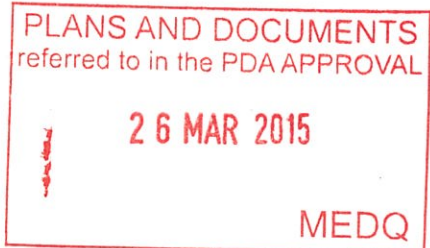


**Proposed Hotel Development
Corner of Wren Street and Campbell Street, Bowen Hills**

Environmental Noise Assessment Report



Auscom Projects Pty Ltd

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20 November, 2014



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1. Introduction

1.1. Background

TTM Soundmatters have been engaged by Auscom Projects Pty Ltd to undertake an environmental noise assessment of a proposed hotel development located at the corner of Wren Street and Campbell Street, Bowen Hills.

The assessment is based on the following:

- a. Noise criteria outlined in:
 - i. Brisbane City Plan 2014;
 - ii. *Queensland Development Code MP 4.4* (QDC) dated the September, 2010;
- b. Development plans by *Thomson Adsett* (samples are provided in Appendix A);
- c. Site inspection, noise measurements, analysis and calculations conducted by Soundmatters.

1.2. Scope

The assessment includes the following:

- i. Description of the site;
- ii. Unattended noise monitoring of existing road traffic and ambient noise levels;
- iii. Assessment criteria relating to road traffic noise intrusion and environmental noise emissions;
- iv. Prediction of future road traffic noise levels onto the development;
- v. Prediction of offsite activity noise onto the development;
- vi. Prediction of noise produced by the development onto nearby sensitive receivers;
- vii. Discussion of potential noise associated with RNA showgrounds;
- viii. Analysis of predicted noise levels;
- ix. Details of recommendations to be incorporated to achieve predicted compliance.

2. Site Description

2.1. Site Location

The site is described by the following:

- Lot 24-34 RP9941, Lot 18-20 RP9941, and Lot 22 RP 155465.
- Corner of Campbell Street and Wren Street, Bowen Hills.

The site locality is shown in Figure 1.

Figure 1: Site Locality



2.2. Current Conditions Surrounding the Site

The site is bound by Wren Street to the west, Campbell Street to the north, Inner City Bypass to the east and O'Connell Terrace to the south. The surrounding area is comprised of a mix of residential and commercial uses. The nearby commercial premises are either office or business with typical daytime operating hours.

2.3. Current Acoustic Environment

The acoustic amenity of the site is primarily affected by road traffic associated with the surrounding road network, particularly the Inner City Bypass. Commercial premises surrounding the site may also affect the acoustic amenity during the daytime period. Noise associated with these commercial premises is addressed in Section 8.

3. The Proposed Development

3.1. Development Description

The proposal is for a 20 storey hotel development on the corner of Wren Street and Campbell Street, Bowen Hills. A car park is proposed adjacent to the hotel located in Wren Street, while a future development site is further south on the corner of O’Connell Terrace.

The development is summarised as follows:

Table 1: Proposed Development

Floor Level	Uses
Basements	Car parking
Ground floor	Lobby and services
Level 1 – Level 19	Serviced apartments

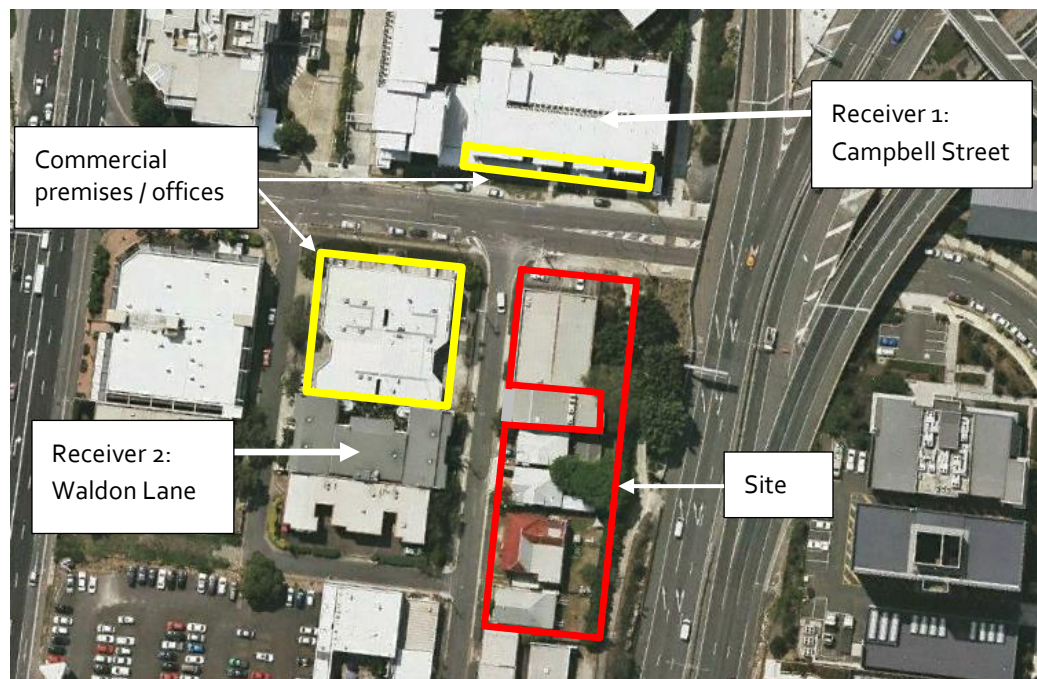
A sample of the development plans are shown in Appendix A.

