acouras
CONSULTANCY

Xpress Group

194 Campbelltown Road, Denham Court

Acoustic DA Assessment

Author	Fu Siong Hie, B.Eng, MAAS Principal Consultant
Document Reference:	SYD2013-1047-R002F
Date	25/06/2018
Comments:	Site plan (Appendix D)

Table of Contents

1 Introduction 4
2 Noise Criteria 4
2.1 Internal Noise Levels 5
2.2 Noise Survey and Project Specific Limits 5
2.3 Sleep Disturbance 6
2.4 Traffic Noise Generation 7
3 Assessment and Recommendations 7
3.1 Operational Assessment 7
3.2 Vehicle Activity 8
3.3 Semi-Trailer Fuelling Station 9
3.4 Self-Service and Automatic Carwash 10
3.5 Café and External Seating Area 11
3.6 Tyre or Car Workshop 11
3.7 Mechanical Plant and Equipment 12
3.8 Façade Glazing Requirements 12
3.9 Building Façade Construction 12
3.10 Assessment of Traffic Noise Generation 13
4 Conclusion 14
Appendix A – Acoustic Terminology 15
Appendix B – Architectural Drawings 16
Appendix C – Noise Logger Results 17
Appendix D – Site Plan 20

Index of Figures

Figure 1 – Site Location, Nearest Residents and Noise Logger Position 4

Index of Tables

Table 1— Recommended Internal Design Noise Levels (AS/NZS 2107) 5
Table 2 – Measured Ambient and Traffic Noise and Levels, dBA 5
Table 3—Noise Survey Summary and Project Limits, dBA 6
Table 4 – Sleep Disturbance Limits, dBA 6
Table 5— Road traffic noise assessment criteria for residential land uses 7
Table 6 – Typical Noise Level of Vehicles, L_{max} dBA 8
Table 7 – Predicted Noise Level of Vehicles Activity, dBA 9
Table 8 – Predicted Noise Level of Vehicles Activity, dBA 9
Table 9 –Typical Noise Level for Vehicle and Carwash, L_{max} dBA 10
Table 10 – Predicted Noise Level of Operational Activity, dBA 10
Table 11 — Typical Noise Level of Speech 11
Table 12 – Typical Noise Level of Power Tools 11
Table 13 – Schedule of Window and Glazing (R_w) 12
Table 14 – External Façade Construction (R_w) 12
Table 15: Predicted Change Traffic Noise Levels during Peak Periods 13

1 Introduction

The following report has been prepared by Acouras Consultancy on behalf of Xpress Group to assess the potential for noise impact associated with the proposed new service station at 194 Campbelltown Road, Denham Court. The site location is shown in Figure 1.

