Lloyd George Acoustics
PO Box 717
Hillarys WA 6923
T: 9401 7770 F: 9300 4199
W: www.lgacoustics.com.au

Environmental Noise Assessment

McDonalds Restaurant and Drive-Through

Lot 906 Thomas Road, Byford

Reference: 17053989-01

Prepared for:
McDonald's Australia Ltd
C/-Planning Solutions

Report: 17053989-01

Lloyd George Acoustics Pty Ltd
ABN: 79 125 812 544

PO Box 717
Hillarys WA 6923

T: 9300 4188 / 9401 7770
F: 9300 4199

Contacts	Daniel Lloyd	Terry George	Matt Moyle	Olivier Mallié
E:	daniel@lgacoustics.com.au	terry@lgacoustics.com.au	matt@lgacoustics.com.au	olivier@lgacoustics.com.au
M:	0439 032 844	0400 414 197	0412 611 330	0439 987 455

Date:	Rev	Description	Prepared By	Verified
14/06/17	0	Issued to Client	Matt Moyle	Terry George

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1 INTRODUCTION

Lloyd George Acoustics was commissioned by Planning Solutions to undertake a noise assessment for a proposed McDonalds Restaurant development at Lot 906 Thomas Road, Byford (subject site) – refer *Figure 1-1*. The commercial development consists of the following elements:

- A single takeaway restaurant with dual-lane drive-through ordering system, including outdoor speakers.
- Mechanical plant situated on the roof top.

The nearest noise sensitive premises are located to the south and east of the subject site, with other nearby receivers being commercial use. Noise sources considered were those associated with mechanical plant and vehicle noise in drive-through and parking areas. Noise from this equipment was assessed against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997* by way of noise modelling.

Figure 1-1 Subject Site Locality (Source: Google Earth, dated 25/1/2017)

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

2 CRITERIA

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

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 2-1* are made to the noise emission as measured at the point of reception.

Table 2-1 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 2-2*.

Table 2-2 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
Commercial	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, applicable at the noise sensitive premises has been calculated as 3 dB, as shown in *Table 2-3* based on some surrounding commercial land use (including the subject site) and Thomas Road being a secondary road – having 7,500 vehicles per day (MRWA June 2010 count).

Table 2-3 Influencing Factor Calculation

Description	Within 100 metre Radius	Within 450 metre Radius	Total
Industrial Land	0 dB 0 %	0.0 dB 0 %	0 dB
Commercial Land	1.3 dB 25%	0.1 dB 2 %	1.4 dB
Transport Factor			**2 dB**
Total			**3 dB**

Table 2-4 shows the assigned noise levels including the influencing factor at the receiving locations. The receiving noise sensitive premises are identified in *Figure 2-1*.

