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Acoustic Assessment
For
Proposed Aged Care Development
135A Marmong Street, Marmong Point NSW

Prepared For:

EMPOWERED LIVING SUPPORT SERVICES

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1. INTRODUCTION

Hunter Acoustics has been engaged by Empowered Living Support Services to conduct an acoustic assessment of a proposed Aged Care Development that is proposed to be developed on Lot 1, DP 377679 Marmong Point, NSW.

This report assesses the potential noise impacts of the development on nearby residents as a result of noise generated by, onsite traffic, and the operation of the facilities within the development. The assessment is conducted in accordance with relevant Australian Standards and NSW DECC guidelines and makes recommendations to ensure that appropriate noise amenity is maintained for residents of the facility and nearby neighbours.

2. TERMS AND DEFINITIONS

dB(A) ..... Unit of sound pressure level, modified by the A-weighting network to represent the sensitivity of the human ear.

SPL ..... The incremental variation of sound pressure from the reference pressure level expressed in decibels.

SWL (L_W) ..... Sound Power Level of a noise sources per unit time expressed in decibels from reference level $W_{O.}$

L_X ..... Statistical noise descriptor. Where (x) represents the percentage of the time for which the specified noise level is exceeded.

L_{eq} ..... Equivalent continuous noise level averaged over time on an equivalent energy basis.

L_1..... Average Peak Noise Level in a measurement period.

L_{10} ..... Average Maximum Noise Level in a measurement period.

L_{90} ..... Average Minimum Noise Level in a measurement period.

L_{max} ..... Maximum Noise Level in a measurement period.

Background Noise Level ..... Noise level determined for planning purposes as the one tenth percentile of the ambient L_{A90} noise levels.

P_O ..... Reference Sound Pressure for the calculation of SPL in decibels.

W_O..... Reference Sound Power for the calculation of SWL in decibels.

3. DESCRIPTION OF THE DEVELOPMENT

The proposed development is an Aged Care Facility comprising 94 housing units within 47 two storey duplex buildings, a community centre, pool / gymnasium, activities building, bowling green and maintenance facilities.

The development is proposed to be located towards the northern part of the property and is described in drawings by Peter Dalton Architects Drawing, Project ELSS01, amended on the 28th of March 2012 (**Appendix 2**). The site adjoins residential properties to the east at Marmong Street and Kylie Close, to the south at Columbia Close and Defender Close, to the southwest at Sara Close, to the west at Leeward Close, to the northwest on Hayden Brook Road and Denman Way to the north. The Woodrising Shopping Centre is located approximately 60 meters to the west of the western boundary of the site. The property contains areas of heavy vegetation, in the south and southwest of the site and a large pond is located in the northern corner of the property. The bowling green, Community Centre, activities building and the pool/gym will be at the north eastern corner of the property, and the maintenance facilities will be located to the northwest of the main accommodation areas. The main part of the development is approximately 200 metres from the nearest dwelling.

Access to the development will be via an existing access road at the south eastern part of the property. The access road passes adjacent to dwellings at numbers 2 & 4 Kylie Close and 149 & 151 Marmong Street to link the development with Marmong Street at its southern end.

The facility will conduct social activities that will include community group events, and health activities within the community centre and pool / gym complex. The facility has a maintenance workshop which will conduct general repairs for the facility and house yard maintenance equipment.

The facility will operate 24 hours per day with the various activities operating as follows:-

- Use of general accommodation and site 24 hours per day,
- Delivery vehicles entering and leaving the facility during daytime hours,
- The recreational facilities (community centre, pool/gym and activities centre) will operate between 8.00 a.m. & 9.00 p.m.
- On site mechanical plant including the pool filtration equipment, kitchen ventilation fans and air conditioning plant are expected to operate 24 hours per day,
- Maintenance and repair activities will be conducted during the daytime by on site personnel within the maintenance building and around the property. Maintenance activities are expected to involve the use of general hand power tools, hand repairs using hammers and the like and the operation of ground maintenance equipment such as mowers and leaf blowers.

4. ACOUSTIC ISSUES

The potential for acoustic impacts arises as a result of sound from the proposed development affecting nearby residences. The possible noise sources that may affect the nearby residences are:-

- Sound from plant and equipment, in particular, the air conditioning units, pool equipment,
- Sound from the conduct of maintenance activities and use of the maintenance facilities,
- Sound from any activities within the community centre, pool and gymnasium,
- Sound from onsite traffic using the perimeter and access roads within the site, and
- Traffic noise from the proposed development impacting on residences near to Marmong Street.

4.1 ENVIRONS

The area is classified as Suburban under Section 2.2.1 Cl 6 of the Industrial Noise Policy and, the overall acoustic climate is not expected to change as a result of the proposed development. However, it is necessary to adequately maintain the amenity of the adjacent residences after the construction of the proposed Aged Care Residence at Marmong Point and this report examines the acoustic impact of the operations of the development on the nearby residents.

The surrounding potentially affected dwellings are shown in **Appendix 1**. The residences near to the development are both single storey and two storey dwellings. Most of the residences have some protection from noise emissions that may be produced from the development, due to the surrounding topography and there is a large section of bushland that will remain undeveloped around most of the project.

5. DETERMINATION OF NOISE LEVELS AND CRITERIA.

5.1 NOISE CRITERIA FOR THE OPERATION OF THE DEVELOPMENT

This assessment was conducted in accordance with the NSW DECC Industrial Noise Policy (INP) released by the DECC in January 2000 and the Noise Guide for Local Government. Acoustic data logging was conducted at 6 Columbia Close, Woodrising, adjacent to the site boundary over the period 20th of July 2010 to 27th of July 2010 inclusive and the logged data was used to determine the Rating Background Noise levels for the area.

The data was filtered to remove any information affected by adverse weather conditions in accordance with the requirements of the INP. The Daytime, Evening and Night time, Rating Background Levels (RBL) were determined in accordance with Section 3 and Appendix B of the Industrial Noise Policy.

The proposal is not considered to be of a size and type that has the potential to significantly influence the amenity of the area. Rating Background Levels and the associated Intrusiveness Criteria are set out in Table 1 below.

Table 1 Intrusiveness and Amenity Criteria

	Day Time 07:00-18:00 hrs Mon – Sat 08:00-18:00 hrs Sun & P/Hol	**Evening** 18:00-22:00 hrs any day	**Night Time** All other times	**Shoulder Periods**
Rating Background Level (RBL)	37.5	35.3	32.3	N/A
INP Intrusiveness Criteria	42.5	40.3	37.3	N/A
Current Amenity level	46.3	41.9	39.4	N/A
Acceptable Noise Level (ANL) for Suburban Areas	55	45	40	N/A
Sleep Disturbance Criteria $L_{A01\ 1\ min}$	N/A	N/A	47	N/A

The limiting noise criteria for the equipment, machinery and vehicles expected on site is as follows:

- Plant and equipment (e.g. pool pump, air conditioners) - the INP night time intrusiveness criteria of 37 dB(A) $L_{eq\ 15\ min}$;

- Maintenance activities (day time only), for example the use of hand tools - the INP day time intrusiveness criteria of 42.5 dB(A) $L_{eq\ 15\ min;}$ and
- Traffic movements within the proposed development and on the access road 42 dB(A) $L_{eq\ 15\ min}$ and night time sleep disturbance criteria 47 dB(A) $L_{01\ 1\ min;}$

5.2 TRAFFIC NOISE CRITERIA

Marmong Street is the street that is most affected by additional traffic generated by the proposed development. The traffic noise assessment criteria are taken from the Environmental Criteria for Road Traffic Noise (ECRTN) Table 1 Line 13 "Land Use Developments with the potential to create additional Traffic on Local Roads". The criteria for traffic movements on Marmong Street resulting from the development are 55 dB L_{Aeq1hr} daytime and 50 dB L_{Aeq1hr} night time.

5.3 CONSTRUCTION NOISE CRITERIA

Construction Noise is assessed in accordance with Interim Construction Noise Guideline while vibration from road construction activities is assessed in accordance with BS7385 and DIN 4150 Pt 3.