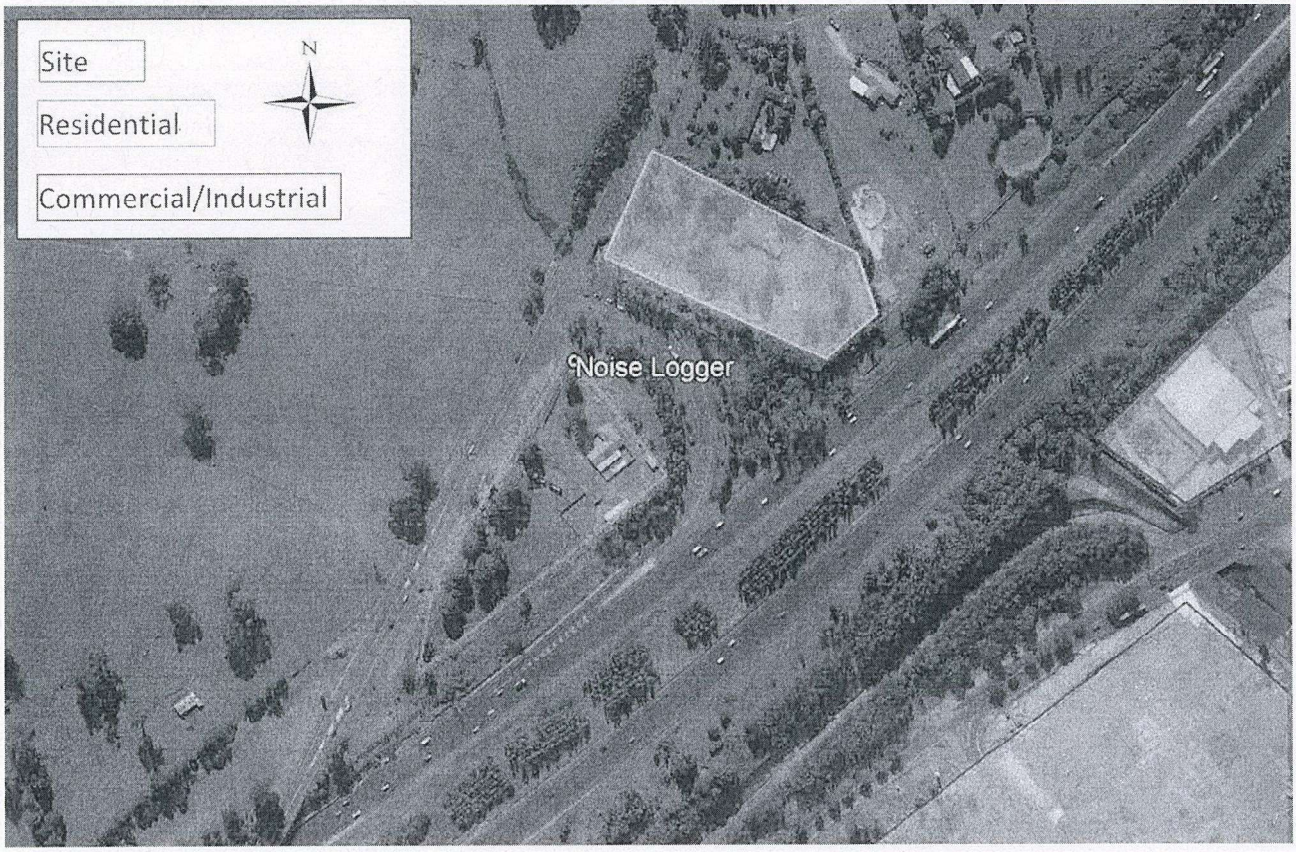


Figure 1 – Site Location, Nearest Residents and Noise Logger Position

2 Noise Criteria

The following standards and guidelines are applicable to this project:

- NSW EPA "Industrial Noise Policy" (INP).
- NSW EPA "Road Noise Policy" (RNP).
- Australian standard AS/NZS 2107-2000: Acoustics – Recommended design sound levels and reverberation times for building interiors.
- Australian standard AS 1055.1-1997: Acoustics – Description and measurement of environmental noise - General procedures.

2.1 Internal Noise Levels

For the commercial developments, the AS/NZS 2107–2000 outlines the acceptable internal noise levels such that a satisfactory acoustic environment within occupied spaces in new and existing buildings can be achieved. Table 1 presents the recommended internal design noise levels for retail buildings.

Table 1— Recommended Internal Design Noise Levels (AS/NZS 2107)

Type of occupancy/activity	Recommended design sound level, L_{eq} in dB(A)	
	Satisfactory	Maximum
Small retail store (small)	45	50

2.2 Noise Survey and Project Specific Limits

An unattended noise survey was carried out at the site to measure the background and ambient noise levels. Nose monitoring was conducted between Wednesday 23rd to 29th May 2018. The monitor was positioned in on the boundary at the northern end of the site. Location is shown in Figure 1. Measurements were conducted using the following equipment:

- SVAN 977 Type 1 Real time Analyser/Noise Logger. Serial No. 34892.
- SVAN SV30A Type 1 Sound Level Calibrator. Serial No. 31830.

Noise monitoring was conducted in general accordance with Australian standard AS 1055.1-1997: Acoustics-Description and measurement of environmental noise-General procedures.

The noise analyser was calibrated immediately before and after measurements were taken with no discernible differences between these two recorded levels. The sound analyser is Type 1 and comply with Australian standard AS1259.2: 1990.

Table 2 presents a summary of the measured ambient noise level and traffic noise impacting the development.

Table 2 – Measured Ambient and Traffic Noise and Levels, dBA

Location	Period	Average L_{eq}	Highest L_{eq} 1hr
194 Campbelltown Rd	Day (07:00-22:00)	63	68
	Night (22:00-07:00)	60	66

Table 3 presents a summary of the measured background noise level and the allowable intrusive noise limit for this project in accordance with the NSW Industrial Noise Policy guidelines.

Table 3—Noise Survey Summary and Project Limits, dBA

Location	Time Period	Existing Noise Levels		NSW Industrial Noise Policy	
		$L_{eq\ (period)}$	RBL	Amenity Criteria Recommended Noise Level (acceptable), L_{eq}	Project Specific Limit L_{eq}
1	Day	63	51	50	53
	Evening	61	52	45	51
	Night	60	46	40	50

During detailed design stage, the design and selection of the mechanical equipment required to service the proposed development will be required to achieve the NSW INP noise limits as presented in the table above.

During the monitoring period any adverse weather condition have been excluded. The noise logger results are presented in Appendix C.

2.3 Sleep Disturbance

The NSW INP does not specifically address sleep disturbance from high noise level events. The EPA, although not ideal continues to use the sleep criterion of an $L_{A1,\ (1\ minute)}$ not exceeding the $L_{A90,\ (15\ minute)}$ by more than 15 dB(A) as a guide to identify the likelihood of sleep disturbance.

