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Noise Impact Assessment

Lot 9101 Warton Road, Piara Waters

Reference: 21026102-01C

Prepared for:
Aigle Royal Developments

Report: 21026102-01C

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Date:	Rev	Description	Prepared By	Verified
07-Apr-21	-	Draft issued for comments	Olivier Mallié	Terry George
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25-Jul-22	A	Updated to 2041 Road Traffic Volumes. No Change to Dog Kennel Assessment.	Terry George	-
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26-Jun-23	C	Re-included 2.1m high side wall	Terry George	-

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1 INTRODUCTION

This report presents the assessment of noise impacts from road traffic on Warton Road and nearby kennels onto Lot 9101 Warton Road in Piara Waters.

The proposed Structure Plan and Subdivision Plan are shown on *Figure 1-1* and *Figure 1-2* (Rowe Group Design).

This assessment is based on work undertaken by Lloyd George Acoustics for the following projects in the area:

- South Forrestdale local structure plan: *Noise Impact Assessment, Warton Road, South Forrestdale Concept Plan*, document reference 18014294-01, revision B dated 31 December 2019. And,
- Lot 9007 noise study for National Lifestyle Village (NLV), document reference 19014780-01, 06 June 2019.

It is noted that as part of the South Forrestdale 2019 noise study (the 2019 noise study), consultation with the City of Armadale, City of Cockburn, Department of Water and Environment Regulation and the kennel owners was undertaken throughout June 2018. Of particular interest, the discussions held with the City of Armadale were critical in determining an appropriate methodology for the noise assessment of the potential impacts from the kennels. The relevant aspects of the consultation to this assessment can be summarised as follows:

- Ashridge Kennel owner confirmed 100% occupancy of kennels during the noise survey undertaken in July 2018.
- City of Armadale supported noise logging exercise during the school holiday period when kennels are historically at peak occupancy.
- City of Armadale supported the methodology and data analysis as highlighted in *Section 3.1* and *Section 4.1* respectively.
- City of Armadale requested that the cumulative effects of an additional kennel be considered in the assessment to provide a conservative assessment.
- City of Armadale was supportive of the use of noise walls, quiet house design principles and Memorials on Titles as part of the overall noise control package.

Appendix A contains a description of some of the terminology used throughout this report.

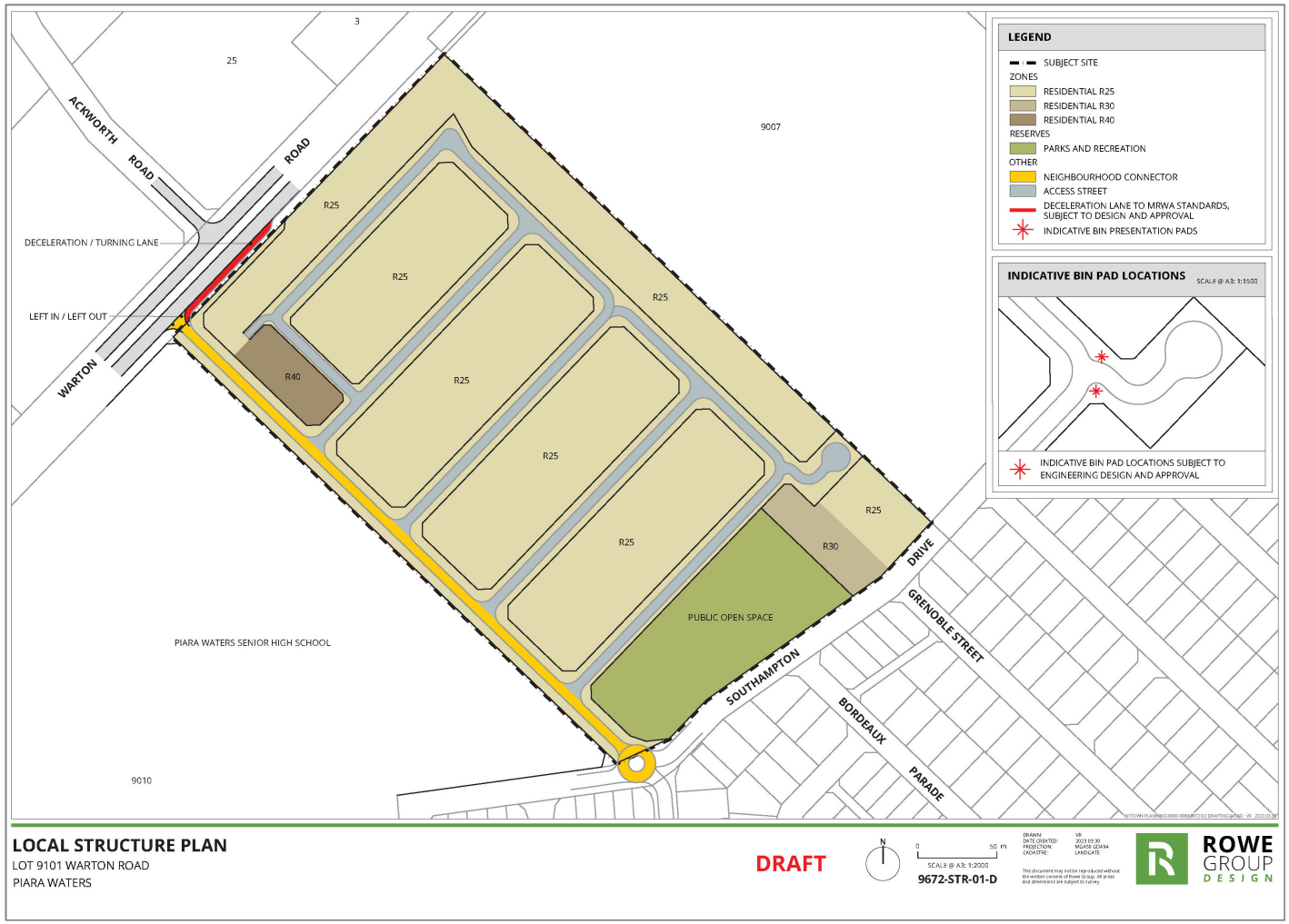


Figure 1-1 Lot 9101 Local Structure Plan

Figure 1-2 Lot 9101 Subdivision Concept Plan

2 CRITERIA

2.1 Road Traffic Noise

The criteria relevant to this assessment are provided in *State Planning Policy No. 5.4 Road and Rail Noise* (hereafter referred to as SPP 5.4) produced by the Western Australian Planning Commission (WAPC). The objectives of SPP 5.4 are to:

- Protect the community from unreasonable levels of transport noise;
- Protect strategic and other significant freight transport corridors from incompatible urban encroachment;
- Ensure transport infrastructure and land-use can mutually exist within urban corridors;
- Ensure that noise impacts are addressed as early as possible in the planning process; and
- Encourage best practice noise mitigation design and construction standards

Table 2-1 sets out noise targets that are to be achieved by proposals under which SPP 5.4 applies. Where the targets are exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.

Table 2-1 Noise Targets for Noise-Sensitive Land-Use

Outdoor Noise Target		Indoor Noise Target	
55 dB $L_{Aeq(Day)}$	50 dB $L_{Aeq(Night)}$	40 dB $L_{Aeq(Day)}$ (Living and Work Areas)	35 dB $L_{Aeq(Night)}$ (Bedrooms)

Notes:

- Day period is from 6am to 10pm and night period from 10pm to 6am.
- The outdoor noise target is to be measured at 1-metre from the most exposed, habitable[1] facade of the noise sensitive building.
- For all noise-sensitive land-use and/or development, indoor noise targets for other room usages may be reasonably drawn from Table 1 of Australian Standard/New Zealand Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors (as amended) for each relevant time period.
- Outdoor targets are to be met at all outdoor areas as far as is reasonable and practicable to do so using the various noise mitigation measures outlined in the Guidelines.

The application of SPP 5.4 is to consider anticipated traffic volumes for the next 20 years from when the noise assessment is undertaken.

In the application of the noise targets, the objective is to achieve:

- indoor noise levels specified in *Table 2-1* in noise-sensitive areas (e.g. bedrooms and living rooms of houses and school classrooms); and
- a reasonable degree of acoustic amenity for outdoor living areas on each residential lot. For non-residential noise-sensitive developments, for example schools and childcare centres, the design of outdoor areas should take into consideration the noise target..

[1] A habitable room is defined in State Planning Policy 3.1 as a room used for normal domestic activities that includes a bedroom, living room, lounge room, music room, sitting room, television room, kitchen, dining room, sewing room, study, playroom, sunroom, gymnasium, fully enclosed swimming pool or patio.

