PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2016/776

Date: 17/08/2018

Queensland Government

Environmental Noise Level Impact Assessment for Proposed Supermarket, Liquor Store, Commercial and Retail, Homestead Drive, Flagstone

conducted for

Coles Group Property Developments Ltd

Report No: R16030/D3114/Rev.2/16.05.2018

Revision No.	Date	Comment
0	27.04.2016	Original report.
1	15.05.2016	Lot 25010 deleted from proposed development
2	16.05.2018	Fuel outlet and some retail at the northern end of the site deleted from the proposed development and commercial building added

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Dates of assessment:	Monday 1 to Monday 8 February 2016
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Our reference:	R16030/D3114/Rev.2/16.05.2018

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INTRODUCTION

It is proposed to establish Coles Flagstone on proposed Lot 25000 on Homestead Drive, Flagstone, cancelling Lots 906 on SP216472 and Lot 873 on SP166448 and consisting of:

- Coles supermarket and associated loading dock;
- liquor store;
- retail;
- commercial;
- carparking; and
- internal roadways.

Noise sources associated with this proposed supermarket, liquor store, commercial and retail include the supermarket loading dock, retail loading area, refrigeration and airconditioning plant and mechanical exhaust, people noise and carparking and internal roadway activities (including delivery vehicles).

The closest residences to the proposed supermarket, liquor store, commercial and retail are to the south in Elderberry Drive.

To establish appropriate noise limits an extended ambient noise level study was conducted from just south of the subject site from adjacent to the closest residences to the south, for a complete 7-day period, in February 2016. The ambient noise levels at this monitoring location would be very similar for all of the closest residences to the proposed supermarket, liquor store, commercial and retail.

This report details the results of the ambient noise level measurements, noise limits, plant, loading dock, delivery vehicles, people and carpark and internal roadway source noise levels, noise level impact at the closest residences and any required noise control measures.

Refer Figure 1 for locality plan and monitoring location A and Figure 2 for site plan.

Figure 1
Approximate Location of Subject Site for Proposed Supermarket, Liquor Store, Commercial and Retail, Monitoring Location A and Closest Residences (Top of the Page is North)

With respect to the closest residences it should be noted that they are all single storey.

Figure 2
Proposed Supermarket, Liquor Store, Commercial and Retail Site Plan (Top of the Page is Approx. North)

CRITERIA

All noise level measurements were conducted in accordance with the following:

- general requirements of the Queensland environmental protection legislation;
- Environmental Protection (Noise) Policy 2008;
- *Noise Measurement Manual*, Queensland Government, Department of Environment and Heritage Protection, Version 4, 22 August 2013;
- Australian Standard AS 1055.1-1997, *Acoustics – Description and Measurement of Environmental Noise*, Part 1, *General Procedures*.

NOISE LIMITS

Noise limits have been defined for both steady state noise sources (eg. refrigeration and airconditioning plant, mechanical exhaust) and time varying noise sources (eg. truck unloading activities, carpark, trolley collection, etc), in accordance with the requirements of the Logan City Council Planning Scheme 2015, Version 1.1, SC 6.2.3 Planning Scheme Policy 3 – Environmental Management, 3.2 *Emission and Immission Standards*.

For the protection of residential amenity Table 3.2.1.1 refers, as detailed below.

Non-Steady Sound (Time Varying Noise)

Noise from vehicle movements, trolley collection, people laughing and talking, etc are time-varying. For this type of noise source, the following noise limits apply at the boundary of a residential premises:

- Monday to Saturday:
    - Daytime (0700 to 1800 hours): $L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A);
    - Evening (1800 to 2200 hours): $L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A);
    - Night (2200 to 0700 hours): $L_{Aeq,adj,T} \leq L_{A90}$ plus 0 dB(A) and $L_{Amax} \leq 60$ dB(A);
- Sunday and Public Holidays:
    - Daytime (0700 to 1800 hours): $L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A);
    - Evening (1800 to 2200 hours): $L_{Aeq,adj,T} \leq L_{A90}$ plus 5 dB(A);
    - Night (2200 to 0700 hours): $L_{Aeq,adj,T} \leq L_{A90}$ plus 0 dB(A) and $L_{Amax} \leq 60$ dB(A);

Continuous Noise

For the constant continuous noise of plant such as that from airconditioning and refrigeration units the following noise limits apply at the boundary of a residential premises:

- Monday to Saturday:
    - anytime: $L_{A90,T}$ plus 0 dB(A);
- Sunday and Public Holidays:
    - anytime: $L_{A90,T}$ plus 0 dB(A).

NOISE LEVEL MEASUREMENTS

Table 1 details the results of the ambient noise level measurements conducted from monitoring location A, from just south of the subject site and adjacent to the closest residences to the subject site. For details of noise measurement equipment, equipment settings, calibration and atmospheric conditions, refer Appendix A. For all of the results of the ambient noise assessment refer Appendix B.

With respect to Table 1 the following should be noted:

- daytime: 0700 to 1800 hours;
- evening: 1800 to 2200 hours;
- night-time: 2200 to 0700 hours;
- 'A' weighted: adjustment made by the sound level meter to the measured noise to correspond to the response of the human ear. This adjustment is standardised by international noise standards;

- $L_{Aeq,T}$: the equivalent continuous (or approximately the 'average') 'A' weighted sound pressure level for the measurement period 'T';
- $L_{A1,T}$: the 'A' weighted sound pressure level exceeded for 1% of the measurement period 'T';
- $L_{A10,T}$: the 'A' weighted sound pressure level exceeded for 10% of the measurement period 'T', which is an approximation of the 'average of the maximum noise levels';
- $L_{A90,T}$: the 'A' weighted sound pressure level exceeded for 90% of the measurement period 'T', which is an approximation of the 'average of the minimum noise levels', which is also known as the 'background' noise level.

Table 1
Results of Ambient Noise Level Measurements, Monitoring Location A

Day	Date	Time Period	Ambient Noise Level, dB(A)							
			L_{Aeq}		L_{A1}		L_{A10}		L_{A90}	
			Range	Av.	Range	Av.	Range	Av.	Range	Av.
Monday	01/02/16	Daytime	43.3-60.8	52.9	48.8-65.9	58.7	44.6-62.9	55.7	38.3-56.3	47.6
		Evening	36.1-55.9	48.5	38.3-61.4	56.2	37.2-58.8	50.7	34.8-47.9	41.4
		Night	35.1-52.9	43.2	37.6-61.5	52.9	36.2-57.7	45.8	33.5-42.7	37.2
Tuesday	02/02/16	Daytime	46.2-60.3	52.9	51.2-71.3	60.0	47.1-63.2	55.2	43.3-54.9	49.3
		Evening	40.8-54.8	48.0	42.9-61.7	56.5	42.1-56.5	49.8	38.9-51.3	43.4
		Night	41.8-49.7	45.4	43.9-61.7	53.4	43.1-51.3	46.5	39.9-46.8	42.4
Wednesday	03/02/16	Daytime	47.1-65.8	53.7	53.4-71.8	60.2	47.4-69.7	56.8	39.9-55.0	47.6
		Evening	43.9-63.4	52.9	46.1-68.5	58.6	45.3-67.9	56.6	41.8-55.4	46.9
		Night	42.9-52.1	46.1	45.1-62.5	53.7	44.2-54.3	47.9	41.0-49.5	42.8
Thursday	04/02/16	Daytime	43.6-56.6	50.4	48.4-61.9	57.4	45.3-58.3	52.9	39.1-54.7	45.7
		Evening	43.0-52.3	48.4	45.0-61.8	56.0	44.1-53.7	49.4	41.3-50.0	44.7
		Night	42.6-53.2	46.4	44.2-62.3	55.3	43.6-56.1	48.4	41.0-45.5	42.4
Friday	05/02/16	Daytime	45.2-58.5	52.6	50.7-71.8	60.6	45.8-61.8	55.1	38.6-55.9	47.9
		Evening	38.2-57.6	49.1	42.5-65.5	56.7	39.3-64.2	53.7	36.4-46.3	41.1
		Night	36.1-52.6	43.8	39.5-61.6	53.7	37.1-56.9	46.2	34.6-42.7	37.8
Saturday	06/02/16	Daytime	44.3-59.4	53.3	50.2-67.7	60.2	45.2-62.8	57.0	39.0-52.9	44.9
		Evening	39.4-54.0	46.3	42.4-59.3	53.2	41.1-57.4	48.6	36.9-48.1	41.7
		Night	37.5-64.4	50.1	40.7-78.3	63.5	39.1-62.2	48.9	35.5-41.0	37.6
Sunday	07/02/16	Daytime	44.4-57.5	51.2	51.5-70.3	60.1	45.1-58.4	53.7	38.6-51.3	44.8
		Evening	38.5-56.6	48.0	43.4-60.8	54.7	41.4-59.2	50.5	34.4-48.1	41.2
		Night	34.3-49.9	43.0	37.3-62.2	53.9	35.2-52.4	44.6	32.9-41.2	36.0

