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Proposed Sporting Facility Development
210 Learoyd Road
Willawong

ACOUSTIC REPORT



Client:
Luzerong Pty Ltd

Reference:
2026055 R01G 210 Learoyd Road, Willawong ENV

Date Issued:
18 August 2026

Document Information

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18/05/26	R01B	Khoi Phan	Kaitlyn Dawn	ME
21/05/26	R01C	Khoi Phan	Kaitlyn Dawn	ME
30/06/26	R01D	Khoi Phan	Khoi Phan	ME
01/07/26	R01E	Khoi Phan	Khoi Phan	ME
18/08/26	R01G	Khoi Phan	Greg Pearce	ME

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1. Introduction

This report is in response to a request by Luzerong Pty Ltd for an environmental noise assessment of a proposed sporting facility development to be located at 210 Learoyd Road, Willawong. To facilitate the assessment, unattended noise monitoring was conducted to determine the criteria for onsite activities to sensitive receivers. Based on the outcomes of the assessment, recommendations for acoustic treatments and management controls are specified in this report.

The environmental impact assessment has been updated and included in this report revision (R01G) dated August 2026.

2. Site Description

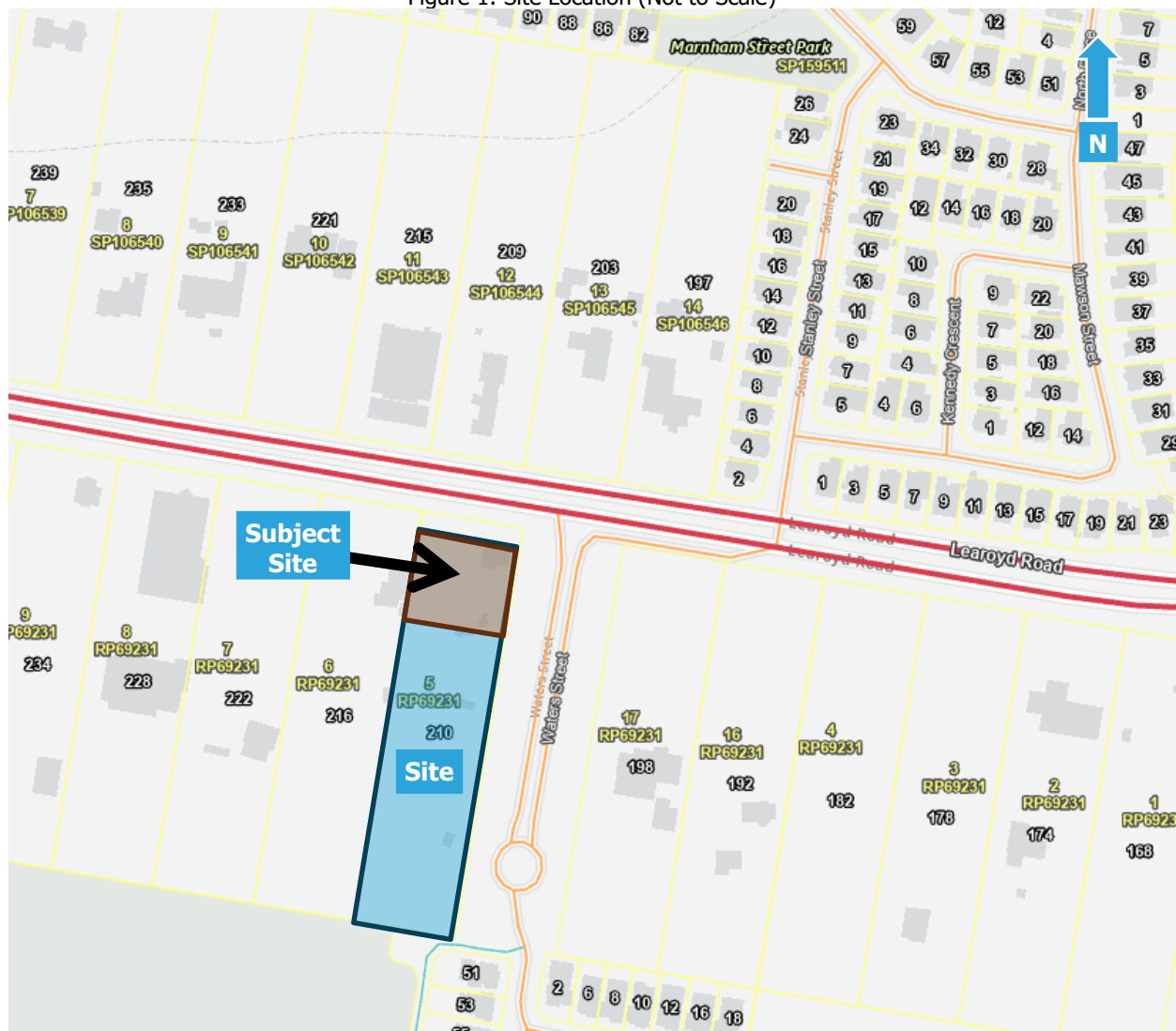
2.1 Site Location

The site is described by the following:

210 Learoyd Road, Willawong
Lot 5 on RP69231

Refer to Figure 1 for site location.

Figure 1: Site Location (Not to Scale)



A site survey was conducted on 17 February 2026 and identified the following:

- a) The site is currently occupied by a single storey residential dwelling and will be demolished to make way for the new development.
- b) Learoyd Road bounds the site to the north, separating it from residential land uses.
- c) Residential land uses are located adjacent to the western and southern boundaries of the site.
- d) Paradise Road Park is located to the southwest of the site.
- e) Waters Avenue bounds the site to the east, separating it from a community centre.

2.2 Proposal

The proposal is to construct a badminton centre comprised of the following:

- Total site area of 10,120m².
- Subject site area is approximately 4,628m².
- Ground level:
 - 14 badminton courts,
 - reception, 2 office areas, storage and amenities.
- Mezzanine level:
 - Internal observation deck, 1 office area.
- 61 car parking spaces are located to the south of the badminton centre on ground level.
- Proposed operating hours: 9am to 9pm, Monday to Sunday.
- Site access via Waters Avenue.

Refer to the Appendix for proposed development plans.

2.3 Zoning

Review of the Brisbane City Council (BCC) interactive mapping indicates that the area of the proposed development is zoned EC Emerging Community. The nearest receivers located to the north, east, south and west are zoned as EC Emerging Community.

Based on this information, the applicable criteria for onsite activities is specified in Section 8.

2.4 Acoustic Environment

The site is primarily affected by road traffic noise from Learoyd Road and flora & fauna.

3. Equipment

The following equipment was used to facilitate the ambient noise monitoring:

- Rion NL42 Environmental Noise Monitor
- Pulsar Model 105 Sound Calibrator

The Rion NL42 Environmental Noise Monitor holds current NATA Laboratory Certification and are field calibrated before and after the monitoring period, with no significant drift from the reference signal recorded.