The maximum noise level or $L_{A1,\ (1\ minute)}$, is the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Other factors that may be important in assessing the extent of impacts on sleep include:

- how often high noise events will occur.
- time of day (normally between 10pm and 7am).
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).

The $L_{A1,\ (1\ minute)}$ descriptor is meant to represent a maximum noise level measured under 'fast' time response. The EPA will accept analysis based on either $L_{A1,\ (1\ minute)}$ or $L_{A,\ (Max)}$. Table 4 presents the limits for sleep disturbance.

Table 4 – Sleep Disturbance Limits, dBA

Period	Background Level, RBL	Sleep Disturbance Limits $L_{A1,\ (1min)}$
22:00 to 07:00	46	61

2.4 Traffic Noise Generation

The development of the service station facilities has the potential to generate increased traffic noise along Campbelltown Road will be assessed in accordance with the NSW EPA Road Noise Policy (RNP). Table 5 sets out the assessment criteria for residences to be applied to particular types of project, road category and land use.

Table 5— Road traffic noise assessment criteria for residential land uses

Road Category	Type of project/land use	Assessment Criteria - dBA	
		Day (7am-10pm)	Night (10pm-7am)
Freeway/ arterial/ sub-arterial road	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,\ (15\ hour)}$ 60 (external)	$L_{Aeq,\ (9\ hour)}$ 55 (external)

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

3 Assessment and Recommendations

3.1 Operational Assessment

The proposed service station, is to be located in a rural environment with nearby commercial/industrial areas. The facility is bounded by the Campbelltown Road to the west and the M5 Motorway (Hume Highway) to the east. Traffic noise from the motorway dominates the ambient noise levels in the area. The nearest noise sensitive receiver that may potentially be affected by the operation of the site is located to the north (refer to Figure 1).

As part of our assessment we have taken the following activities into consideration:

- Activities associated with patron vehicles entering/exiting the service station.
- Activities from truck fuel delivery and using the refuelling station.
- The service station and convenience store will operate between 24hrs, seven (7) days a week.
- Café, fast food restaurant and drive through.
- Operation of the self-service and automated car wash.
- Tyre or car workshop.
- Operation of external mechanical plant, including exhaust ventilation fans and outdoor condensers.

3.2 Vehicle Activity

The proposed service station and convenience store is expected to operate between 24hrs seven days a week. From on our understanding of the proposed operation:

- The facility is expected to cater for at least 240 passenger cars during the peak hour. This would be considered the worst case scenario and any other periods outside the peak hour would have a less impact.
- Cars and trucks using the facilities will be able to enter and exit the site in a forward direction without reversing.

Table 3 below provide sound pressure levels of typical vehicle noise that have been used for the calculations.

Table 6 – Typical Noise Level of Vehicles, L_{max} dBA

Type	Sound Pressure Level Range @ 0.5m, L_{max} dBA[1]
General passenger vehicle	67-88
3 to 6 tonne Truck (rigid)	84-90
Semi-trailer (Fuel delivery only, eg, Western Star or Kenworth)	80-101

Based on the operation and above sound pressure levels, Table 3 details the predicted noise level at the nearest residential receiver to the north of the development site. Note this is based on the peak time periods and night time levels are expected to be considerably less.

Vehicles for the delivery of fuel accessing the site can take approximately 40minutes to complete the operation. Refuelling operations not expected to cause an impact provided that all operations are conducted only during the day between 07:00 and 18:00.

[1] Based on ADR83/00 external noise test.

Table 7 – Predicted Noise Level of Vehicles Activity, dBA

Type	Sound Pressure Level at Nearest Residential Receiver			
	$L_{eq(15min)}$ dBA	INP Noise Limit D/E/N	L_{max} dBA	Sleep Disturbance Limit
General passenger vehicle	44	53/51/50	40	61
Truck (rigid)	27	53/51/50	42	61
Semi-trailer (fuel delivery)	37	53/51/50	53	61
Cumulative	**45**	**53/51/50**	-	-

From the calculation above, the predicted noise level from operational activities is estimated to comply with the NSW INP for operational noise and for sleep disturbance noise limits.

3.3 Semi-Trailer Fuelling Station

The fuelling station for semi-trailers is located on the eastern site of the development. The semi-trailers using fuelling station will be able to enter in a forward direction and exit via the service road without having to reverse.

As a worst-case scenario during peak periods, a maximum of four (4) semi-trailers using the fuel station have been estimated for the predictions.

The sound pressure level of the semi-trailers is based on the date given Table 3 and have been used for the calculations presented in Table 8.

Table 8 – Predicted Noise Level of Vehicles Activity, dBA

Type	Sound Pressure Level at Nearest Residential Receiver			
	$L_{eq(15min)}$ dBA	INP Noise Limit D/E/N	L_{max} dBA	Sleep Disturbance Limit
Semi-trailer (fuel station)	42	53/51/50	55	61

The predicted noise level in the above table in only for the movement of four (4) semi-trailers over a period od 15 minutes. The cumulative noise of all vehicle movements (worst-case scenario) would be approximately L_{eq} 47dBA.