From Table 1, the following average ambient noise levels should be noted:

- $L_{Aeq,T}$:
  - daytime: 52.9, 52.9, 53.7, 50.4, 52.6, 53.3, 51.2 Average = 52.4 dB(A);
  - evening: 48.5, 48.0, 52.9, 48.4, 49.1, 46.3, 48.0 Average = 48.7 dB(A);
  - night-time: 43.2, 45.4, 46.1, 46.4, 43.8, 50.1, 43.0 Average = 45.4 dB(A);

- $L_{A1,T}$:
  - daytime: 58.7, 60.0, 60.2, 57.4, 60.6, 60.2, 60.1 Average = 59.6 dB(A);
  - evening: 56.2, 56.5, 58.6, 56.0, 56.7, 53.2, 54.7 Average = 56.0 dB(A);
  - night-time: 52.9, 53.4, 53.7, 55.3, 53.7, 63.5, 53.9 Average = 55.2 dB(A);

- $L_{A10,T}$:
  - daytime: 55.7, 55.2, 56.8, 52.9, 55.1, 57.0, 53.7 Average = 55.2 dB(A);
  - evening: 50.7, 49.8, 56.6, 49.4, 53.7, 48.6, 50.5 Average = 51.3 dB(A);
  - night-time: 45.8, 46.5, 47.9, 48.4, 46.2, 48.9, 44.6 Average = 46.9 dB(A);

- $L_{A90,T}$:
  - daytime: 47.6, 49.3, 47.6, 45.7, 47.9, 44.9, 44.8 Average = 46.8 dB(A);
  - evening: 41.4, 43.4, 46.9, 44.7, 41.1, 41.7, 41.2 Average = 42.9 dB(A);
  - night-time: 37.2, 42.4, 42.8, 42.4, 37.8, 37.6, 36.0 Average = 39.5 dB(A)

Based on the above the noise limits for non-steady sound are:

- daytime (0700 to 1800 hours): 46.8 + 5 = 52 dB(A) $L_{Aeq,adj,T}$
- evening (1800 to 2200 hours): 42.9 + 5 = 48 dB(A) $L_{Aeq,adj,T}$
- night-time (2200 to 0700 hours): 39.5 + 0 = 40 dB(A) $L_{Aeq,adj,T}$ and $L_{Amax} \leq 60$ dB(A);

and the noise limits for continuous noise are, for any time of the day, evening or night, the L_{A90} + 0 dB(A), which is the equivalent of:

- daytime (0700 to 1800 hours): 46.8 + 0 = 47 dB(A) $L_{A90,T}$
- evening (1800 to 2200 hours): 42.9 + 0 = 43 dB(A) $L_{A90,T}$
- night-time (2200 to 0700 hours): 39.5 + 0 = 40 dB(A) $L_{A90,T}$.

SOURCE NOISE LEVELS

Continuous Noise

From previous noise level measurements conducted by the consultant typical continuous source noise levels are:

- supermarket refrigeration condensers: 85 dB(A) SWL;
- supermarket airconditioning condensers: 85 dB(A) SWL;
- exhaust fans: 65 dB(A) $L_{Aeq,adj,T}$ @ 1 m;
- cassette airconditioner: 60 dB(A) $L_{Aeq,adj,T}$ @ 1 m;
- refrigeration unit: 70 dB(A) $L_{Aeq,adj,T}$ @ 1 m;
- refrigerated trailer (current model): 71 dB(A) $L_{Aeq,adj,T}$ @ 1 m.

The following has been assumed with respect to the number of items of plant and equipment:

- supermarket: two airconditioning units;
four refrigeration units;
four exhaust fans;
- commercial: one airconditioning unit;
- liquor store and retail: one airconditioning cassette each;
one refrigeration unit for liquor store.

The following are the assumed locations of all of the above plant and equipment:

- supermarket – all plant on the roof, located immediately east of the loading dock;
- liquor store – all plant centrally located on the roof;
- commercial – all plant on the roof, centrally located;
- retail – all plant located centrally on the roof.

With respect to the above plant and equipment, the following hours of operation have been assumed:

- supermarket and liquor store – 24 hours per day, 7 days per week;
- retail – daytime, 7 days per week;
- commercial – daytime, 6 days per week.

With respect to trading hours, the standard trading hours will apply to the supermarket, namely:

- Monday to Friday: 0800 to 2100 hours;
- Saturday: 0800 to 1700 hours; and
- Sunday: 0900 to 1800 hours.

It is envisaged that the trading hours for liquor store will be no longer than the trading hours for the supermarket, and for the retail it is considered unlikely that it would trade past 1800 hours on any day of the week.

For the commercial building it has been assumed that it would operate from 0700 to 1800 hours 6-days per week.

Non-Steady Sound (Time Varying Noise)

The following noise levels for time varying noise, based on noise assessments conducted for a number of similar premises, are:

- car driving on site: 47 dB(A) $L_{Aeq,adj,T}$ and 55 dB(A) $L_{Amax,T}$ @ 8 m;
- car door closing: 49 dB(A) $L_{Aeq,adj,T}$ and 55 dB(A) $L_{Amax,T}$ @ 30 m;
- car engine starting: 49 dB(A) $L_{Aeq,adj,T}$ and 55 dB(A) $L_{Amax,T}$ @ 30 m;
- people laughing, talking: 57 dB(A) $L_{Aeq,adj,T}$ and 63 dB(A) $L_{Amax,T}$ @ 8 m;
- semi-trailer driving: 72 dB(A) $L_{Aeq,adj,T}$ and 75 dB(A) $L_{Amax,T}$ @ 8 m;
- trolley tractor driving: 68 dB(A) $L_{Aeq,adj,T}$ and 73 dB(A) $L_{Amax,T}$ @ 8 m;
- trolleys off tractor: 70 dB(A) $L_{Aeq,adj,T}$ and 75 dB(A) $L_{Amax,T}$ @ 8 m;
- waste collection vehicle: 70 dB(A) $L_{Aeq,adj,T}$ and 75 dB(A) $L_{Amax,T}$ @ 8 m;
- MRV driving: 67 dB(A) $L_{Aeq,adj,T}$ and 72 dB(A) $L_{Amax,T}$ @ 8 m;
- SRV driving: 62 dB(A) $L_{Aeq,adj,T}$ and 67 dB(A) $L_{Amax,T}$ @ 8 m.