4. Noise Sensitive Receivers and Off-Site Premises

4.1. Noise Sensitive Receivers

The nearest noise sensitive receivers are residential apartments located at 141 Campbell Street and 16-18 Waldon Lane, as shown in Figure 2. If compliance can be achieved at the following locations, all remaining residential buildings in the vicinity are predicted to comply.

Figure 2: Noise Affected Receivers and Offsite Premises



4.2. Offsite Activities

To adequately assess noise intrusion into the proposed site, consideration must be given to the surrounding commercial activities. The nearest commercial premises are offices or small businesses located at 100 and 141 Campbell Street, as shown in Figure 2. These commercial premises have typical daytime operating hours of 8am to 5pm Monday to Friday.

The RNA showgrounds are located approximately 190m from the proposed hotel development. The RNA is used for, and can host music festivals among other events. These events are likely to cause noise annoyance however the road traffic noise requirements are expected to mitigate and potentially mask some of the amplified music noise. Due to the infrequent occurrence of these events further treatment is not expected to yield greatly improved amenity but a more detailed review shall be conducted during detailed design.

5. Measurements

5.1. Equipment

The following equipment was used to measure existing road traffic and ambient noise levels in the vicinity of the site:

- Two ARL EL₃₁₆ Environmental Noise Monitors (SN# 16-707-040 and 16-707-045).
- SVAN SV₃₁ Sound Calibrator (SNo. 38174).

All equipment was calibrated by a NATA accredited laboratory. The equipment was calibrated before and after the measurement session. No significant drift from the reference signal was recorded.

5.2. Unattended Road Traffic and Ambient Noise Monitoring

Unattended noise monitoring was conducted to establish existing road traffic and ambient noise levels between Thursday 23/10/2014 and Wednesday 29/10/2014. Refer to **Figure 3** for the location of the unattended noise monitors.

A noise monitor was placed on the eastern boundary of the site (within the bikeway corridor) approximately 14m from the nearest lane of the Inner City Bypass. The microphone was in a free field position approximately 1.4 metres above ground level, with line of sight to the road.

A second noise monitor was located in the front garden of 100 Campbell Street approximately 12m from the nearest lane of the road. The microphone was in a free field position approximately 1.4 metres above ground level, with line of sight to the road. Ambient noise levels used to determine the environmental criteria were taken from this noise monitor.

The monitors were set to measure noise statistics in “A” weighting, “Fast” response, over 15 minute intervals. Noise measurements were conducted in accordance with Australian Standard *AS1055:1997 Acoustics – Description and Measurement of Environmental Noise*.

Road traffic noise monitoring was conducted generally in accordance with Australian Standard *AS2702:1984 'Acoustics - Methods for the measurement of road traffic noise'*.

Weather during the monitoring period was fine with calm wind conditions. The temperature range during the monitoring period was between 16-34°C (source: Bureau of Meteorology, Brisbane 2014).

Figure 3: Noise Monitoring Locations



5.3. Noise Source Measurements

Noise levels associated with typical on-site and off-site activities were taken from similar investigations conducted by TTM Acoustics. All measurements were conducted generally in accordance with Australian Standard *AS1055:1997 Acoustics – Description & Measurement of Environmental Noise* (AS1055).

5.4. Results of Measurements

5.4.1. Road Traffic Noise Levels

Table 2 presents the measured road traffic noise levels at the noise monitoring locations.

Table 2: Measured Road Traffic Noise Levels

Location / Date	Road Traffic Noise Descriptor	Time Period	Measured Level dB(A)
Campbell Street, Tuesday 28/10/2014	$L_{A10,18hr}$	6am to midnight	65.0
	Noisiest day-time $L_{Aeq,1\ hour}$	7.30am to 8.30am	68.0
	Noisiest night-time $L_{Aeq,1\ hour}$	5am to 6am	63.4
	$L_{Aeq,24\ hour}$	Midnight to midnight	62.8
Inner City Bypass, Tuesday 28/10/2014	$L_{A10,18hr}$	6am to midnight	74.4
	Noisiest day-time $L_{Aeq,1\ hour}$	6.30am to 7.30am	74.5
	Noisiest night-time $L_{Aeq,1\ hour}$	5am to 6am	73.6
	$L_{Aeq,24\ hour}$	Midnight to midnight	72.0

The decimal place is presented in Table 2 to show the rounding corrections used throughout the analysis.

5.4.2. Environmental Noise Levels

Table 3 presents the measured ambient noise levels from week long noise monitoring. The noise level data is based on the unattended noise monitoring results shown graphically in Appendix B, and are a 10th percentile average of all non-weather affected periods.