5.4 STRUCTURAL DAMAGE CRITERIA

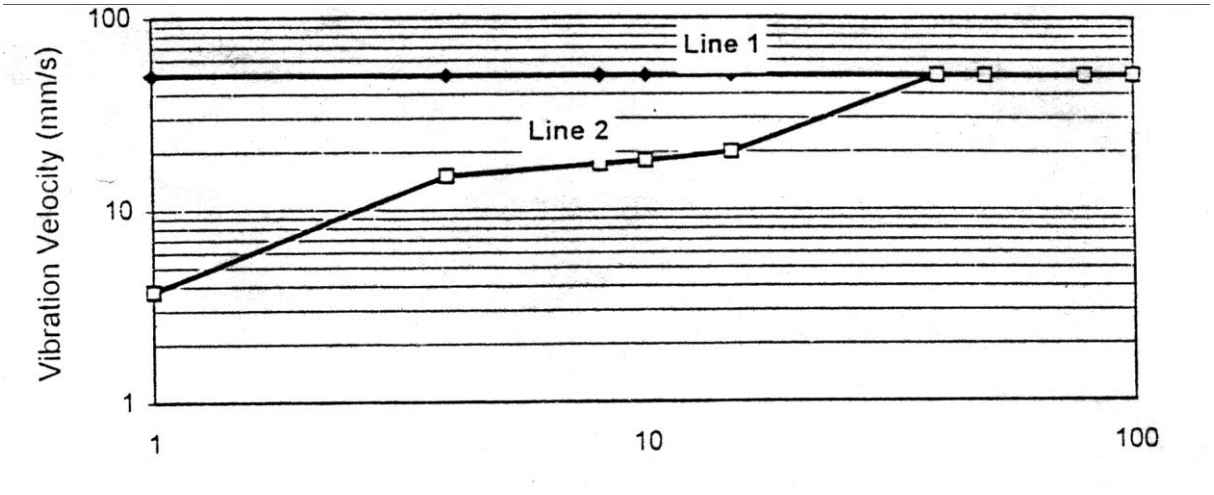
The criteria from BS7385 and DIN 5140 are shown below in Tables 2 , 3 and 4.

Table 2 Transient Vibration Guide Values for Cosmetic Damage

	Type of Building.	**Peak Component Particle Velocity in Frequency Range Line Type of Building of Predominant Pulse**	
		4 Hz to 15 Hz	**15 Hz and above**
1	Reinforced or framed structures Industrial and heavy commercial	50 mm/s at 4 Hz and above buildings	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

5.5 BRITISH STANDARDS 7385

Figure 1 Graph of Transient Vibration Guide Values for Cosmetic Damage



Line 1 .Cosmetic Damage (5% Risk) BS 7385 Industrial-
Line 2 : Cosmetic Damage (5% Risk) BS 7385 Residential

Table 3 below sets out the types of damage classified in BS 7385 and associated with the criteria published in that standard.

Table 3 BS 7385 Damage Classification.

BS 7385-1:1990—DAMAGE CLASSIFICATION

Damage classification	Description
Cosmetic	The formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in the mortar joints of brick/concrete block construction
Minor	The formation of cracks or loosening and falling of plaster or drywall surfaces, or cracks through bricks/concrete blocks
Major	Damage to structural elements of the building, cracks in support columns, loosening of joints, splaying of masonry cracks etc.

Table 4 Permissible Velocities, for the Assessment of Short Term Vibrations in Buildings according to DIN 4150 Part 3.

		Permissible Velocities PPV in mm/s			
	Type of Building	**At the Foundation Level**			**At the Highest Full Floor Level**
		Frequencies			**All Frequencies**
		< 10 Hz	10- 50 Hz	50- 100 Hz	
1	Industrial buildings and similar structures	20	20 –40	40 -50	40
2	Residential houses and similar structures	5	5 –15	15 –20	15
3	Buildings and structures that are much more sensitive to vibration than those in 1 and 2 or need special protection	3	3 –8	8 –10	8

5.6 HUMAN VIBRATION EXPOSURE

The NSW DECC published recommended human comfort limits for vibration exposure in its document Assessing Vibration - A Technical Guideline. The guide is based on BS 6472 and recommends appropriate criteria for human exposure to environmental vibration. Table 5 below is a reproduction of Table C1.1 from the DECC document Assessing Vibration – A Technical Guideline and shows the preferred and maximum Peak velocity and RMS acceleration values for continuous vibration.

It is generally not possible to meet the human comfort criteria set out in the guide when road construction occurs adjacent to (within 20 meters of) dwellings. It is more practical to assist the residents to manage the short term vibration impacts by developing good liaison and implementing appropriate management actions though a vibration management plan.

Table 5 Permissible Vibration Values for Continuous Vibration

Place	Time	Assessment criteria: [1]rms acceleration (m/s^2) (& vib. accel. value) (dB re 10^{-6} m/s^2) Preferred	Maximum	[2]rms velocity (mm/s) (& vib. velocity value) (dB re 10^{-9} mm/s) Preferred	Maximum	[2]Peak velocity (mm/s) Preferred	Maximum
Continuous vibration							
Critical working areas (e.g. hospital operating theatres, precision laboratories)	Day- or night-time	0.0050 (74 dB)	0.010 (80 dB)	0.10 (100 dB)	0.20 (106 dB)	0.14	0.28
Residences	Daytime[3]	0.010 (80 dB)	0.020 (86 dB)	0.20 (106 dB)	0.40 (112 dB)	0.28	0.56
	Night-time	0.0070 (77 dB)	0.014 (83 dB)	0.14 (103 dB)	0.28 (109 dB)	0.20	0.40

6. ASSESSMENT OF NOISE IMPACTS FROM THE PROPOSED DEVELOPMENT

6.1 METHODOLOGY FOR ASSESSMENT OF ON SITE NOISE

This section is the assessment of the impacts of noise from the proposed development on the nearby residential receivers. To determine the predicted received noise levels from the proposed development at affected receivers, noise source levels and spectra have been taken from Hunter Acoustics database of sound levels which have been measured under conditions consistent with the requirements of Australian Standards AS 1055 and AS 1217 as applicable. The sound levels from the sources were propagated to the worst affected receivers as octave band spectra using DECC approved software that includes allowance for distance attenuation, topographic and manmade barriers, atmospheric absorption and ground absorption and reflection. The predicted received noise levels were then compared with the Project Specific Noise Goals (PSNG) as appropriate for the source.

6.1.1 Sound From On Site Plant and Equipment

To determine the noise emission from the air-conditioning plant it is assumed that the swimming pool area, the community hall and the activities building will each be fitted with a large single package air-conditioning unit with a Sound Power Level (SWL) of approximately 90 dB(A) which is mounted on the roof.

It is also assumed that each individual unit is fitted with a single split system type air conditioner (two per residential duplex building) with a Sound Power Level (SWL) of approximately 66 dB(A) mounted at ground level on an external wall.

The maximum number of individual air conditioning units that could affect any particular residential location was determined from the site plan assuming the least favourable mounting configuration and the total sound emission level for the all the air-conditioning plant that could affect the worst effected dwelling in each direction was determined by propagating the sound from the individual machines to the residence and then log adding the individual plant contributions to obtain a total incident sound pressure level.

The pool filtration equipment was assumed to be two electrically driven pumps with a total power of 7.5 kW mounted externally at ground level on the eastern side of the building that houses the gym and pool complex. The Sound Power Level for the pool pumping equipment was taken to be 85dB(A) and the noise imissions from the pool filtration equipment was also added to the noise sound level contribution from the air conditioning plant at the nearby residence that it would affect.

The calculated total received sound levels from the plant and equipment at the residences was then

compared with the night time Project Specific Noise Goal.

6.1.2 Sound from On Site Maintenance Activities

Maintenance equipment within the maintenance building is expected to consist of hand tools, hand held power tools such as saws and angle grinders and a lathe. The worst case condition for maintenance activities was considered to be the use of a power saw outside the maintenance workshop on the north western side of the building where it is directly exposed to the residences on Hayden Brook Road. The maintenance staff is expected to be one or two people and it is not likely that more than one item of hand held power equipment will be used outside at any one time. The use of a power saw as the noise source also accounts for lawn and yard care equipment which may work at different parts of the site but generally have lower Sound Power Levels than a power saw when in use.

The sound from the maintenance equipment is considered separately from the mechanical plant and the sound was propagated to the closest affected residence and compared with the daytime project specific noise goals.

6.1.3 Sound from Community Activities

The detailed plans for the individual buildings are not final at this time, therefore, the sound level generated by people within the community hall, and pool / gym complex has been propagated though the building shell assuming brick veneer construction with nominal window sizes and assuming the windows comprising at least 15% of the building wall area are open.

6.1.4 Sound from On Site Traffic

Noise levels at the nearest receiver from on site traffic within the development and from vehicles using the access road were calculated as an $L_{Aeq\ 15min}$ based on the number of vehicles identified in the traffic report as using the site.

To assess the noise impact from vehicles at the residential area on the site the maximum vehicle noise level is assumed to be continuous and it is assumed that 4 vehicles (1/4 of peak hourly traffic flow from the traffic report) are operating unprotected on the site at any one time. The maximum received sound levels are assessed as a fifteen minute equivalent continuous sound pressure level ($L_{Aeq15min}$) and are compared with the daytime noise criteria.

To assess the noise impact of vehicles travelling on the access road the vehicle pass by sound levels at the residential facade were assessed as an $L_{Aeq15min}$ for the highest hourly traffic flows. Maximum (L_{Amax}) pass by sound levels at the facade were compared with the sleep disturbance criteria to ensure that night time traffic does not cause disturbance of sleep at the residences adjacent to the access road.

The fifteen minute L_{Aeq} values were calculated using intermittent traffic noise level calculations and L_{Amax} sound level measured from typical similar traffic bypass events. The intermittent traffic calculation assumes that 4 vehicles (1/4 of peak hourly traffic flow from the traffic report) pass along the access road in fifteen minutes at an average speed of 20 km/hr. Traffic noise calculations assume the presence of a fence along the boundary of the access road as specified in Section 9 of this report.