It should be noted that there are no forklifts associated with the subject site.

NOISE LEVEL IMPACT – CONTINUOUS NOISE

At the closest residences to the south (closest of these residences to each of the potential noise sources) the continuous source noise levels will be as per Table 2.

Table 2
Continuous Noise Source Noise Levels Calculated to Closest Residences to South

Premises	Noise Source			Source Noise Level (dB(A))	Distance to Receptor (m)	Noise Level Reduction (dB(A))			Receptor Noise Level (dB(A))
	Type	Number	Adjustment (dB(A))			Distance	Barrier	Ground	
Closest Residence on Eastern Side of Elderberry Drive									
Retail 349 m^2	A/C	1	0	60@1m	125	-42	0	0	18
Retail 201 m^2	A/C	1	0	60@1m	65	-36	0	0	24
Liquor Store	A/C	1	0	60@1m	80	-38	0	0	22
	Refrig	1	0	70@1m	80	-38	0	0	32
Commercial	A/C	1	0	70@1m	155	-44	0	0	26
Supermarket	A/C	2	+8	85SWL	120	-50	-5	0	38
	Refrig	4							
	Fans	4	+6	65@1m	120	-42	-5	0	24
	trailer	1	0	71@1m	125	-42	-20	0	9
								TOTAL	39.5
Closest Residence on Western Side of Elderberry Drive									
Retail 261 m^2	A/C	1	0	60@1m	125	-42	-20	0	0
Retail 265 m^2	A/C	1	0	60@1m	65	-36	0	0	24
Liquor Store	A/C	1	0	60@1m	80	-38	-15	0	7
	Refrig	1	0	70@1m	80	-38	-15	0	17
Commercial	A/C	1	0	70@1m	130	-42	-5	0	23
Supermarket	A/C	2	+8	85SWL	95	-48	-5	0	40
	Refrig	4							
	Fans	4	+6	65@1m	95	-40	-5	0	26
	trailer	1	0	71@1m	90	-39	-10	0	22
								TOTAL	40

With respect to line of sight and barrier calculations, refer site plan for the location of the on-site buildings relative to the closest residences on the eastern and western sides of Elderberry Drive. It should be noted that for some of the roof mounted noise sources the leading edge of the supermarket building is acting as an acoustic barrier, and for some of the other noise sources the supermarket building itself is acting as an acoustic barrier.

For all of the closest residences to the proposed supermarket, liquor store, commercial and retail the combined plant and equipment noise levels comply with the daytime, evening and night-time noise limits, with all of the plant and equipment detailed in Table 2 operating for the complete 24-hour day.

All of the above calculations are based on the assumed number, location and noise level of plant and equipment for the proposed supermarket, liquor store, commercial and retail.

Once a more precise number of items of plant and equipment is known, as well as the location for this plant and equipment and the associated noise levels, plant and equipment noise level impact should be recalculated to the closest residences.

NOISE LEVEL IMPACT – NON-STEADY SOUND (TIME VARYING NOISE)

At the closest residences to the south, on the eastern and western sides of Elderberry Drive the time varying source noise levels will be as per Table 3.

With respect to line of sight and barrier calculations, refer site plan for the location of the on-site buildings.

All supermarket trucks (including waste collection) will enter the subject site from Road No. 6 and exit via Road No. 7.

For the Liquor Store, commercial and retail loading bays (Stage 3) (SRV and MRV trucks and waste collection) trucks will enter the subject site off either Road No. 6 or Homestead Drive and will all exit to Road No. 6.

Table 3
Time Varying Source Noise Levels Calculated to Closest Residences

Premises	Noise Source	Source Noise Level (dB(A))	Distance to Receptor (m)	Noise Level Reduction (dB(A))			Receptor Noise Level (dB(A))
				Distance	Barrier	Ground	
Closest Residence to South, Eastern Side of Elderberry Drive							
Supermarket Loading Dock	Semi trailer driving	72 $L_{Aeq,adj,T}$ @ 8m	120	-24	-20	0	28
		75 $L_{Amax,T}$ @ 8m	120	-24	-20	0	31
	MRV	70 $L_{Aeq,adj,T}$ @ 8m	120	-24	-20	0	26
		72 $L_{Amax,T}$ @ 8m	120	-24	-20	0	28
	Waste collection vehicle	70 $L_{Aeq,adj,T}$ @ 8m	120	-24	-20	0	26
		75 $L_{Amax,T}$ @ 8m	120	-24	-20	0	31
Vehicle movements	MRV, Liquor Store	67 $L_{Aeq,adj,T}$ @ 8m	80	-20	0	0	47
		72 $L_{Amax,T}$ @ 8m	80	-20	0	0	52
	SRV, Liquor Store	62 $L_{Aeq,adj,T}$ @ 8m	80	-20	0	0	42
		67 $L_{Amax,T}$ @ 8m	80	-20	0	0	47
	Trolley tractor driving	68 $L_{Aeq,adj,T}$ @ 8m	80	-20	0	0	48
		73 $L_{Amax,T}$ @ 8m	80	-20	0	0	53
	Trolleys off tractor	70 $L_{Aeq,adj,T}$ @ 8m	130	-24	-20	0	26
		75 $L_{Amax,T}$ @ 8m	130	-24	-20	0	31
Car park	Car driving	47 $L_{Aeq,adj,T}$ @ 8m	60	-18	0	0	29
		55 $L_{Amax,T}$ @ 8m	60	-18	0	0	37
	Car door closing	49 $L_{Aeq,adj,T}$ @ 30m	60	-6	0	0	43
		55 $L_{Amax,T}$ @ 30m	60	-6	0	0	49
	Car engine starting	49 $L_{Aeq,adj,T}$ @ 30m	60	-6	0	0	43
		55 $L_{Amax,T}$ @ 30m	60	-6	0	0	49
	People laughing, talking	57 $L_{Aeq,adj,T}$ @ 8m	60	-18	0	0	39
		63 $L_{Amax,adj,T}$ @ 8m	60	-18	0	0	45

Table 3
Time Varying Source Noise Levels Calculated to Closest Residences

Premises	Noise Source	Source Noise Level (dB(A))	Distance to Receptor (m)	Noise Level Reduction (dB(A))			Receptor Noise Level (dB(A))
				Distance	Barrier	Ground	
Closest Residence to South, Western Side of Elderberry Drivey							
Supermarket Loading Dock	Semi trailer driving	72 $L_{Aeq,adj,T}$ @ 8m	90	-21	-12	0	39
		75 $L_{Amax,T}$ @ 8m	90	-21	-12	0	42
	MRV	70 $L_{Aeq,adj,T}$ @ 8m	90	-21	-12	0	37
		72 $L_{Amax,T}$ @ 8m	90	-21	-12	0	39
	Waste collection vehicle	70 $L_{Aeq,adj,T}$ @ 8m	90	-21	-12	0	37
		75 $L_{Amax,T}$ @ 8m	90	-21	-12	0	42
Vehicle movements	MRV	67 $L_{Aeq,adj,T}$ @ 8m	80	-20	0	0	47
		72 $L_{Amax,T}$ @ 8m	80	-20	0	0	52
	SRV	62 $L_{Aeq,adj,T}$ @ 8m	80	-20	0	0	42
		67 $L_{Amax,T}$ @ 8m	80	-20	0	0	47
	Trolley tractor driving	68 $L_{Aeq,adj,T}$ @ 8m	80	-20	0	0	48
		73 $L_{Amax,T}$ @ 8m	80	-20	0	0	53
	Trolleys off tractor	70 $L_{Aeq,adj,T}$ @ 8m	130	-24	-20	0	26
		75 $L_{Amax,T}$ @ 8m	130	-24	-20	0	31
Carpark	Car driving	47 $L_{Aeq,adj,T}$ @ 8m	70	-19	0	0	28
		55 $L_{Amax,T}$ @ 8m	70	-19	0	0	36
	Car door closing	49 $L_{Aeq,adj,T}$ @ 30m	70	-7	0	0	42
		55 $L_{Amax,T}$ @ 30m	70	-7	0	0	48
	Car engine starting	49 $L_{Aeq,adj,T}$ @ 30m	70	-7	0	0	42
		55 $L_{Amax,T}$ @ 30m	70	-7	0	0	48
	People laughing, talking	57 $L_{Aeq,adj,T}$ @ 8m	70	-19	0	0	38
		63 $L_{Amax,adj,T}$ @ 8m	70	-19	0	0	44