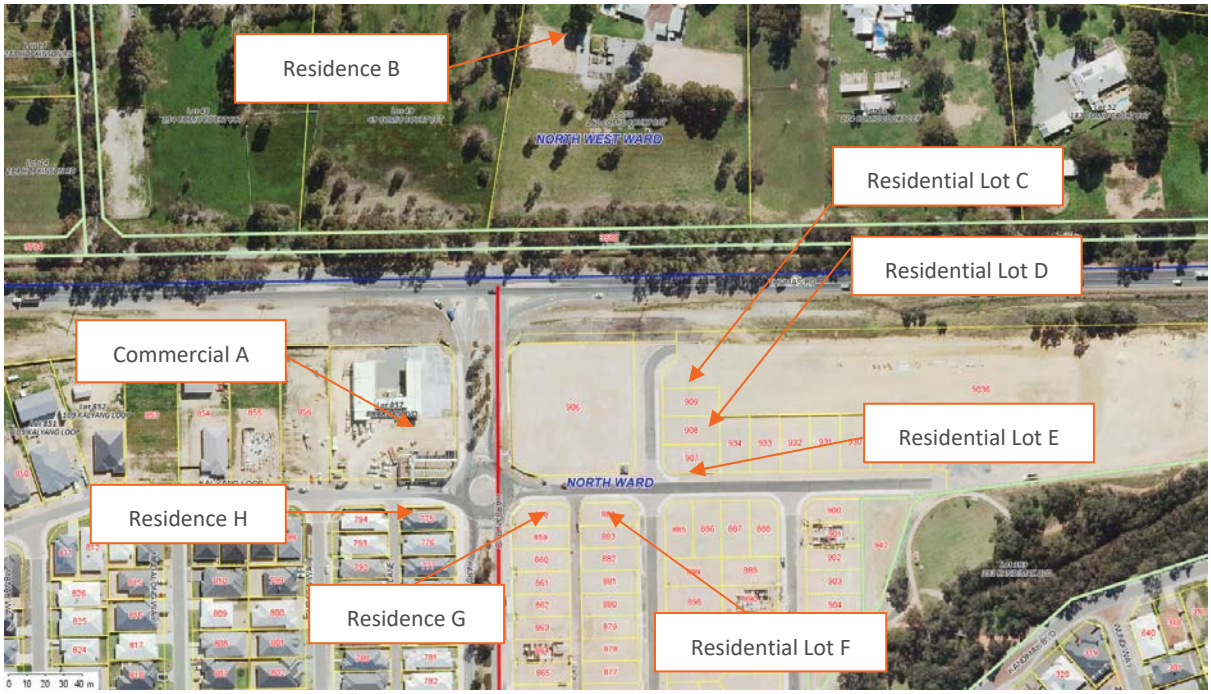


Figure 2-1 Noise Receiving Premises

Table 2-4 Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Residences B, G, H	0700 to 1900 hours Monday to Saturday (Day)	48	58	68
	0900 to 1900 hours Sunday and public holidays (Sunday)	43	53	68
	1900 to 2200 hours all days (Evening)	43	43	58
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	38	48	58
Residential Lots C to F	All hours	60	75	80
Commercial A	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.

Residential lots are proposed to be noise sensitive and are currently unoccupied, hence the higher assigned noise levels. When residences are constructed, the B, G & H assigned noise levels will be applicable.

It must be noted the assigned noise levels apply outside the receiving premises and at a point at least 3 metres away from any substantial reflecting surfaces.

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 4 hour RAP, which is assumed to be appropriate given the nature of the operations, this is to be used for guidance only.

Regulation 3 states the following with regards to vehicles:

(1) Nothing in these regulations applies to the following noise emissions —
(a) noise emissions from the propulsion and braking systems of motor vehicles operating on a road;

Since the development is open to the public, the carpark and associated like areas are considered to be a road and therefore vehicle noise (propulsion and braking) is not strictly assessed. However, the drive-through area has been considered assessable in this report due to the 24-hour nature of the restaurant and the nature of the lanes being solely for food ordering purposes and not road access. Vehicle door closing noise is also assessable in any parts of the car park, as this does not form part of the 'propulsion or braking' systems.

Regulation 14A provides requirements for the collection of waste stating that this activity can also be exempt from having to comply with regulation 7 prescribed standards provided it is undertaken between 7am and 7pm Mondays to Saturdays and undertaken in the quietest reasonable manner.

The restaurant is proposed to operate 24-hours 7-days which is critical to the assessment levels.

3 METHODOLOGY

Computer modelling has been used to predict the noise emissions from the site. The advantage of modelling is that it is not affected by background noise sources and can provide the noise level for various weather conditions and operating scenarios if necessary.

The software used was *SoundPLAN 7.4* with the ISO 9613 algorithms selected. These 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.

3.1 Meteorological Information

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	Night (1900-0700)	Day (0700-1900)
Temperature (^{o}C)	15	20
Humidity (%)	50	50
Wind Speed (m/s)	Up to 5m/s	Up to 5m/s
Wind Direction*	All	All

* 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.

3.2 Topographical Data

Topographical data was sourced from *Google Earth*. Buildings have also been included as these can provide barrier attenuation when located between a source and receiver, much the same as a hill. Property fences have been modelled at the side of dwellings and at heights of 1.8m.

This site plan is included in *Appendix A,* which includes a 2.0m high masonry wall along the eastern carpark boundary.

3.3 Ground Absorption

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). In this instance, a value of 0.7 has been used in built up and landscaped areas and 0.1 for all road and car park areas.

3.4 Source Sound Levels

Table 3-2 shows the sound power levels used in the modelling. The spectrum and overall levels are for individual point sources within the model. The general list of noise emissions considered in the assessment is:

- Mechanical Services (Air conditioning, ventilation systems, and refrigeration plant);
- Drive-through speaker noise;
- Vehicles idling in drive through areas; and
- Car doors closing in parking bays.

Modelled noise sources and positioning were based on file data and manufacturer specifications used on similar McDonald's Restaurant project sites. The locations of the noise sources are based on general locations on the site plan (refer *Appendix A*) noting the following:

- Mechanical Plant are to be roof mounted at 1.0m above building height in the noise model;
- For night time scenarios, mechanical plant is modelled with low speed noise levels;
- Car door and engine sources are modelled at 0.5m above ground;
- 5 (night) to 9 (day) vehicles are modelled idling in the Drive-Through queuing and ordering areas;
- Parapets of 1.0m height are assumed to be surrounding the rooftop areas of the new building.

Given the proposed hours of operation, the night-time scenario is most critical for highly sensitive noise premises and the daytime scenario is most critical for commercial premises. Noise modelling scenarios are:

1. Night L_{A10} – Consists of all mechanical plant operating on low speed mode and 5 vehicles idling in the drive-through areas;
2. Night L_{A1} – Consists of drive-through speaker noise, 9 vehicles idling, and low speed mechanical equipment;
3. Night L_{Amax} – Includes all mechanical plant described for the night scenario, and car door closures at parking bays; and
4. Day L_{A10} – Includes all mechanical plant (at high speed). Also includes 9 vehicles idling in the drive-through areas.