Table 3: Measured Ambient Noise Levels

Location	Time Period	L ₉₀ dB(A)	L _{eq} dB(A)	L _{max} dB(A)
Wren Street	Day (7am – 6pm)	55	62	76
	Evening (6pm – 10pm)	51	58	72
	Night (10pm – 7am)	44	52	68

The data presented above was used to determine the assessment criteria for the development.

6. Noise Criteria

6.1. Brisbane City Council - City Plan 2014

City Plan 2014 details the site specific planning scheme zones, overlays and codes relevant for a particular address. Table 4 summarises with the planning scheme requirements for the site which are relevant to the acoustic assessment.

Table 4: City Plan 2014 - Site Specific Acoustic Requirements

Zone	Overlay Code	Code
Emerging Community zone	Airport environs overlay	Multiple Dwelling
	Industrial amenity overlay	
	Transport noise corridor overlay	

6.1.1. Development Noise Emissions/Immisions

The criteria for noise emissions/immisions, described by the $L_{Aeq,adj,T}$, should not exceed the project specific criteria determined in Table 5 below.

Time period T equals:

- Day - 7am to 6pm;
- Evening - 6pm to 10pm;
- Night - 10pm to 7am.

Table 5: Noise (Planning) Criteria (applicable to Development Noise Emissions/Immisions)

Criteria Location	Intrusive noise criteria, dB(A) Day, evening and night $L_{Aeq,adj,T}$ are not greater than the RBL plus 5 dB(A) for the relevant criteria location			Acoustic amenity criteria, dB(A) Day, evening and night $L_{Aeq,adj,T}$ are not greater than the values in this column for the relevant criteria location		
	Day	Evening	Night	Day	Evening	Night
Emerging Community zone	60	56	49	55	50	45
Project Specific Criteria*				55	50	45

*The project specific noise criterion is determined by applying the most stringent value for each time period from the Intrusive and Amenity noise criteria.

These criteria are applicable to on-site and off-site noise, including transient noise and mechanical plant. Performance Outcome (PO₄₂) of the multiple dwelling code states a separate criteria for mechanical plant of RBL + 3 dB(A). We note that compliance with the project specific criteria will ensure compliance with PO₄₂.

6.1.2. Sleep Disturbance

The night-time noise criteria (i.e. sleep disturbance) are detailed in Table 6.

Table 6: Night-time (Sleep Disturbance) Criteria

Criteria Location	Where the existing $L_{Aeq,9hr}$ night at the criteria location is:	Average of the highest 15 single L_{Amax} events over a given night (10pm-7am) period is not greater than the following values at the relevant criteria location:	The absolute highest single L_{Amax} event over a given night (10pm-7am) period is not greater than the following values at the relevant criteria location:
At the zone boundary of: Low density residential zone; Low-medium density residential zone; Medium density residential zone; High density residential zone; Character residential zone; Tourist accommodation zone; or Emerging community zone.	<45dB(A)	50dB(A)	55dB(A)
	45 to 60dB(A)	$L_{Aeq,9hr}$ night + 5dB(A)	$L_{Aeq,9hr}$ night + 10dB(A)
	>60dB(A)	65dB(A)	70dB(A)

As the measured $L_{Aeq(9\text{ hour})}$ night-time ambient noise level was 52 dB, the project specific L_{Amax} criteria for sleep disturbance is 62 dB(A) (i.e. $L_{Aeq(9\text{ hour})} + 10\text{dB}$).

6.1.3. Aircraft Noise

Aircraft noise is pursuant to the Airport Environs Overlay Code. The internal noise criterion is detailed in Table 7 which is in line with the criteria outlined in Australian Standard *AS2021:2000 Acoustics - Aircraft Noise Intrusion - Building Siting and Construction*.

Table 7: Internal Noise Criteria for Aircraft Noise

Sensitive Use	Activity of Internal Space	L_{Smax} , dB(A)
Dwelling house, dwelling unit, multiple dwelling, residential care facility	Sleeping areas	50
	Other habitable rooms	55

6.2. Road Traffic Noise

6.2.1. Brisbane City Council

Based on a property address search on City Plan 2014, the site is located in the Transport Noise Corridor Overlay. To adequately assess the requirements of *PO4.1* of the *Multiple Dwelling Code* an assessment of the potential road traffic noise impacts was conducted to determine in-principle glazing treatments for the residential component of the building.

To ensure a satisfactory level of acoustic amenity is provided for the development an assessment in has been conducted to achieve compliance with the internal requirements of *AS2107*.

The internal noise limits recommended are the design sound levels from *AS2107* and are reproduced in Table 8.

Table 8: Internal Noise Limits for Residential Buildings from AS/NZS 2107:2000

Type of Occupancy / Activity	Recommended Maximum Design Sound Level, L_{Aeq} dB(A)
7. RESIDENTIAL BUILDINGS	
Houses and apartments near major roads -	
Living and working areas	45
Sleeping areas	40

Recommendations shall be prescribed in accordance with the Queensland Development Code *MP4.4* to demonstrate that compliance with the criteria at development application stage can be achieved.