For all of the closest residences to the proposed supermarket, Liquor Store, commercial and retail the time varying noise sources, as applicable to the hours of the day, evening and night when these noise sources will occur on site, all noise sources comply with the noise limits. This assumes that the carpark activities, trolley tractor and retail, commercial and Liquor Store deliveries will only occur during the daytime and evening (as applicable).

This compliance with the relevant time period noise limits is without any additional noise control measures in place.

NOISE CONTROL

For all potential continuous noise sources and non-steady sound noise sources associated with the proposed development, no additional noise control measures are required. This is based on the fact that carpark activities, trolley tractor and retail, commercial and Liquor Store deliveries will only occur during the daytime and evening (as applicable), and that for some of the noise sources intervening buildings (and for roof mounted plant the leading edge of the roof) can act as an acoustic barrier.

Once a more precise number of items of plant and equipment is known, as well as the location for this plant and equipment and the associated noise levels, plant and equipment noise level impact should be recalculated to the closest residences.

CONCLUSIONS

It is proposed to establish Coles Flagstone on proposed Lot 25000 on Homestead Drive, Flagstone, cancelling Lots 906 on SP216472 and Lot 873 on SP166448 and consisting of:

- Coles supermarket and associated loading dock;
- liquor store;
- retail;
- commercial;
- carparking; and
- internal roadways.

Noise sources associated with this proposed supermarket, liquor store, commercial and retail include the supermarket loading dock, retail loading area, refrigeration and airconditioning plant and mechanical exhaust, people noise and carparking and internal roadway activities (including delivery vehicles).

The closest residences to the proposed supermarket, liquor store, commercial and retail are to the south in Elderberry Drive.

To establish appropriate noise limits an extended ambient noise level study was conducted from just south of the subject site from adjacent to the closest residences to the south, for a complete 7-day period, in February 2016. The ambient noise levels at this monitoring location would be very similar for all of the closest residences to the proposed supermarket, liquor store, commercial and retail.

Noise limits for this proposed development were based on the requirements of the Logan Planning Scheme 2015, Version 1.1, SC 6.2.3 Planning Scheme Policy 3 – Environmental Management, 3.2 *Emission and Immission Standards*. Noise limits for both non-steady sound (time varying noise) and continuous noise are defined for the different time periods, relative to the residential boundary.

Continuous noise and time varying source noise levels were estimated based on previous noise level measurements conducted by the consultant for similar premises, calculated to the closest residences and compared to the noise limits.

For all of the closest residences to the proposed supermarket, liquor store, commercial and retail the combined plant and equipment noise levels comply with the daytime, evening and night-time noise limits, with all of the plant and equipment detailed in Table 2 operating for the complete 24-hour day.

All of the above calculations are based on the assumed number, location and noise level of plant and equipment for the proposed supermarket, liquor store, commercial and retail.

Once a more precise number of items of plant and equipment is known, as well as the location for this plant and equipment and the associated noise levels, plant and equipment noise level impact should be recalculated to the closest residences.

For the time varying noise sources, with due consideration of:

1. the height of the noise sources and receptors;
2. separation distances;
3. hours of operation of the carpark, trolley tractor and delivery vehicles to the Liquor Store, commercial and retail assumed to be daytime and evening (as applicable) only (not night-time); and
4. aspects of the development which have acoustic barrier properties (intervening buildings, etc);

the noise limits are complied with at the closest residences to the south, for the western and eastern sides of Elderberry Drive. This noise limit compliance is achieved with no additional noise control measures in place.

RECOMMENDATION

It is recommended that, from an environmental noise perspective, the proposed supermarket, liquor store, commercial and retail at proposed Lot 25000 on Homestead Drive, Flagstone be approved, with no additional noise control measures required to achieve compliance with the noise limit criteria of Logan City Council, for the nominated hours of operation of the different noise sources.

APPENDIX A: NOISE LEVEL MEASUREMENT EQUIPMENT

Measurement Equipment

The following equipment was used to conduct the 7-day background noise assessment at monitoring location A:

- Bruel and Kjaer Type 2250D Light Modular Precision Sound Level Meter, Serial No. 3004552, with Type 4189 prepolarised free field half-inch condenser microphone, Serial No. 2879996 and windshield;
- Bruel and Kjaer Type 3592 outdoor microphone kit, including Type UA1404 outdoor microphone;
- Bruel and Kjaer Type AO 0442 ten metre microphone extension cable; and
- Bruel and Kjaer Type 4231 Sound Level Calibrator, Serial No. 2292736.

This equipment is Type 1 in accordance with the requirements of Australian Standard AS 1055.1-1997, *Acoustics – Sound Level Meters*.

Measurement Equipment Settings

The above equipment was used with the following settings:

Detector:	RMS
Time Weighting:	FAST
Frequency Spectrum:	THIRD-OCTAVE
Frequency Range:	16 TO 16000 Hz
Frequency Weighting:	LINEAR (Frequency Analysis); A (Overall Sound Pressure)
Microphone Sensitivity:	49.424 mV/Pa.

Calibration

The sound level meter was calibrated to the required value of 93.8 dB at 1000 Hz immediately before and after the noise level measurements were conducted. At no time was an adjustment of more than ±0.5 dB required. This complies with the requirements of the Australian Standard.

Monitoring Location

Monitoring Location A was just south of the subject site, adjacent to the closest residences which are to the south of the subject site, with the microphone elevated 1.8 metres. Refer Figure 1 for further detail.

Atmospheric Conditions

Throughout the 7-day period, atmospheric conditions complied with the requirements of the Australian Standard, with the only exception being Thursday 4 February when there was 36 mm of rainfall. However, from the average results of the ambient noise levels, there was no significant difference between the results for Thursday and any of the other six days assessed. Therefore the noise data for Thursday was included in determining the background noise levels. Refer following copy of Bureau of Meteorology data sheet for Beaudesert for February 2016 – this is the closest weather station to the subject site.