2.2 Environmental Protection (Noise) Regulations 1997

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations). The Regulations are applicable to the noise emissions from the kennels and the local pistol club.

Regulation 7 defines the prescribed standard for noise emissions as follows:

"7. (1) Noise emitted from any premises or public place when received at other premises –

(a) Must not cause or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and

(b) Must be free of –

i. tonality;

ii. impulsiveness; and

iii. modulation,

when assessed under regulation 9"

A "…noise emission is taken to significantly contribute to a level of noise if the noise emission … exceeds a value which is 5 dB below the assigned level…"

Tonality, impulsiveness and modulation are defined in Regulation 9. Noise is to be taken to be free of these characteristics if:

(a) The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and

(b) The noise emission complies with the standard prescribed under regulation 7 after the adjustments of *Table 2-2* are made to the noise emission as measured at the point of reception.

Table 2-2 Adjustments Where Characteristics Cannot Be Removed

Where Noise Emission is Not Music			Where Noise Emission is Music	
Tonality	Modulation	Impulsiveness	No Impulsiveness	Impulsiveness
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

Note: The above are cumulative to a maximum of 15dB.

The baseline assigned levels (prescribed standards) are specified in Regulation 8 and are shown in *Table 2-3*.

Table 2-3 Baseline Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays (Sunday)	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days (Evening)	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

The influencing factor will depend on a receiver's vicinity to commercial land (e.g. kennels) and will also include a transport factor that will depend on the receiver's location relative to Warton Road. The influencing factor was calculated as follows:

- Based on land use maps from the City of Cockburn and City of Armadale, the surrounding land west of Warton Road is zoned 'resource' which would imply an industrial type of use e.g. sand mining however, the current use of the land is kennels and rural residential. On the east side of Warton Road, the land is predominantly residential type. As such, and to be conservative, only the land used for the existing commercial kennels (i.e. 7, 15 and 18 Hybrid Court, and 660 Warton Road) were considered commercial type premises, resulting in future premises within 450 metres of the kennels having a 1-2 dB increase in their influencing factor. Should the land west of Warton Road be considered as industrial, the influencing factor increase would be as much as 5 dB for future residences within 100 metres of the kennels.
- Based on existing traffic data for Warton Road, either sides of Jandakot Road (MRWA count 2019/20 at sites 3673 and 51134), the transport factor is 6 dB at future premises within 100 metres of Warton Road and 2 dB at future residences further than 100 metres but within 450 metres, and 0 dB elsewhere.

From the previous discussion, the influencing factor applicable at future residences was determined to be:

- 8 dB at future residences within 100 metres of both the kennels and Warton Road;
- 7 dB at future residences within 100 metres of Warton Road and within 450 metres from the kennels; and
- 3 dB at future residences within 450 metres of Warton Road and the kennels, but further than 100 metres from both.

Table 2-4 shows the range assigned noise levels including the influencing factor and transport factor at the receiving locations.

Table 2-4 Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	48 to 53	58 to 63	68 to 73
	0900 to 1900 hours Sunday and public holidays (Sunday)	43 to 48	53 to 58	68 to 73
	1900 to 2200 hours all days (Evening)	43 to 48	53 to 58	58 to 63
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	38 to 43	48 to 53	58 to 63

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

It must be noted the assigned noise levels above apply outside the receiving premises and at a point at least 3 metres away from any substantial reflecting surfaces. Where this not achievable, the noise emissions can also be assessed internally in accordance with regulation 19.

It is further noted the assigned noise levels are statistical levels and therefore the period over which they are determined is important. The Regulations define the Representative Assessment Period (RAP) as *a period of time of not less than 15 minutes, and not exceeding 4 hours*, which is determined by an *inspector* or *authorised person* to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission. An *inspector* or *authorised person* is a person appointed under Sections 87 & 88 of the *Environmental Protection Act 1986* and include Local Government Environmental Health Officers and Officers from the Department of Environment Regulation. Acoustic consultants or other environmental consultants are not appointed as an *inspector* or *authorised person*. Therefore, whilst this assessment is based on a 1 hour RAP, which is assumed to be appropriate given the nature of the operations, this is to be used for guidance only.

3 METHODOLOGY

The noise modelling methodology used is the same as that used for the 2019 study, with the exception of the finished levels for Lot 9101 and Lot 9007 (NLV LifeStyle Village) included.

3.1 Kennels Noise

As agreed during various stages of consultation with the City of Armadale, noise monitoring was undertaken during school holidays (between 05 and 11 July 2018) at two (2) locations opposite the closest kennels in order to quantify the existing noise levels from each kennel and determine the applicable L_{A10}, L_{A1} and L_{Amax} of each kennel at the logger locations. The Ashridge Kennels owner also confirmed the kennels were at 100 % capacity.

Figure 3-1 shows the location of each logger.

Figure 3-1 Logger Locations for Kennel Noise Monitoring

The instruments used were ARL type Ngara noise data logger (S/N 87803A and 8780F4), deployed close to the verge on the east side of Warton Road and in-line with the outdoor dog exercise areas. Each logger was setup with the microphone approximately 1.4 metres above ground level and to record A-weighted and slow time-weighted noise levels as well as audio over the survey period. The loggers were field calibrated before and after the measurement session and found to be accurate to within +/- 1 dB. Lloyd George Acoustics also holds current laboratory calibration certificates for the loggers.

The data was then analysed based on the audio recordings to determined representative noise levels for each kennel – refer *Section 4.1*.

3.2 Road Traffic Noise

Noise monitoring was undertaken at one (1) location along Warton Road between 25 and 31 July 2018 in order to:

- Quantify the existing noise levels;
- Determine the differences between different acoustic parameters ($L_{A10,18hour}$, $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$); and
- Calibrate the noise model for existing conditions.

The instrument used was an ARL type Ngara noise data logger (S/N 87803A), located approximately 25 metres from the edge of Warton Road, with the microphone 1.4 metres above ground level. The logger was programmed to record hourly L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} levels. This instrument complies with the instrumentation requirements of *Australian Standard 2702-1984 Acoustics – Methods for the Measurement of Road Traffic Noise*. The logger was field calibrated before and after the measurement session and found to be accurate to within +/- 1 dB. Lloyd George Acoustics also holds current laboratory calibration certificate for the logger.

The monitoring was undertaken further south to minimise potential impact from the kennels and whilst undertaken a number of years ago, is valid to provide an appropriate point for model calibration, to then allow extrapolation by modelling across the entire subdivision.

Figure 3-2 shows the location of the logger.

Figure 3-2 Logger Location for Warton Road Noise Monitoring

3.3 Noise Modelling

The computer programme *SoundPLAN 8.1* was utilised for all noise modelling, with the following algorithms:

- For kennel noise emissions: CONCAWE, and
- For road traffic noise: the *Calculation of Road Traffic Noise* (CoRTN) algorithms, modified to reflect Australian conditions.

Both approaches above are discussed in more details in the following sections.

3.3.1 Kennel Noise

The *CONCAWE* algorithms have been selected as they include the influence of wind and atmospheric stability. Input data required in the model are:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

Meteorological information utilised is provided in *Table 3-1* and is considered to represent worst-case conditions for noise propagation. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

Table 3-1 Modelling Meteorological Conditions

Parameter	Day (0700-1900)	Night (1900-0700)
Temperature (°C)	20	15
Humidity (%)	50	50
Wind Speed (m/s)	4	3
Wind Direction*	All	All
Pasquil Stability Factor	E	F

* Note that the modelling package used allows for all wind directions to be modelled simultaneously.

It is generally considered that compliance with the assigned noise levels needs to be demonstrated for 98% of the time, during the day and night periods, for the month of the year in which the worst-case weather conditions prevail. In most cases, the above conditions occur for more than 2% of the time and therefore must be satisfied.

Topographical data of the area was taken from those publicly available from *Google* in the form of spot heights and data already on file from the previous noise study. Lot levels throughout the subdivision were provided by Cossill & Webley (18 May 2023) and for Lot 9007 (6315 00 design strings 3d 20210406 A.dxf).

Ground absorption varies from a value of 0 to 1, with 0 being for an acoustically reflective ground (e.g. water or bitumen) and 1 for acoustically absorbent ground (e.g. grass). For this assessment, a value of 0.0 has been used for hard surfaces such as roads, 0.6 for the future subdivisions and 1.0 elsewhere e.g. public open spaces.

Noise emissions for the kennels were derived from the measured levels and calibrated against existing conditions (refer *Section 4.1*).