4. Noise Monitoring

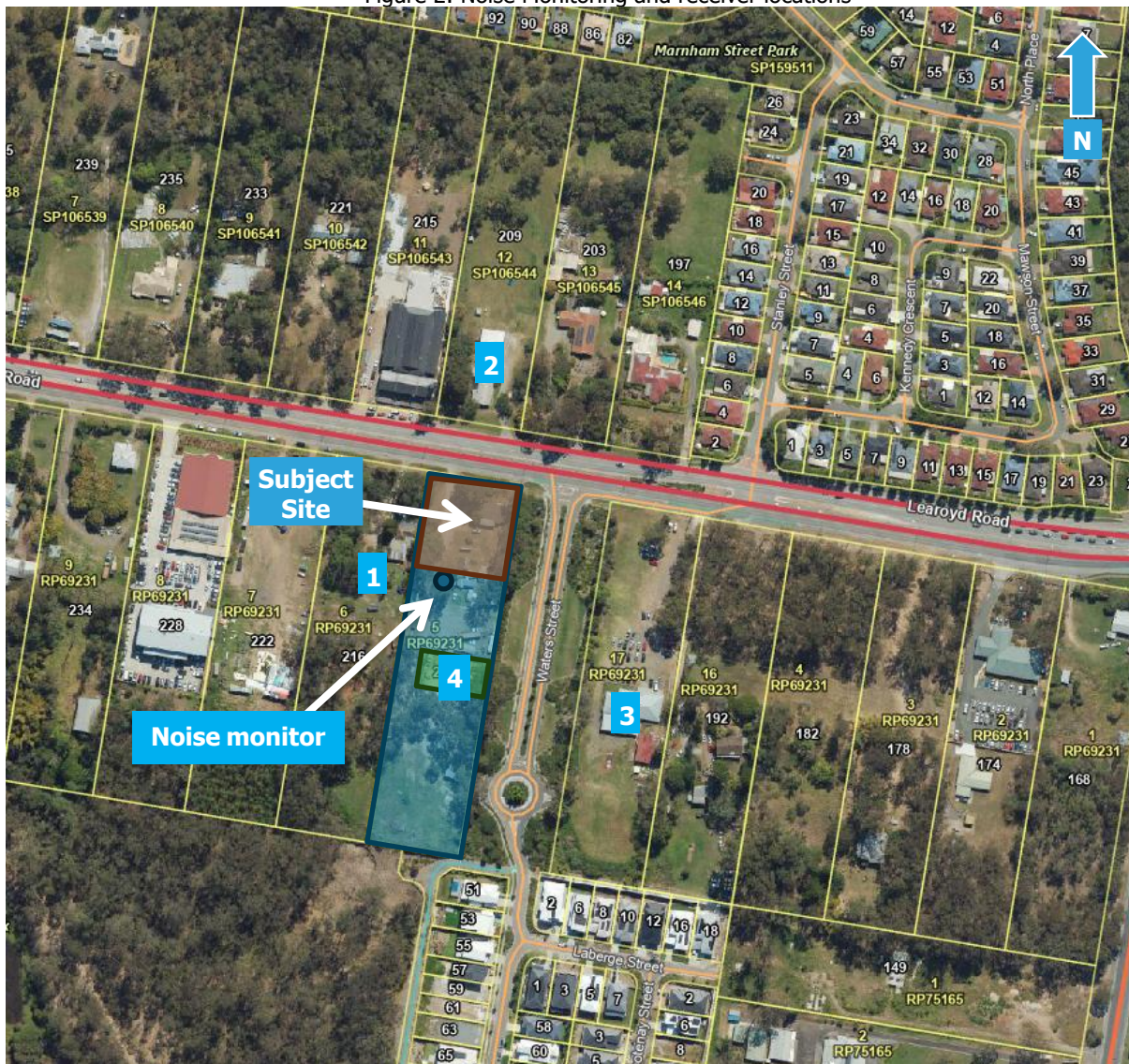
4.1 Receiver Locations

The nearest sensitive receiver locations were identified as follows;

1. A single storey residential dwelling is located adjacent to the western site boundary at 6 Learoyd Road, zoned as EC Emerging Community.
2. A single storey residential dwelling is located to the north of the site at 209 Learoyd Road, zoned as EC Emerging Community.
3. A community centre is located to the east of the site at 198 Learoyd Road, zoned as EC Emerging Community.
4. Proposed onsite residential subdivision lot 9 to be located to the south of the subject site at 210 Learoyd Road, zoned as EC Emerging Community.

These locations were chosen as being representative of the nearest sensitive receivers to the proposed development. Refer to Figure 2 for these locations.

Figure 2: Noise Monitoring and receiver locations



4.2 Unattended Ambient Noise Monitoring

A Rion NL42 noise monitor was placed onsite at 210 Learoyd Road to measure ambient noise levels. The monitor was located in a free-field position with the microphone approximately 1.4 metres above ground surface level. The noise monitor was set to record noise levels between the 17 and 26 February 2026.

The environmental noise monitor was set to record noise levels in "A" Weighting, Fast response using 15-minute statistical intervals. Ambient noise monitoring was conducted generally in accordance with Australian Standard AS1055:2018 *Acoustics – Description and measurement of environmental noise*.

For the unattended noise monitoring location refer to Figure 2.

5. Measured Noise Levels

The following tables present the measured road traffic and background noise levels from the unattended noise survey. Any periods of inclement weather or extraneous noise were omitted from the measured data prior to determining the results.

5.1 Meteorological Conditions

Meteorological observations during the unattended noise monitoring survey were obtained from the Bureau of Meteorology website (<http://www.bom.gov.au/climate/data>), shown in Table 1 below.

Table 1: Meteorological Conditions – Archerfield

Day	Date	Rainfall (mm)	Wind			
			9am		3pm	
			Direction	Speed (km/h)	Direction	Speed (km/h)
Tuesday	17/02/26	0	S	13	SE	22
Wednesday	18/02/26	0	W	9	NE	20
Thursday	19/02/26	0	NNE	2	NNE	22
Friday	20/02/26	0	E	11	E	19
Saturday	21/02/26	0	WSW	6	ENE	20
Sunday	22/02/26	0	S	6	ENE	9
Monday	23/02/26	0	SSE	9	E	22
Tuesday	24/02/26	0	SSE	11	E	26
Wednesday	25/02/26	0.4	S	9	ESE	20
Thursday	26/02/26	0	SE	28	SE	35

5.2 Environmental Noise Levels

The environmental noise levels measured at the monitoring location are as follows;

Table 2: Measured ambient noise levels – all time periods

Day	Date	RBL L90 dB(A)		
		Day	Eve	Night
Tuesday	17/02/26	47	45	42
Wednesday	18/02/26	47	45	35
Thursday	19/02/26	47	44	34
Friday	20/02/26	46	44	33
Saturday	21/02/26	46	43	33
Sunday	22/02/26	45	43	31
Monday	23/02/26	47	42	36
Tuesday	24/02/26	47	43	34
Wednesday	25/02/26	47	45	32
Thursday	26/02/26	49	-	33
Overall value		47	44	34

Refer to the appendix for a graphical representation of the noise monitoring.

6. Noise Criteria

6.1 BCC - Environmental Noise Criteria

To ensure a reasonable acoustic amenity is maintained, Brisbane City Council (BCC) requires environmental noise be assessed in accordance with Noise Impact Assessment PSP (2014). To accurately assess environmental noise, the noise must first be classified as to the type and its duration. Section 6.2.1 outlines the noise criteria based on the applicable zoning and overlay codes for the site.

6.1.1 Onsite Activities

To ensure a reasonable amenity is maintained, the following criteria shall be applied for the assessment of onsite activities to sensitive receivers. The noise criteria as applied by Brisbane City Council in accordance with the Indoor sport and recreation code of the Brisbane City Plan 2014 are as follows;

Table 3: Noise (Planning) Criteria – Indoor sport and recreation code (Table 9.311.3.B)

Criteria Location	Intrusive Noise Criteria	Acoustic Amenity Criteria		
	Day, evening and night $L_{Aeq,adj,T}$ are not greater than the RBL plus the value in this column for the relevant criteria location, where T equals: - Day - 11hr - Evening - 4hr - Night - 9hr	Day, evening and night $L_{Aeq,adj,T}$ are not greater than the values in the column below for the relevant criteria location, where T equals: - Day - 11hr - Evening - 4hr - Night - 9hr		
		Day	Evening	Night
Receivers 1 to 4 Emerging community zone boundary	5 dB(A)	55 dB(A)	50 dB(A)	45 dB(A)

Based upon the measured noise levels presented in Section 5.2, the intrusive noise criteria applicable to this development is provided in Table 4.

Table 4: Applicable Intrusive noise criteria

Time Period	Measured RBL $L_{A90,T}$	Receivers 1 to 4
		Intrusive Criteria dB(A) (RBL L_{90} + 5 dB(A))
Day (7am-6pm)	47	52
Evening (6pm-10pm)	44	49
Night (10pm-7am)	34	39

The night time noise criteria as applied by Brisbane City Council in accordance the Brisbane City Plan 2014 are as follows;

Table 5: Night-time Noise Criteria (Indoor sport and recreation code Table 9.3.11.3.C)

Criteria Location	Where the existing $L_{Aeq,9hr\ night}$ at the criteria location is:	Average of the highest 15 single L_{Amax} events over a given night (10pm-7pm) period is not greater than the following values at the relevant criteria location	The absolute highest single L_{Amax} event over a given night (10pm-7am) period is not greater than the following values at the relevant criteria location
At a zone boundary of a: Emerging Community zone (Receivers 1 to 4)	< 45dB(A)	50dB(A)	55dB(A)
	45 to 60dB(A)	$L_{eq,9hr\ night} + 5dB(A)$	$L_{eq,9hr\ night} + 10dB(A)$
	> 60dB(A)	65dB(A)	70dB(A)

Based on the measured noise levels in Section 5 the intrusive noise criteria and night-time noise criteria applicable to this development is as follows:

Table 6: Applicable Night-time Noise Criteria

Criteria Location	Time Period	Average highest 15 events L_{Amax} dB(A)	Highest single event L_{Amax} dB(A)
At a zone boundary of a: Emerging Community zone (Receivers 1 to 4)	Night 10pm – 7am	58	63

6.1.2 Mechanical Plant

Development that included mechanical plant (including air-conditioning plant, heat pumps and swimming pool pumps) ensures it is located, designed and attenuated to achieve the following criteria:

$L_{Aeq,adj,T}$ emitted from mechanical plant is not greater than the rating background level plus 3 at a sensitive use not associated with the development.