Based on our predictions, the noise level from semi-trailers using the fuel station is estimated to comply with the EPA INP levels and sleep disturbance noise limits.

3.4 Self-Service and Automatic Carwash

The automatic carwash and vacuum cleaner bays are located on southern end of the site which is over 200m from the residents. The carwash would operate between 7am and 10pm.

As part of our assessment of the automated carwash, we have taken the following activities into consideration:

- Operational noise from the automated carwash bay (high pressure water spray and dryer). Final drying would be manually done by hand. Typical noise levels of activities associated with the operation of the automated carwash are presented in Table 9.
- Operational noise from the manually operated high pressure water sprays and vacuums. Drying would be manually done hand. Typical noise levels are presented in Table 9.

Table 9 –Typical Noise Level for Vehicle and Carwash, L_{max} dBA

Noise Source	Sound Pressure Level
Automatic wash (incl. dryer)	88 @ 7.5m, L_{eq} dBA
High pressure rinse	68 @ 9m, L_{eq} dBA
Vacuum	76 @ 1.5m, L_{eq} dBA

Based on the sound pressure levels of operation activities expected to occur at the facility, the predicted noise level at the nearest residential receiver to the north east of the development site are presented in Table 10.

Table 10 – Predicted Noise Level of Operational Activity, dBA

Type	Sound Pressure Level at Nearest Residential Receiver $L_{eq(15min)}$ dBA	INP Noise Limit (Day/Evening), $L_{eq(period)}$
High pressure rinse (2 off)	41	53/50
Vacuum (2 off)	32	53/50
Automated Carwash	49	53/50
Wash Tunnel	34	53/50
Cumulative	50	**53/50**

From the calculation given in Table 10, the predicted noise level from operational activities is estimated comply the NSW INP noise limit for the operation for the daytime and night time periods. It is recommended that the carwash facility not operate during the night period.

3.5 Café and External Seating Area

The proposed café could potentially operate between 7am and 10pm each day to service the carwash patrons and has approximately eight (8) internal and eight (8) external seating for patrons. Noise associated with the café would predominately be from patrons talking in the external seated areas. Table 11 presents the typical speech noise levels used for assessing the impact at the nearest sensitive residential receivers to the north-east.

Taking into consideration the noise from the seated patrons in the external area, the attenuation effects of distance, directivity etc, we predict the noise levels would be less than 30dBA an inaudible at the nearest receiver.

Table 11 — Typical Noise Level of Speech

	Octave Band, Hz Lin									Overall dBA
	31.5	63	125	250	500	1k	2k	4k	8k	
Typical Speech at 1m[2]	29	39	49	59	63	65	59	53	47	61

3.6 Tyre or Car Workshop

The proposed tyre/car workshop is located to the most western portion of the site, which is more than 300m to the nearest residence. The workshop would operate between 7am and 6pm and all service/repairs and use of pneumatic hand tools would be used within the building envelope of the workshop. Table 12 presents the typical noise level of had operated power tools that would be common in workshops.

Table 12 – Typical Noise Level of Power Tools

Description of Noise Source	Sound Pressure Level, L_p dBA @ 10m[3]
Hand tools (electric)	74
Hand tools (pneumatic)	88

Taking into consideration the attenuation effects of distance, directivity, on-time correction, building attenuation etc, we predict the noise levels would be less than 40dBA at the nearest receiver.

[2] Raised single male voice. Harris "Handbook of Acoustical Measurements and Noise Control".

[3] • Australian Standard 2436:2010: "Guide to noise and vibration control on construction, demolition and maintenance sites".

3.7 Mechanical Plant and Equipment

At this stage, the design and selection of the mechanical equipment required to service the proposed development has not been finalised therefore the possible to conduct a detailed assessment of the mechanical plant noise. However, the mechanical services consultant should consider the relevant requirements when designing and selecting such equipment.

- Selection of low noise equipment.
- Location of rooftop plant equipment, such as exhaust fans, condensers etc such that it is shielded from the noise sensitive.
- Consider the construction of acoustic enclosures for plant equipment, acoustic attenuators on exhaust systems and acoustic louvers at ventilation openings.

Following the approval of the proposed DA, at Construction Certificate stage, detailed assessment of mechanical plant and equipment noise and their ameliorative measures should be conducted to ensure compliance with the EPA INP requirements as given in Section 2.2 .

3.8 Façade Glazing Requirements

Acoustic glazing for the convenience store given in Table 13 is required to reduce noise impact on the internal occupants and should result in noise levels within such spaces in accordance with the AS/NZS 2107:2000.

Table 13 – Schedule of Window and Glazing (R_w)

Façade	Space	Glazing Thickness	Minimum R_w (Glazing+Frame)
All	All	6mm monolithic	28

3.9 Building Façade Construction

To provide sufficient acoustic attention of noise, the general external construction of the proposed building would need to be constructed as detailed in Table 14.