Beaudesert, Queensland
February 2016 Daily Weather Observations

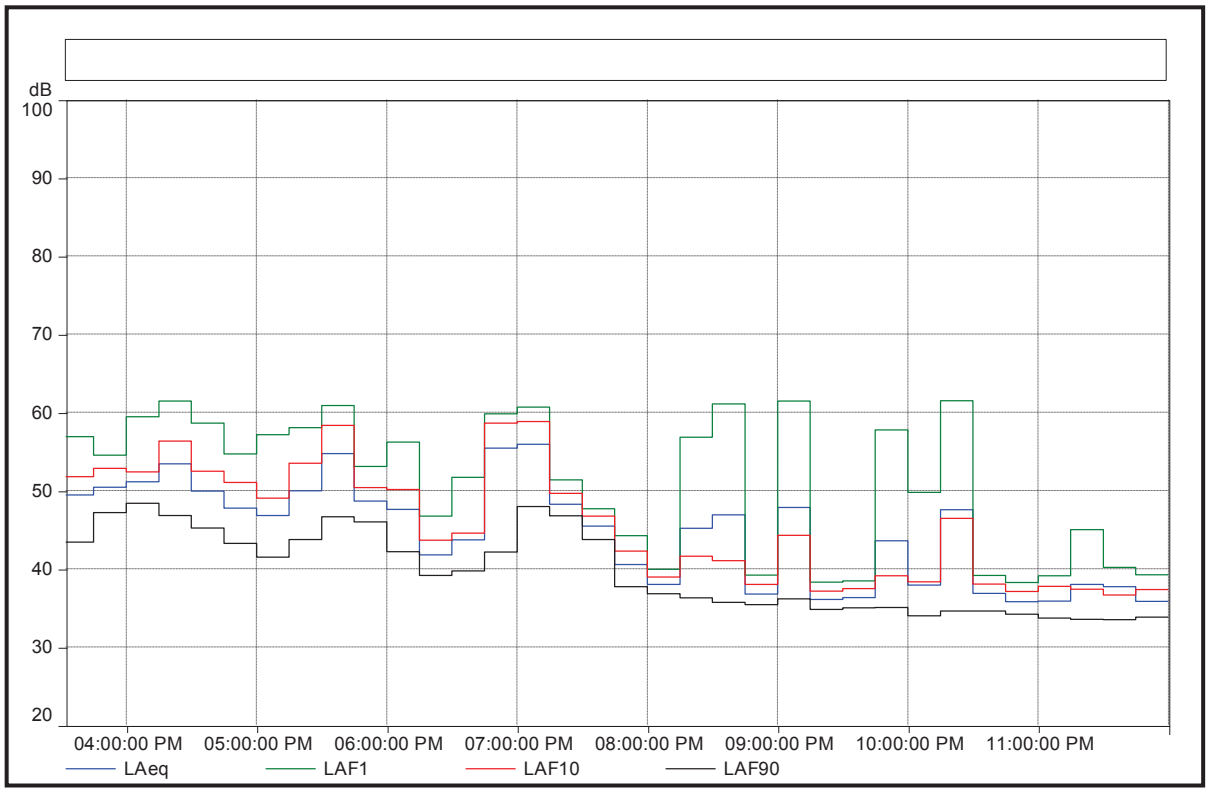
Observations from a site in Drumley Street, about 1.5 km northwest of the town centre.

Australian Government
Bureau of Meteorology

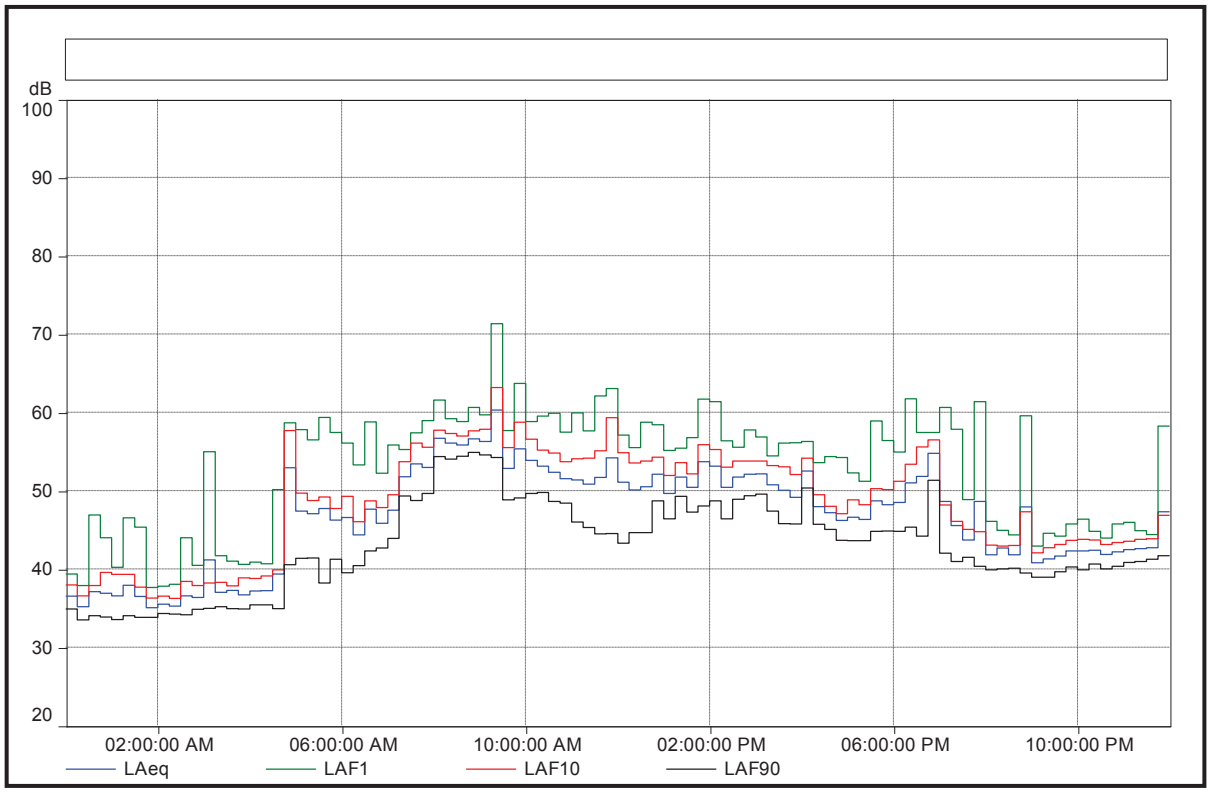
Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Mo	22.9	36.4	3.4			NW	28	16:18	26.8	82		NW	4	1008.5	35.4	42		NW	7	1002.2
2	Tu	21.5	32.9	0.2			NNW	22	18:36	29.0	71		WNW	2	1004.8	31.6	58		WNW	4	1001.7
3	We	23.4	34.9	0			SE	31	16:58	28.6	64		SE	2	1004.1	33.9	51		W	6	1000.0
4	Th	22.8	28.2	35.6			SE	26	15:29	27.4	73		S	6	1005.4	26.1	61		SE	11	1005.6
5	Fr	20.6	29.3	3.4			SSW	30	12:25	25.1	71		SSW	13	1009.1	28.0	58		SSE	15	1007.8
6	Sa	21.2	28.2	0			ESE	37	14:21	25.4	73		SSW	13	1011.6	27.1	68		S	17	1009.3
7	Su	20.2	26.6	4.2			SSW	33	10:58	23.0	76		SW	15	1014.3	25.9	62		SSW	11	1012.6
8	Mo	14.8	30.1	0.2			SSE	33	16:31	24.8	61		SSW	11	1016.1	28.6	47		SSE	19	1012.8
9	Tu	17.7	30.0	0			SSE	43	13:15	26.1	57		SSE	17	1015.9	28.7	50		SE	19	1013.7
10	We	16.2	30.5	0			ESE	28	17:58	25.0	65		SSW	15	1014.5	29.9	47		S	9	1010.8
11	Th	17.2		0						26.2	64		WSW	9	1013.2	28.6	53		ESE	9	1010.4
12	Fr	16.7	29.6				ESE	33	12:34	27.2	60		SE	11	1013.5	28.1	56		ESE	17	1011.4
13	Sa	15.1	27.9	0			SE	31	13:51	26.3	63		SSW	19	1011.6	27.3	61		S	13	1009.6
14	Su	15.4	33.0	0			SSW	28	11:51	26.0	62		SSW	13	1009.0	31.8	49		WSW	13	1006.1
15	Mo	14.6	33.4	0			SW	28	15:07	26.8	63		SSW	7	1010.3	32.9	50		SSW	15	1006.9
16	Tu	16.2	37.9	0			NNE	33	17:17	24.7	76		SW	4	1009.0	37.2	26		SSW	2	1003.6
17	We	23.3	33.9	0			ENE	31	16:20	27.9	63		SW	7	1008.1	31.3	58		ENE	15	1004.7
18	Th	21.9	35.6	0			ENE	31	16:47	28.6	68		N	9	1008.5	33.6	51		NE	15	1004.2
19	Fr	24.5	33.2	0			W	67	15:35	28.6	67		NE	9	1013.3	24.6	68		SE	17	1009.8
20	Sa	19.6	32.0	56.6			E	28	16:55	26.7	80		WSW	4	1017.4	30.9	54		E	9	1014.4
21	Su	19.5	30.9	0			ESE	35	16:19	26.7	64		SSE	11	1021.0	30.0	43		ESE	17	1018.8
22	Mo	17.4	30.8	0			ESE	31	13:56	25.9	64		SSW	6	1023.0	29.9	49		ESE	17	1018.9
23	Tu	17.0	31.0	0			E	33	12:18	26.8	56		SE	15	1019.7	29.4	45		ESE	13	1016.0
24	We	15.8	31.8	0			E	22	16:57	24.9	68		WSW	9	1018.0	30.4	41		ESE	7	1014.1
25	Th	18.2	32.8	0			N	26	15:34	25.1	64		WSW	4	1016.6	32.4	38		NW	4	1012.1
26	Fr	16.3	35.8	0			SE	31	16:09	25.2	70		W	2	1012.9	35.2	41		SSW	4	1007.7
27	Sa	19.6	32.4	0			S	35	08:44	28.4	53		SSE	19	1013.1	31.9	45		S	17	1010.2
28	Su	21.8	31.4	0			SW	37	14:38	27.0	68		SSW	13	1015.0	29.3	64		SSW	22	1011.7
29	Mo	20.6	30.4	0			SSE	31	17:03	25.6	68		SSW	19	1017.0	29.4	57		S	9	1014.4
Statistics for February 2016																					
Mean		19.0	31.8							26.4	66			9	1012.9	30.3	51			12	1009.7
Lowest		14.6	26.6							23.0	53		#	2	1004.1	24.6	26		SSW	2	1000.0
Highest		24.5	37.9	56.6			W	67		29.0	82		#	19	1023.0	37.2	68		SSW	22	1018.9
Total				103.6																	