6.2.2. Queensland Development Code

The *Queensland Development Code Part MP 4.4 - 'Buildings in a Transport Noise Corridor'* September 2010 (QDC) specifies Noise Categories to ensure that habitable rooms of residential buildings are adequately protected from transport noise.

Whilst this criteria isn't specific to the assessment it provides for conservative design treatments to assist in demonstrating compliance with the relevant internal noise limits for BCC and SDAP.

The Noise Categories list the minimum acoustic R_w ratings for each building component to comply with the indoor sound levels as outlined in Australian Standard *AS2107*. Details regarding the noise categories and acceptable forms of construction can be found within Schedule 1 and 2 of the QDC document. The triggers for each noise category are summarised in Table 9.

Table 9: Noise Category Levels – QDC MP4.4 Road Traffic Noise (Schedule 3)

Noise Category	Level of Transport Noise* $L_{A10,18Hour}$ for State-Controlled Roads and Designated Local Government Roads
Category 4	≥ 73 dB(A)
Category 3	68 – 72 dB(A)
Category 2	63 – 67 dB(A)
Category 1	58 – 62 dB(A)
Category 0	≤ 57 dB(A)

* Measured at 1 metre from the façade of the proposed or existing building.

The noise categories presented in Table 9 were obtained from QDC and are applied to apartments/floors/facade located within transport noise corridors.

7. Analysis – Road Traffic Noise

7.1. Traffic Volumes

The existing traffic volumes and percentage heavy vehicles for the surrounding road network were obtained from Veitch Lister Consulting (VLC) and TTM. Forecast traffic volumes for the Inner City Bypass were obtained from VLC. Forecast traffic volumes for the remainder of the road network are based upon growth rates advised by TTM engineers.

Table 10: Traffic Volumes used in the Noise Model

Road	Traffic Volumes (AADT)			Heavy Vehicles (%)	Growth Rate (% p.a.)
	2012	2014	2026		
Inner City Bypass (ICB):					
To Lutwyche Road	-	16,961	22,529	21.5	From VLC
To ICB (northbound)	-	28,407	29,231	12.6	From VLC
From ICB (southbound)	-	26,892	27,014	14.2	From VLC
From Lutwyche Road	-	20,286	30,349	19.4	From VLC
Bowen Bridge Road	-	44,920	50,116	1.9	1.0
O'Connell Terrace	-	6,895	7,693	3.4	1.0
Campbell Street	6,945	7,085	7,904	3.8	1.0

The 18 hour traffic volumes used in the noise model are taken to be 95% of the AADT.

7.2. Noise Model

7.2.1. Noise Modelling Parameters

Road traffic noise predictions were conducted using 'SoundPLAN' v7.3, a CoRTN based modelling program. The basis of the 'SoundPLAN' model is as follows:

Table 11: Noise Modelling Parameters

Description	Value
Angle Increment	1°
Road surface type	Impervious (+0 dB(A))
Speed limit – Inner City Bypass and Clem 7	80 km/h
Speed limit – Bowen Bridge Road and O'Connell Terrace	60 km/h
Speed limit – Campbell Street	50 km/h
Noise source height above grade	0.5m
Assumed Ground FFL	DERM 0.25m contour Interval data
Receiver heights	1.8m above each floor level
Façade correction	+2.5 dB(A)

7.2.2. Noise Model Verification

To verify the road traffic noise model, the $L_{A10,18\text{hour}}$ noise levels were modelled and compared to the measured levels as presented in Table 12. As the noise monitors were in free-field locations, the predicted noise level is also shown as free-field.

Table 12: Results of Verification

Location	Measured $L_{A10, 18 \text{ hour}}$	Predicted $L_{A10, 18 \text{ hour}}$	Required Correction
Campbell Street	65.0	65.5	0
Inner City Bypass	74.4	74.2	0

The model required a correction factor for both noise monitors of -3.0dB. With the correction the model is within the allowable tolerance of 2 dB(A) of the measured level.

7.3. Predicted Road Traffic Noise Levels - Year 2026

Noise modelling was conducted to determine road traffic noise levels at the development in the 10 year planning horizon. The predicted noise levels take into account year 2026 traffic volumes and shielding from known screening features where applicable. Figure 4 and Figure 5 present the predicted road traffic noise levels at selected floors of the development.