Table 3-2 Source Sound Power Levels, dB

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
Refrigeration Condenser WRC335BEC Axitop – L_{A10}	82	81	79	75	70	64	58	53	**76**
AC-1 Actron PKY960T Low Speed – L_{A10}	-	84	78	75	73	69	60	54	**78**
AC-1 Actron PKY960T High Speed – L_{A10}	-	89	83	80	78	74	64	60	**83**
AC-2 and AC-3 Actron PCG340 Package Unit Low Speed – L_{A10}	-	75	74	73	71	67	65	60	**76**
AC-2 and AC-3 Actron PCG340 Package Unit High Speed – L_{A10}	-	78	78	77	75	71	69	64	**80**
AC-4 Actron PCA260U Package Unit Low Speed – L_{A10}	-	71	71	70	67	62	61	56	**72**
AC-4 Actron PCA260U Package Unit High Speed – L_{A10}	-	76	75	74	71	66	65	60	**76**
Exhaust Fan – Kitchen – L_{A10}	80	78	74	71	62	64	63	53	**73**
Exhaust Fan – General/Toilet – L_{A10}	78	77	68	65	60	58	56	52	**68**
Drive-Through Speaker – L_{A1}	62	64	66	77	80	73	57	42	**82**
Car Idling – L_{A10}	81	78	74	72	74	74	67	64	**79**
Car Door Closing – L_{Amax}	71	74	77	81	80	78	72	61	**84**

4 RESULTS

4.1 Scenario 1: Predicted Noise Night L_{A10}

The results of the L_{A10} Night scenario noise modelling are shown as a noise level contour plot in *Figure 4-1* and summarised below in *Table 4-1.* Refer to *Figure 2-1* for predicted locations as positioned within the noise model.

Table 4-1 Predicted Night Noise Levels, dB L_{A10}

Location	Mechanical Plant	5 Drive-Through Vehicles	Combined	Critical Assigned Level, dB L_{A10}
Commercial A	37	43	44	60
Residence B	26	26	29	38
Residential Lot C	36	25	36	60 (38)
Residential Lot D	36	28	37	60 (38)
Residential Lot E	35	31	37	60 (38)
Residence F	35	33	37	38
Residence G	35	34	38	38
Residence H	33	36	38	38

Noise is highest at Residences G and H (15 and 16 Kardan Bvd), both with a combined assessment level of 38 dB L_{A10} with drive-through vehicles being the dominant contributor at H and both sources similar for G. The vehicles alone would not be considered tonal due to the number of vehicles and variation in engine sounds over the representative period, or when combined with mechanical plant noise. Given the low levels of predicted noise, background noise would be considered to mask any tonality present, therefore no penalties have been applied herein.

The assigned level at this location is 38 dB L_{A10} and therefore noise is predicted to marginally comply.

Note that Residential Lots C through E are currently vacant and therefore have a higher assigned level (and currently comply easily). Should residential buildings be constructed on these lots, the assigned level would be 38 dB L_{A10}. Therefore compliance by a factor of 1 to 2 dB would result for these premises. The dominant noise source at these locations is mechanical plant.

Compliance at the commercial premises is readily achieved.

Summary Scenario 1: Compliance achieved at all receivers by at least 1 dB

Figure 4-1

Predicted Noise level L_{A10} dB

- = 36
- = 38
- = 40
- = 42
- = 44
- = 46
- = 48

N

Signs and symbols

✳ Point source

OCM125.4/09/17

Lot 906 Thomas Road, Byford - McDonalds Restaurant

L_{A10} Noise Level Contours - Scenario 1 - Ground Floor Predicted Noise Levels

Lloyd George Acoustics
by Matt Moyle
matt@lgacoustics.com.au
(61) 412 611 330

4.2 Scenario 2: Predicted Noise Night L_{A1}

The results of the Night L_{A1} scenario noise modelling are shown as a noise level contour plot in *Figure 4-2* and summarised below in *Table 4-2.*

Table 4-2 Predicted Night Noise Levels, dB L_{A1}

Location	Drive-Through Speaker	9 Drive-Through Vehicles	Combined[1]	Critical Assigned Level, dB L_{A1}
Commercial A	40	46	47	75
Residence B	18	27	30	48
Residential Lot C	23	33	38	75 (48)
Residential Lot D	24	34	38	75 (48)
Residential Lot E	23	35	39	75 (48)
Residence F	28	36	39	48
Residence G	31	37	40	48
Residence H	31	40	41	48