APPENDIX B: AMBIENT NOISE LEVEL MEASUREMENT RESULTS

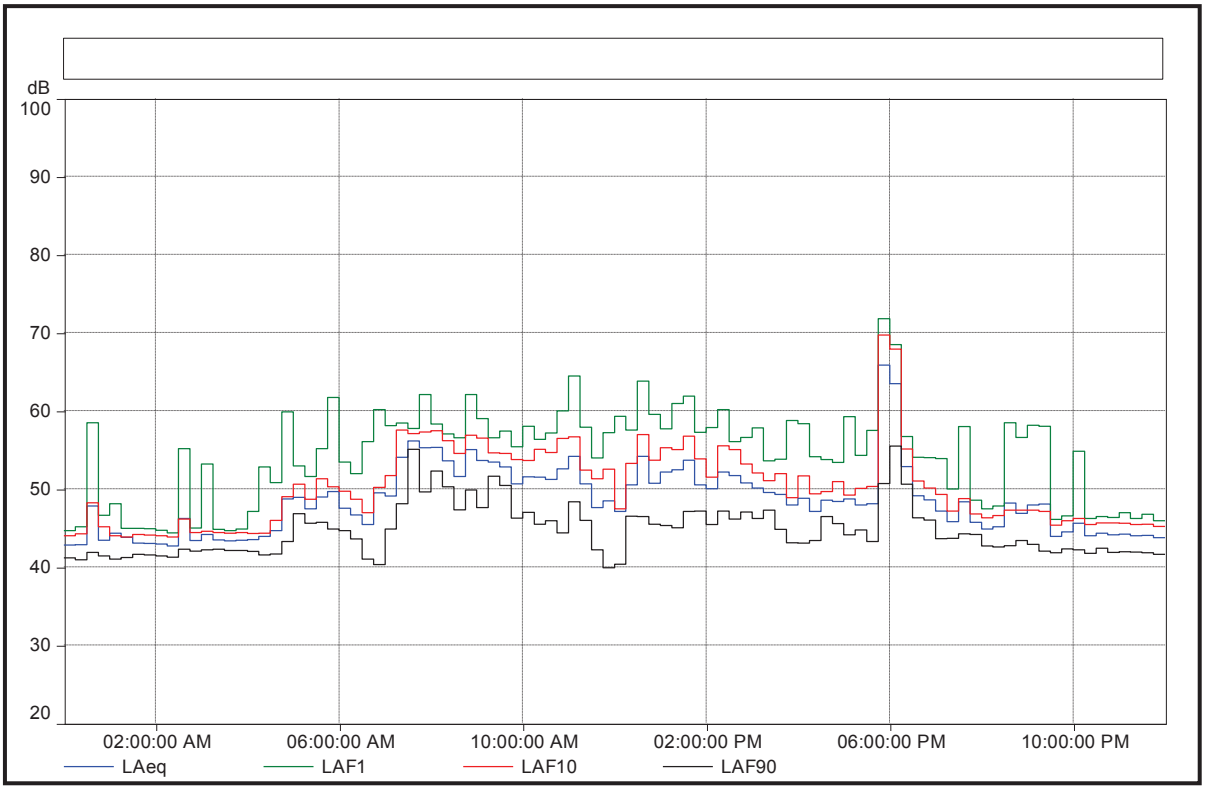
Instrument:		2250-L
Application:		BZ7133 Version 4.1.6
Start Time:		02/01/2016 15:32:06
End Time:		02/10/2016 11:20:24
Elapsed Time:		8.00:00:02
Bandwidth:		1/3-octave
Max Input Level:		141.05
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		A
Spectrum:	FS	Z
Instrument Serial Number:		3004552
Microphone Serial Number:		2879996
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field
Calibration Time:		02/01/2016 15:29:09
Calibration Type:		External reference
Sensitivity:		49.4236722588539 mV/Pa