Figure 4: Predicted Road Traffic Noise Levels - Level 5

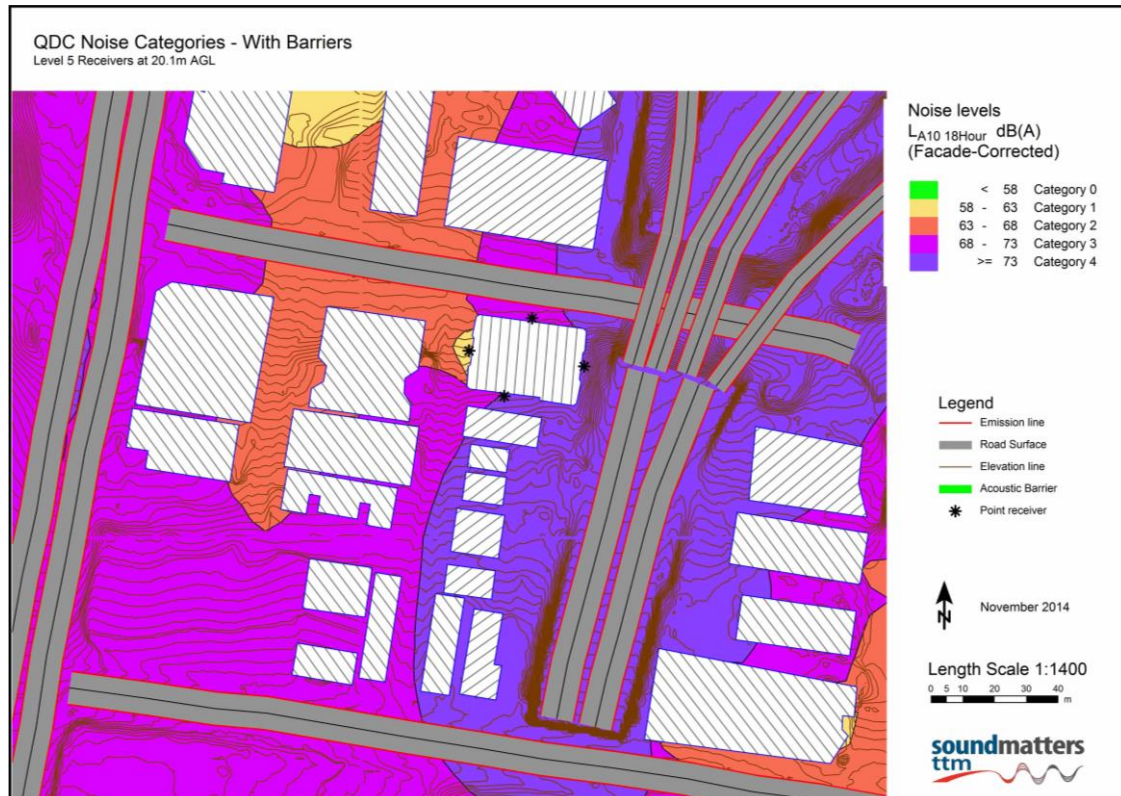
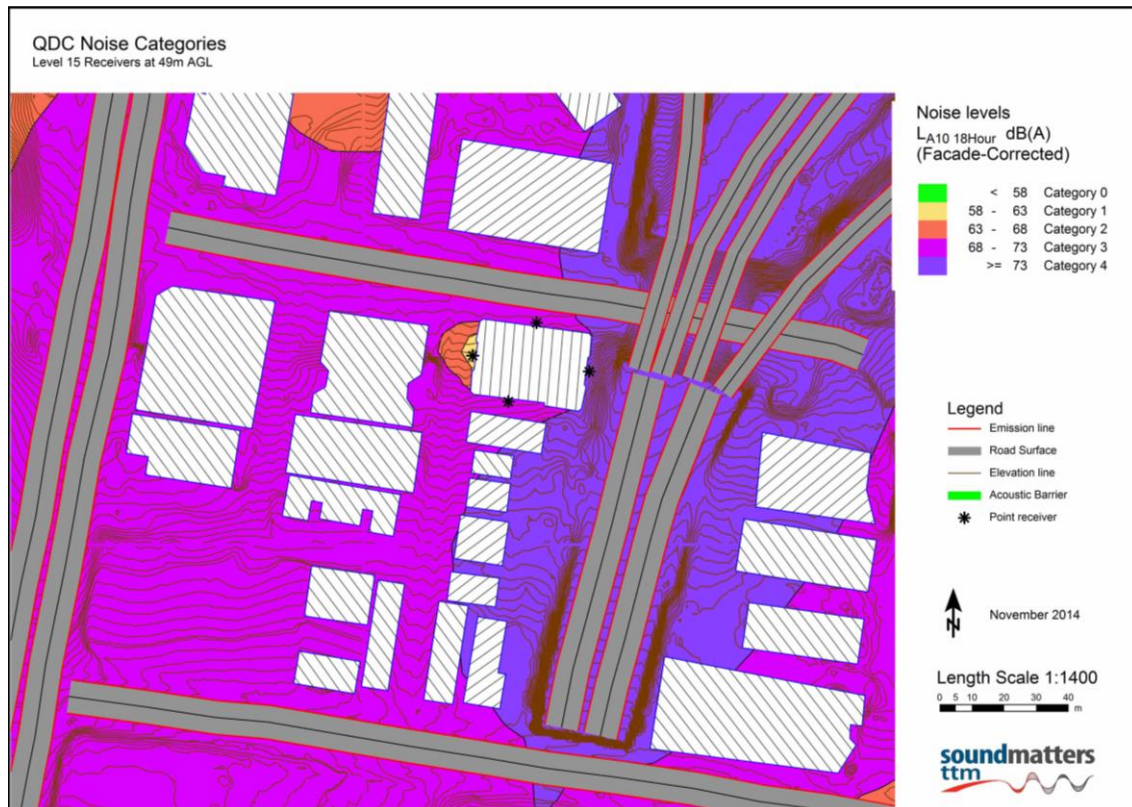


Figure 5: Predicted Road Traffic Noise Levels - Level 15



Based on the predicted impacts from road traffic noise, all floors are predicted to exceed the criteria and require further assessment as detailed in Section 10.