1. Combined level includes Night L_{A10} sources of *Table 4-1*.

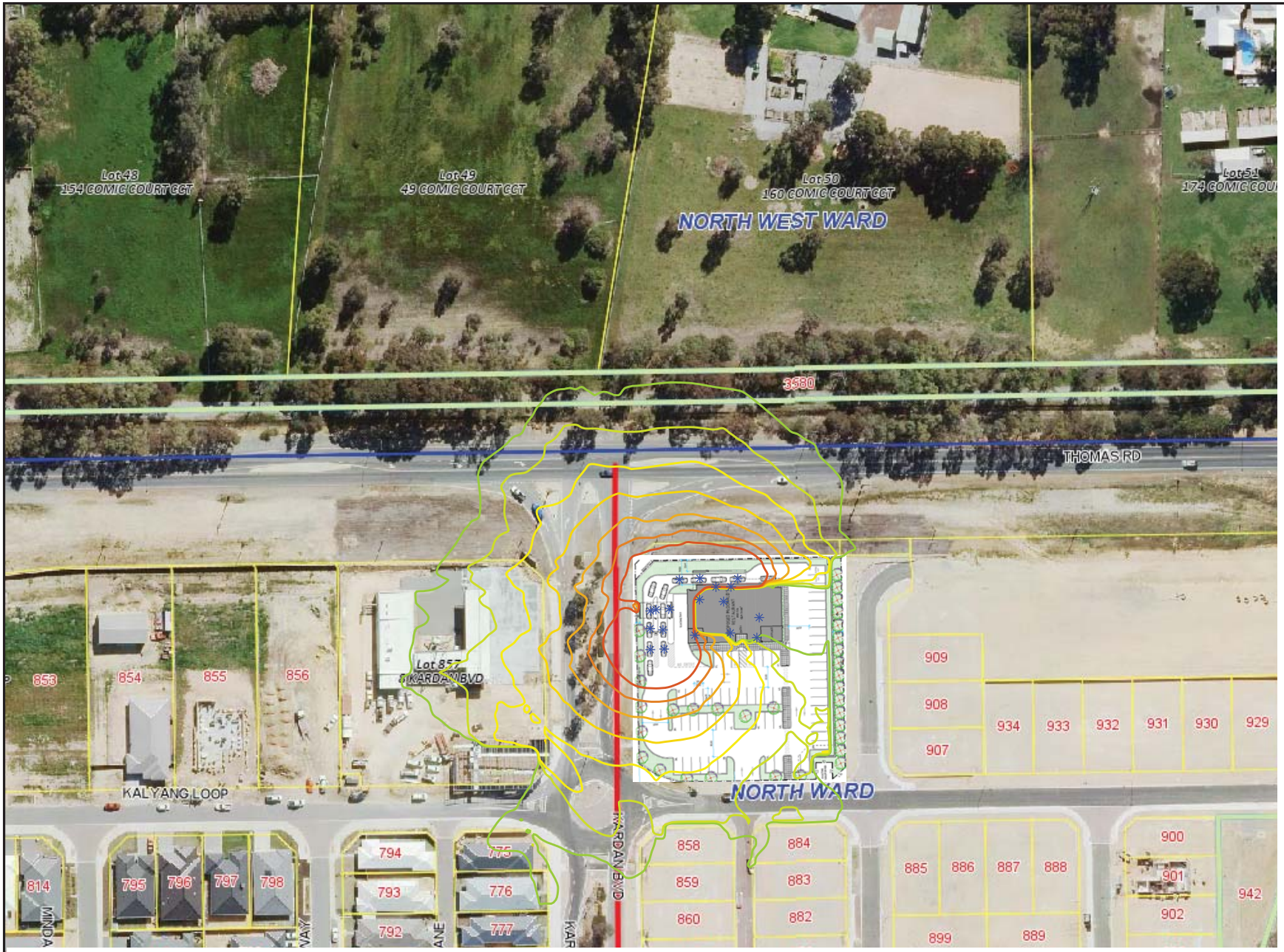
The worst-case calculated noise level for assessment purposes is 41 dB L_{A1} at Residence H (16 Kardan Bvd). This noise level is predominantly from vehicles idling in the drive-through area. The assigned night-time noise level is 48 dB L_{A1} and therefore the noise level complies by at least 7 dB. As with the L_{A10} scenario, noise from vehicles in not considered to contain tonal characteristics when assessed over the representative period.

Note that Residential Lots C though E are currently vacant and therefore have a higher assigned level (and currently complies). Should residential buildings be constructed on these lots, the assigned level would be 48 dB L_{A1}. Despite this, compliance is still achieved as the level is at most 40 dB L_{A1}. The dominant noise source at this location is vehicles idling in drive-through lanes.

Compliance at the commercial premises is readily achieved.