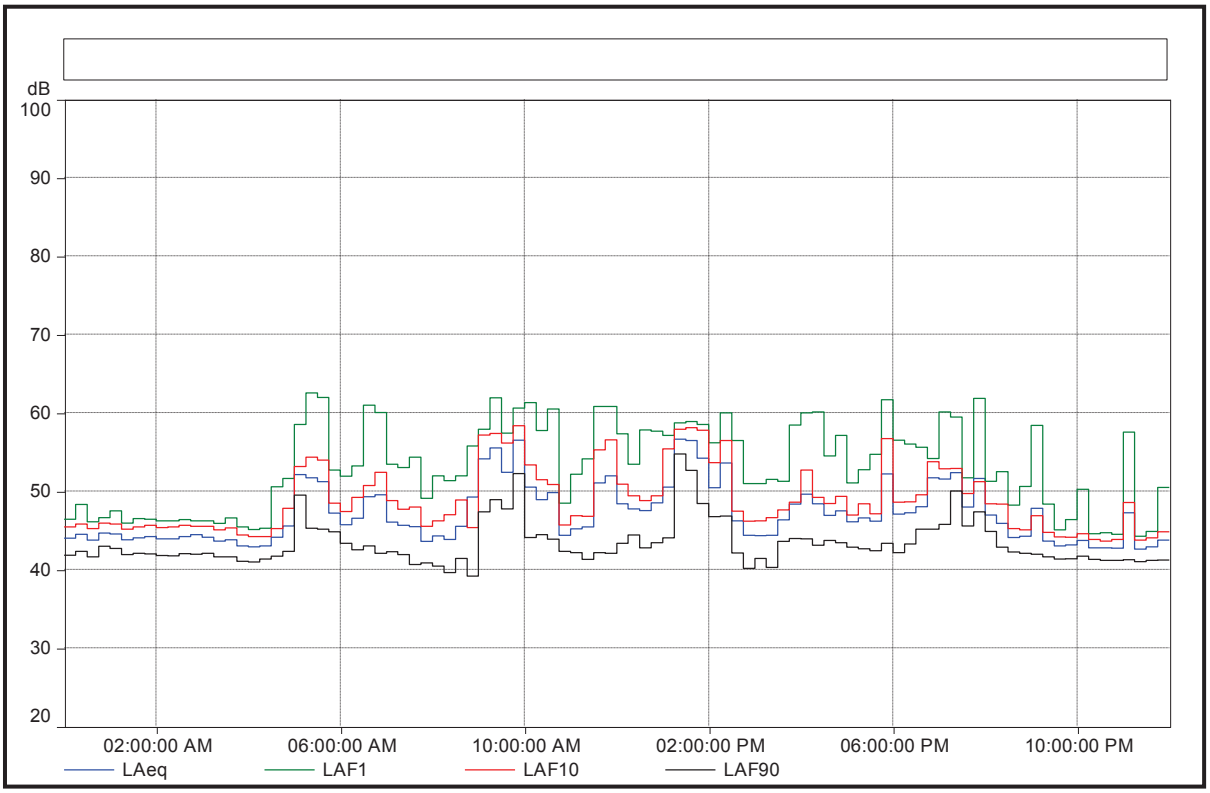
Ambient Noise Levels, Monday 1st February 2016, from 1530 hours



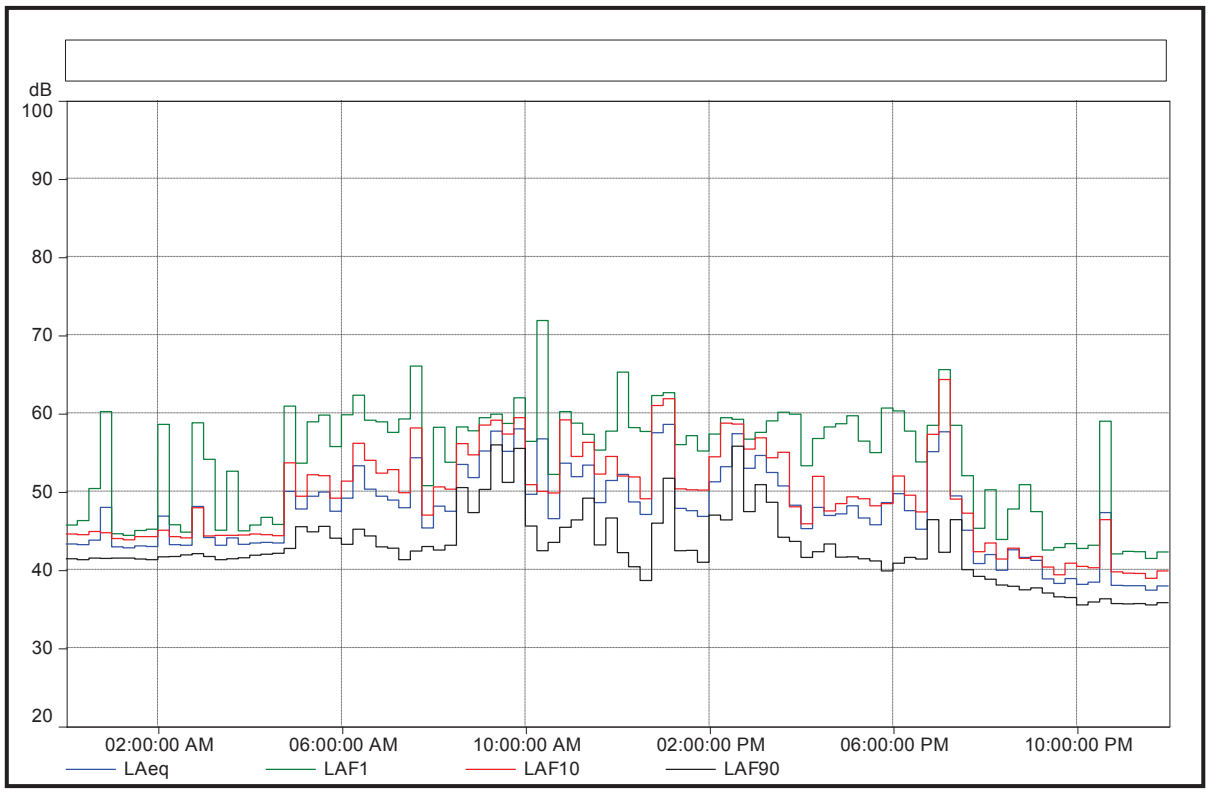
Ambient Noise Levels, Tuesday 2nd February 2016



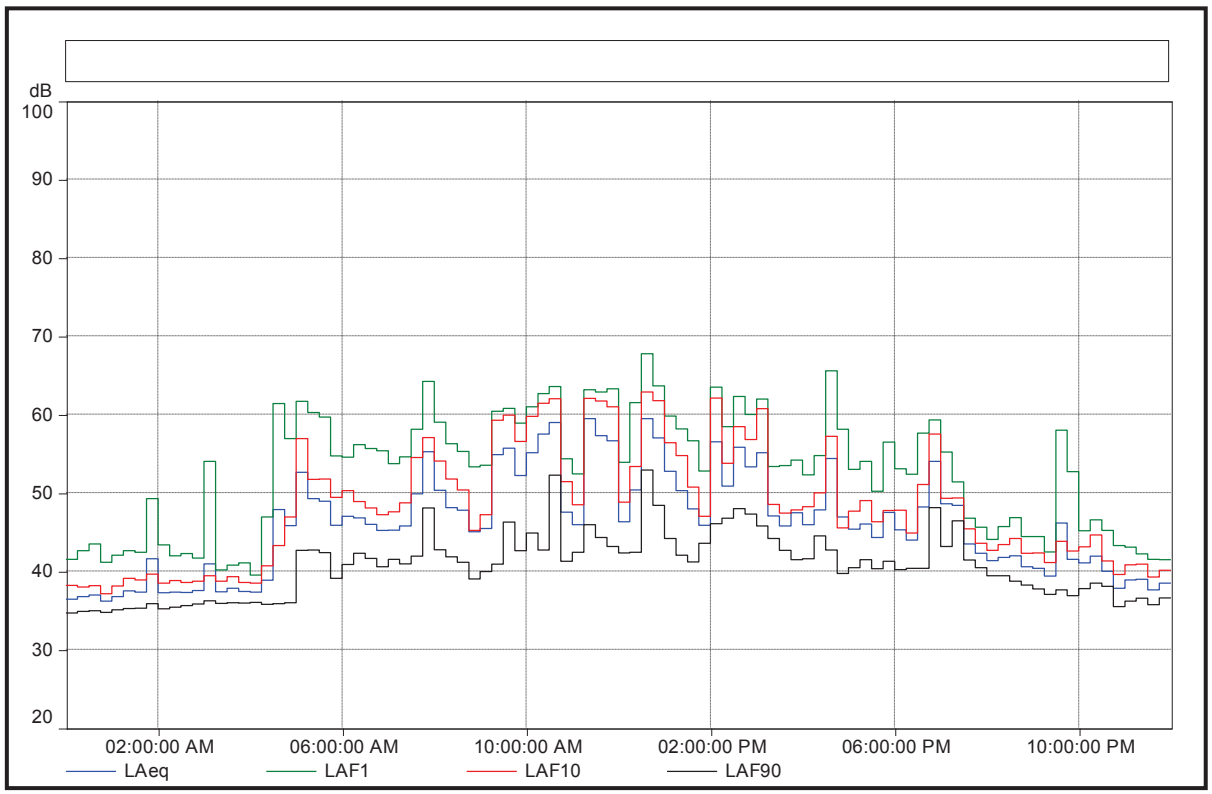
Ambient Noise Levels, Wednesday 3rd February