8. Analysis – Offsite Activity Noise

8.1. Noise Sources

The noise sources associated with potential offsite activity are presented in Table 13. The noise sources were selected as they represent the likely activities offsite that have the potential to impact the proposed development. The noise source levels were calculated to one metre and include corrections for tonality and impulsiveness as per AS1055.

Table 13: Typical Transient Noise Source Levels

Noise Source Description	Noise Level at 1m, dB(A)			Measured Duration (s)
	L _{Aeq,T}	L _{A10,T}	L _{AMax}	
Single event car door closure	75*	77*	83*	2
Single event car bypass @ 5km/h	69	75	77	6
Single event car engine ignition	72	74	75	3
Conversation (refer Table 14)	65	68	70	Long term

* Includes 2 dB(A) adjustment to account for impulsiveness characteristics in accordance with AS1055.

Includes 5 dB(A) adjustment to account for tonal noise characteristics in accordance with AS1055.

Noise levels for voice are based on published data contained in Harris, C.M., Handbook of Acoustical Measurements and Noise Control – 3rd ed. Ch 16.3, Mc Graw-Hill Inc, 1991. The average A-Weighted Sound Levels (long term averages) of speech for different individual vocal efforts under quiet conditions at a distance of 1 metre are as follows:

Table 14: Voice (Conversation) Noise Levels

Vocal Effort	Male, dB(A)	Female, dB(A)
Casual	53	50
Normal	58	55
Raised	65	62
Loud	75	72

The voice (conversation) levels used for assessment are from the 'Raised' category with an associated noise level of 65 dB(A) for an individual male.

8.2. Predicted Offsite Activity Noise

Activities associated with nearby offsite premises identified in Section 4.2 have the potential to impact the proposed development. To assess the impacts from the premises, the noise source levels presented in Table 13 were utilised (which are taken from similar investigations). Table 15 presents the predicted noise impacts from nearby commercial premises. Car park calculations are based on 120 events per hour and conversation is calculated on 50% continuous per hour.

Table 15: Predicted Noise Impact Levels from Nearby Premises

Source	Noise Source	Predicted Level dB(A) L _{Aeq}	Assessment Criteria Complies (Yes/No)
General Offsite Activities	Car door closure – eastern car park of 100 Campbell Street	43	✓
	Car bypass @ 5 km/h – eastern car park of 100 Campbell Street	39	✓
	Car starting – eastern car park of 100 Campbell Street	39	✓
	Conversation – eastern car park of 100 Campbell Street	39	✓

All activities are predicted to comply with the criteria without additional treatments.

8.3. RNA Showgrounds

The RNA showgrounds are located approximately 190m from the proposed hotel development. The RNA is used for, and can host music festivals among other events. These events are likely to cause noise annoyance however the road traffic noise requirements are expected to mitigate and potentially mask some of the amplified music noise. Due to the infrequent occurrence of these events further treatment is not expected to yield greatly improved amenity but a more detailed review shall be conducted during detailed design.

8.4. Aircraft Noise

A site visit was conducted on the 23rd and 29th October, 2014 to measure aircraft noise levels at the site. Due to the level of road traffic noise surrounding the development aircraft noise was barely audible when they were observed and clear measurements could not be obtained. It is considered that aircraft noise will not be a significant impact at the site and would be treated by the more onerous road traffic noise requirements.

9. Analysis – On-Site Activity Noise

9.1. Noise Sources

The noise sources associated with potential on-site activities are presented in Table 16. The noise source levels were calculated to one metre and include corrections for tonality and impulsiveness as per AS1055.

Table 16: Typical Transient Noise Source Levels

Noise Source Description	Noise Level at 1m, dB(A)			Measured Duration (s)
	L _{Aeq,T}	L _{A10,T}	L _{AMax}	
Single event car door closure	75*	77*	83*	2
Single event car bypass @ 5km/h	69	75	77	6
Single event car engine ignition	72	74	75	3
Conversation	65	68	70	Long term
Deliveries	85 [#]	86 [#]	86 [#]	60
Waste collection	93*	94*	105*	40

* Includes 2 dB(A) adjustment to account for impulsiveness characteristics in accordance with AS1055.

Includes 5 dB(A) adjustment to account for tonal noise characteristics in accordance with AS1055.

The voice (conversation) levels used for assessment are from the 'Raised' category with an associated noise level of 65 dB(A) for an individual male.

9.2. Proposed Onsite Activity Noise

The following parameters were used for noise calculations:

Table 17: Parameters used for Noise Calculations

Noise Source Description (Type of Event)	Prediction Location	Daytime/ Evening/Night Time Period
		(Events/Per hour)* or (% of Hour)
Car door closure	Nearest car park	288 events
Car bypass @ 5km/h	Car park entrance	144 events (generation rate based on 0.6 vph/unit)
Car engine ignition	Nearest car park	144 events
Conversation	Communal areas	50% of the time
Deliveries	From delivery area	2 events
Waste collection	Bin storage/refuse	1 event

9.3. Predicted Onsite Activity Noise Levels

The predicted noise levels at receiver locations from typical onsite activities are presented in Table 18.