Summary Scenario 2: Compliance achieved at all receivers by at least 7 dB

Figure 4-2



Predicted Noise level L_{A1} dB

- = 42
- = 44
- = 46
- = 48
- = 50
- = 52
- = 54

N

Signs and symbols

- Point source

OCM125.4/09/17

Lot 906 Thomas Road, Byford - McDonalds Restaurant

L_{A1} Noise Level Contours - Scenario 2 - Ground Floor Predicted Noise Levels

Lloyd George Acoustics
by Matt Moyle
matt@lgacoustics.com.au
(61) 412 611 330

4.3 Scenario 3: Predicted Noise Night L_{Amax}

The results of the Night L_{Amax} scenario noise modelling below in *Table 4-3.* Note that the L_{Amax} scenario also includes the L_{A10} and L_{A1} individual noise sources.

Table 4-3 Predicted Night Noise Levels, dB L_{Amax}

Location	Car Doors	Maximum	Critical Assigned Level, dB L_{Amax}
Commercial A	41	41	80
Residence B	22	24[1]	58
Residential Lot C	37	37	80 (58)
Residential Lot D	37	37	80 (58)
Residential Lot E	37	37	80 (58)
Residence F	44	44	58
Residence G	43	43	58
Residence H	44	44	58

1. Maximum level source is the Refrigeration Plant on rooftop.

Vehicle door noise dominates and is up to 44 dB L_{Amax} at the worst case receiver, being Residence F and H. Such an event may be impulsive and subject to +10 dB adjustment, resulting in a level for assessment purposes of 54 dB L_{Amax}. This is 4 dB below the assigned level and therefore compliant.

Note that Residential Lots C through E are currently vacant, however the assigned level has been shown in brackets in *Table 4-3* to provide information for future dwellings. The proposed 2m high masonry wall adequately attenuates car park noise along this boundary and would likely also eliminate the impulsive characteristic of the noise.

Compliance at the commercial premises is readily achieved.

Summary Scenario 3: Compliance achieved at all receivers by at least 4 dB

4.4 Scenario 4: Predicted Noise Day L_{A10}

The day time period includes a full drive-through area with nine (9) cars in total. Mechanical plant are operating at high speeds, however assigned levels are higher for noise sensitive premises at this time, hence this scenario is more critical for commercial compliance. The results of the Sunday Day L_{A10} scenario noise modelling are shown as a noise level contour plot in *Figure 4-4* and summarised in *Table 4-4.*

Table 4-4 Predicted Day Noise Levels, dB L_{A10}

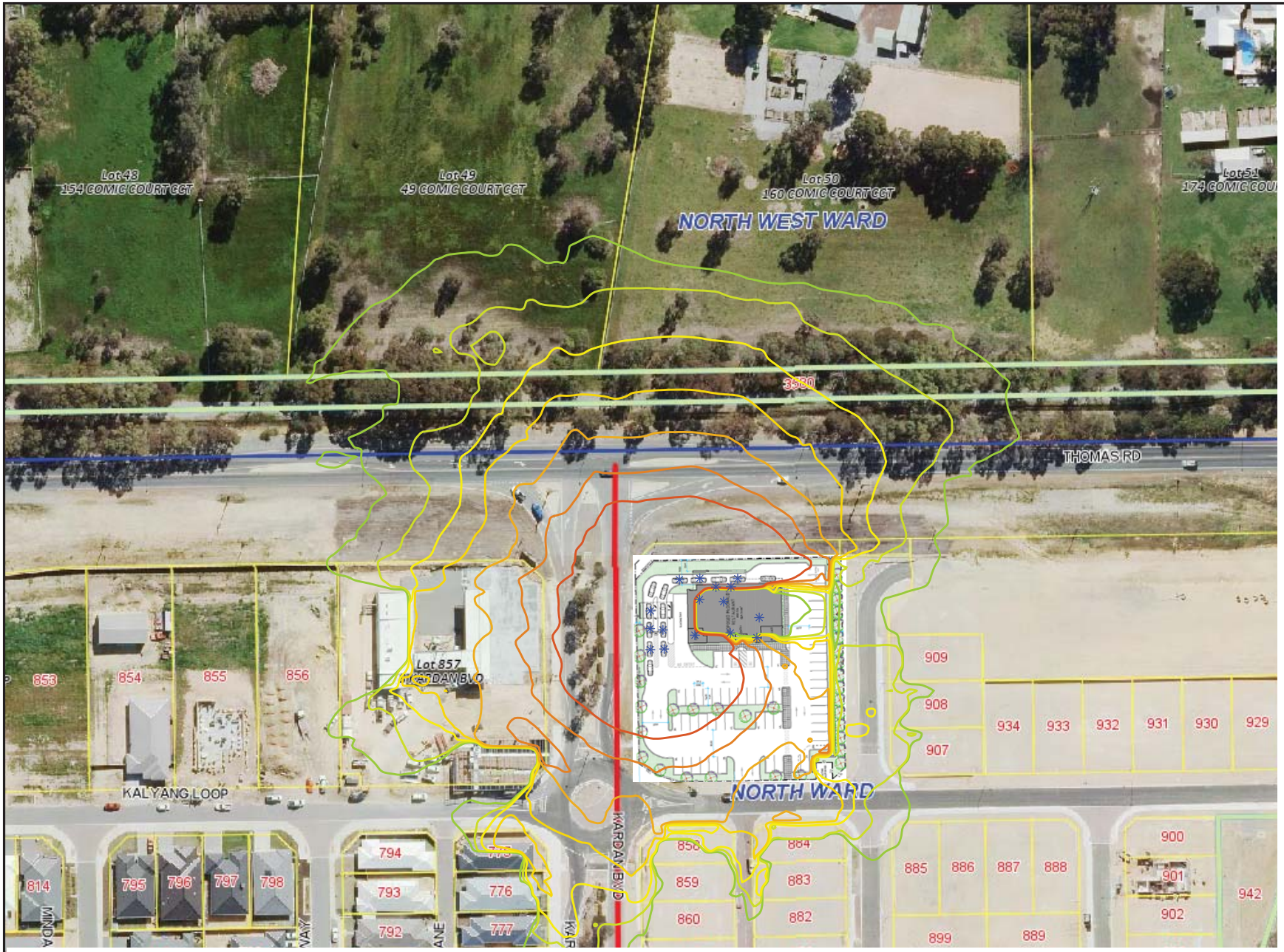
Location	Mechanical Plant	9 Drive-Through Vehicles	Combined	Critical Assigned Level, dB L_{A10}
Commercial A	39	46	47	60
Residence B	27	27	30	43
Residential Lot C	38	33	39	60 (43)
Residential Lot D	38	33	39	60 (43)
Residential Lot E	38	35	39	60 (43)
Residence F	37	36	40	43
Residence G	37	37	40	43
Residence H	35	40	41	43