Table 14 – External Façade Construction (R_w)

Building Element	Proposed Construction	Minimum R_w
External Wall	Concrete or masonry	45
Roof and ceiling	Colorbond roof with internal suspended ceiling.	45

3.10 Assessment of Traffic Noise Generation

This section details a review of the expected increase in traffic noise generation from this development. Based on the report prepared by Colston Budd Hunt & Kafes Pty Ltd (ref: 9880) dated August 2015, Table 2.2 indicates the following expected net increase in traffic during the morning (AM) peak and afternoon (PM) peak.

Based on the current traffic flows along Campbelltown Road, the following Table 15 summaries the predicted change in traffic noise level.

Table 15: Predicted Change Traffic Noise Levels during Peak Periods

Period	Direction	Existing Peak Traffic Flow	Net Increase Peak Traffic Flow	Change in Traffic Noise, dBA
AM Peak	North of M5 Ramp	1,035	1,095	0.2
	South of M5 Ramp	1,365	1,425	0..2
PM Peak	North of M5 Ramp	865	955	0.4
	South of M5 Ramp	1,010	1,100	0.4

At this stage the traffic report has not been updated to allow for addition semi-trailer fuelling station. However, allowing a maximum of an additional eight (8) vehicles per hour during the peak periods the overall change in traffic noise would increase by more that 1dB as shown in the table above.

Based on the above calculations, increases in traffic noise levels are predicted to be less than 1dB and therefore comply with the EPA RNP guidelines.

4 Conclusion

An acoustic assessment of the proposed development has been carried out in accordance with the Industrial Noise Policy and Road Noise Policy of the EPA.

An environmental noise survey of the site has been conducted and the noise limiting criteria for mechanical plant/equipment noise emission has been determined based on the NSW EPA INP are presented in Table 3. The noise limit ($L_{A1,1\ minute}$) for sleep disturbance in accordance with the NSW EPA INP is given in Table 4.

The review the potential noise impact from vehicle movements and semi-trailer fuel station are detailed in Section 3.2 and Section 3.3 . Based on our predictions, the cumulative vehicle noise is expected to be less than $L_{eq(15min)}$ 48dBA (at nighttime) noise limit and sleep disturbance limit at the nearest residential receiver. The addition semi-trailers during the peak periods would not significantly increase the traffic noise and would still be less than 1dB overall.

A review of the commercial operational activities, such as the carwash, café and workshop are detailed in Section 3.4 to 3.6 . Based on our predictions and recommendations, the activity noise level are expected to comply with the EPA INP guidelines.

Construction for glazing, external walls and the roof/ceiling systems have been provided to achieve the internal noise criteria and are detailed in Section 3.8 and Section 3.9 .

The assessment of increased traffic generation in Section 3.10 has been assessed according to EPA RNP noise guidelines. Based on the expected traffic for the centre, the increase in traffic is expected to be less than 1dB and therefore comply with the EPA RNP guideline.

Providing the recommendations in this report are implemented, the noise from the proposed development is predicted to comply with acoustic requirements of the EPA noise limits and relevant Australian standards.

Appendix A – Acoustic Terminology

Decibel, dB: A dimensionless unit which denotes the ratio between two quantities that are proportional to power, energy or intensity. One of these quantities is a designated reference by which all other quantities of identical units are divided. The sound pressure level in decibels is equal to 10 times the logarithm (to the base 10) of the ratio between the pressure squared divided by the reference pressure squared. The reference pressure used in acoustics is 20 micro Pascals.

A-WEIGHTING: A measure of sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. To describe sound in a manner representative of the human ear's response it is necessary to reduce the effects of the low and high frequencies with respect to medium frequencies. The resultant sound level is said to be A-weighted, and the units are in decibels (dBA). The A-weighted sound level is also called the noise level.

Sound Pressure Level, L p (dB), of a sound: 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Ambient Noise/Sound: All noise level present in a given environment, usually being a composite of sounds from many sources far and near. Traffic, HVAC, masking sound or even low-level background music can contribute to ambient level of noise or sound.

Percentile Level - L 90 , L 10 , etc: A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. L 90 is the level which is exceeded for 90% of a measurement period. L 90 is commonly referred to as the "background" sound level.

Background Noise (L 90): The sum total of all unwanted residual noise generated from all direct and reflected sound sources in a space that can represent an interface to, or interfere with good listening and speech intelligibility.