6.2 IMPACTS FROM SITE ACTIVITIES ON NEARBY RESIDENCES

6.2.1 Sound From On Site Plant and Equipment

The predicted received sound levels were calculated assuming all equipment is operating at once. Table 6 shows that the predicted sound levels at the worst affected residential receiver locations are well within the appropriate criteria and even under the most conservative assessment the noise impact from mechanical plant will remain below the night time criteria.

Table 6 Predicted Received Sound levels from Aged Care Facility

Source	Sound Power Levels dB(A) $L_{eq15\ min}$	Nearest Residence to West (17 Leeward Close Woodrising)	Nearest Residence to South East (153 Marmong Street)	Nearest Residence to Northwest (46 Hayden Brook Road, Booragul)	Nearest Residence to South (30 Defender Close Marmong Point)	Nearest Residence to North (18 Denman Way)	Nearest Residence to East – After 10pm (121 Marmong Street)	Nearest Residence to East – Before 10pm (121 Marmong Street)
Area/ Equipment								
Air conditioner (A/C) units, single and split system unit (and no. of units considered,	66.2	(22 A/C units) 79.6 dB(A) combined	(10 A/C units) 76.2 dB(A) combined	(12 A/C units) 77.0 dB(A) combined	(20 A/C units) 79.2 dB(A) combined	(18 A/C units) 78.8 dB(A) combined	(8 A/C units) 75.2 dB(A) combined	(8 A/C units) 75.2 dB(A) combined
Pool and Gym A/C	90		90					90
Community Hall A/C	90					90	90	90
Activities Hall A/C	90							90
Kitchen Vent Fans	90					90	90	90
Pool pump (1 off, located outside and unscreened),	85.0		85.0				85	85
Distance to Receiver, from facility item (metres)		300	330	250	280	250	310	310
Distance Attenuation (dB(A))		57	58	56	57	56	58	58
Total Received Noise Level and from facility items shown above		**23**	**32**	**21**	**22**	**35**	**36**	**38**
Noise Target		**37.0 dB(A) – INP Night**						**40.0 dB(A) INP Evening**

6.2.2 Sound From Maintenance Activities

Table 7 sets out the received sound levels from maintenance activities at nearby receivers which remain below the daytime criteria.

Table 7 Sound Levels Received from Maintenance Activities

Source	Sound Power Levels dB(A) $L_{eq15\ min}$	Nearest Residence to West (13 Leeward Close, Woodrising)	Nearest Residence to North (18 Denman Way, Booragul)	Nearest Residence to Northwest (46 Hayden Brook Road, Booragul)	Nearest Residence to South (6 Columbia Close, Woodrising)
Maintenance activities outside workshop	95.0	95.0	95.0	95.0	95.0
Distance to Receiver (metres)		285	220	180	460
Drop in SPL due to distance		57	55	53	61
Total Received Noise Level and from facility items shown above dB(A)		**38**	**40**	**42**	**34**
Daytime Noise Target		**42**			

6.2.3 Sound from Community Activities

The predicted received sound levels from activities within the community and pool/gym facilities are shown in Table 8. The received sound levels at the worst affected residence have been predicted assuming an internal sound pressure level of 80 dB(A) from background music played in the gym and for any community activities that may involve singing or the use of a PA system (such as for bingo). The activities hall is not expected to generate any significant noise other than the A/C plant serving the hall.

Table 8 Sound Levels Received from Community Activities

Source	Nearest Residences to North (18 Denman Way, Booragul)	Nearest Residence to East (121 Marmong Street, Marmong Point)
Sound Power Levels dB(A) Leq15 min Open Windows on most exposed Wall of Pool Area or Community Centre 15 metres by 2.5 metres Internal SPL 80 dB(A)	95	
Distance to residence (metres)	285	300
Distance loss	57	58
Received SPL	**38**	**37**
INP Evening Criteria	**40**	**40**

The assessed worst case condition of music or a Public Address system within the gym or hall spaces with open windows that comprise most of the wall that faces the receiver complies with the evening criteria and is not likely to become a source of intrusive noise.

6.2.2 Noise from Onsite Traffic within the Development

Table 9 shows the predicted received sound levels from on site vehicles at the worst affected residence and Table 10 shows the predicted sound levels at residences adjacent to the access road from vehicles using the access road.

Table 9 Sound Levels Received from On Site Vehicles

Noise Source	Source Location	Vehicle SWL	Sound Level at Adjacent and Nearest Receptor $L_{Aeq15min}$			
		dB(A)	4 Kylie Close Marmong Point 270 metres	60 Hayden Brook Road Booragul 180 meters	139 Marmong Street, Marmong Point 230 metres	30 Defender Close, Marmong Point 240 metres
Site traffic on road within development	Perimeter Road closest to residential location	90	**33**	**37**	**35**	**35**
INP Daytime Criteria			**42**			

Table 10 Sound Levels Received from Vehicles on the Access Road.

Noise Source	Source Location	L_{Amax} Pass by SPL at Facade	Sound Level at Adjacent and Nearest Receptor $L_{Aeq15min}$		
		dB(A)	Upper floor 4 Kylie Close Marmong Point 10 metres	Upper floor 149 Marmong Street 10 meters	151 Marmong Street 10 meters
Traffic on access road adjacent to residence. 4 vehicles in 15 minutes	12 meters from the residential facade, without acoustic fence	64	48	49	48
Traffic on access road adjacent to residence. 4 vehicles in 15 minutes	12 meters from the residential facade, with acoustic fence	56	41	41	36
	INP Daytime Criteria		43	43	43
	Sleep Disturbance Criteria	47			

6.3 METHODOLOGY FOR THE ASSESSMENT OF TRAFFIC NOISE

Noise from vehicle traffic generated by the proposed development along Marmong Street was calculated based on the peak hourly traffic generation in the traffic report by BJ Bradley and Associates dated April 2010. The traffic noise levels are predicted at the facade of residences along Marmong Street and includes all cumulative traffic growth for the development as identified in the Traffic Report.

Hunter Acoustics' intermittent traffic noise prediction model was used to determine the peak 1 hourly equivalent continuous traffic noise levels for the existing road traffic and for the fully developed traffic flows after completion of the proposed. The model and input parameters have been verified by comparative measurement on similar roads.

The predicted traffic noise levels represent the traffic noise impact for the worst one hour of the day and were assessed in accordance with the requirements of the DECC Environmental Criteria for Road Traffic Noise (ECRTN).

6.4 TRAFFIC NOISE LEVELS ON MARMONG STREET

Site observations of the existing traffic at Marmong Street by Hunter Acoustics showed that the road carries low level intermittent traffic flows. Table 11 shows predicted traffic noise levels, determined for the residences on Marmong Street.

Table 11 Predicted Traffic Noise Levels Marmong Street.

	Proposed Development	Existing	Total New Level
Peak Traffic Volume	17	48	65
Calculated $L_{Aeq\ 15min,}$ Intermittent Traffic flow		50.5	52
NSW EPA Road Traffic Criteria for Local Roads, ($L_{Aeq,\ 1h)}$	**Daytime**	**55**	

The worst case traffic noise levels remain below the criteria for the ERCTN and are considered acceptable.

6.5 CONSTRUCTION NOISE

6.5.1 General Site Activities

From information provided by the proponent, the construction of this facility is expected to take place over six (6) stages, each of 18 months' duration. Construction will only take place during normal day time hours and will involve the use of medium sized earthmoving machinery which will move around the site. Hunter Acoustics has predicted noise levels for 'worst case' machinery expected on site during the construction stage.

To determine the predicted received noise levels from construction of the proposed development at affected receivers, source sound power levels and spectra have been taken from Hunter Acoustics data base of sound levels which have been measured under conditions consistent with the requirements of Australian Standards AS 1055 and AS 1217 as applicable. Sound pressure levels from the sources were propagated as octave band spectra using DECC approved software that includes allowance for distance attenuation, topographic and manmade barriers, atmospheric absorption and ground absorption and reflection.

Table 12 shows the predicted noise levels from construction machinery.

Table 12 Predicted Received Sound levels from Construction machinery – main site

Machinery type	Sound Power Levels dB(A) $L_{eq15\ min}$	Minimum Distance to Nearest Receiver, meters	Distance Attenuation (dB(A))	Received Noise Level at Nearest Residence
On Site Truck	**105**	200	54	**51**
Caterpillar Loader	**112**	200	54	**58**
Crane	**110**	200	54	**56**
Hand Tools angle Grinders and Hammer Drills	**110**	200	54	**56**
Criteria Interim Construction Noise Guideline				
Noise Affected		**RBL + 10 =47 dB(A)** $L_{Aeq\ 15min}$		
Highly Noise affected)		**75.0 dB(A)** $L_{Aeq\ 15min}$		

It is likely that there will be times when noise from construction will have a minor impact on the nearby residents but this is not at levels that are inconsistent with the ambient environment and are expected to be short term in nature. It is not likely that construction on the site (other than the access road) will give rise to noise impacts that will cause nearby residents to be highly noise affected.

