is below the British Standard 8233:2014 criteria for day time rooms only. Therefore, we would consider plant noise to be suitably controlled to the dwellings in the vicinity when absolute levels are considered.

8.6.2. Residual Noise Levels

We should also consider the residual noise climate. British Standard 4142:2014 also states:

"2.) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is

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likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it."

We have compared the residual noise climate, i.e. the ambient sound at the assessment location when the specific sound source (plant) is suppressed to such a degree that it does not contribute to the ambient sound, to the specific sound level (plant) and rating level (plant noise level with character correction applied). This is summarised below:

Table 13: British Standard 4142:2014 Initial Estimate

Parameter	Daytime dB	Night-time dB
Residual Sound Level $L_{Aeq,T}$	55	47
Rating Level $L_{Ar,T}$	37	37
Difference	-18	-10

As can be seen, the plant rating sound level is lower than the residual sound during the hours of operation only.

8.7. Summary of British Standard 4142:2014 Assessment

As can be seen above, once context is considered and the noise impact of the plant is compared to the existing noise climate and internal noise levels compared to the relevant adopted guidance, then it is clear that plant noise will be acceptable when assessed to British Standard 4142:2014+A1:2019. This is subject to the noise attenuation measures noted in this report.

As such the plant noise is easily acceptable and meets the aims of Planning Policy Wales by avoiding significant adverse impact.

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9. Summary and Conclusions

Childs Sulzmann Architects appointed Acoustic Consultants Limited to undertake a noise survey to determine the impact that noise associated with the proposed cinema has on the nearby dwellings.

The report has been produced to determine the impact of both break out noise from the cinema itself and from the proposed plant for planning.

The noise impact assessment has been undertaken in accordance with Planning Policy Wales, TAN11, the 'Good Practice Guide on The Control of Noise from Pubs and Clubs' and BS4142.

An assessment of cinema noise has been carried out. The predicted noise levels at the NSRs due to cinema noise is 10 dB below the ambient noise level at the nearest NSR during the daytime and evening periods.

After assessing the proposed plant at the existing dwellings, the noise impact in terms of BS4142:2014, with the attenuation measures as noted, will have no adverse impact with the plant running during day and night hours only.

As such the development noise is easily acceptable and meets the aims of Planning Policy Wales by avoiding significant adverse impact.

10. Appendix 1 – Glossary of Acoustic Terminology

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.

Noise Rating (NR) – A single figure value to determine acceptable indoor noise environments for hearing preservation, speech communication and annoyance. The level also takes into account the frequency content of the noise.

Equivalent sound absorption area of a room, A - hypothetical area of a totally absorbing surface without diffraction effects, expressed in square metres (m²), which, if it were the only absorbing element in the room, would give the same reverberation time as the room under consideration.

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.

Reverberation time, T – time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped NOTE Reverberation time is usually measured in octave or third octave bands. It is not necessary to measure the decay over the full 60 dB range. The decay measured over the range 5 dB to 35 dB below the initial level is denoted by T30, and over the range 5 dB to 25 dB below the initial level by T20.

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 NOTE The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory (see Annex C and BS EN ISO 717-1).

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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.

Weighted standardized impact sound pressure level, $L'_{nT,w}$ - single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies. NOTE weighted standardized impact sound pressure level is used to characterize the insulation of floors in buildings (see Annex C and BS EN ISO 717-2).

Weighted standardized level difference, $D_{nT,w}$ – single-number quantity that characterizes the airborne sound insulation between rooms. NOTE Weighted standardized level difference is used to characterize the insulation between rooms in a building (see Annex C and BS EN ISO 717-1).

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