Table 18: Predicted Onsite Transient Activity Noise Levels

Receiver Location	Noise Source	Predicted Level at the Receiver, L_{Aeq} dB(A)	Assessment Criteria Complies (Yes/No)		
			Day 55 dB(A)	Evening 50dB(A)	Night 45dB(A)
1	Car door closure	35	✓	✓	✓
	Car starting	33	✓	✓	✓
	Car passby	31	✓	✓	✓
	Conversation	30	✓	✓	✓
	Deliveries	25	✓	✓	✓
	Waste collection	28	✓	✓	✓
2	Car door closure	41	✓	✓	✓
	Car starting	37	✓	✓	✓
	Car passby	37	✓	✓	✓
	Conversation	36	✓	✓	✓
	Deliveries	10	✓	✓	✓
	Waste collection	13	✓	✓	✓

Onsite activity noise levels are predicted to comply with the project specific noise emission criteria of City Plan 2014.

9.4. Predicted Sleep Disturbance Noise Levels

Table 19 presents the predicted sleep disturbance noise levels from onsite activities.

Table 19: Predicted Sleep Disturbance Noise Levels from Onsite Activities

Receiver Location	Noise Source	Predicted Level, L_{Amax} dB(A)	Complies with Assessment Criteria, L_{Amax} 62 dB(A)
Receiver 1	Car door closure	51	✓
	Car starting	47	✓
	Car passby	43	✓
	Conversation	38	✓
	Deliveries	51	✓
	Waste collection	70	✗
Receiver 2	Car door closure	57	✓
	Car starting	51	✓
	Car passby	49	✓
	Conversation	44	✓

Receiver Location	Noise Source	Predicted Level, L_{Amax} dB(A)	Complies with Assessment Criteria, L_{Amax} 62 dB(A)
	Deliveries	35	✓
	Waste collection	55	✗

Sleep disturbance noise levels are predicted to comply with the criteria with the exception of waste collection which in isolation may cause some sleep disturbance if carried out before 7am. Therefore we recommend that waste collection occurs during daytime hours.

9.5. Mechanical Plant

Mechanical plant associated with the proposed development is expected to be located in an open topped plant room on the roof (Level 20).

We have undertaken a preliminary assessment based on the night time criteria, distance and relative heights of the receiver locations. Based on these details, an estimate of the maximum allowable noise output of roof top mechanical plant can be specified. It is predicted that the maximum allowable output of all plant combined, measured at 1m, is L_{eq} 95dB(A).

Compliance with these design levels is predicted to achieve compliance with the criteria outlined in Section 6.1.1.

We recommend that a full detailed assessment of the plant noise design is carried out during the design stage of the project.

10. Recommendations

Compliance with the noise criteria outlined in Section 6 is predicted based on the inclusion of the recommendations specified below.

10.1. Road Traffic Noise

Based on the predicted noise levels, all floor levels exceed the criteria and require additional acoustic treatment to the building façade to achieve an acceptable level of acoustic amenity within the apartments.

Alternative communal recreation areas on higher levels are naturally screened from road traffic noise to minimise impacts to satisfy Po1 of the *Transport Noise Corridor Overlay Code* requirements.

For the purposes of DA, we recommend that the building treatments described within Section 10.1.1 are applied. Once the building application drawings are finalised we recommend a detailed assessment is conducted to optimise glazing treatments and should be conducted by a suitably qualified consultant.

10.1.1. Queensland Development Code

For the purposes of the development application, the Queensland Development Code provides a conservative design approach to the treatment of internal rooms within an apartment and is applied for this assessment.

The most stringent requirement was applied to each floor of each façade to establish an estimated level of treatment required to achieve internal noise levels. This was determined by modelling the noise levels and then assigning the predicted façade corrected level the corresponding QDC category number.

The QDC MP_{4.4} requires that habitable rooms in residential buildings located in a transport noise corridor are adequately protected from transport noise to safeguard occupant's health and amenity.

In order to achieve the performance requirements of the QDC MP_{4.4}, the external envelope of habitable rooms must comply with the minimum R_w for each building component specified in Schedule 1 to achieve a minimum transport noise reduction level for the relevant noise category by either one of the following:

- a. Using materials specified in Schedule 2 of the QDC MP_{4.4};

OR

- b. Using materials with manufacturer's specifications that, in combination, achieve the minimum R_w value for the relevant building component and applicable noise category.

For application of Point (b), possible alternative constructions can be determined by the glazier (for glazing) and construction manuals such as 'The Red Book' by CSR (for walls and roof/ceiling).

Noise Categories applicable to the development are listed in Table 20. The treatments are based on detailed modelling to establish a conservative level of acoustic treatment in the 10 year planning horizon.