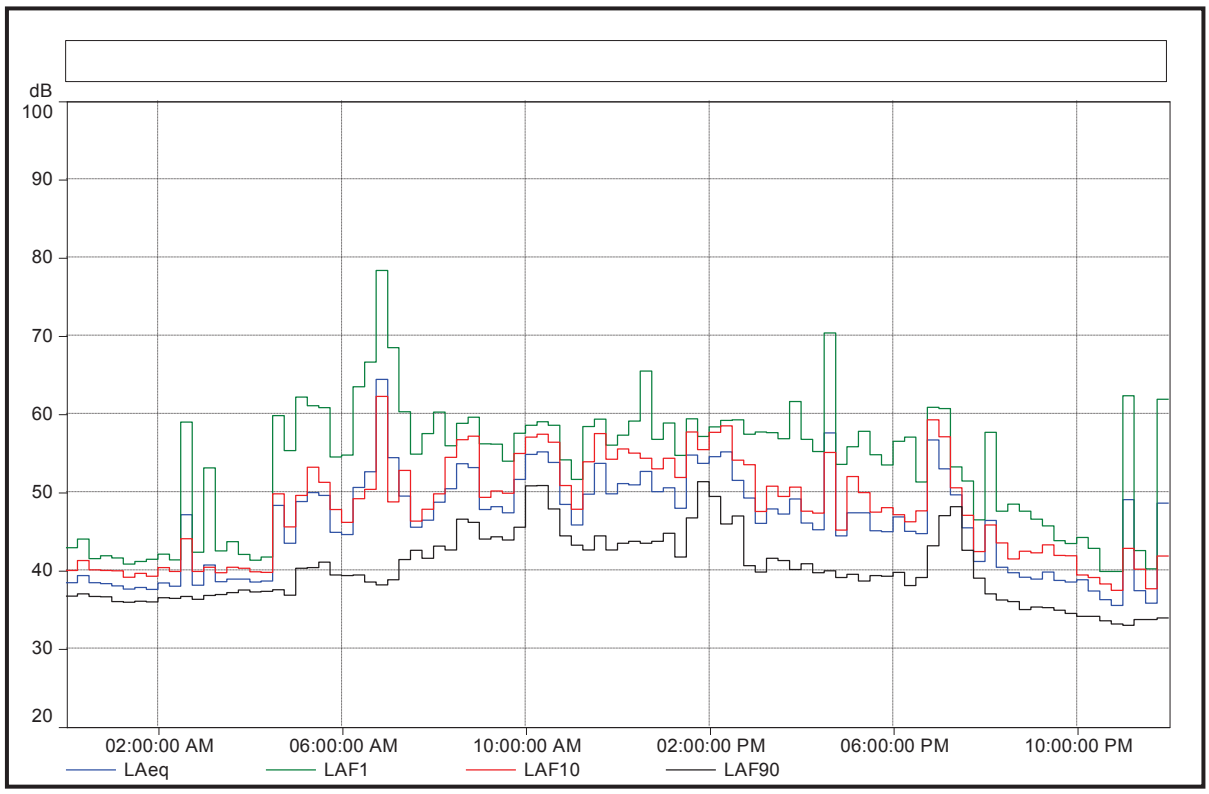
Ambient Noise Levels, Thursday 4th February



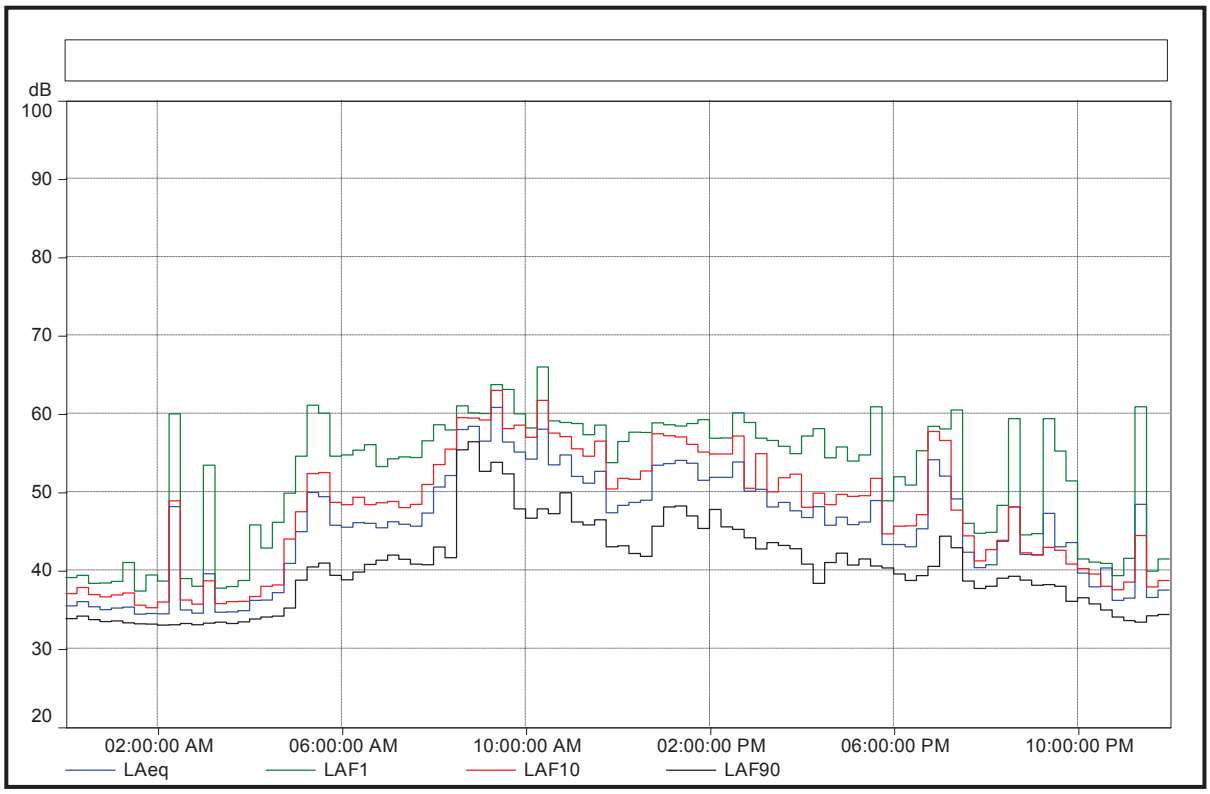
Ambient Noise Levels, Friday 5th February



Ambient Noise Levels, Saturday 6th February



Ambient Noise Levels, Sunday 7th February



Ambient Noise Levels, Monday 8th February