As with the Night L_{A10} assessment, noise from vehicles is dominant for most receivers. The day time scenario includes 9 modelled cars, however, leading to increased combined levels. This combined noise level with mechanical plant, yields a worst case level of 41 dB at Residence H (16 Kardan Bvd). The noise level is higher during the day, and compliance is achieved by a factor of 2 dB or more at all receivers, assessing against the more critical Sunday.

Compliance at the commercial premises is readily achieved.

Summary Scenario 3: Compliance achieved at all receivers by at least 2 dB

Figure 4-3



Predicted Noise level L_{A10} dB

- = 36
- = 38
- = 40
- = 42
- = 44
- = 46
- = 48

N

Signs and symbols

- Point source

OCM125.4/09/17

Lot 906 Thomas Road, Byford - McDonalds Restaurant

L_{A10} Noise Level Contours - Scenario 4 - Ground Floor Predicted Noise Levels (Day time)

Lloyd George Acoustics
by Matt Moyle
matt@lgacoustics.com.au
(61) 412 611 330

5 ASSESSMENT

All assessment scenarios are predicted to comply with the assigned levels. The assessment identifies that vehicle idling in the drive-through areas (resulting from 5 vehicles at night) noise and mechanical plant are the dominant noise source groups. The proposed masonry wall along the eastern boundary is effective in addressing vehicle noise at residences to the east.

6 RECOMMENDATIONS

The assessment has indicated that noise complies with the assigned levels determined in accordance with the *Environmental Protection (Noise) Regulations 1997*. Therefore, no further noise controls are required, other than ensuring noise from the selected mechanical plant is similar to that in *Table 3-1*, including low speed night time options.

Some best practice recommendations have been included below – to be implemented in the design if budget permits.