6.5.2 Construction of the Access Road

6.5.2.1 Noise

The construction of the access road, will take place at distances of approximately 10 meters from the residences of each side of the access way at to 2 Kylie Close, and 151 Marmong Street, Marmong Point. Table 13 shows the sound pressure levels received at the adjacent residences from road construction machinery operating along the new access road and compares them with the targets in the DECC Interim Construction Noise Guide.

It will be necessary to liaise with nearby residents to ensure that sensitive individuals are identified and that the construction of the access road is limited to times when excessive disturbance of residents is minimised.

Table 13 Sound pressure levels from construction machinery – new access road

Machinery type	Sound Power Levels dB(A) $L_{eq15\ min}$	Minimum Distance to Nearest Receiver Facade (meters)	Received Sound level
Trucks	**105**	12	**75**
Excavator / Loader / Grader including Reversing Alarm	**112**	12	**82**
Vibratory Roller	**110**	12	**80**
Asphalt Laying Machine	**108**	12	**78**

6.5.2.2 Vibration

The construction of the access road and the installation of services such as water and sewer to the site will require the use of excavation and compaction equipment in the access corridor within close proximity to the existing residences.

Some excavation activities will generate vibration levels up to 5 mm/s while the use of vibrating compaction rollers and will generate vibration levels up to 8 mm/s at adjacent residences.

The vibration levels that will be generated by the construction of the access road are not likely to exceed the levels set out in BS7385 and therefore are not likely to cause damage to dwellings. The vibration levels will, however, exceed the levels set out in the DECC Vibration Guide at which people are likely to make adverse comment and some people may become very concerned. It is also likely that vibration levels at adjacent residences may be such that loose items may be displaced from shelving and break.

It will be necessary to develop a vibration management plan for the construction of the access road to ensure that either:-

- Only static rolling is used for the construction of the access road and installation of services,

or

- That a suitable community liaison program is put into place to manage the vibration impacts associated with the use of vibratory rolling equipment.

7. NOISE IMPACTS WITHIN THE DEVELOPMENT FROM ON SITE EQUIPMENT

This section addresses the assessment of the impacts of noise from the proposed development on the internal residents. The significant issues that need to be assessed are noise from plant and equipment that may impact on the residential dwelling units within the development. It is not considered likely that issues will arise from the use of the community centre and pool/gym complex by members of the community. Any likely noise impact on dwellings within the complex from the use of the community centre should be considered in detail at Constructing Certificate stage when final designs are in place for the community centre and the pool/gym.

Noise emissions from the maintenance facility are not assessed as part of this report and will need to be controlled by the facility management so that noise from maintenance works does not unreasonably interfere with the residents' quiet and repose.

7.1.1 Sound Emission Levels from Mechanical Plant

The maximum allowable Sound Power Level (SWL) for air-conditioners has been determined by predictive propagation of sound levels to the facade of a new unit. This also takes into account the satisfactory design sound levels, $L_{Aeq\ 1hr}$ for living areas within residential buildings, as shown in Australian Standard AS/NZS 2107:2000 and in Table 14 below.

The maximum level was also calculated by taking into account an acoustic loss through an open window.

Table 14 Noise Within Residences From Air Conditioning Units

Noise Source	Distance to Receiver	Criteria	Acoustic loss (dB(A))		Maximum SWL for Equipment
		dB(A)	Open window	Distance Attenuation	dB(A)
Air conditioning units (2 of) from nearest duplex to residence	5m	30	10	22	62
Kitchen Exhaust Fans	15 (assumed)		10	30	70**
AC on Community Centre	50		10	42	82**
AC on Activities Hall	40		10	40	80**
AC on Pool /Gym	40	30	10	40	80**

** After Enclosure or Acoustic Treatment

7.1.2 Sound Emission Levels from Sewerage Pumping Station

A Hunter Water Australia (HWA) sewerage pumping station is located on site approximately 10 metres to the North West of the maintenance shed. Hunter Acoustics has previously conducted noise surveys of similar pumping stations and has found them to be relatively quiet, with a Sound Power Level of approximately 75 dB(A). The predicted received sound pressure level from the sewerage pumping station at the closest residential dwelling, within the development, is predicted to be 27dB(A), which is 5 dB(A) below the night time Rating Background Level. Sound from the sewerage pumping station will remain inaudible as the stations do not emit any adverse sound characteristics as part of the sound signature.

8. DISCUSSION

The noise levels from on site plant and equipment will not cause offensive noise at nearby residential properties not associated with the proposed development. On site vehicles will not cause offensive noise at the nearby residences, however, vehicle traffic on the access road has the potential to interfere with sleep and may cause offensive noise at nearby residential facades during the day or evening. Suitable acoustic treatments need to be put in place to control noise impacts from the access road to the adjacent dwellings. The recommended treatment will reduce the 15 minute equivalent continuous noise level for the maximum hourly peak traffic flows to below the INP criteria. The L_{Amax} by pass noise level for an individual vehicle will remain above the sleep disturbance criteria at the upper floors of No 2 Kylie close and Number 149 Marmong Street for individual vehicles using the access road at night. Given that the nature of the development is one that is not likely to generate significant traffic volumes after 10pm it is not likely the occasional vehicle using the access road after 10pm will generate any significant interference or discomfort for those dwellings.

Construction noise and vibration has the potential to adversely impact dwellings adjacent to the access road and suitable controls need to be put into place to control noise and vibration impacts during construction of the access road.

The mechanical plant on the site has the potential to adversely impact residents within the proposed development and sound emissions from the mechanical plant on the site including the pool filtration equipment, kitchen exhaust fans, air conditioning plant for the community centre, pool/gym area, activities hall and for each domestic unit. The sound emissions level of the plant and equipment need to be controlled either by selecting the equipment to match the maximum SWL in Table 14 above or by providing suitable acoustic treatments to the equipment.

Air conditioning plant and pool filtration equipment should be selected and installed in accordance with the ANZECC guidelines attached at **Appendix 4**.

9. RECOMMENDATIONS

9.1 BUILDINGS AND FACILITIES WITHIN THE PROPOSED DEVELOPMENT

The following recommendations are made to ensure that sound emissions from plant and equipment do not become a source of offensive or intrusive noise for residents within the development:-

- The air conditioning plant associated with the new dwelling units will need to have Sound Power Levels of not more than 60 dB(A).
- The pool pump filtration equipment is to be installed so that is has an effective SWL of not more than 75dB(A).
- The Air conditioning equipment for the Community Centre, Pool / Gym and Activities building are to be installed so that each has an effective SWL of not more than 75dB(A).
- The Kitchen ventilation equipment is to be installed so that is has an effective SWL of not more than 70dB(A).
- The Pool / Gym and Activities buildings are to have the air conditioners serving the buildings not in use after 10pm,
- Community Centre, Pool / Gym facility and Activities buildings to be brick veneer construction unless otherwise approved by an appropriately qualified acoustic professional.

9.2 ACCESS ROAD

The following recommendations are made so that traffic on the access road does not become a source of offensive noise for adjacent residences:-

- Construct an acoustic fence to a height of 1.8 metres above the finished road level and not more than 1.5 metres from the edge of the access road carriageway as shown in Figure 2 below.

Figure 2 Location of Acoustic Fence to Protect Residences Adjacent to the Access Road.

Location of Acoustic Fence

9.3 CONSTRUCTION NOISE AND VIBRATION

The following recommendations are made so that control of construction noise and vibration emissions during the construction of the access road is adequately controlled:-

- A construction noise and vibration management plan that addresses control of noise and vibration for dwellings within 40 meters of the construction activity.

10. CONCLUSIONS

The assessment has shown that the proposed development can comply with the requirements of the Protection of The Environment Operations Act and the NSW Industrial Noise Policy. Recommendations have been made to ensure that construction noise and vibration levels are appropriately managed during the construction of the project. Therefore, it is my professional opinion that the level of noise impact will not exceed what would be considered acceptable by the majority of the population.