3.3.2 Road Traffic Noise

The *Calculation of Road Traffic Noise* (CoRTN) algorithms, modified to reflect Australian conditions were used. The modifications included the following:

- Vehicles were separated into heavy (Austroads Class 3 upwards) and non-heavy (Austroads Classes 1 & 2) with non-heavy vehicles having a source height of 0.5 metres above road level and heavy vehicles having two sources, at heights of 1.5 metres and 3.6 metres above road level, to represent the engine and exhaust respectively. By splitting the noise source into three, allows for less barrier attenuation for high level sources where barriers are to be considered.
- Note that a -8.0 dB correction is applied to the exhaust and -0.8 dB to the engine (based on Transportation Noise Reference Book, Paul Nelson, 1987), so as to provide consistent results with the CoRTN algorithms for the no barrier scenario;

Predictions are made at heights of 1.4 m above ground floor level for single storey house. The noise is predicted at 1.0 metre from an assumed building facade resulting in a + 2.5 dB correction due to reflected noise.

Local topography and ground absorption are as described in *Section 3.3.1*. Traffic data includes:

- Road Surface – The existing and future road surface for Warton Road was assumed to be dense graded asphalt.
- Vehicle Speed – The existing posted speed along Warton Road is 80 km/hr and assumed to remain unchanged in the future
- Traffic Volumes – Existing (2016) and forecast (2041) traffic volumes were provided by Main Roads WA (Traffic Modelling Analysts, Reference: #42269) with more recent existing counts obtained from the Main Roads WA Traffic Map. A validation plot was also provided allowing the Main Roads WA traffic volume model to be calibrated against actual counts. *Table 3-2* provides the traffic volume input data in the model.

Table 3-2 Traffic Information Used in the Modelling

Road	Parameter	Scenario			
		Existing		Future - 2041	
		Eastbound	Westbound	Eastbound	Westbound
Warton Road – North of Armadale Road	24 Hour Volume	10,727	10,234	15,100	14,400
	% Heavy	7	7	5	5

4 RESULTS

4.1 Kennels Noise Monitoring

4.1.1 North Kennel (Pampered Pooch, 660 Warton Road)

The results of the noise monitoring at logger 87803A are shown graphically in *Figure 4-1* as L_{max}, L_{10} and L_{90} noise levels determined over a 15 minute interval.

The noise levels recorded at the logger to the north were found to be dominated by road traffic noise, as is evident by the day/night trend following that of a typical road traffic pattern in *Figure 4-1*. Therefore noise levels from the dog kennels could not be derived. It is also noted the Pampered Pooch kennel is designed in such a way that the kennel's outdoor areas are located behind the main building on site and therefore away from the logger, and approximately 100 metres from the kerb. As such, it would be expected the noise emissions from this kennel to be relatively low.

It is noted the microphone was knocked off the pole by livestock at around 00.37am on the Sunday, resulting in lower noise levels being recorded after this time, which is also evident in *Figure 4-1*. However, given the dominance of road traffic noise relative to potential dog barking noise, the layout of the kennel and the outdoor exercise area distance from the road, this is not expected to have adversely affected the outcome of this study.

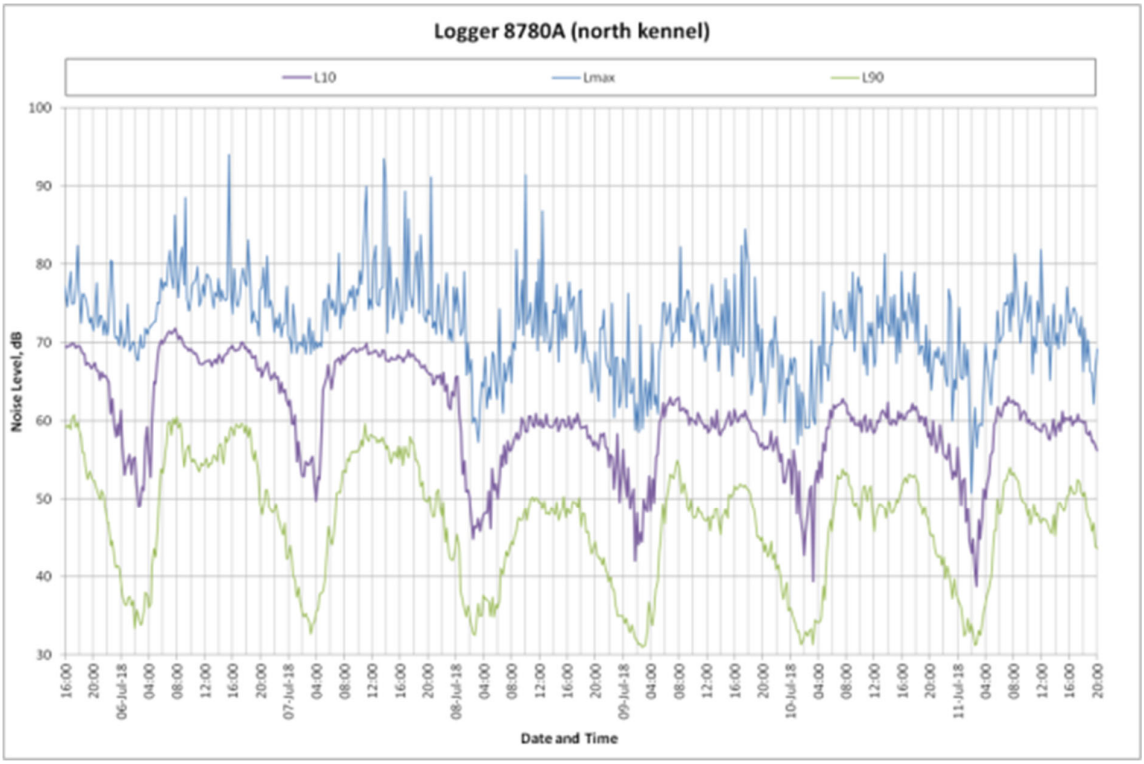


Figure 4-1 Logged Noise Levels Near North Kennel (Pampered Pooch)

4.1.2 South Kennel (Ashridge Kennels, 7 Hybrid Court)

At this southern location (opposite Ashridge Catery and Kennels), dogs barking were found to be at higher levels than the north section and also audible above background at times. Various audio files were reviewed to find times where adequate quality data could be obtained. Whilst dog barking was more audible than at the north location, road traffic noise was still a significant factor, particularly during the weekday with *Figure 4-2* showing the overall logged noise levels. *Table 4-1* provides the results of the analysis of the good quality data that could be obtained. It is evident that only the Sunday morning between 7am and 8.30am resulted in a reasonable duration of dog barking being quantifiable above background noise.

The results of the noise monitoring at this location are shown graphically on *Figure 4-2*, showing the L_{max}, L_{10} and L_{90} noise levels over a 15 minute interval.

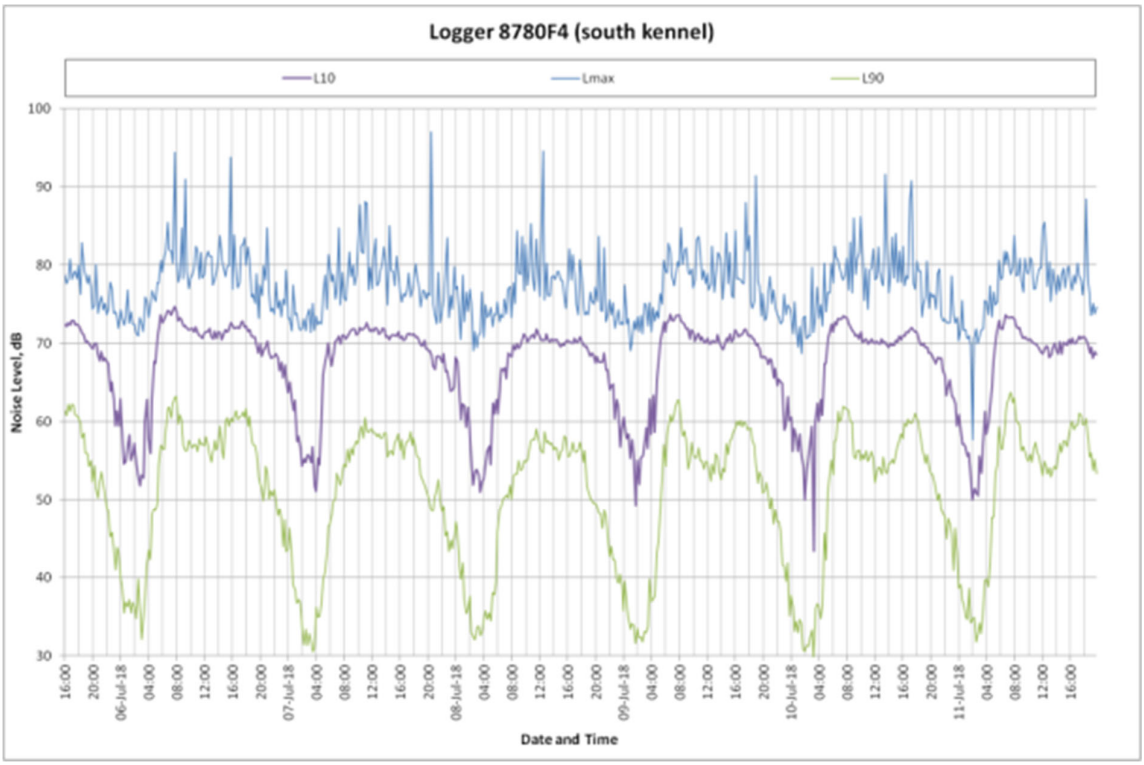


Figure 4-2 Logged Noise Levels Near North Kennel (Ashridge)