Rating Background Level – RBL: Method for determining the existing background noise level which involves calculating the tenth percentile from the L A90 measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

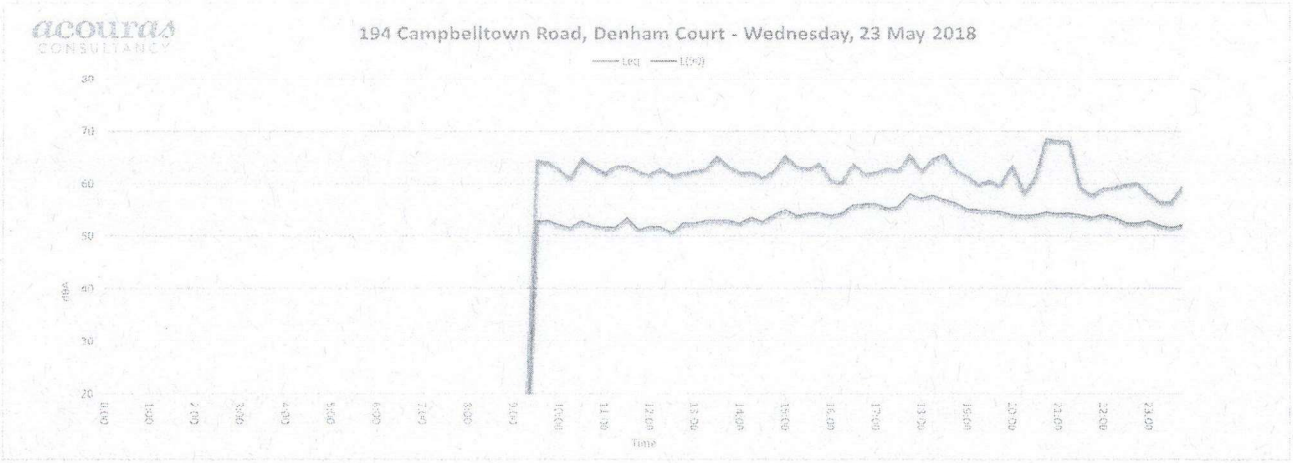
L AEQ,T : Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

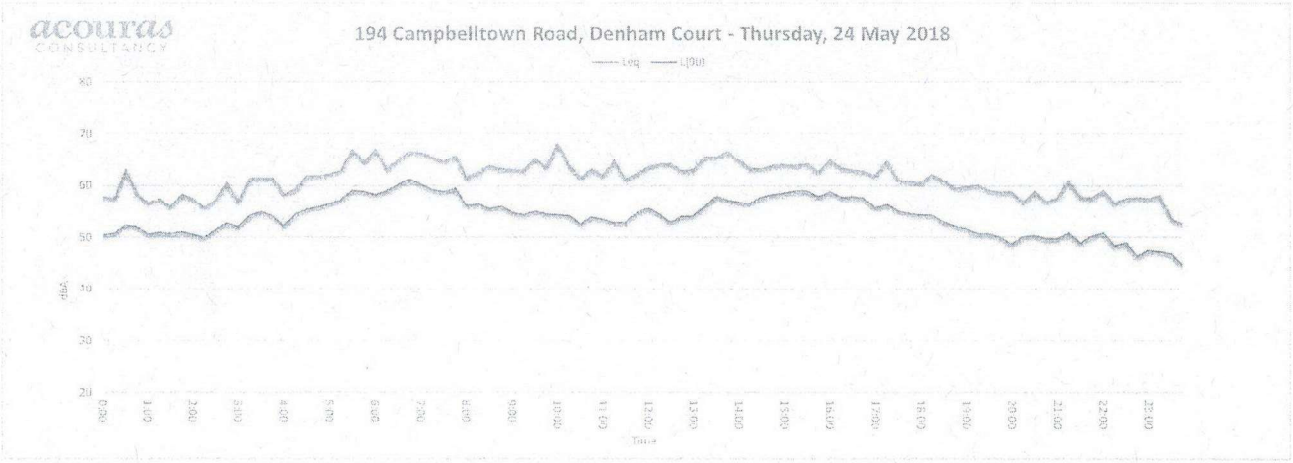
Appendix B – Architectural Drawings

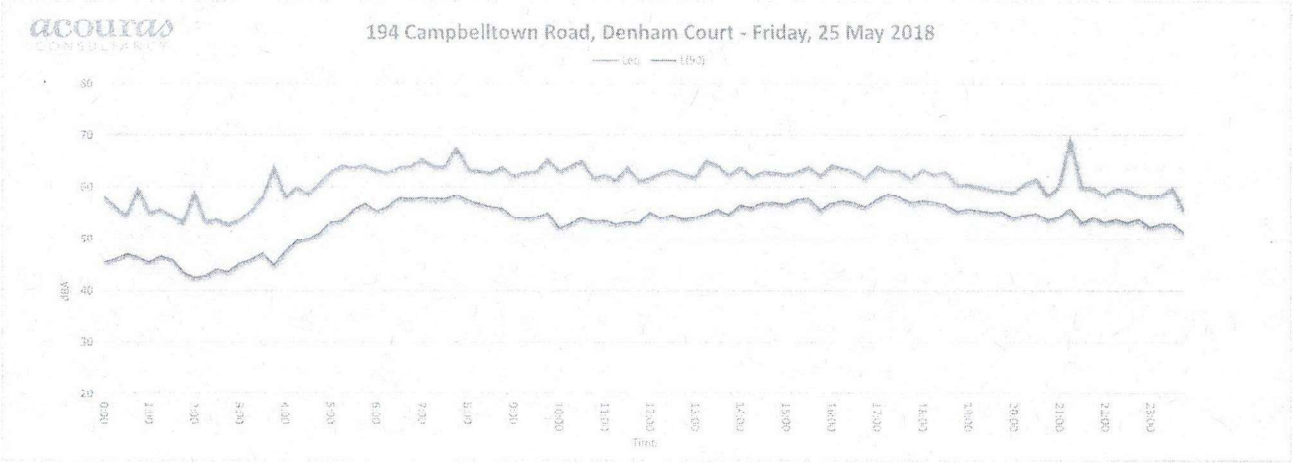
This assessment was based on the following drawings provided by R.J. Sinclair Pty Ltd.