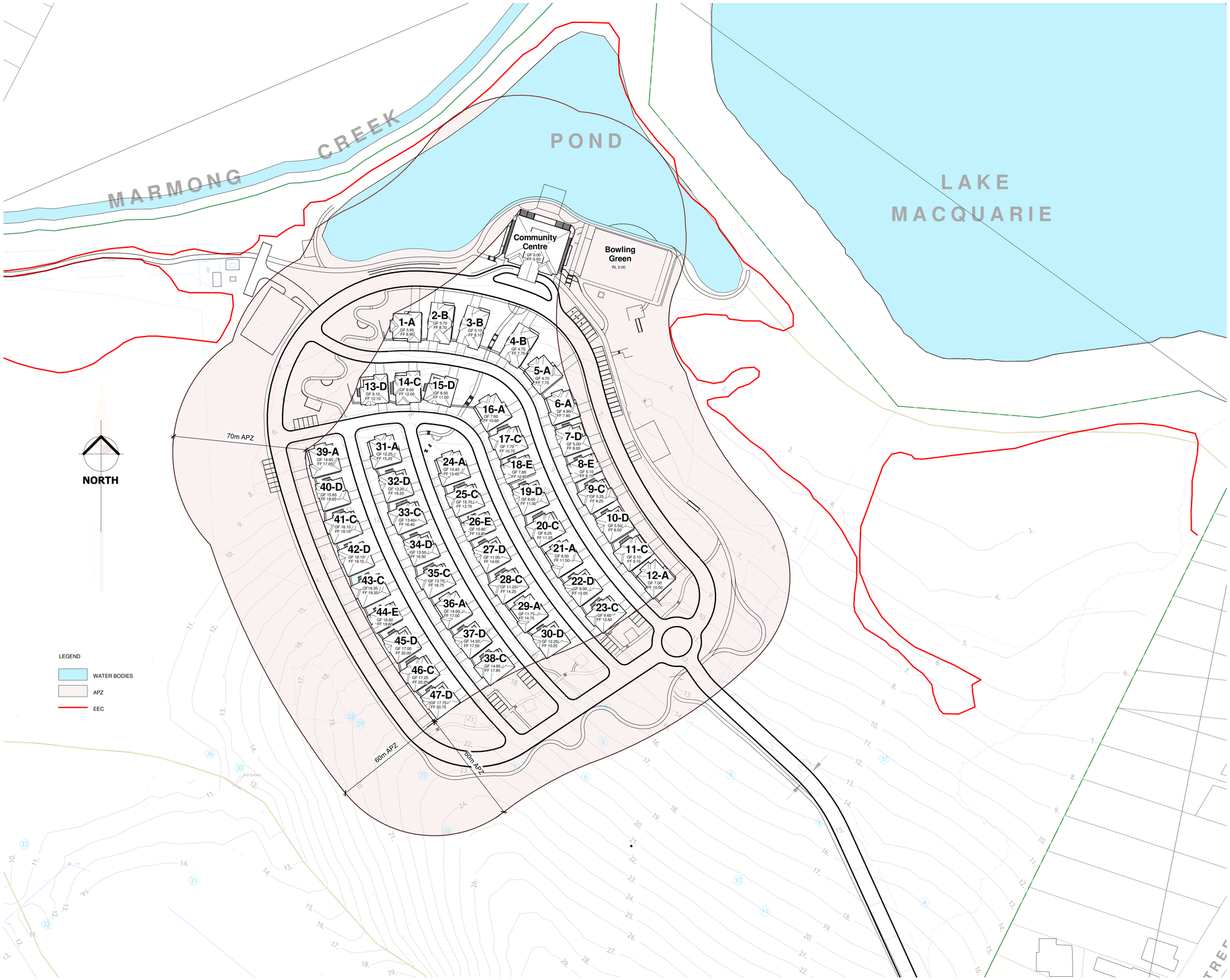
Please do not hesitate to contact me if you have any questions regarding this report.

Yours Sincerely
Hunter Acoustics

Matthew Bain MDesSc (Audio & Acoustics)
Acoustics Consultant / Technician

Appendix 1 Location and Surrounding Dwellings

Appendix 2 – Drawing of Site Plan - Peter Dalton Architects Drawing, Project ELSS01, amended 28 March 2012.



1 Site 1/1000

1 : 1000

REVISION	DESCRIPTION	DATE
1	ISSUED FOR REVISED DA	25/10/12

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Empowered Living Support Services Ltd

Aged Care Development
153 Marmong St
Marmong Point

Site Plan 1/1000

A101

Scale 1 : 1000

1 Site 1/2000

1 : 2000

Building	Level	Living area	Garage	Patios	Total	Qty	Total Floor area	Description
Type A	Ground Floor	171	33	24	204	11	2244	2 bedrooms + 3rd bedroom /study + Ensuite + bathroom + double garage
Type A	First Floor	152	33	22	185	11	2035	2 bedrooms + 3rd bedroom /study + Ensuite + bathroom + double garage
Type B	Ground Floor	197	33	27	230	3	690	2 bedrooms + 3rd bedroom /study + Ensuite + bathroom + double garage
Type B	First Floor	194	33	27	227	3	681	2 bedrooms + 3rd bedroom /study + Ensuite + bathroom + double garage
Type C	Ground Floor	160	33	22	193	14	2702	2 bedrooms + 3rd bedroom /study + Ensuite + bathroom + double garage
Type C	First Floor	162	33	23	195	14	2730	2 bedrooms + 3rd bedroom /study + Ensuite + bathroom + double garage
Type D	Ground Floor	154	33	15	187	15	2805	2 bedrooms + 3rd bedroom /study + Ensuite + bathroom + double garage
Type D	First Floor	175	33	25	208	15	3120	2 bedrooms + 3rd bedroom /study + Ensuite + bathroom + double garage
Type E	Ground Floor	124	23	11	146.6	4	586.4	2 bedrooms + Ensuite + bathroom + single garage
Type E	First Floor	124	23	21	147	4	588	2 bedrooms + Ensuite + bathroom + single garage
						94	**18181.4**	

NOTE:
- DEVELOPMENT TO BE IN ACCORDANCE WITH SEPP (HOUSING FOR SENIORS OR PEOPLE WITH A DISABILITY) 2004
- REFER TO CIVIL ENGINEERING PLANS (ADW JOHNSON) FOR STORMWATER, ROAD DESIGN, SEDIMENT & EROSION DETAILS
- REFER TO LANDSCAPING PLANS (MOIR LANDSCAPE ARCHITECTURE) FOR LANDSCAPING DETAILS & FINISHES

Building Sustainability Assessments Ph: 4962 3438
enquiries@buildingsustainability.net.au www. buildingsustainability.net.au

Important Note for Development Applicants:

The following specification details the requirements necessary to achieve the thermal performance values as indicated on the ABSA Certificate. Once the development is approved by Council, these specifications will become a condition of consent and must be included in the built works. If you do not want to include these requirements, or need further information, please contact Building Sustainability Assessments.

ABSA Assessor #20305 **Certificate # - Refer to stamp** **October 2012**
Thermal Performance Specifications - BSA Ref: 5726 (Marmong Point)

These are the Specifications upon which the Certified Assessment is based. If they vary from drawings or other written specifications, these Specifications shall take precedence. If only one specification option is detailed for a building element, that specification must apply to all instances of that element for the whole project. If alternate specifications are detailed, the location and extent of the alternate specification must be detailed below and / or clearly indicated on referenced documentation.

External Wall Construction	*Insulation*	*Colour (Solar Absorptance)*		*Detail*
Brick Veneer	R1.5	Any		
Cavity Brick	none	Any		
Internal Wall Construction	*Insulation*	*Detail*		
Plasterboard on studs & Brick	none			
Ceiling Construction	*Insulation*	*Detail*		
Plasterboard	R3.5 to ceilings adjacent to roof space			
Roof Construction	*Insulation*	*Colour (Solar Absorptance)*		*Detail*
Roofing Tile	Foil	Any		
Floor Construction	*Insulation*	*Covering*		*Detail*
Concrete	none	As drawn (if not noted default values used)		

Windows	*Glass and frame type*	*U*	*SHGC*	*Area sq m*	*Detail*
Generic	Single clear Aluminium			As drawn on plans	

Skylights	*Glass and frame type*	*U*	*SHGC*	*Area sq m*	*Detail*

U and SHGC values are according to NFRC. Alternate products may be used if the U value is lower and the SHGC is less than 10% higher or lower than the above figures.

External Window Cover *Detail*

Fixed shading - Eaves *Width includes guttering, offset is distance above windows*
Width as drawn Offset: as drawn Nominal only, refer to plan for detail
Fixed shading - Other *Verandahs, Pergolas (type and description)*
Shaded areas as drawn

Ventilation and Infiltration to Habitable Rooms

Open fire no damper	no	*Exhaust fans no dampers*	no
Door and window seals	yes	*Vented skylights*	no
Vented downlights	no	*Fixed wall or ceiling vents*	no

"No" means that the item was not included in the assessment and shall not be installed.
Yes to door & window seals means that seals are to be fitted to all external doors and windows.