Table 4-1 Measured Noise Levels From Dogs Barking (South Kennel)

Date	Measured Noise Level, dB		
	L_{Amax}	L_{A1}	L_{A10}
Friday, 06 July, 06.30am to 7.00am	66.8	n/a	n/a
Friday, 06 July,7am to 8am	68.6	60.4	n/a
Saturday, 07 July, 02.00am to 3.00am	52.4	46.9	n/a
Saturday, 07 July,7am to 8am	60.1	56.1	n/a
Sunday, 08 July, 7.00am to 08.30am	67.1	60.5	55.3

From the Sunday measurements, the L_{A10} sound power level was calculated for the dog kennel and shown in *Table 4-2*. With reference to *Table 2-4* and the assigned noise levels during the most stringent night period, the L_{Amax} and L_{A1} are permitted to be 20 dB and 10 dB higher respectively than the L_{A10} respectively. As the measured L_{Amax} and L_{A1} noise levels are only 12 dB and 5 dB respectively higher than the L_{A10}, it is the L_{A10} that will dictate compliance. Although not specifically detected during this survey, noise emissions from kennels are likely to contain annoying characteristics such as impulsiveness or tonality based on previous studies, and therefore the predicted noise levels would need to be adjusted as follows (refer *Table 2-2*):

- L_{Amax} adjusted by +10 dB for impulsiveness, and
- L_{A1} and L_{A10} adjusted by +5 dB for tonality.

Based on the above, it is noted the highest measured L_{Amax} level of 68.6 dB at the logger would result in an exceedence of 15.6 dB (78.6 dB – 63 dB assigned noise level at logger/nearest house), while the measured L_{A10} level of 55.3 dB results in an exceedence of 17.3 dB (60.3 dB – 43 dB assigned noise level at logger/nearest house). As such, the L_{A10} noise level dictates compliance with the Regulations.

Whilst the analysis has resulted in only a single sound power level to be used for modelling rather than different sound levels for different times of the day or days of the week, this is considered conservative as in reality, it is likely the noise levels are less at other time periods (e.g. outside of feeding time) and the assigned levels are higher.

Table 4-2 Kennels Source Sound Power Levels, dB

Description	Octave Band Centre Frequency (Hz)						Overall dB(A)
	125	250	500	1k	2k	4k	
Dogs barking (L_{A10})	104	97	102	101	92	84	**104**

4.2 Traffic Noise Monitoring

The results of the noise monitoring are summarised below in *Table 4-3* and shown graphically in *Figure 4-3* and *Figure 4-4*.

Table 4-3 Measured Average Noise Levels – Warton Road (South of Jandakot Road)

Date	Average Weekday Noise Level, dB			
	$L_{A10,18hour}$	$L_{Aeq,24hour}$	$L_{Aeq\ (Day)}$	$L_{Aeq\ (Night)}$
Wednesday, 25 July 2018	63.7	59.8	60.9	56.0
Thursday, 26 July 2018	61.0	58.3	59.7	52.1
Friday, 27 July 2018	62.5	59.0	60.4	53.0
Saturday, 28 July 2018	60.3	56.9	58.2	52.0
Sunday, 29 July 2018	59.5	56.9	58.4	49.2
Monday, 30 July 2018	61.0	58.0	59.3	52.5
Tuesday, 31 July 2018	61.0	58.1	59.3	53.4
Weekday Average	**62.1**	**58.7**	**60.0**	**53.7**

It is noted that weather conditions over the survey period were generally fine, except for the Thursday 26 July when adverse weather conditions were recorded. Data recorded on the 26th and over the weekend were ignored when calculating the weekday averages.

From the results, it can be seen that the average differences between the weekday $L_{A10,18hour}$ and $L_{Aeq(Day)}$ is 2.1 dB. This conversion has been used in the modelling for the future scenario. The average differences between the weekday $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ is 6.3 dB and therefore it is the daytime levels which dictate compliance, since these are more than 5 dB over the night-time levels.

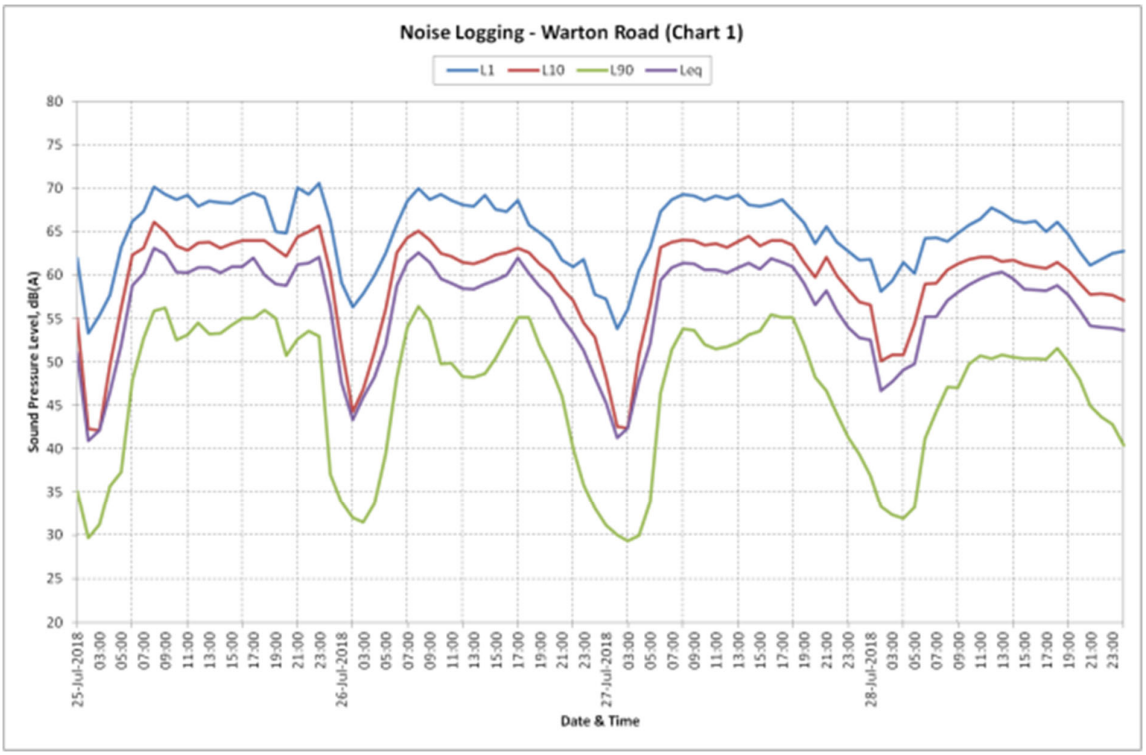


Figure 4-3 Warton Road Noise Monitoring Results (Chart 1)