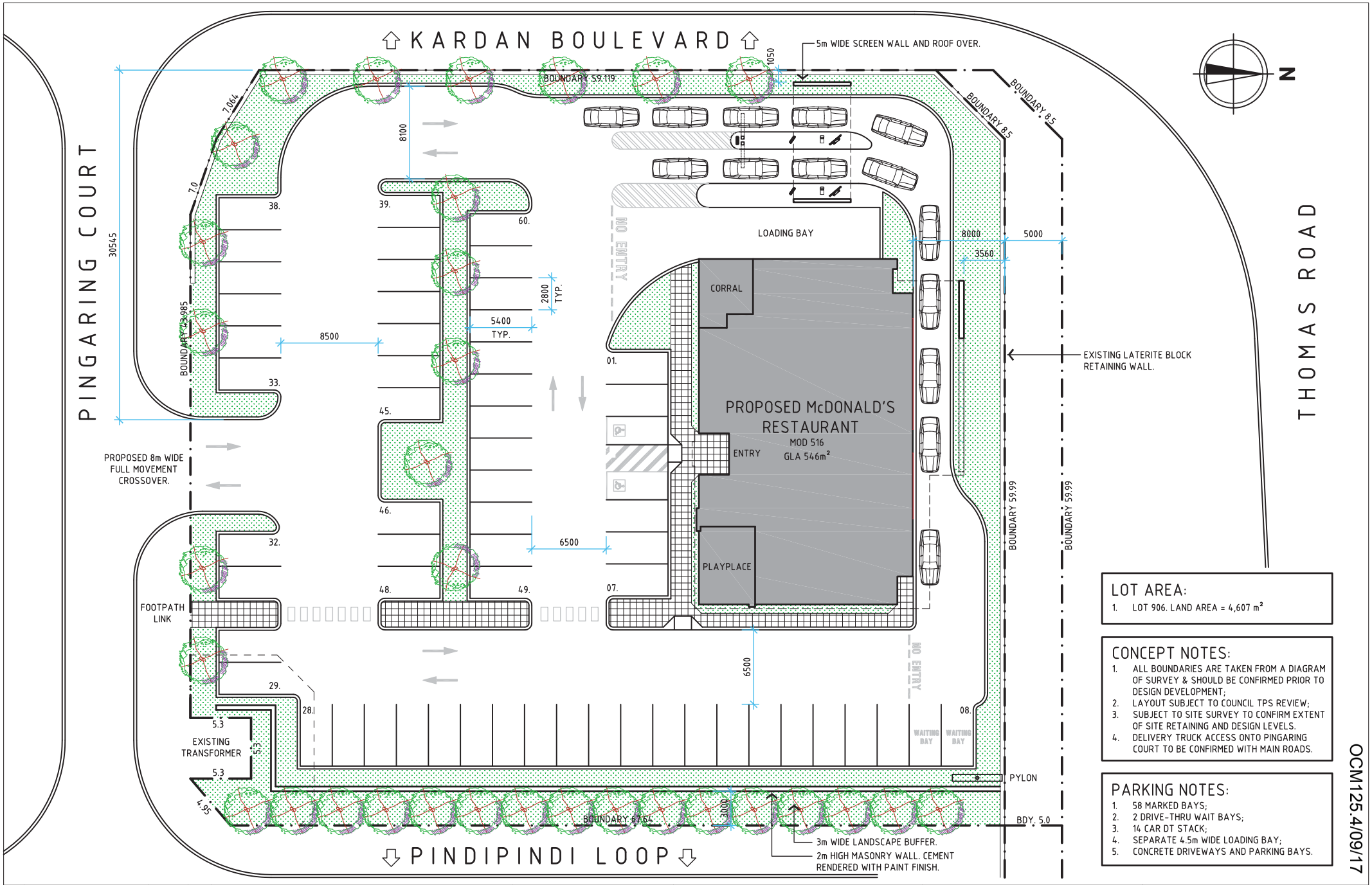
- Mechanical plant for all stores to be located as close to parapet walls as possible or behind localised screens;
- All delivery vehicles are to be encouraged to have broadband type reversing alarms fitted rather than standard tonal alarms. Where a safe work practice can be provided (e.g. use of spotters), reversing alarms are to be turned off;
- Mechanical plant to be regularly maintained to ensure noise levels do not increase over time;
- Mechanical plant to be installed using vibration isolation mounts;
- External speakers shall not play music or the like between the hours of 10pm and 7am;

7 CONCLUSION

The potential noise impacts resulting from the proposed McDonald's Restaurant development at Lot 906 Thomas Road, Byford have been assessed against the *Environmental Protection (Noise) Regulations 1997*. Compliance with the assigned levels has been demonstrated at all assessable time periods, therefore no further noise mitigation measures are necessary.

Appendix A

Proposed Site Plans



LOT AREA:

1. LOT 906. LAND AREA = 4,607 m²

CONCEPT NOTES:

1. ALL BOUNDARIES ARE TAKEN FROM A DIAGRAM OF SURVEY & SHOULD BE CONFIRMED PRIOR TO DESIGN DEVELOPMENT;
2. LAYOUT SUBJECT TO COUNCIL TPS REVIEW;
3. SUBJECT TO SITE SURVEY TO CONFIRM EXTENT OF SITE RETAINING AND DESIGN LEVELS.
4. DELIVERY TRUCK ACCESS ONTO PINGARING COURT TO BE CONFIRMED WITH MAIN ROADS.

PARKING NOTES:

1. 58 MARKED BAYS;
2. 2 DRIVE-THRU WAIT BAYS;
3. 14 CAR DT STACK;
4. SEPARATE 4.5m WIDE LOADING BAY;
5. CONCRETE DRIVEWAYS AND PARKING BAYS.

OCM125 4/09/17

ISSUE	AMENDMENT	DATE	INT

NOTES.