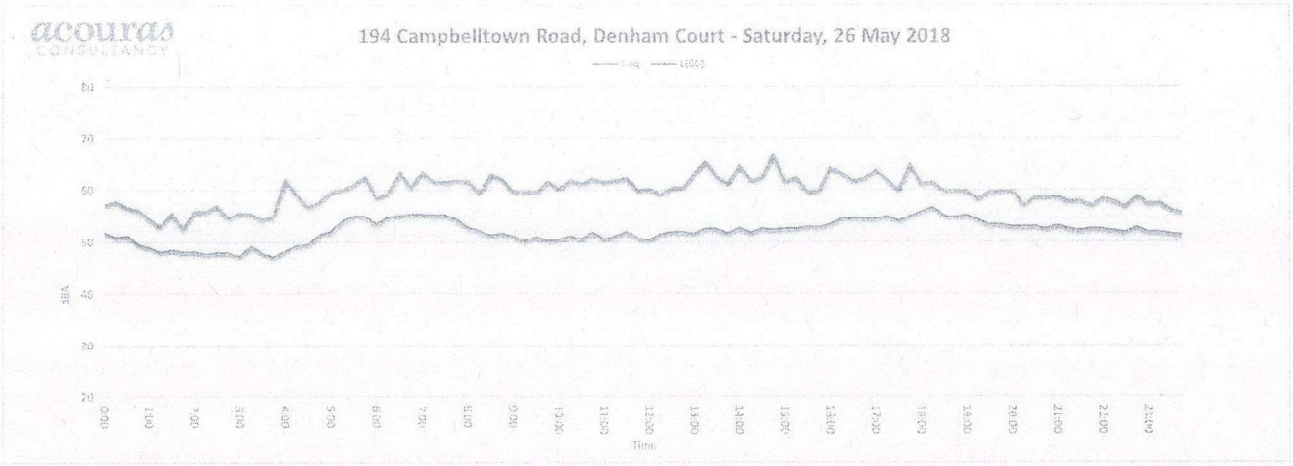
Drawing	Issue	Date	Description
A-02	DA5	14.03.17	Proposed Site Plan