REVISION	DESCRIPTION	DATE
3	REVISED TO SUIT RFS REQ	25/10/12
2	AMENDED	28/03/12
1	ISSUED FOR DA	19/09/11

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Empowered Living Support Services Ltd

Aged Care Development
153 Marmong St
Marmong Point

Site Plan 1/2000

A100

Scale 1 : 2000

EXISTING SEWER PUMPING STATION

8m WIDE ROAD REFER TO CIVIL ENGINEERING PLANS FOR DETAILS

Community Centre
GF 3.15
FF 6.15

Bowling Green
RL 2.95

CARAVAN & BOAT PARKING AREA

VISITORS CARPARKING
16 OFF (2500x6000)
4 OFF (DISABLED In accordance with AS2890.6)

VISITORS CARPARKING
5 OFF (2500x6000)

VISITORS CARPARKING
7 OFF (2500x6000)

VISITORS CARPARKING
6 OFF (2500x6000)

VISITORS CARPARKING
8 OFF (2500x6000)

8m WIDE ROAD REFER TO CIVIL ENGINEERING PLANS FOR DETAILS

6m WIDE ROAD REFER TO CIVIL ENGINEERING PLANS FOR DETAILS

NORTH

1-A GF 5.95 FF 8.95
2-B GF 5.70 FF 8.70
3-B GF 5.10 FF 8.10
4-B GF 4.75 FF 7.75
5-A GF 4.75 FF 7.75
6-A GF 4.90 FF 7.90
7-D GF 5.00 FF 8.00
8-E GF 5.10 FF 8.10
9-C GF 5.25 FF 8.25
10-D GF 5.50 FF 8.50
11-C GF 6.10 FF 9.10
12-A GF 7.00 FF 10.00
13-D GF 9.10 FF 12.10
14-C GF 9.00 FF 12.00
15-D GF 8.50 FF 11.50
16-A GF 7.60 FF 10.60
17-C GF 7.70 FF 10.70
18-E GF 7.85 FF 10.85
19-D GF 8.00 FF 11.00
20-C GF 8.25 FF 11.25
21-A GF 8.50 FF 11.50
22-D GF 9.00 FF 12.00
23-C GF 9.60 FF 12.60
24-A GF 10.45 FF 13.45
25-C GF 10.70 FF 13.70
26-E GF 10.80 FF 13.80
27-D GF 11.00 FF 14.00
28-C GF 11.25 FF 14.25
29-A GF 11.75 FF 14.75
30-D GF 12.25 FF 15.25
31-A GF 12.25 FF 15.25
32-D GF 13.20 FF 16.20
33-C GF 13.40 FF 16.40
34-D GF 13.50 FF 16.50
35-C GF 13.75 FF 16.75
36-A GF 14.00 FF 17.00
37-D GF 14.50 FF 17.50
38-C GF 14.85 FF 17.85
39-A GF 14.65 FF 17.65
40-D GF 15.65 FF 18.65
41-C GF 16.10 FF 19.10
42-D GF 16.15 FF 19.15
43-C GF 16.35 FF 19.35
44-E GF 16.60 FF 19.60
45-D GF 17.00 FF 20.00
46-C GF 17.25 FF 20.25
47-D GF 17.75 FF 20.75

REVISION	DESCRIPTION	DATE
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Empowered Living Support Services Ltd

Aged Care Development
153 Marmong St
Marmong Point

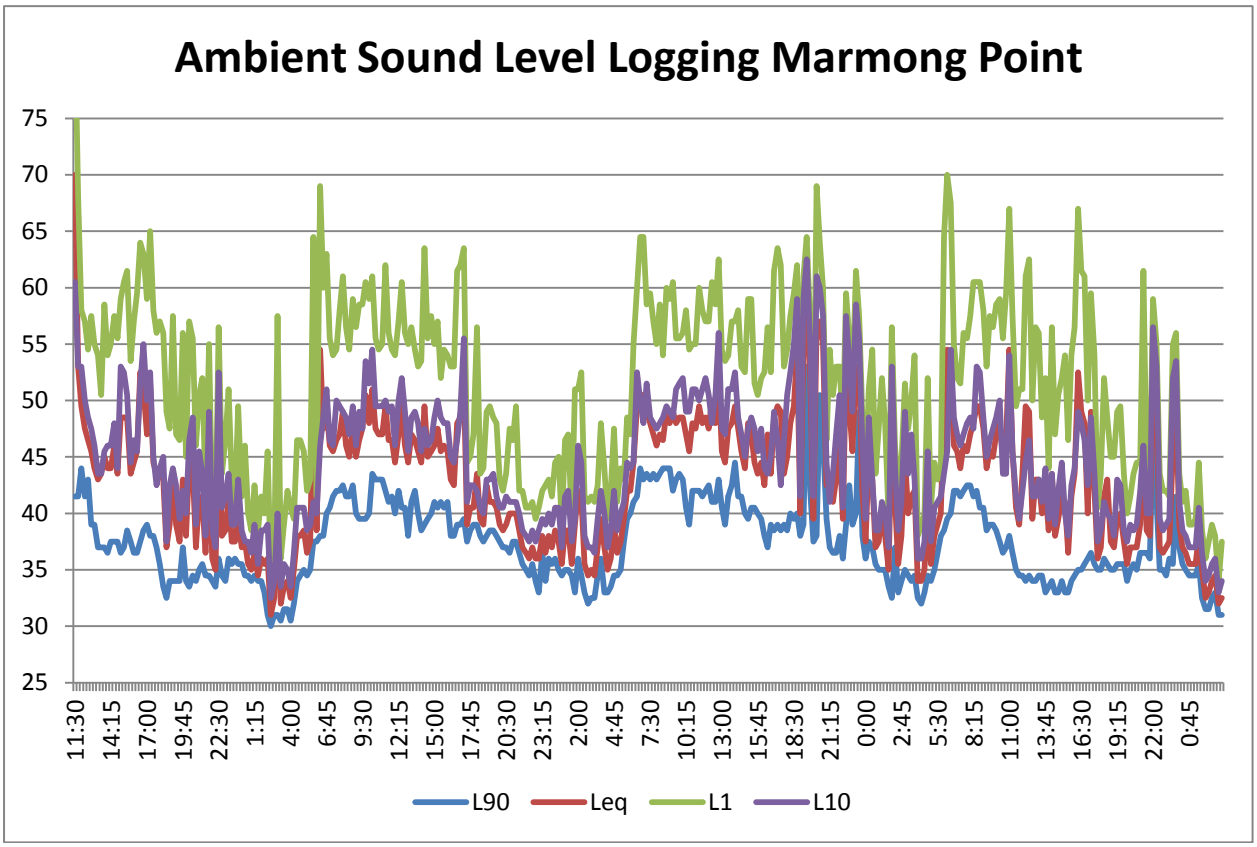
Site Plan 1/500

A102

Scale 1 : 500

1 Site 1/500
1 : 500

Appendix 3 Data Logged Sound Levels – Marmong Point Development



Air conditioner noise

Buying an air conditioner?

Then protect your investment and buy one that will not intrude noisily on your neighbours.

In Australia there are laws that stop noisy air conditioners from being used where the noise is annoying to neighbours. In fact your air conditioner may need to be inaudible to your neighbours if you wish to use it at night.

The best policy is to buy the quietest air conditioner suited to your heating/cooling needs and have it installed as far as possible from neighbours or in a well shielded location.Most air conditioners in Australia have a label which describes the amount of noise they make. **The smaller the number of dBA on the label the quieter the air conditioner.**

OUTSIDE SOUND POWER LEVEL	60 dBA
(LOWER LEVELS MEAN LOWER OUTSIDE NOISE) THE LEVEL SHOWN ABOVE MAY BE USED TO ESTIMATE WHETHER THE OUTSIDE NOISE FROM THE PROPOSED INSTALLATION OF THIS UNIT WILL BE WITHIN ACCEPTABLE LIMITS	
CONSULT YOUR SUPPLIER BEFORE INSTALLATION	
(MANUFACTURER)	(MODEL No.)

The number on the air conditioner you buy should not exceed the number you calculate using this guide.

Note that the back page provides a quick estimation for some commonly used air conditioner locations.

It is also recommended that you consult your air conditioner salesperson or installer before you commit yourself.

What to do

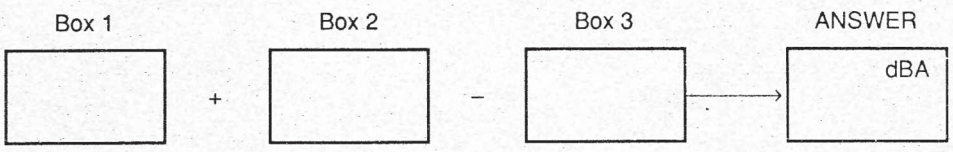
Follow steps 1 - 4 carefully or make sure that the person selling or fitting your new air conditioner makes a similar check for you.

Step 1 The closer your air conditioner is to your neighbour the quieter it will need to be. Follow the procedure in Appendix A and put your answer in Box 1.

Step 2 If there is a fence or wall between yourself and your neighbour the noise may be reduced. Check this using Appendix B and put your answer in Box 2.

Step 3 Noise can reflect off walls and make your air conditioner appear louder. Follow the instructions in Appendix C and put your answer in Box 3.

Step 4 Add the numbers in Box 1 and Box 2 then subtract the number in Box 3.



The number on the label of your air conditioner should not be more than the number in the answer box.

If you already own an air conditioner and the number on it is bigger than that in the answer box, then you may need to consider the feasibility of installing a noise control device specially designed for the air conditioner, locating the air conditioner elsewhere or replacing it.

AUSTRALIAN ENVIRONMENT COUNCIL

Appendix A

Step 1 Measure the **shortest** distance, in metres, between where you want to put your air conditioner and the nearest neighbouring fence line. Mark the distance with an X in column 1, below .

Bear in mind that to reduce noise, air conditioners are best placed in a location which provides the greatest distance between the air conditioner and neighbours. This could, for example, mean mounting your air conditioner facing the back fence or front street.