Where T is:

- (7am to 6pm): 11hr
- (6pm to 10pm): 4hr
- (10pm to 7am): 9hr

Where $L_{Aeq,adj,T}$ is the A-weighted equivalent continuous sound pressure level during measurement time T , adjusted for tonal and impulsive noise characteristics, determined in accordance with the methodology described in the Noise impact assessment planning scheme policy.

The noise criteria applicable to this development are as follows:

Table 7: Applicable Noise Criteria

Time Period	Criteria dB(A) (RBL $L_{90} + 3\text{ dB(A)}$)
Day 7am – 6pm	50
Evening 6pm – 10pm	47
Night 10pm – 7am	37

7. Environmental Assessment

7.1 Onsite Activities to Offsite Receivers

Noise associated with the development, such as car park activities, badminton activities, etc., has been assessed based on measurements of similar activities conducted at other sporting facilities. The calculations assume that the activities are located at the closest point within the development site to each receiver location. Any relevant shielding or building transmission loss is taken into account for these activities. Sporting activities have been assessed for the nighttime period considering occasional late finishes past 10pm.

7.1.1 Noise Level for Badminton Activities

Badminton games have been previously measured at other facilities with the measurements taking into account typical activities during games such as shuttlecock impacts, player vocalisation, and players moving on courts. Refer to the appendices for the measured noise level spectrum of badminton activities.

7.1.2 Noise Level for Crowds

Noise associated with spectators for small crowds is based on a technical paper 'Prediction of Noise from Small to Medium Sized Crowds' (Hayne et al, 2011). The paper was based upon attended noise measurements conducted at a sample of premises to account for up to 100 patrons. Based on the measured levels, the resulting analysis determined that the Sound Power Level ($L_{Aeq, T}$) of a small-medium crowd can be predicted by the following equation:

$$LW_{Aeq} = 15 \log (\text{number of patrons}) + 64 \text{ dB(A)} \text{ (approx. maximum 100 patrons)}$$

Both formulas only apply for a maximum of 100 patrons. Therefore, in areas where more than 100 patrons are assessed; a simple logarithmic increase is used for the additional patrons.

I.e. where $N > 100$,

$$LW_{Aeq} = 15 \log (100) + 64 \text{ dB(A)} + 10 \log (N/100)$$

Using the above formulas, the predicted overall spectators crowd sound power level is presented in the table below:

Table 8: Predicted Sound Power Level of Patrons

Location	Typical number of people	Predicted L_{Aeq} sound power level dB(A)
Spectators Crowd (80 People)	80	92

7.1.3 Composite Façade Transmission Loss Calculation

The composite calculation for all 4 facades and roof transmission loss used for noise impact predictions is shown in Table 9. The TL data was based on tested systems.

The calculation has been conducted based on the advices from client with closed façade windows and doors during operation, sheet metal wall and single glazing window 3mm float based on the provided architectural plans.

Table 9: Composite Transmission Loss Calculation

N Façade (doors & windows Closed)		Octave band transmission loss dB							
Surface type	Area (m ²)	63	125	250	500	1000	2000	4000	8000
Glazing window - single 3mm float (closed)	15	14	16	20	25	25	22	25	25
sheetmetal wall	409	6	14	13	14	17	18	20	20
		63	125	250	500	1000	2000	4000	8000
Composite TL	6	14	13	14	17	18	20	20	20
S Façade (doors & windows Closed)		Octave band transmission loss dB							
Surface type	Area (m ²)	63	125	250	500	1000	2000	4000	8000
Glazing window - single 3mm float (closed)	12	14	16	20	25	25	22	25	25
sheetmetal wall	412	6	14	13	14	17	18	20	20
		63	125	250	500	1000	2000	4000	8000
Composite TL	6	14	13	14	17	18	20	20	20
E Façade (doors & windows Closed)		Octave band transmission loss dB							
Surface type	Area (m ²)	63	125	250	500	1000	2000	4000	8000
sheetmetal wall	510	6	14	13	14	17	18	20	20
		63	125	250	500	1000	2000	4000	8000
Composite TL	6	14	13	14	17	18	20	20	20
W Façade (doors & windows Closed)		Octave band transmission loss dB							
Surface type	Area (m ²)	63	125	250	500	1000	2000	4000	8000
Glazing window - single 3mm float (closed)	17	6	14	13	14	17	18	20	20
sheet metal wall, 150mm I beam or purlin with 75mm thick insulation, 9mm FC	492	18	21	28	37	42	49	50	50
		63	125	250	500	1000	2000	4000	8000
Composite TL	16	20	25	28	31	33	35	35	35
Metal Deck Roof		Octave band transmission loss dB							
Surface type	Area (m ²)	63	125	250	500	1000	2000	4000	8000
Metal Deck Roof	2087	6	14	13	14	17	18	20	20

7.1.4 Intrusive Noise and Acoustic Amenity (Doors & Windows Closed)

The predicted impacts from internal noise sources have been calculated by taking into consideration room correction, directivity, composite transmission loss, and distance attenuation.

Table 10 to Table 13 detail the octave band calculation of the predicted noise impacts at all receiver locations (No time correction). The calculation considers a spectator's crowd of 80 people, badminton activities (14 courts) and the facades' entry door & windows closed.

The average noise source levels and predicted impacts at the receiver locations are shown in Table 10 to Table 13 as follows. L_{Aeq} results are not shown where the calculated total is less than 0dBA.

Table 10: Predicted Noise Levels from Badminton Activities and Spectators – Receiver 1 (W)

N Façade (Door and Windows Closed)									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	18	18	18	18	18	18	18	18	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	68	81	82	89	85	83	76	69	90
Composite Transmission Loss	6	14	13	14	17	18	20	20	
distance correction (hemispherical)					19				
Distance Calc	-34	-34	-34	-34	-34	-34	-34	-34	
Directivity (90 Degrees)	-6	-7	-8	-8	-9	-9	-9	-9	
Predicted Noise Impact dB(A)	22	26	28	33	26	23	13	6	33
(Single event, no time correction)									
W Façade (Door and Windows Closed)									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	19	19	19	19	19	19	19	19	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	69	82	83	90	86	84	77	69	91
Composite Transmission Loss	16	20	25	28	31	33	35	35	
distance correction (hemispherical)					6				
Distance Calc	-24	-24	-24	-24	-24	-24	-24	-24	
Directivity (90 Degrees)	0	0	0	0	0	0	0	0	
Predicted Noise Impact dB(A)	29	38	34	38	31	28	18	11	38
S Façade (Door and Windows Closed)									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	18	18	18	18	18	18	18	18	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	68	81	82	89	85	83	76	69	90
Composite Transmission Loss	6	14	13	14	17	18	20	20	
distance correction (hemispherical)					11				
Distance Calc	-29	-29	-29	-29	-29	-29	-29	-29	
Directivity	-6	-7	-8	-8	-9	-9	-9	-9	
Predicted Noise Impact dB(A)	27	31	32	38	30	27	18	11	37
Roof									dB(A)
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	25	25	25	25	25	25	25	25	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	75	88	89	96	92	90	83	75	97
Composite Transmission Loss	6	14	13	14	17	18	20	20	
distance correction (hemispherical)					15				
Distance Calc	-32	-32	-32	-32	-32	-32	-32	-32	
Directivity	-10	-12	-13	-14	-16	-16	-17	-18	
Predicted Noise Impact dB(A)	27	31	32	36	28	24	15	6	35
Combined Noise Impact dB(A)	33	39	38	43	35	32	23	15	42

Table 11: Predicted Noise Levels from Badminton Activities and Spectators – Receiver 2 (N)

N Façade (Door and Windows Closed)								
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
A-weighted Correction	26	16	9	3	0	-1	-1	1
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71
Cumulative Noise Level	71	84	85	92	88	86	78	71
Reverberant Area correction	18	18	18	18	18	18	18	18
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8
Cumulative noise level including correction	68	81	82	89	85	83	76	69
Composite Transmission Loss	6	14	13	14	17	18	20	20
distance correction (hemispherical)					36			
Distance Calc	-39	-39	-39	-39	-39	-39	-39	-39
Directivity (90 Degrees)	0	0	0	0	0	0	0	0
Predicted Noise Impact dB(A)	23	28	30	36	29	26	17	9
(Single event, no time correction)								
W Façade (Door and Windows Closed)								
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
A-weighted Correction	26	16	9	3	0	-1	-1	1
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71
Cumulative Noise Level	71	84	85	92	88	86	78	71
Reverberant Area correction	19	19	19	19	19	19	19	19
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8
Cumulative noise level including correction	69	82	83	90	86	84	77	69
Composite Transmission Loss	16	20	25	28	31	33	35	35
distance correction (hemispherical)					44			
Distance Calc	-41	-41	-41	-41	-41	-41	-41	-41
Directivity (90 Degrees)	-6	-7	-8	-8	-9	-9	-9	-9
Predicted Noise Impact dB(A)	6	13	9	13	5	2	-8	-15
E Façade (Door and Windows Closed)								
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
A-weighted Correction	26	16	9	3	0	-1	-1	1
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71
Cumulative Noise Level	71	84	85	92	88	86	78	71
Reverberant Area correction	18	18	18	18	18	18	18	18
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8
Cumulative noise level including correction	68	81	82	89	85	83	76	69
Composite Transmission Loss	6	14	13	14	17	18	20	20
distance correction (hemispherical)					44			
Distance Calc	-41	-41	-41	-41	-41	-41	-41	-41
Directivity	-6	-7	-8	-8	-9	-9	-9	-9
Predicted Noise Impact dB(A)	15	19	20	26	19	16	6	-1
Roof								
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
A-weighted Correction	26	16	9	3	0	-1	-1	1
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71
Cumulative Noise Level	71	84	85	92	88	86	78	71
Reverberant Area correction	25	25	25	25	25	25	25	25
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8
Cumulative noise level including correction	75	88	89	96	92	90	83	75
Composite Transmission Loss	6	14	13	14	17	18	20	20
distance correction (hemispherical)					58			
Distance Calc	-43	-43	-43	-43	-43	-43	-43	-43
Directivity	-10	-12	-13	-14	-16	-16	-17	-18
Predicted Noise Impact dB(A)	16	19	20	25	17	13	3	-6
Combined Noise Impact dB(A)	24	29	31	37	30	27	17	10