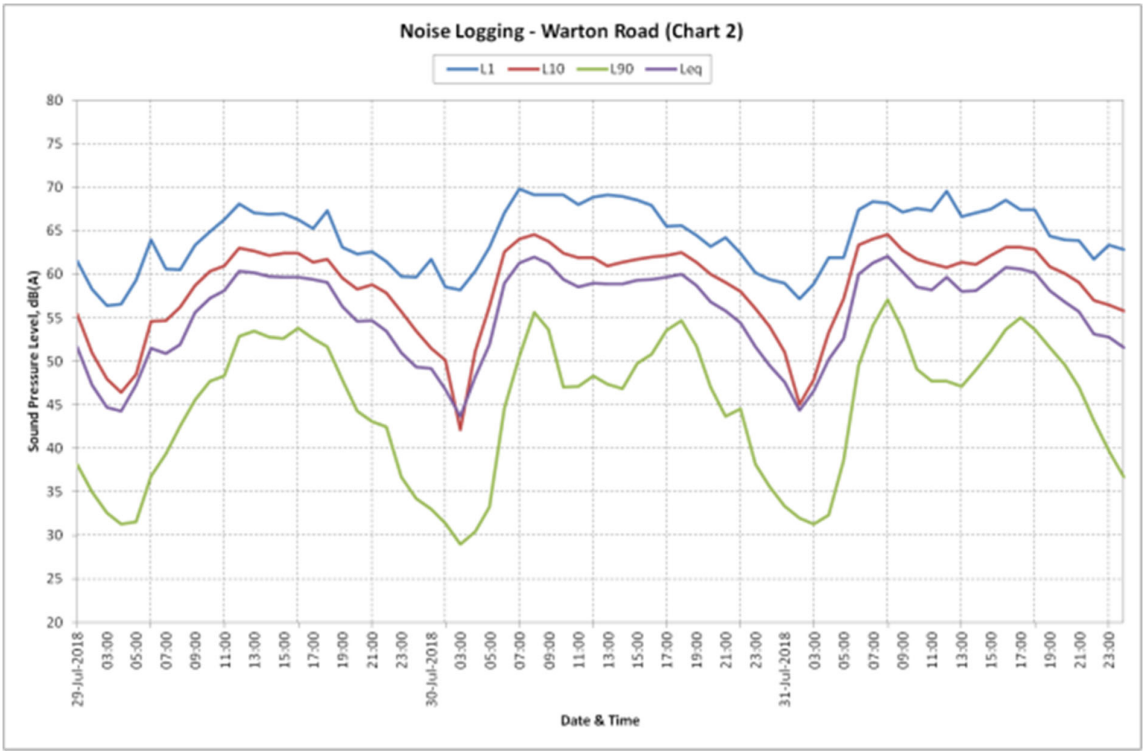


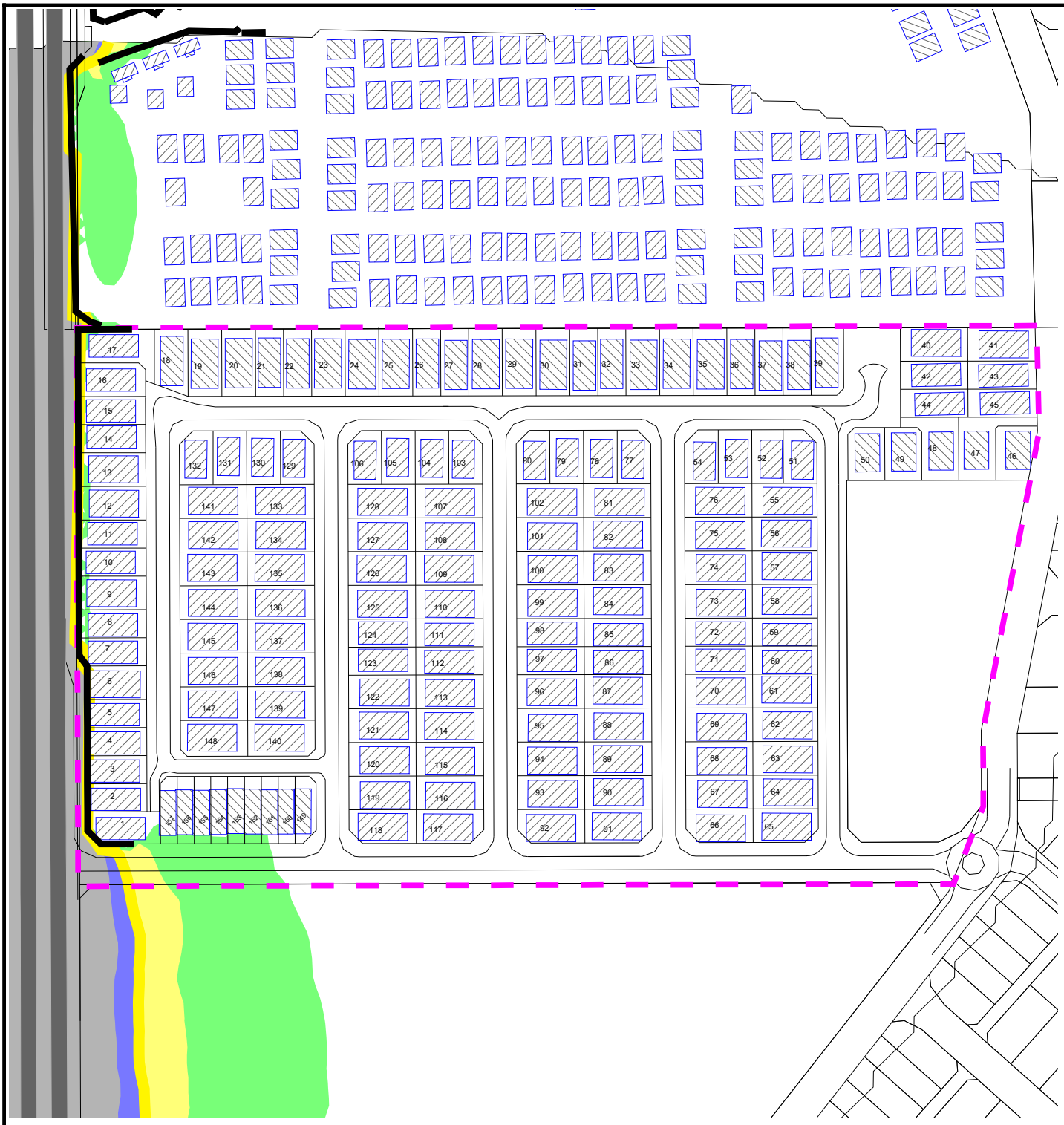
Figure 4-4 Warton Road Noise Monitoring Results (Chart 2)

5 MODELLING RESULTS

5.1 Road Traffic Noise – Year 2041

The predicted noise levels for the future scenario (year 2041) are provided in *Figure 5-1* as an $L_{Aeq(Day)}$ noise contour map and include a 3-metre high noise wall. The small section of wall adjacent the entry road is 2.4 metres high.

From the noise contour map shown in *Figure 5-1*, it can be seen that most of the subdivision will be exposed to noise levels below the outdoor noise target of 55 dB $L_{Aeq(Day)}$ with the exception of those immediately adjoining the road and a handful of lots towards the entry road will all be within Exposure A.



Lot 9101 Warton Road, Piara Waters
Future (2041) Noise Level Contours

$L_{Aeq(Day)}$ Noise Level Contours
Ground Floor Level

SoundPlan v8.1
CoRTN Algorithms

24 May 2023

Signs and symbols

- Road
- Building
- Wall
- Subject Site

Noise levels
$L_{Aeq,Day}$ dB

<= 55	
<= 56	Exposure A
<= 57	
<= 58	
<= 59	Exposure B
<= 60	
<= 61	
<= 62	
<= 63	Exposure C
<= 64	
<= 65	
<= 66	
> 66	Exposure D

SPP 5.4 (Sep 2019)

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Length Scale 1:2500
0 12.5 25 50 75 100 m

Figure 5-1

5.2 Kennel Noise

From the noise monitoring results, it was found that the Ashridge Kennel resulted in higher noise levels than the Pampered Pooch kennel located further to the north. As a worst-case scenario, it was assumed that the source noise levels of the Pampered Pooch kennel are similar to that of Ashridge Kennel, and that a kennel of similar capacity and design to that of Ashridge could be built on the lot located between Ashridge and Pampered Pooch kennels i.e. at #6 Hybrid Court.

Figure 5-2 presents the worst-case predicted cumulative noise levels as L_{A10} noise contours with a 3-metre high noise wall along the west boundary of Lot 9101 and the proposed 2.1 metre noise wall along Lot 9007 (NLV LifeStyle Village), noting this wall is at lower ground level.