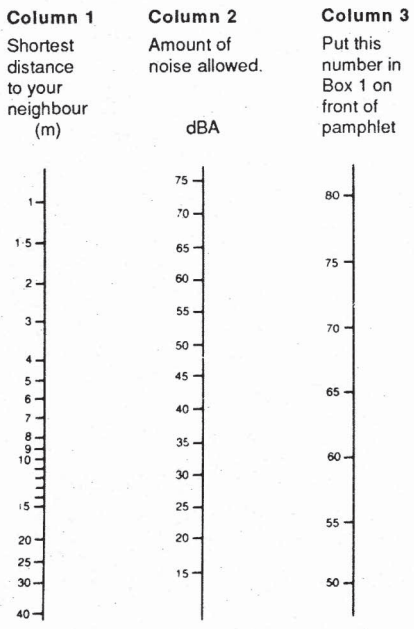
In rural areas you may consider that it is more relevant to measure the distance between your air conditioner and the nearest area used by your neighbour (such as a garden relaxation area).

Step 2 Find out if there are laws regarding noise in your State or local area. Information on who to contact is listed on the back of this pamphlet.

Mark the amount of noise allowed in your area with an X in column 2.

If there is no prescribed maximum amount of noise and you live in a quiet residential area, a mark at 40 dBA or less could be used as a guide. Alternatively you may wish to arrange to have the background noise levels in your area measured.

Step 3 Draw a straight line from the X in column 1 through the X in column 2 to cut through column 3. Write down in Box 1 on the front of this pamphlet the number in column 3 that is on the line you have drawn.



Appendix B

A fence/barrier can reduce the level of air conditioner noise heard in neighbouring premises. To do this a fence/barrier will need to be continuous and solid. It should contain very few gaps, particularly where the fence meets the ground. The fence/barrier must also prevent the airconditioner being seen from noise sensitive locations on neighbouring premises. Noise sensitive locations include windows of bedrooms and living rooms (including those of multistorey dwellings) and outdoor entertaining/ relaxing areas.

What to do

Carefully read through the fence/barrier descriptions below starting at point 1. Select a value that corresponds to the fence/barrier description applicable to your situation. Put this value in Box 2 on the front page.

Value for box 2

1. The fence/barrier does not prevent the airconditioner being seen from between the air conditioner and noise sensitive locations on the neighbouring premises. 0

2. The fence/barrier only just blocks "line of sight" and it is made of material having gaps, such as a standard picket fence, a brush fence or a brick fence with fancy iron inserts. 0

3. The fence/barrier only just blocks "line of sight" and is made of solid material. 5

4. Fence/Barrier with Gaps

   e.g. Hedges/bushes/trees
   Ti tree/brush
   Picket fence
   Fence in disrepair with holes or missing planks
   Cyclone fence
   Masonry fence with decorative open inserts. 0

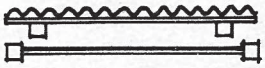
5. The fence/barrier completely blocks "line of sight" of the air conditioner noise sensitive locations.

   Typical Paling Fence  6

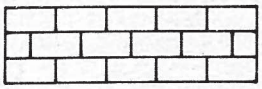
   e.g. Planks overlapped by 25 mm planks, 13 mm thick. Air gaps between palings due to warping etc.

   Solid Fence with no Gaps and Flush to the Ground. 10

   e.g. Galvanised iron
   Fibre cement sheeting
   20 mm Pine planking with 35 mm overlap.

   Concrete block/ masonry/brick

Special notes

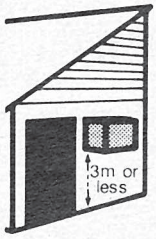
1. If you consider that your house would stop noise reaching your neighbours, consult the authority listed on page 4 for an appropriate value.

2. If in doubt about your fence type, select a low value.

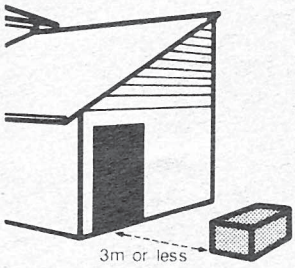
Appendix C

Just as light reflects from mirrored surfaces, sound will reflect from walls, carports, roofs and the like. Find a diagram below which would correspond to the placement of your air conditioner. Put the corresponding value in Box 3 on the front page of this pamphlet and go on to **STEP 4** on the front page.

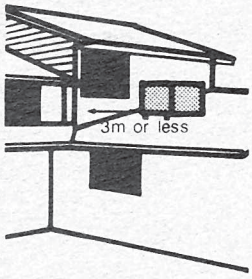
	Value for box 3
One reflective surface	**3**



on side of building

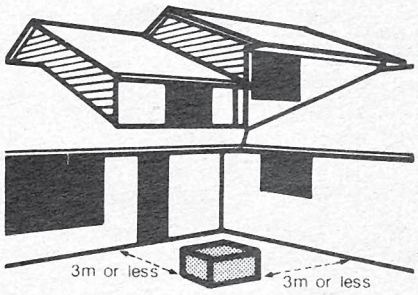


on ground

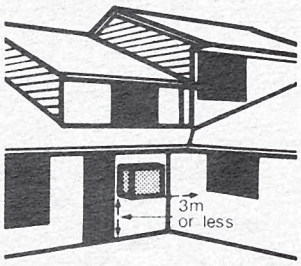


on roof

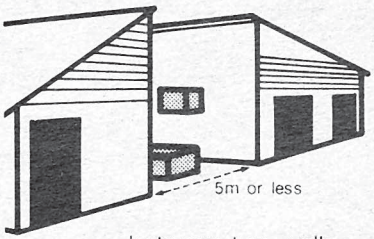
Two reflective surfaces	**6**



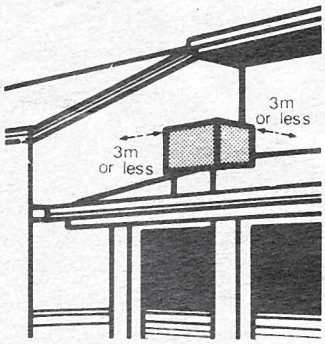
on ground



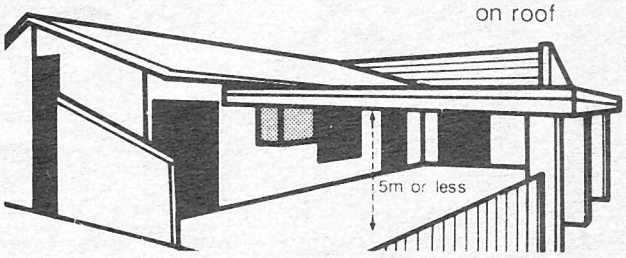
on side of building



between two walls



on roof



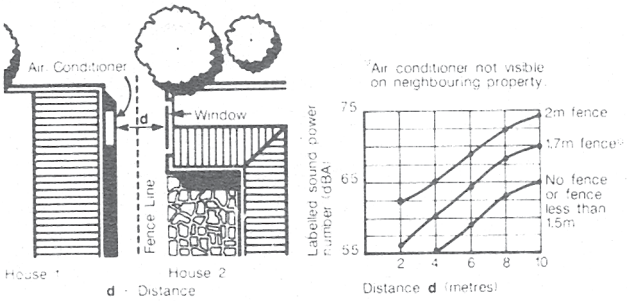
under carport

To find out how much noise your air conditioner is allowed to make talk to:

ACT	Environment Protection Section, ACT Administration
NSW	Your Local Council
NT	Your Local Council or the Conservation Commission
Qld.	Your Local Council
S.A.	Department of Environment and Planning
Tas.	Your Local Council or the Department of the Environment
Vic.	Your Local Council or the Environment Protection Authority
WA	Your Local Council or the Environmental Protection Authority

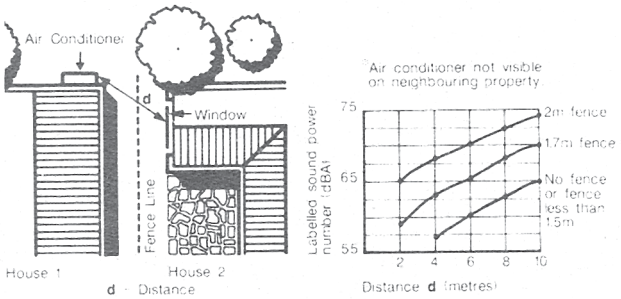
Quick estimations for commonly occurring air conditioner installation locations

Case A An air conditioner between two houses.



1. Measure the shortest distance d, in metres, between where you plan to put the air conditioner and a noise sensitive location on the neighbouring premises.
2. Measure the height of the fence (if any) between your house and your neighbour. Assume the fence is less than 1.5 mm high if it has openings, e.g. picket, brush, poor condition paling fences, brick walls with lots of gaps.

Case B An air conditioner against the front or back wall.



3. Looking at the graph find the applicable distance d then take a vertical line up to meet a line corresponding to the fence height. Read across to the left to determine the maximum sound power number that may be on your air conditioner.