Table 12: Predicted Noise Levels from Badminton Activities and Spectators – Receiver 3 (E)

N Façade (Door and Windows Closed)									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	18	18	18	18	18	18	18	18	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	68	81	82	89	85	83	76	69	90
Composite Transmission Loss	6	14	13	14	17	18	20	20	
	distance correction (hemispherical)				68				
Distance Calc	-45	-45	-45	-45	-45	-45	-45	-45	
Directivity (90 Degrees)	-6	-7	-8	-8	-9	-9	-9	-9	
Predicted Noise Impact dB(A)	11	15	17	22	15	12	2	-5	21
E Façade (Door and Windows Closed)									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	19	19	19	19	19	19	19	19	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	69	82	83	90	86	84	77	69	91
Composite Transmission Loss	6	14	13	14	17	18	20	20	
	distance correction (hemispherical)				64				
Distance Calc	-44	-44	-44	-44	-44	-44	-44	-44	
Directivity (90 Degrees)	0	0	0	0	0	0	0	0	
Predicted Noise Impact dB(A)	19	23	26	31	25	22	13	5	31
S Façade (Door and Windows Closed)									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	18	18	18	18	18	18	18	18	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	68	81	82	89	85	83	76	69	90
Composite Transmission Loss	6	14	13	14	17	18	20	20	
	distance correction (hemispherical)				68				
Distance Calc	-45	-45	-45	-45	-45	-45	-45	-45	
Directivity	-6	-7	-8	-8	-9	-9	-9	-9	
Predicted Noise Impact dB(A)	11	15	17	22	15	12	2	-5	21
Roof									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	25	25	25	25	25	25	25	25	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	75	88	89	96	92	90	83	75	97
Composite Transmission Loss	6	14	13	14	17	18	20	20	
	distance correction (hemispherical)				85				
Distance Calc	-47	-47	-47	-47	-47	-47	-47	-47	
Directivity	-10	-12	-13	-14	-16	-16	-17	-18	
Predicted Noise Impact dB(A)	12	16	17	21	13	9	0	-9	20
Combined Noise Impact dB(A)	21	25	27	33	26	23	14	6	32

Table 13: Predicted Noise Levels from Badminton Activities and Spectators – Receiver 4 (S)

S Façade (Door and Windows Closed)									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	18	18	18	18	18	18	18	18	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	68	81	82	89	85	83	76	69	90
Composite Transmission Loss	6	14	13	14	17	18	20	20	
	distance correction (hemispherical)				35				
Distance Calc	-39	-39	-39	-39	-39	-39	-39	-39	
Directivity (90 Degrees)	0	0	0	0	0	0	0	0	
Predicted Noise Impact dB(A)	23	28	30	36	29	26	17	10	36
(Single event, no time correction)									
W Façade (Door and Windows Closed)									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	19	19	19	19	19	19	19	19	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	69	82	83	90	86	84	77	69	91
Composite Transmission Loss	16	20	25	28	31	33	35	35	
	distance correction (hemispherical)				39				
Distance Calc	-40	-40	-40	-40	-40	-40	-40	-40	
Directivity (90 Degrees)	-6	-7	-8	-8	-9	-9	-9	-9	
Predicted Noise Impact dB(A)	7	14	10	14	6	3	-7	-14	13
E Façade (Door and Windows Closed)									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	18	18	18	18	18	18	18	18	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	68	81	82	89	85	83	76	69	90
Composite Transmission Loss	6	14	13	14	17	18	20	20	
	distance correction (hemispherical)				37				
Distance Calc	-39	-39	-39	-39	-39	-39	-39	-39	
Directivity	-6	-7	-8	-8	-9	-9	-9	-9	
Predicted Noise Impact dB(A)	17	20	22	28	20	17	8	0	27
Roof									A-weighted
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dB(A)
Aweighted Correction	26	16	9	3	0	-1	-1	1	
Spectator Crowd 80 People SWL	67	83	85	92	87	85	75	62	92
Badminton Activities (14 Courts) SWL	68	77	73	78	82	80	76	71	86
Cumulative Noise Level	71	84	85	92	88	86	78	71	95
Reverberant Area correction	25	25	25	25	25	25	25	25	
Sabine Room Correction	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	
Cumulative noise level including correction	75	88	89	96	92	90	83	75	97
Composite Transmission Loss	6	14	13	14	17	18	20	20	
	distance correction (hemispherical)				57				
Distance Calc	-43	-43	-43	-43	-43	-43	-43	-43	
Directivity	-10	-12	-13	-14	-16	-16	-17	-18	
Predicted Noise Impact dB(A)	16	19	20	25	17	13	3	-6	24
Combined Noise Impact dB(A)	25	29	31	37	30	27	18	10	36

The predicted noise impacts from badminton activities and spectators' crowds (As shown in Table 10 to Table 13) have been adjusted in Table 14 to account for their respective durations. Table 14 presents the predicted cumulative noise impacts from all onsite activities at all receiver locations. L_{Aeq} results are not shown where the calculated total is less than 0dBA.

Activities such as player shouting and racket drop are assumed to occurred inside the building. By taking into account the reverberant room correction, sabine room correction and the conversion to sound power level, a reduction of 22dBA is assumed for the building transmission loss.

Table 14: Average noise levels from site activities, all time periods – Doors & windows closed