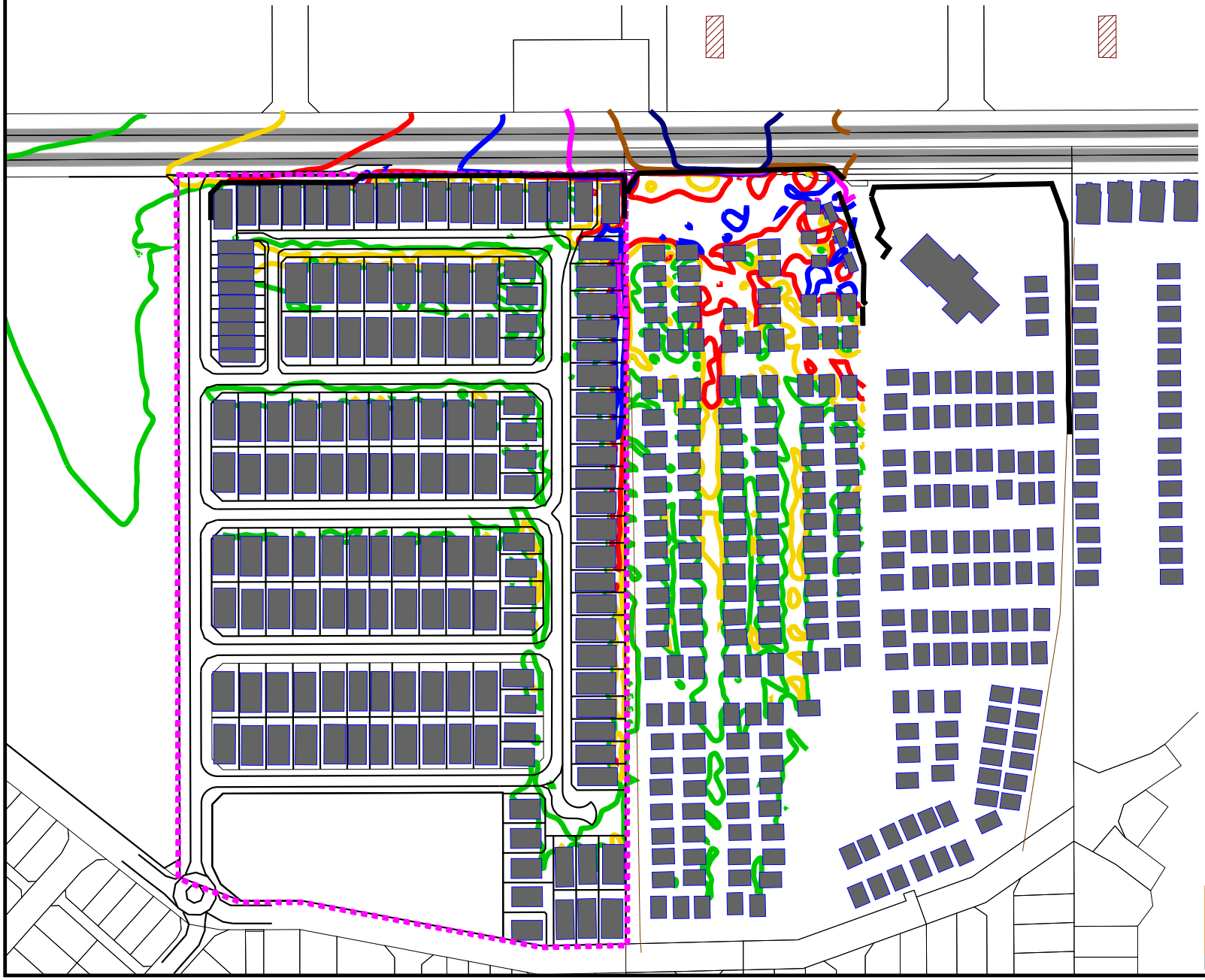
From the modelling results shown in *Figure 5-2*, noise levels up to 52 dB L_{A10} were predicted at the future lots in the north-east corner of the subdivision. This is considered conservative, as this assumes that dogs are barking simultaneously at all kennels. In reality, the barking noise is unlikely to combine together since not all dogs would bark at exactly the same time.

In addition, it is noted that any new kennel in the area will be required to comply with the requirements of the *Environmental Protection (Noise) Regulations 1997*. As such, by considering the cumulative noise levels from all three kennels, a conservative assessment has been undertaken.

Piara Waters - Lot 9101 Warton Road

'Worst-case' Cumulative Dog Kennels Noise Level Contours - Future Conditions (Ashridge Kennels and New Kennels) With All Walls
No Adjustments Made for Annoying Characteristics

Figure 5-2



Noise levels
L_{A10}, dB

= 42.0
= 44.5
= 47.0
= 49.5
= 52.0
= 54.5
= 57.0

Signs and Symbols

- Kennels
- Noise Wall
- Building
- Subject Site
- Warton Road

24/05/2023

Length Scale 1:3150

0 15 30 60 90 120 m

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6 ASSESSMENT

6.1 Road Traffic Noise

The objectives of SPP 5.4 are to achieve:

- indoor noise levels specified in *Table 2-1* in noise-sensitive areas (e.g. bedrooms and living rooms of houses and school classrooms); and
- a reasonable degree of acoustic amenity for outdoor living areas on each residential lot.

From *Section 5.1*, most of the subdivision will be exposed to noise levels below 55 dB $L_{Aeq(Day)}$ with some lots adjoining the road and towards the entry road within Exposure Category A. Some of these lots are noted to also be impacted by kennel noise (refer *Section 6.2*) and the architectural package requirements to mitigate kennel noise will also satisfy SPP 5.4.

Nonetheless, the following must be noted with regard to road traffic noise:

- All affected lots are to have notifications on lot titles as per SPP 5.4 requirements.
- Where an affected lot is to be of double storey construction, specialist advice must be sought, since the upper level will not receive the same level of attenuation provided by walls or other dwellings.
- Where a noise wall is constructed, the 3-metre height is to be relative to finished lot levels, solid, free of gaps and of a material having a minimum surface mass of 15 kg/m^2.

6.2 Kennel Noise

As noted previously, the basis of the design is for a 3-metre high noise wall along Warton Road, with the return along the entry road being reduced to 2.4 metres.

While the noise wall assists in mitigating kennel noise, in particular to those lots adjoining Warton Road, exceedences up to 18 dB of the night-time L_{A10} assigned noise level are predicted. However, it is noted this assumes the L_{A10} noise levels from each kennel will combine and that tonality is present in the noise emissions. This approach is considered conservative given that dogs are not likely to bark simultaneously for extended periods of time (more than 10%), and that tonality will likely be masked by local ambient noise e.g. local traffic, especially at future lots located behind other buildings.

The architectural Packages 1 to 3, presented in *Table 6-1* to *Table 6-3*, were developed to manage the noise emissions from the kennels to compliance with the Regulations.

The minimum package requirements are shown on *Figure 6-1* on the basis of a 3-metre high noise wall along Warton Road. It can be seen that the lots along the boundary with Lot 9007 are most exposed. This is due to a combination of no noise wall being provided along this boundary and that the finished ground levels of Lot 9007 are significantly lower.

Figure 6-2 provides the package requirements where a 2.1-metre high noise wall (relative to Lot 9101 finished levels) is also constructed.

Similarly to road traffic noise, the following is noted:

- All affected lots are to have notifications on lot titles.
- Where an affected lot is to be of double storey construction, specialist advice must be sought, since the upper level will not receive the same level of attenuation provided by walls or other dwellings.
- Where a noise wall is constructed, it is to be relative to finished lot levels, solid, free of gaps and of a material having a minimum surface mass of 15 kg/m^2.

It is noted that any new kennel in the area will be required to comply with the requirements of the *Environmental Protection (Noise) Regulations 1997*. As such, by considering the cumulative noise levels from all three kennels, a conservative assessment has been undertaken.

It is also noted that natural ventilation must be provided in accordance with the National Construction Code. In implementing the acceptable treatment packages, the following must be observed:

- Evaporative air conditioning systems will require attenuated air vents to be provided in the ceiling space and designed so that windows do not need to be opened.
- Refrigerant based air conditioning systems need to be designed to achieve fresh air ventilation requirements.
- External openings (e.g. air inlets, vents) need to be positioned facing away from the noise source.
- Ductwork needs to be provided with adequate silencing to prevent noise intrusion.

Table 6-1 Package 1 Acoustic Treatment (Exceedence Up to 9 dB)

Location	Orientation	Package 1 Measures
Bedrooms	All	• Glazing up to 40% of floor area (minimum $R_w + C_{tr}$ 28) e.g. 6 mm thick glass (monolithic, toughened or laminated) in fixed sash, awning or casement opening with seals to openings.
Other Habitable Rooms Including Kitchens	Facing kennels	• Glazing up to 60% of floor area (minimum $R_w + C_{tr}$ 28) e.g. 6 mm thick glass (monolithic, toughened or laminated) in fixed sash, awning or casement opening with seals to openings. • Sliding doors to incorporate acoustic seals.
	Other	• No requirements.
General	Any	• Closed eaves. • Walls (minimum R_w 50) – Two leaves of 90 mm thick brick with minimum 50 mm cavity. • Roof and ceiling (minimum $R_w + C_{tr}$ 37) – Standard roof construction with 13mm plasterboard ceiling and minimum R2.5 insulation between ceiling joists.
Other		• Notification on title such as: *This lot is in the vicinity of dog kennels, and is currently affected by dog barking noise. Further information is available on request from the City of Armadale.* • Preference should be given to providing at least one outdoor living area that is shielded from the kennels where practicable by way of using the house itself and/or boundary fencing. • To gain the benefits of the improved facade construction, consideration should be given to incorporating mechanical ventilation/air-conditioning in order to allow windows to be closed.