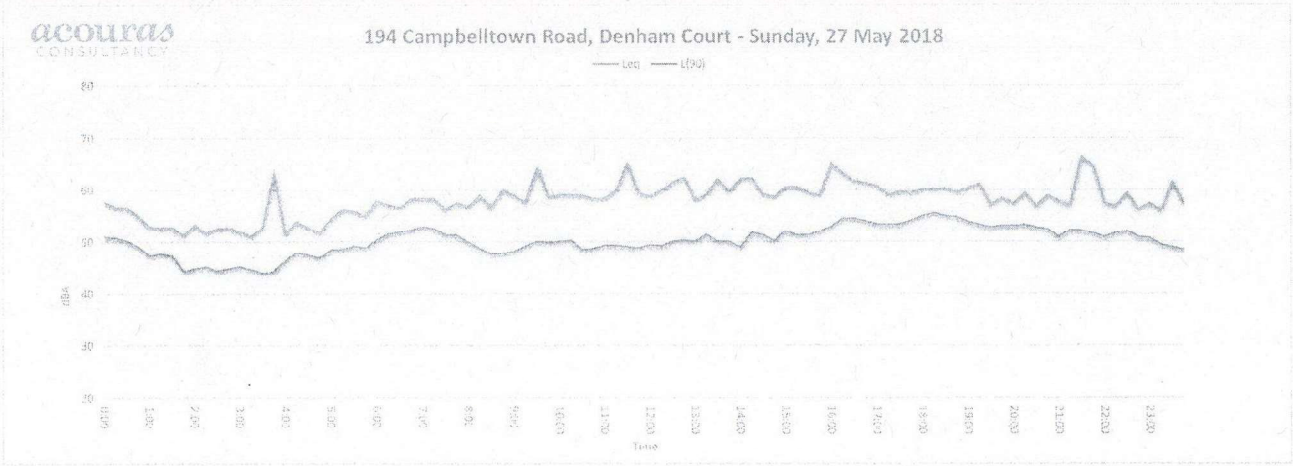
Appendix C – Noise Logger Results

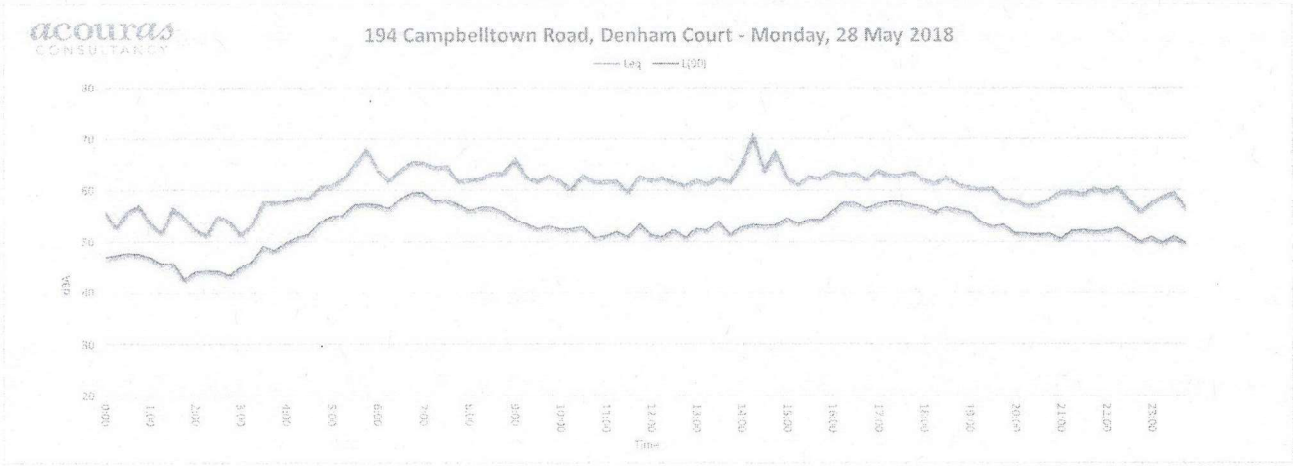


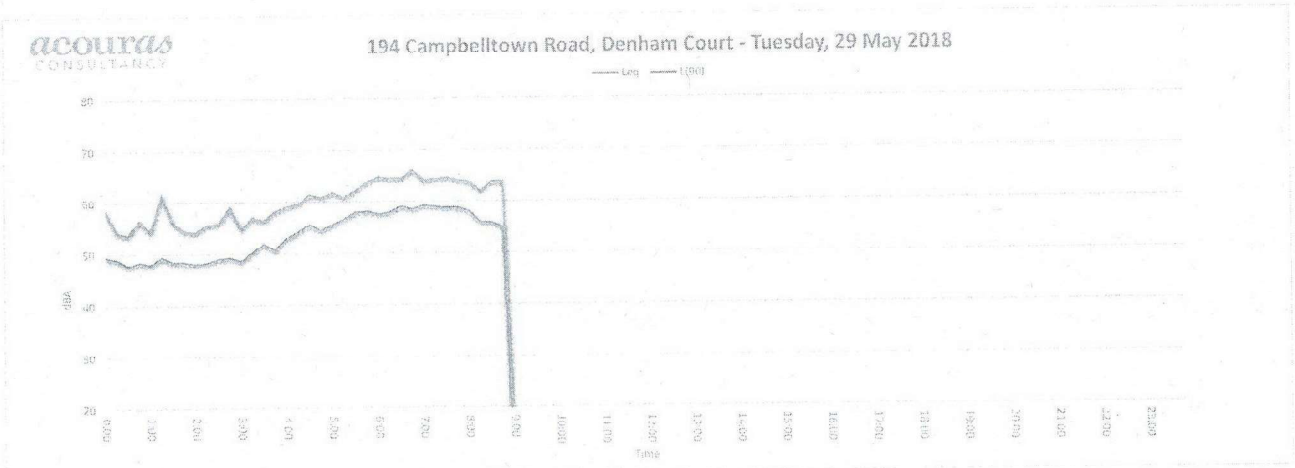





194 Campbelltown Road, Denham Court - Saturday, 26 May 2018
Leq
L(90)
dBA
Time


194 Campbelltown Road, Denham Court - Sunday, 27 May 2018
Leq
L(90)
dBA
Time


194 Campbelltown Road, Denham Court - Monday, 28 May 2018
Leq
L(90)
dBA
Time


acouras
CONSULTANCY
194 Campbelltown Road, Denham Court - Tuesday, 29 May 2018
Leq
L90
dBA
Time

Appendix D – Site Plan