Receiver	Receivers										Source Leq@1m dB(A)	Correction dB(A)*	Corrected Leq@1m dB(A)	No. of events per Day	No. of events per Eve	No. of events per Night	Duration per event	Distance (m) Source	Distance (m) Receiver	No	Barrier (height (m))	Barrier screening dB	Building screening dB	Building TL dB	Dist atten. @6dB/dd	LAeq adj,T ext. dB(A) Day	LAeq adj,T int. dB(A) Day	LAeq adj,T ext. dB(A) Eve	LAeq adj,T int. dB(A) Eve	LAeq adj,T ext. dB(A) Night	LAeq adj,T int. dB(A) Night	Intrusive Compliance LAeq			Amenity Compliance LAeq			
	Description																															Day	Eve	Night	Day	Eve	Night	
1	Criteria																																					
	Badminton Activities (14 Courts) and Spectator Crowd (80 ppl) W										42		42	11	4	1	3600	6	6						0	42	37	42	37	32	27	Yes	Yes	Yes	Yes	Yes	Yes	
	Outdoor Conversation										70		70	11	4	1	3600	1	9	2	-9				-19	42	37	42	37	32	27	Yes	Yes	Yes	Yes	Yes	Yes	
	Car door closure										75	2	77	880	320	60	2	1	35	2	-9				-31	24	19	24	19	13	8	Yes	Yes	Yes	Yes	Yes	Yes	
	Car start										74	2	76	880	320	60	2	1	35	2	-9				-31	23	18	23	18	12	7	Yes	Yes	Yes	Yes	Yes	Yes	
	Car passby										69		69	880	320	60	15	1	35	2	-9				-31	24	19	24	19	14	9	Yes	Yes	Yes	Yes	Yes	Yes	
	Player Shouting (1 every 30 sec)										85	2	87	1320	480	60	30	1	12				-22	-22	43	38	43	38	31	26	Yes	Yes	Yes	Yes	Yes	Yes		
	Raquette Drop (1 every 5 min)										80	2	82	132	48	12	300	1	12				-22	-22	38	33	38	33	29	24	Yes	Yes	Yes	Yes	Yes	Yes		
Total																									48	43	48	43	37	32	Yes	Yes	Yes	Yes	Yes	Yes		
2	Criteria																																					
	Badminton Activities (14 Courts) and Spectator Crowd (80 ppl) N										36		36	11	4	1	3600	36	36						0	36	31	36	31	26	21	Yes	Yes	Yes	Yes	Yes	Yes	
	Outdoor Conversation										70		70	11	4	1	3600	1	90					-24	-39	7	2	7	2			Yes	Yes	Yes	Yes	Yes	Yes	
	Car door closure										75	2	77	880	320	60	2	1	90					-24	-39							Yes	Yes	Yes	Yes	Yes	Yes	
	Car start										74	2	76	880	320	60	2	1	90					-24	-39							Yes	Yes	Yes	Yes	Yes	Yes	
	Car passby										69		69	880	320	60	15	1	95					-24	-40							Yes	Yes	Yes	Yes	Yes	Yes	
	Player Shouting (1 every 30 sec)										85	2	87	1320	480	60	2	1	36					-22	-31	22	17	22	17	10	5	Yes	Yes	Yes	Yes	Yes	Yes	
	Raquette Drop (1 every 5 min)										80	2	82	132	48	12	2	1	36					-22	-31	7	2	7	2			Yes	Yes	Yes	Yes	Yes	Yes	
Total																									36	31	36	31	27	22	Yes	Yes	Yes	Yes	Yes	Yes		
3	Criteria																																					
	Badminton Activities (14 Courts) and Spectator Crowd (80 ppl) E										32		32	11	4	1	3600	50	50						0	32	27	32	27	22	17	Yes	Yes	Yes	Yes	Yes	Yes	
	Outdoor Conversation										70		70	11	4	1	3600	1	92						-39	31	26	31	26	21	16	Yes	Yes	Yes	Yes	Yes	Yes	
	Car door closure										75	2	77	880	320	60	2	1	54						-35	29	24	29	24	18	13	Yes	Yes	Yes	Yes	Yes	Yes	
	Car start										74	2	76	880	320	60	2	1	54						-35	28	23	28	23	17	12	Yes	Yes	Yes	Yes	Yes	Yes	
	Car passby										69		69	880	320	60	15	1	51						-34	30	25	30	25	19	14	Yes	Yes	Yes	Yes	Yes	Yes	
	Player Shouting (1 every 30 sec)										85	2	87	1320	480	60	30	1	54					-22	-35	30	25	30	25	18	13	Yes	Yes	Yes	Yes	Yes	Yes	
	Raquette Drop (1 every 5 min)										80	2	82	132	48	12	300	1	54					-22	-35	25	20	25	20	16	11	Yes	Yes	Yes	Yes	Yes	Yes	
Total																										38	33	38	33	28	23	Yes	Yes	Yes	Yes	Yes	Yes	
4	Criteria																																					
	Badminton Activities (14 Courts) and Spectator Crowd (80 ppl) S										36		36	11	4	1	3600	35	35	1.8	-6				0	30	25	30	25	20	15	Yes	Yes	Yes	Yes	Yes	Yes	
	Outdoor Conversation										70		70	11	4	1	3600	1	36	1.8	-6				-31	33	28	33	28	23	18	Yes	Yes	Yes	Yes	Yes	Yes	
	Car door closure										75	2	77	880	320	60	2	1	5	1.8	-7				-14	42	37	42	37	32	27	Yes	Yes	Yes	Yes	Yes	Yes	
	Car start										74	2	76	880	320	60	2	1	5	1.8	-7				-14	41	36	41	36	31	26	Yes	Yes	Yes	Yes	Yes	Yes	
	Car passby										69		69	880	320	60	15	1	10	1.8	-7				-20	37	32	37	32	26	21	Yes	Yes	Yes	Yes	Yes	Yes	
	Player Shouting (1 every 30 sec)										85	2	87	1320	480	60	30	1	41	1.8	-6				-22	-32	27	22	27	22	14	9	Yes	Yes	Yes	Yes	Yes	Yes
	Raquette Drop (1 every 5 min)										80	2	82	132	48	12	300	1	41	1.8	-6				-22	-32	22	17	22	17	12	7	Yes	Yes	Yes	Yes	Yes	Yes
Total																										46	41	46	41	35	30	Yes	Yes	Yes	Yes	Yes	Yes	

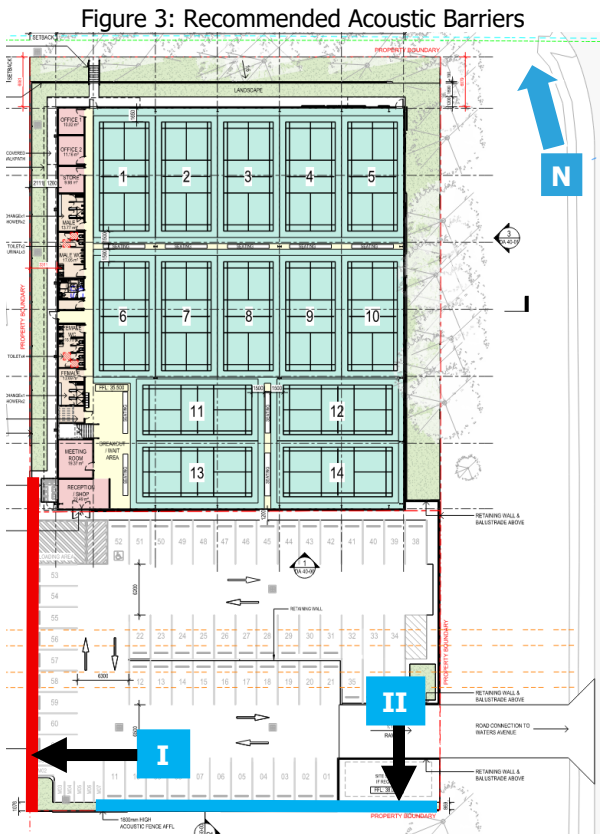
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8. Recommendations

8.1 Acoustic Barriers

Acoustic barriers are recommended to be constructed along the western boundary of the badminton centre, and along the southern boundary of the carparking area as shown in Figure 3. The barriers are recommended to be built to the heights as shown in Table 15 above the finished ground level or boundary level (whichever is higher).

The acoustic barriers shall be constructed using materials that achieve a minimum surface density of at least 11kg/m². Suitable materials may include lapped 19mm thick pine palings with 40% overlap, 9mm fibre cement sheet, masonry, aerated concrete, 6.38mm laminate glass or other materials which satisfy the minimum surface density requirement. The barriers shall be free of gaps and holes.



- Acoustic barrier 2m high above finished ground level or boundary level (whichever is higher)
- Acoustic barrier 1.8m high above finished ground level or boundary level (whichever is higher)

Table 15: Recommended Acoustic Barrier Height

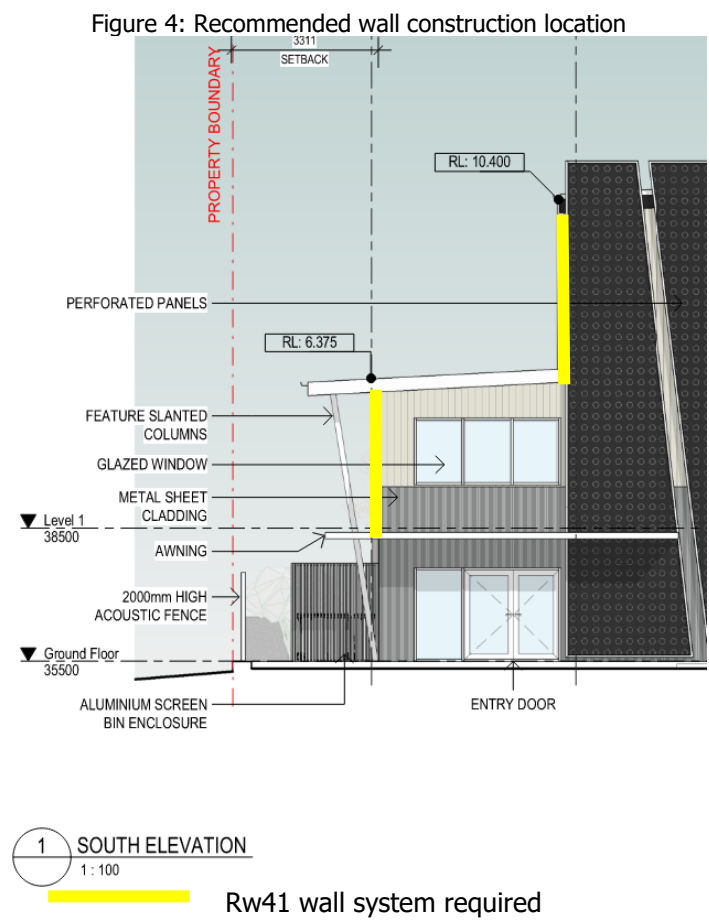
Reference Point	Approximate Finished Level (m)	Recommended Barrier Height (m)	Approximate Finished Top Barrier Level (m)
I	36.8	2.0	38.8
II	36.8	1.8	38.6

8.2 Wall Construction

The maximum rating required rating for the wall located adjacent to the western boundary is Rw 41. The use of lightweight walls systems would require the construction detailed in Table 16 below.