Table 6-2 Package 2 Acoustic Treatment (Exceedence Between 10-14 dB)

Location	Orientation	Package 2 Measures
Bedrooms	Facing or side on from kennels	• Glazing up to 40% of floor area (minimum $R_w + C_{tr}$ 31) e.g. 10 mm thick glass (monolithic, toughened or laminated) in fixed sash, awning or casement opening with seals to openings.. • No external doors.
	Opposite side(s)	• Glazing up to 40% of floor area (minimum $R_w + C_{tr}$ 30) e.g. 6.5mm thick VLam Hush glass in fixed sash, awning or casement opening with seals to openings.
Other Habitable Rooms Including Kitchens	Facing or side on from kennels	• Glazing up to 60% of floor area (minimum $R_w + C_{tr}$ 28) e.g. 6 mm thick glass (monolithic, toughened or laminated) in fixed sash, awning or casement opening with seals to openings. • Sliding doors to incorporate acoustic seals.
	Opposite side(s)	• No requirements.
General	Any	• Closed eaves. • Walls (minimum R_w 50) – Two leaves of 90 mm thick brick with minimum 50 mm cavity. • Roof and ceiling (minimum $R_w + C_{tr}$ 38) – Standard roof construction with 13mm plasterboard ceiling and minimum R3.5 insulation between ceiling joists.
Other		• Notification on title such as: *This lot is in the vicinity of dog kennels, and is currently affected by dog barking noise. Further information is available on request from the City of Armadale.* • Preference should be given to providing at least one outdoor living area that is shielded from the kennels where practicable by way of using the house itself and/or boundary fencing. • To gain the benefits of the improved facade construction, consideration should be given to incorporating mechanical ventilation/air-conditioning in order to allow windows to be closed.

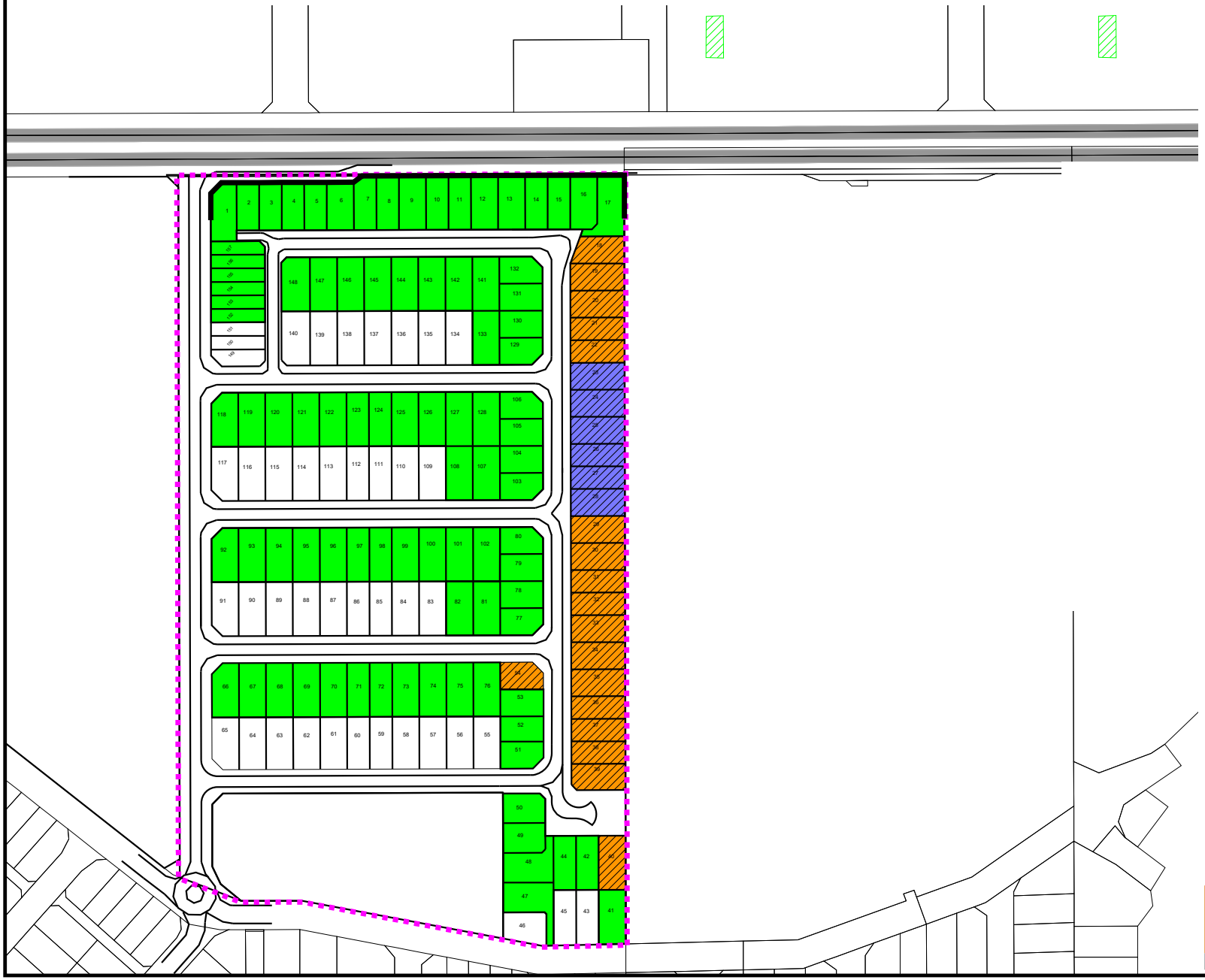
Table 6-3 Package 3 Acoustic Treatment (Exceedence Between 15-20 dB)

Location	Orientation	Package 3 Measures
Bedrooms	Facing or side on from kennels	• Glazing up to 40% of floor area (minimum $R_w + C_{tr}$ 33) – 10.5mm thick VLam Hush glass in fixed sash, awning or casement opening with seals to openings. • No external doors.
	Opposite side(s)	• Glazing up to 40% of floor area (minimum $R_w + C_{tr}$ 30) – 6.5mm thick VLam Hush glass in fixed sash, awning or casement opening with seals to openings.
Other Habitable Rooms Including Kitchens	Facing or side on from kennels	• Glazing up to 60% of floor area (minimum $R_w + C_{tr}$ 30) – 6.5mm thick VLam Hush glass in fixed sash, awning or casement opening with seals to openings. • Sliding doors to incorporate acoustic seals.
	Opposite side(s)	• 6mm (minimum) glazing.
General	Any	• Closed eaves. • Walls (minimum R_w 50) – Two leaves of 90mm thick brick with minimum 50mm cavity. • Roof and ceiling (minimum $R_w + C_{tr}$ 38) – Standard roof construction with 13mm plasterboard ceiling and minimum R3.5 insulation between ceiling joists.
Other		• Notification on title such as: *This lot is in the vicinity of dog kennels, and is currently affected by dog barking noise. Further information is available on request from the City of Armadale.* • Preference should be given to providing at least one outdoor living area that is shielded from the kennels where practicable by way of using the house itself and/or boundary fencing. • To gain the benefits of the improved facade construction, consideration should be given to incorporating mechanical ventilation/air-conditioning in order to allow windows to be closed.