Note 1. Where there is no fence or a fence less than 1.5 m high and d = 2 m, or less, there is unlikely to be an air conditioner suitable for this location.

Note 2. These examples are based on single storey homes located on flat ground. If your situation differs you are advised to use the full calculation method.

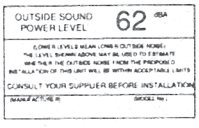
Example of full estimation method

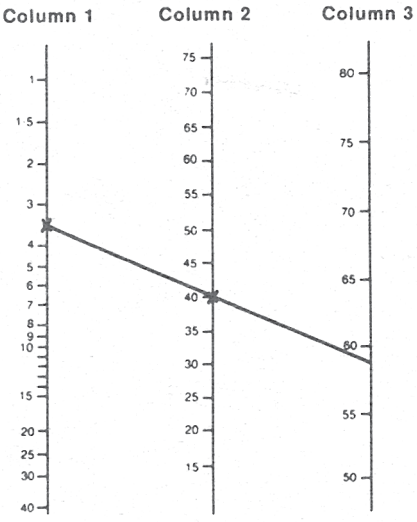
Step 1 You plan to locate your air conditioner 3.5 metres from your neighbour's patio so you put a mark at 3.5 in column 1.
The Local Council advises you that the noise level at your neighbour's property should not exceed 40 dBA, so you put a mark at 40 in column 2. Joining these two points with a straight line through column 3 gives a value of 58.

Step 2 The fence between the air conditioner and your neighbours would block "line of sight" and is made of galvanised iron. Put 10 in Box 2.

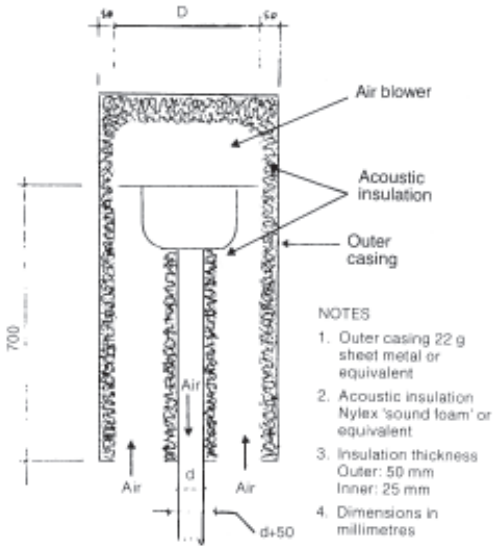
Step 3 The air conditioner is between two walls as shown in Appendix C example 3 d. Put 6 in Box 3.

58	+	10	−	6	→
Box 1		Box 2		Box 3	



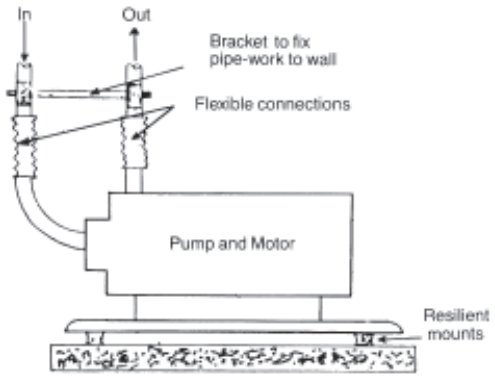


You have therefore found that the number on the air conditioner you buy should not exceed 62 dBA if you install it at this location.



Acoustic Attenuator for Spa Blower

Vibration – problems can be overcome by isolating the equipment using antivibration mounts and flexible connections on the pipework as shown in the following sketch.



Example of a good pump installation

State and Territory Noise Control Authorities

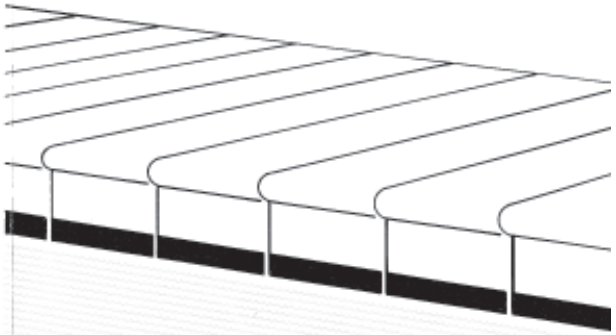
ACT	Department of the Arts, Sport, the Environment, Tourism and Territories Telephone: (062) 467 2211
NSW	State Pollution Control Commission Telephone: (02) 265 8888
Northern Territory	Conservation Commission of the Northern Territory Telephone: (089) 22 0211
Queensland	Contact your local council
South Australia	Department of Environment and Planning Telephone: (08) 216 7600
Tasmania	Department of the Environment Telephone: (002) 30 2770
Victoria	Environmental Protection Authority Telephone: (03) 628 5111
Western Australia	Environmental Protection Authority Telephone: (09)222 7000

Before you take the plunge consider . . .

NOISE!

from

swimming & spa pools



THE AUSTRALIAN ENVIRONMENT COUNCIL

Noise can annoy your neighbour.

A common source of annoyance, particularly during the summer months, is the noise from swimming pool and spa equipment.

Before you buy, your responsibilities.

Respect your neighbours' right to peace and quiet. Consult your Local Council or your State Noise Control Authority about any relevant laws. If you don't, you may find the use of pumps, filters or blowers is restricted and this in turn may spoil your enjoyment.

Before you sign for your pool or spa.

Discuss your concern about noise with your pool salesman and include a statement in the contract which binds your installer to at least satisfy Local, State or Territory Government Laws about noise. This may save you significant costs at a later date.

If there are no laws, ask the installer to ensure that your pump noise is inaudible on nearby residential premises.

Planning your pool or spa.

A lot of problems can be avoided by proper planning. Consider the following factors when planning your pool or spa.

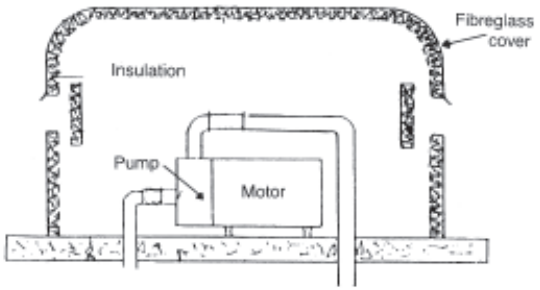
1 **Distance** – locate the noisy equipment as far as practicable from your neighbour.

2 **Fences or barriers** – if possible, place any pool or spa equipment behind a solid fence, wall or barrier to screen the equipment from the direct view of your neighbours.

However any nearby surface other than that between your pool equipment and your neighbours may reflect the noise back towards them – so be careful.

3 **Noise enclosures** – in some instances steps (1) and (2) will be insufficient to adequately reduce the noise. In these cases noise enclosures can be constructed relatively cheaply and may be effective in reducing the noise, while still allowing the equipment to function normally. Alternatively, you may be able to buy a ready-made enclosure. If you decide to build an enclosure yourself, refer to the enclosed sketch and remember these points.

(a) The enclosure cover needs to be strongly constructed and should not contain any holes or gaps other than those shown in the sketch for ventilation.



Typical Custom-built Enclosure

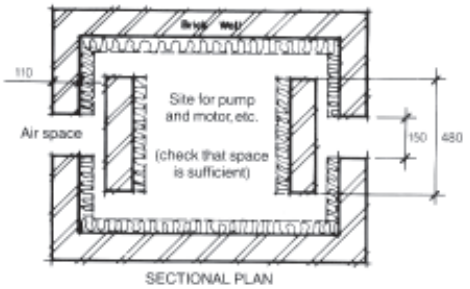
(b) The cover should fit firmly on the ground and should not come into contact with any equipment or pipework. It is preferable that pipework enter or exit the enclosed space from under the ground, rather than through the walls of the enclosure.

If it is necessary for pipework to pass through the enclosure, then make sure that the gap is as small as possible without touching the enclosure and fill the gap with a resilient sealant.

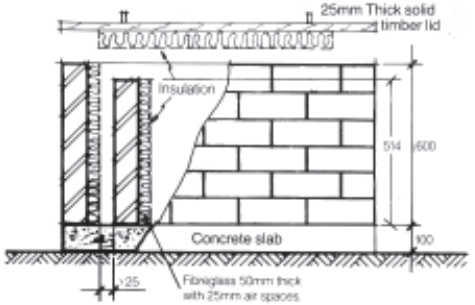
(c) Ventilation should be provided – enough to ensure that the motor does not overheat. Ventilation ducts or passages should be treated with sound absorbing materials.

Typical Enclosure for Swimming Pool Pump and Motor Unit.

Notes: 1. Outside dimensions of enclosure to suit pump/motor requirements.
2. Drawings not to scale.



SECTIONAL PLAN



ELEVATION AND PART SECTION

NOTE: Enclosure lined with fibreglass 50 mm thick and of a density 70-100 kg/m^3 faced with perforated aluminium foil.

Appendix 4 ANZECC guidelines for Air conditioning plant and pool filtration equipment