Table 16: Typical lightweight wall construction

Description	Cavity insulation	R _w Rating
Weatherboard cladding, 90mm steel studs, cavity insulation, with 1 layer of 10mm plasterboard internal	75mm thick R2.0 fibreglass	41



Note that the construction systems listed in the table are not the only possible types of construction. Other similar systems achieving at least Rw 41 would also be suitable.

8.3 Onsite Activities

Based on the predicted noise levels of the site and surrounds for all time periods, noise impacts at the residential receiver locations are predicted to comply on the condition the following acoustic treatments are implemented:

- We recommend waste collection be conducted in accordance with existing residential collections in the area to reduce the potential for disturbance.
- Carpark and driveway finished surfaces should consist of materials which provides low tyre squeal characteristics. Any traversable drainage grates must be securely fastened.
- The hours of operation for the badminton centre are recommended to be between 9am and 9pm.
- Construct the acoustic barriers as recommended in section 8.1.

8.4 Onsite Mechanical Plant

No information regarding mechanical services was available at the time of the assessment. It is recommended that any new mechanical plant is to be acoustically screened from nearby sensitive receivers. The new mechanical plant can also be designed to comply with the noise criteria stated in Section 6.1.2 with an assessment by a qualified acoustic consultant to be conducted prior to installation.

9. Conclusion

An environmental noise assessment was conducted for the proposed sporting facility to be located at 210 Learoyd Road, Willawong. On the condition the recommendations detailed in Section 8 are implemented, compliance is predicted with Brisbane City Council and other relevant assessment criteria.

If you should have any queries, please do not hesitate to contact us.

Report Prepared By



Acoustic Consultant

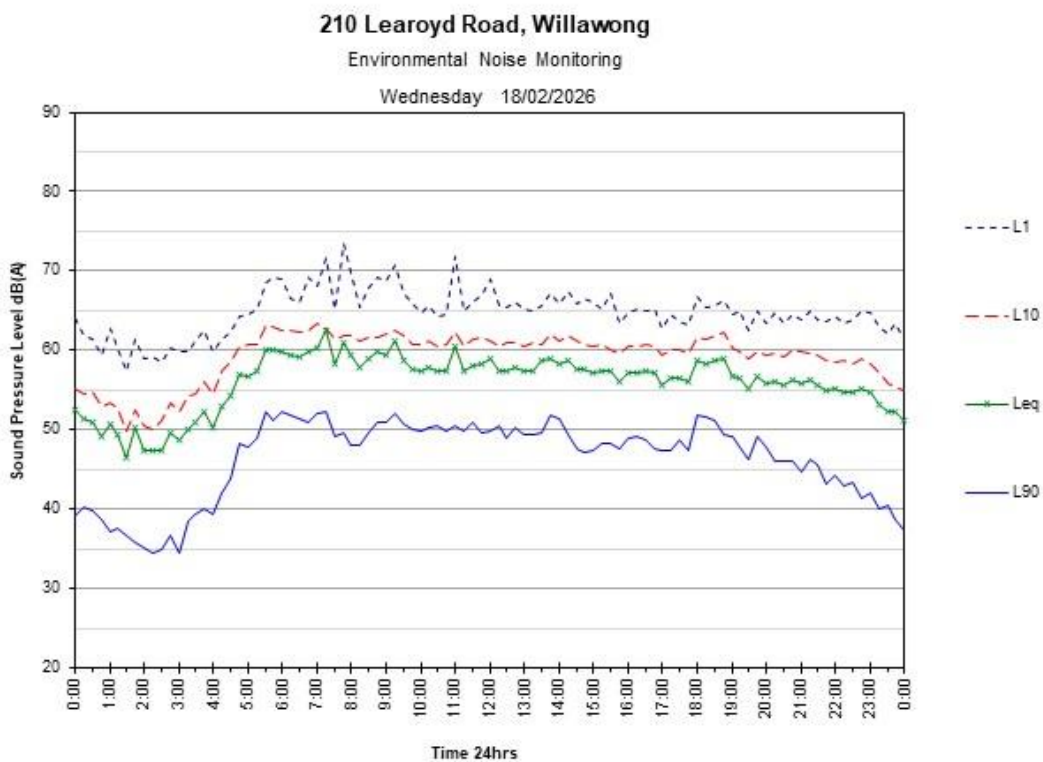
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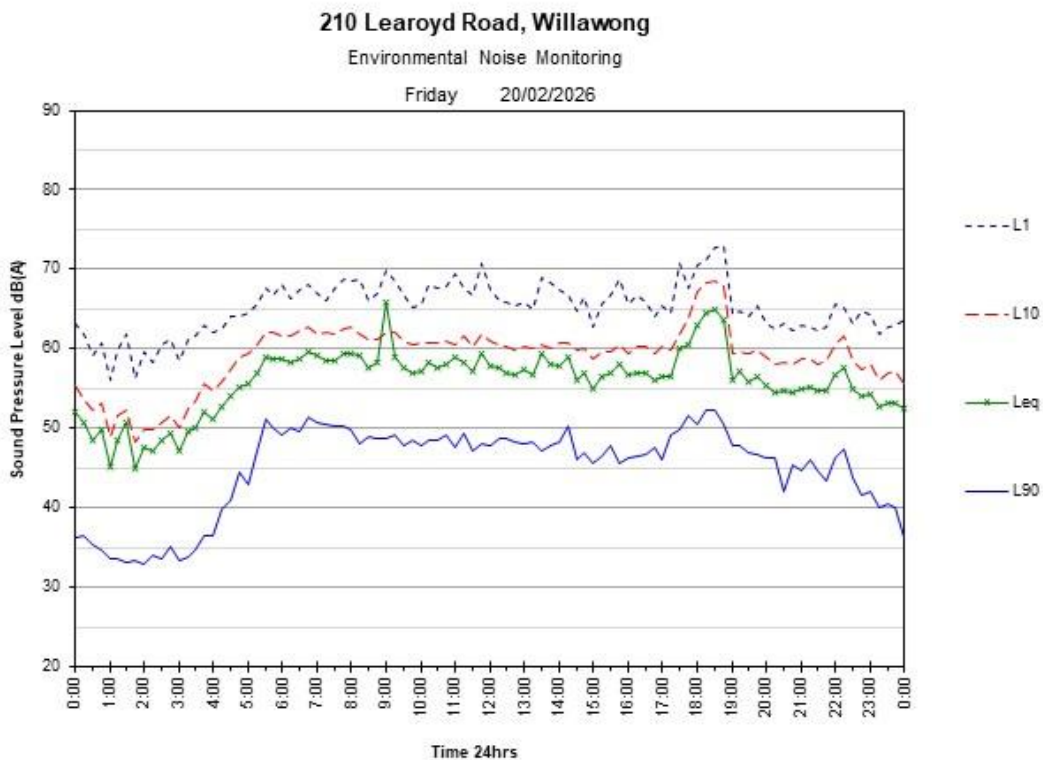
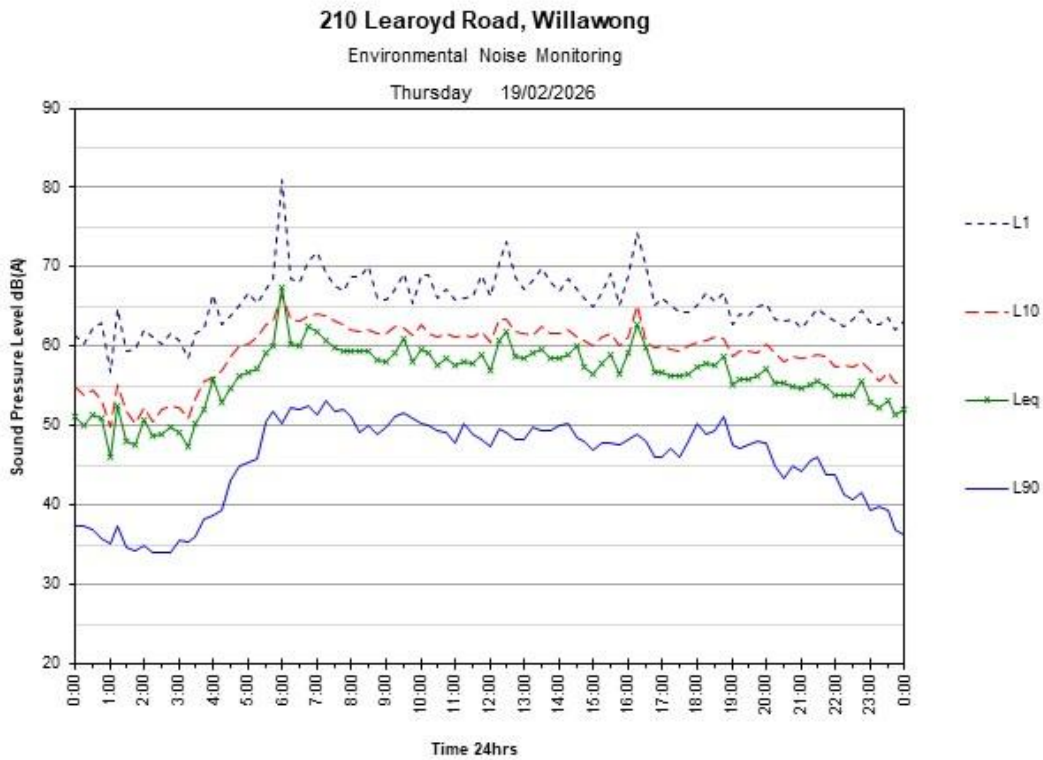
10. Appendices