1. DO NOT SCALE THIS DRAWING.
2. THE DRAWING SHOWS DESIGN INTENT ONLY. ALL DIMENSIONS TO BE CHECKED ON SITE PRIOR TO CONSTRUCTION OR PRODUCTION. CONSTRUCTION DETAILS TO BE CONFIRMED BY CONTRACTOR /MANUFACTURER.
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HINDLEY & ASSOCIATES PTY LTD
BUILDING DESIGNERS
166 STIRLING HIGHWAY
NEDLANDS WA 6009
PHONE +9386 6699
FAX +9386 6700
admin@hhindley.com.au
PO BOX 199
NEDLANDS WA 6909

CONCEPT ISSUE

McDonald's Australia Limited
ABN. 43 008 496 928
☎ 02 9875 6666
devgroup-aust@au.mcd.com
NDG NATIONAL DEVELOPMENT GROUP

PROJECT: 0010
PROPOSED McDONALD'S RESTAURANT
LOT 906 THOMAS ROAD
BYFORD WA 6122

STATUS CONCEPT ONLY
TITLE : PROPOSED SITE PLAN

SERIES MOD 516

UNMODIFIED MASTER DRAWING
PROJECT SPECIFIC DRAWING

DRAWN	CHECKED	SCALE	DWG. NO.	REV.
IJ	AJJ	1:300	SK01	B

Appendix B

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.

Sound Power Level (L_w)
Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure levels at known distances. Noise modelling incorporates source sound power levels as part of the input data.

Sound Pressure Level (L_p)
The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

L_{ASlow}
This is the noise level in decibels, obtained using the A frequency weighting and the S time weighting as specified in AS1259.1-1990. Unless assessing modulation, all measurements use the slow time weighting characteristic.

L_{AFast}
This is the noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. This is used when assessing the presence of modulation only.

L_{APeak}
This is the maximum reading in decibels using the A frequency weighting and P time weighting AS1259.1-1990.

L_{Amax}
An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

L_{A1}
An L_{A1} level is the A-weighted noise level which is exceeded for one percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{A10}
An L_{A10} level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{Aeq}
The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

L_{A90}
An L_{A90} level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the "*background*" noise level.

One-Third-Octave Band
Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20 000 Hz inclusive.

L_{Amax} assigned level
Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded at any time.

L_{A1} assigned level
Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period.

L_{A10} assigned level
Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period.

Tonal Noise
A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

the presence in the noise emission of tonal characteristics where the difference between -

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

Modulating Noise
A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

a variation in the emission of noise that —

(a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band;

(b) is present for at least 10% of the representative.

Impulsive Noise
An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness is:

a variation in the emission of a noise where the difference between $L_{A\ peak}$ and $L_{A\ Max\ slow}$ is more than 15 dB when determined for a single representative event;

Major Road
Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

Secondary / Minor Road
Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

Influencing Factor (IF)

$$= \frac{1}{10}(\%\ \text{Type A}_{100} + \%\ \text{Type A}_{450}) + \frac{1}{20}(\%\ \text{Type B}_{100} + \%\ \text{Type B}_{450})$$

where:

$\%\ \text{Type A}_{100}$ = the percentage of industrial land within a 100m radius of the premises receiving the noise

$\%\ \text{Type A}_{450}$ = the percentage of industrial land within a 450m radius of the premises receiving the noise

$\%\ \text{Type B}_{100}$ = the percentage of commercial land within a 100m radius of the premises receiving the noise

$\%\ \text{Type B}_{450}$ = the percentage of commercial land within a 450m radius of the premises receiving the noise

+ Traffic Factor (maximum of 6 dB)

= 2 for each secondary road within 100m

= 2 for each major road within 450m

= 6 for each major road within 100m

Representative Assessment Period
Means a period of time not less than 15 minutes, and not exceeding four hours, 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.

Background Noise
Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings, etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.

Ambient Noise
Means the level of noise from all sources, including background noise from near and far and the source of interest.

Specific Noise
Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.

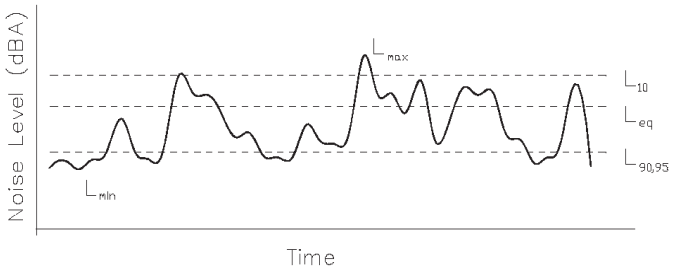
Peak Component Particle Velocity (PCPV)
The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and in one of the three orthogonal directions (x, y or z) measured as a peak response. Peak velocity is normally used for the assessment of structural damage from vibration.

Peak Particle Velocity (PPV)
The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and is the vector sum of the PCPV for the x, y and z directions measured as a peak response. Peak velocity is normally used for the assessment of structural damage from vibration.

RMS Component Particle Velocity (PCPV)
The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and in one of the three orthogonal directions (x, y or z) measured as a root mean square (rms) response. RMS velocity is normally used for the assessment of human annoyance from vibration.

Peak Particle Velocity (PPV)
The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and is the vector sum of the PCPV for the x, y and z directions measured as a root mean square (rms) response. RMS velocity is normally used for the assessment of human annoyance from vibration.

Chart of Noise Level Descriptors



Typical Noise Levels