Piara Waters - Lot 9101 Warton Road

Architectural Packages Requirement

Figure 6-1



Signs and Symbols

- Kennels
- Noise Wall
- Package 1
- Package 2
- Package 3
- Warton Road
- Subject Site

24/05/2023

Length Scale 1:3150

0 15 30 60 90 120 m

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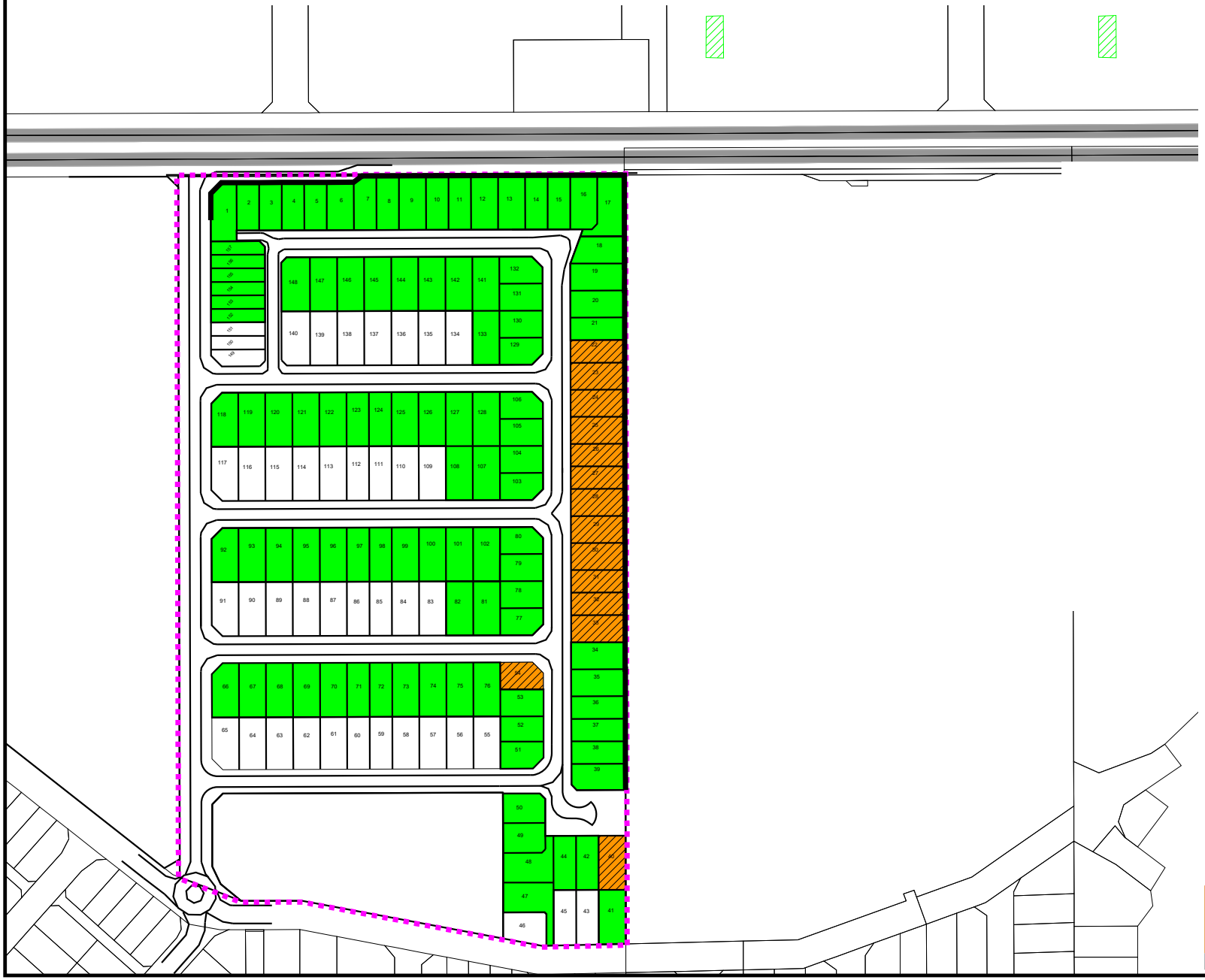
Piara Waters - Lot 9101 Warton Road

Architectural Packages Requirement

Figure 6-2



Signs and Symbols

- Kennels
- Noise Wall
- Package 1
- Package 2
- Package 3
- Warton Road
- Subject Site

26/06/2023

Length Scale 1:3150

0 15 30 60 90 120 m

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7 CONCLUSION

To mitigate noise from road traffic and kennels, the following noise controls are recommended:

- All affected lots are to have notifications on title advising of the potential impacts from road traffic noise, dog barking from kennels or both;
- Noise wall is to be constructed along Warton Road at a minimum height of 3.0 metres, reducing to 2.4 metres at the entry road. Heights are relative to finished lot levels;
- Dwellings are to incorporate Package 1, 2 or 3 (refer *Table 6-1* to *Table 6-3*) as shown on *Figure 6-1* or as per *Figure 6-2* where a 2.1-metre high wall is constructed (relative to Lot 9101 finished levels) on the side boundary to the NLV;
- Where a noise wall is constructed, it is to be solid, free of gaps and of a material having a minimum surface mass of 15 kg/m^2.

Appendix A

Terminology

The following is an explanation of the terminology used throughout this report.

Decibel (dB)

The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.

L_1

An L_1 level is the noise level which is exceeded for 1 per cent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{10}

An L_{10} level is the noise level which is exceeded for 10 per cent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{90}

An L_{90} level is the noise level which is exceeded for 90 per cent of the measurement period and is considered to represent the "*background*" noise level.

L_{eq}

The L_{eq} level represents the average noise energy during a measurement period.

$L_{A10,18hour}$

The $L_{A10,18\ hour}$ level is the arithmetic average of the hourly L_{A10} levels between 6.00 am and midnight. The *CoRTN* algorithms were developed to calculate this parameter.

$L_{Aeq,24hour}$

The $L_{Aeq,24\ hour}$ level is the logarithmic average of the hourly L_{Aeq} levels for a full day (from midnight to midnight).

$L_{Aeq,8hour}$ / $L_{Aeq\ (Night)}$

The $L_{Aeq\ (Night)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 10.00 pm to 6.00 am on the same day.

$L_{Aeq,16hour}$ / $L_{Aeq\ (Day)}$

The $L_{Aeq\ (Day)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 6.00 am to 10.00 pm on the same day. This value is typically 1-3 dB less than the $L_{A10,18hour}$.

R_w

This is the weighted sound reduction index and is similar to the previously used STC (Sound Transmission Class) value. It is a single number rating determined by moving a grading curve in integral steps against the laboratory measured transmission loss until the sum of the deficiencies at each one-third-octave band, between 100 Hz and 3.15 kHz, does not exceed 32 dB. The higher the R_w value, the better the acoustic performance.

C_{tr}

This is a spectrum adaptation term for airborne noise and provides a correction to the R_w value to suit source sounds with significant low frequency content such as road traffic or home theatre systems. A wall that provides a relatively high level of low frequency attenuation (i.e. masonry) may have a value in the order of –4 dB, whilst a wall with relatively poor attenuation at low frequencies (i.e. stud wall) may have a value in the order of -14 dB.

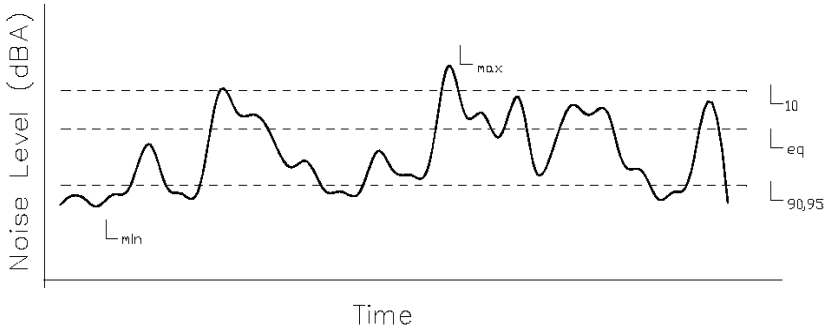
Satisfactory Design Sound Level

The level of noise that has been found to be acceptable by most people for the environment in question and also to be not intrusive.

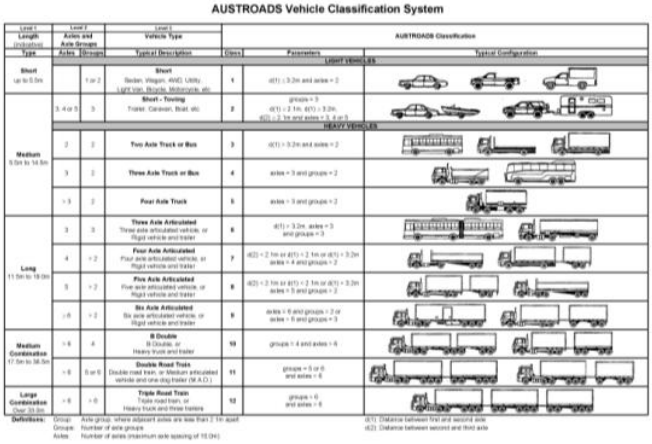
Maximum Design Sound Level

The level of noise above which most people occupying the space start to become dissatisfied with the level of noise.

Chart of Noise Level Descriptors



Austroads Vehicle Class



Typical Noise Levels