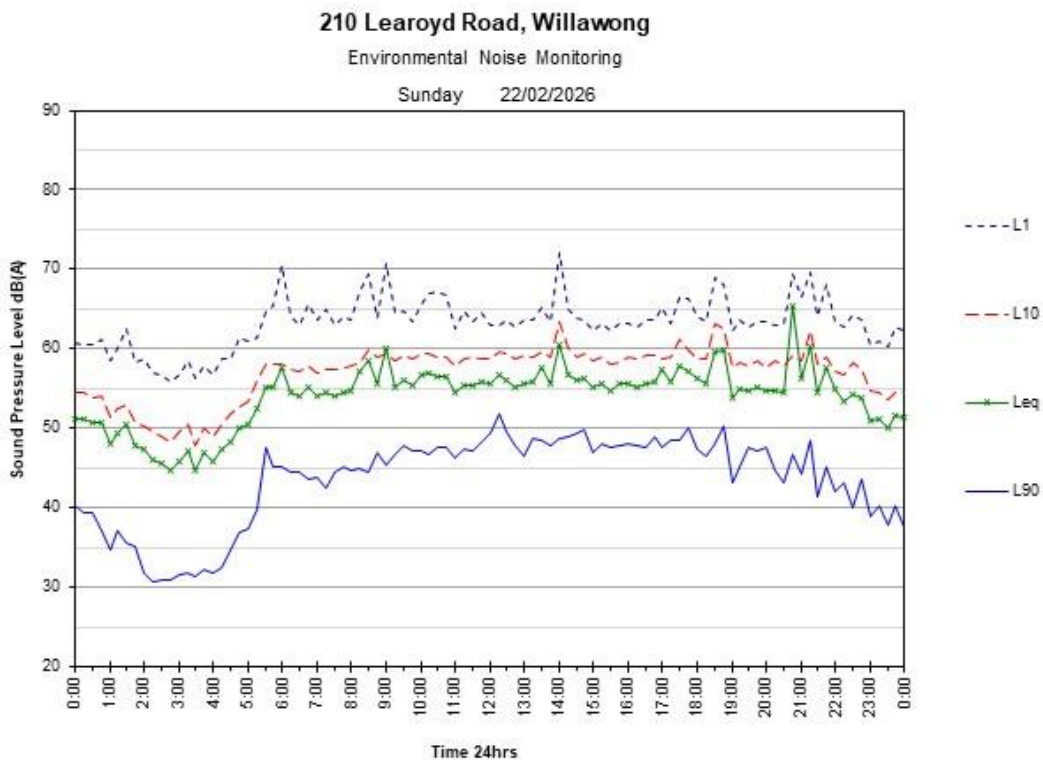
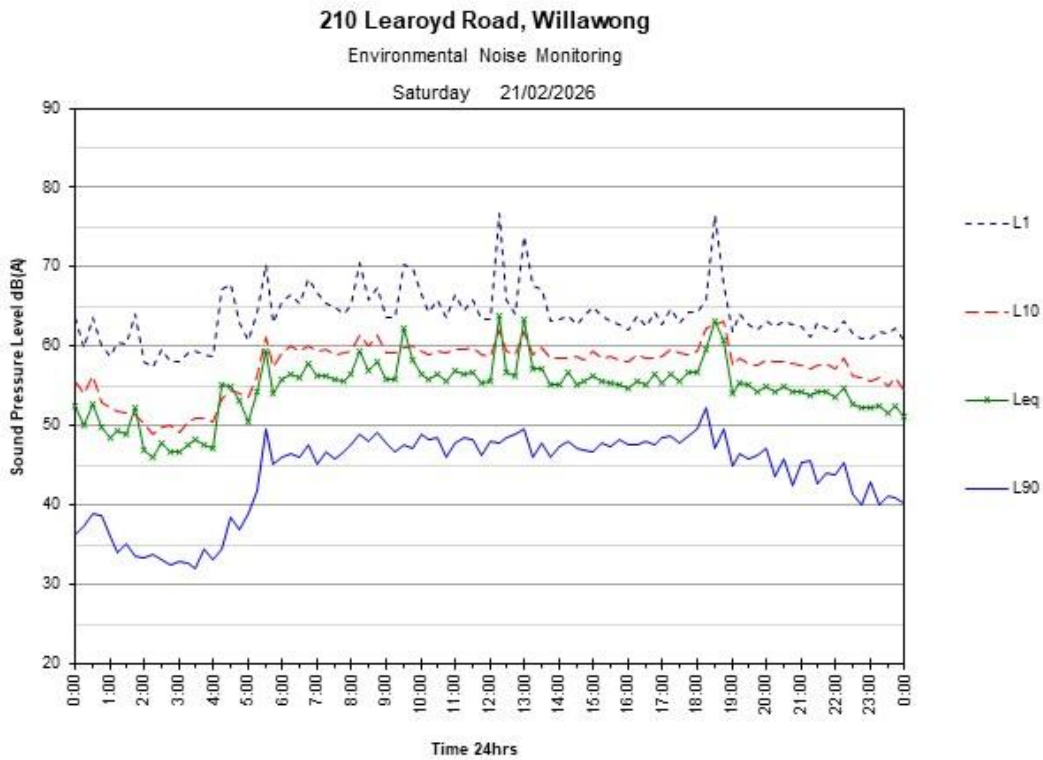
10.1 Badminton Activities Measured Noise Level Spectrum

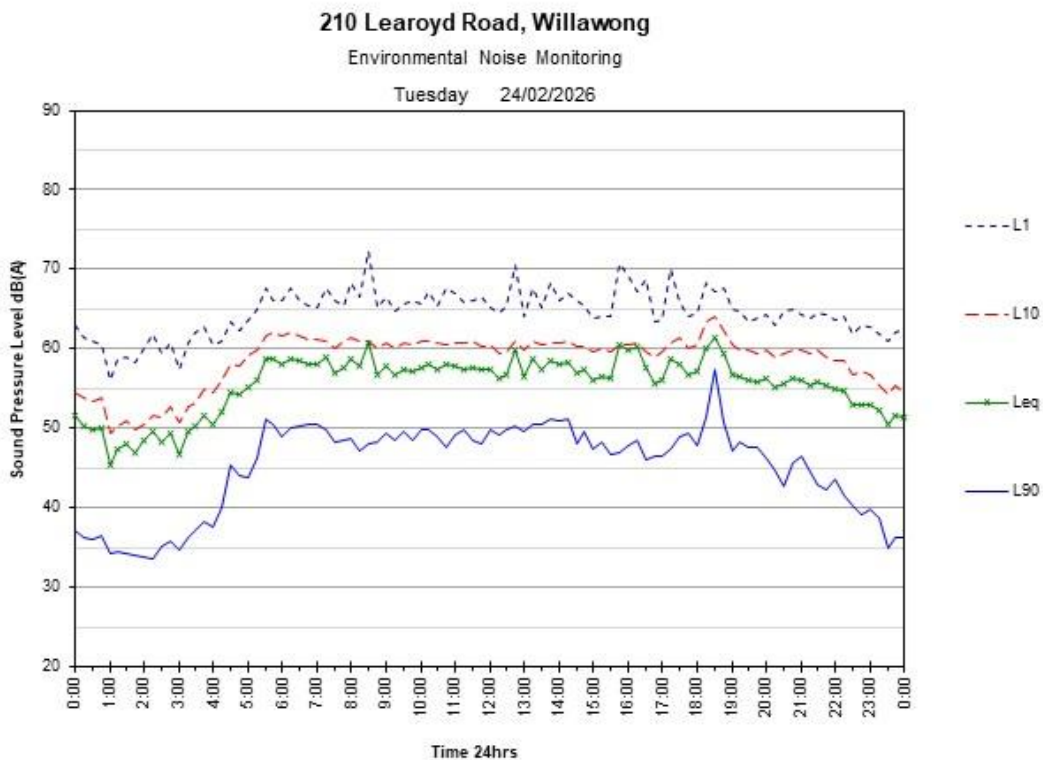
Reverberant noise level for 2 badminton courts in operation																																					
	Overall	6.3 Hz	8.0 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1.0 kHz	1.25 kHz	1.6 kHz	2.0 kHz	2.5 kHz	3.15 kHz	4.0 kHz	5.0 kHz	6.3 kHz	8.0 kHz	10.0 kHz	12.5 kHz	16.0 kHz	20.0 kHz
L _{req}	70.8	42.5	47.5	46.2	40.3	34.6	35.4	35.7	37.8	39.2	42	45.4	50.9	54	57.1	57	52.8	51.8	52.2	54.3	55.2	59.2	62.7	61.8	59.6	60.8	59.6	57.1	56.3	56	53.1	51.7	49.7	46.5	41.5	34.8	33

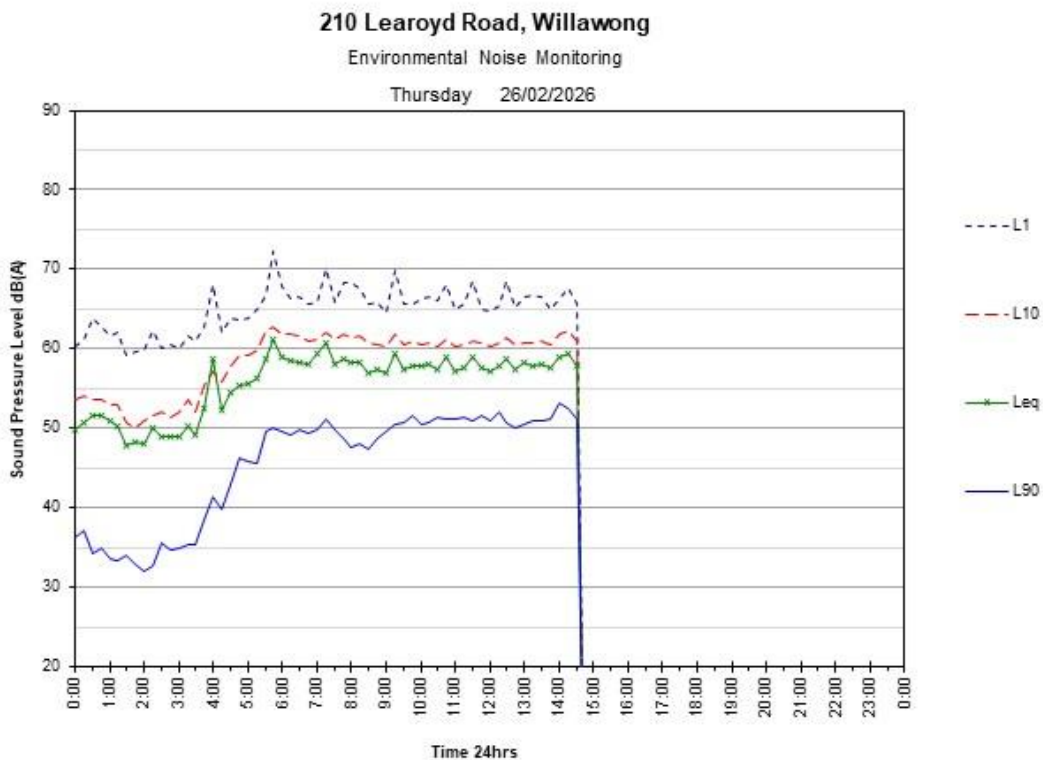
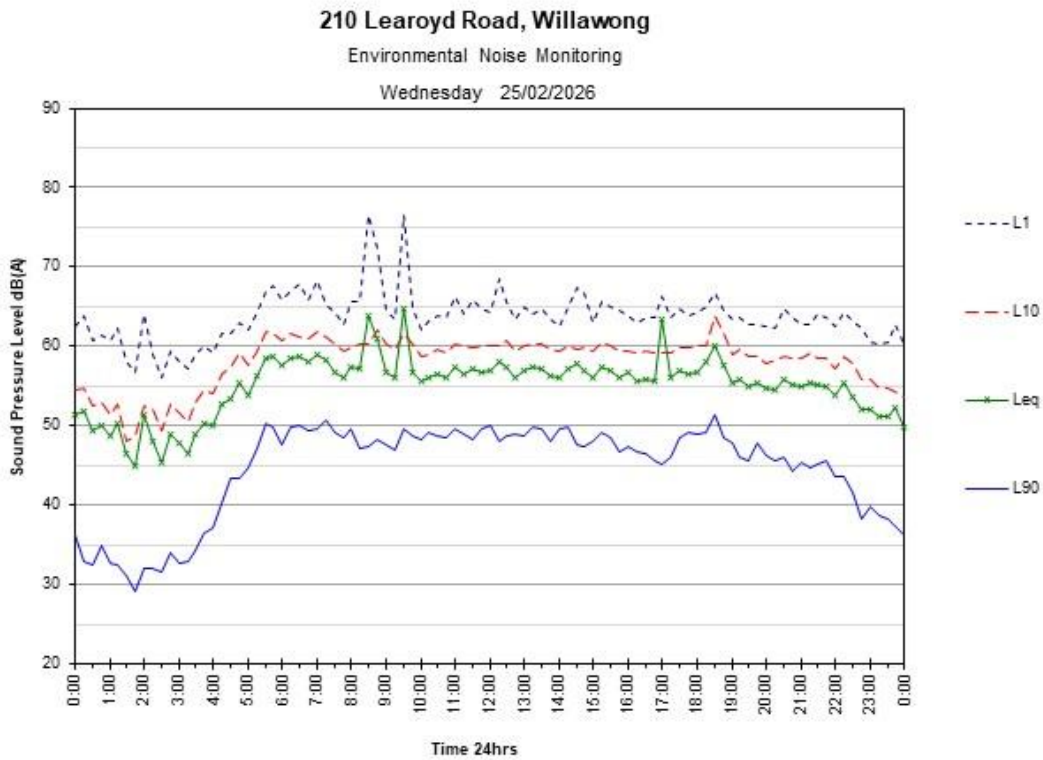
10.2 Noise Monitoring Charts





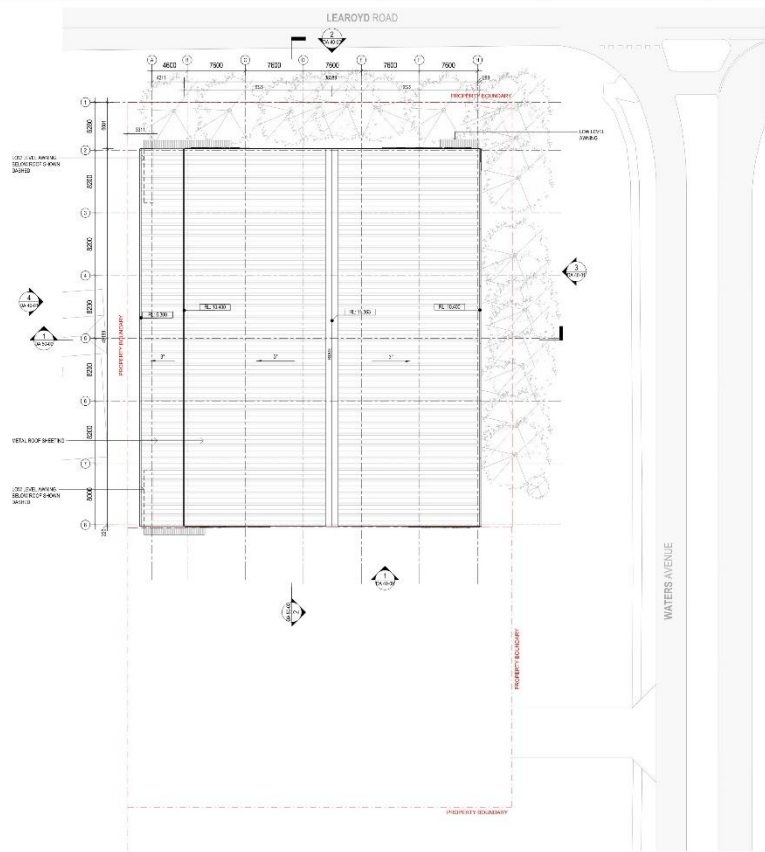






10.3 Development Plans





Willawong Badminton Centre ROOF PLAN Date: 08/05/2024 Scale: 1:200 Project Number: 22002026 Drawing Number: 01 Hames Sharley



Willawong Badminton Centre BUILDING ELEVATIONS Date: 08/05/2024 Scale: 1:200 Project Number: 22002026 Drawing Number: 02 Hames Sharley