Table 20: QDC MP4.4 Noise Categories to Each Floor and Façade

Floor Level	QDC Noise Category (0 - 4) by Façade			
	N	E	S	W
Ground	3	2	1	1
1	3	4	2	1
2	3	4	2	1
3	3	4	3	1
4	3	4	3	1
5	3	4	3	1
6	3	4	4	1
7	3	4	4	1
8	3	4	4	1
9	3	4	4	1
10	3	4	4	1
11	3	4	4	1
12	3	4	4	1
13	3	4	4	1
14	3	4	3	1
15	3	4	3	1
16	3	4	3	1
17	3	4	3	1
18	3	4	3	1
19	3	4	3	1

It is recommended detailed design is conducted by a suitably qualified acoustic consultant once building floor plans are finalised to optimise the glazing treatments in accordance with Australian Standard AS3671 and AS2107.

10.2. Off-Site Noise

Potential noise from off-site premises has been investigated from the reasonable worst case locations. Noise levels are predicted to comply at the development without the need for any additional building treatments.

10.3. On-Site Noise

On-site activities are predicted to comply at the nearest receivers, with the exception of waste collection during the night period (sleep disturbance criteria). Therefore we recommend the following management strategies:

10.3.1. Management Strategies

We recommend that the following noise management strategies are implemented to minimise annoyance:

- a. Waste collection should be between the hours 7am - 6pm;
- b. Speed bumps should be built into the finished surface of the car park and not be made of metal;
- c. Any grates or other protective covers in the car parks and access driveways must be rigidly fixed in position to eliminate clanging, and be maintained.

10.3.2. Mechanical Plant

Mechanical plant associated with the proposed development is expected to be located in an open topped plant room on the roof (Level 20).

We have undertaken a preliminary assessment based on the night time criteria, distance and relative heights of the receiver locations. Based on these details, an estimate of the maximum allowable noise output of roof top mechanical plant can be specified. It is predicted that the maximum allowable output of all plant combined, measured at 1m, is $L_{eq} 95dB(A)$.

Compliance with these design levels is predicted to achieve compliance with the criteria outlined in Section 6.1.1.

Car park exhausts located in proximity to residents on Wren Street may require acoustic attenuation. We recommend that any required car park exhausts are located on the eastern side of the site in screened locations from neighbouring residents.

We recommend that a full detailed assessment of the plant noise design is carried out during the design stage of the project.

11. Conclusion

An environmental noise assessment was undertaken for a proposed hotel development at the corner of Wren Street and Campbell Street, Bowen Hills.

Road traffic noise levels were assessed with QDC noise categories specified where appropriate to provide indicative treatments for compliance with the BCC criteria.

Off-site and on-site noise sources were generally predicted to comply with the criteria. Noise management strategies were recommended to minimise noise annoyance.

Compliance with the criteria outlined in Section 6 is predicted based on the implementation of the recommendations in Section 10.

Appendix A Sample of the Development Plans

Site Plan

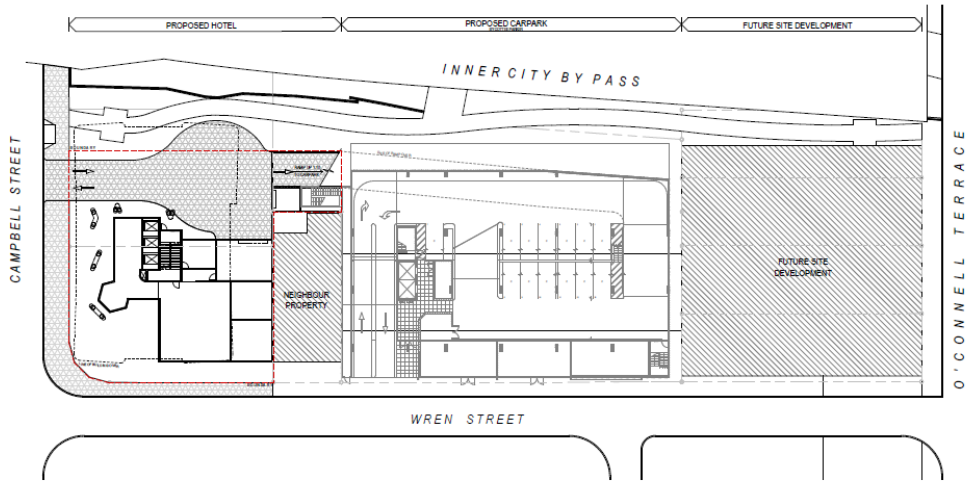
	Hotel	Car park	Total
Site Area	1,361m ²	1,650m ²	3,011m ²
Plot ratio			5.0
GFA	14,548m ²	550m ²	15,098m ²
Units	140		
Car parks		400	



0 15m

1. Hotel street entrance
2. Main hotel entrance
3. Hotel reception
4. Hotel deliveries
5. Bin store & refuse collection vehicle turning
7. Internal road to carpark - one way
8. Main car park entry / exit
9. Cafe
10. Garden 'Urban Jungle'

Bicycle path - BCC easement



1 SITE PLAN
1:200



CAMPBELL STREET HOTEL

SCHEMATIC DESIGN

ONR CAMPBELL AND WREN STREET,
BRISBANE

AUSCOM PROJECTS PTY LTD

SITE PLAN

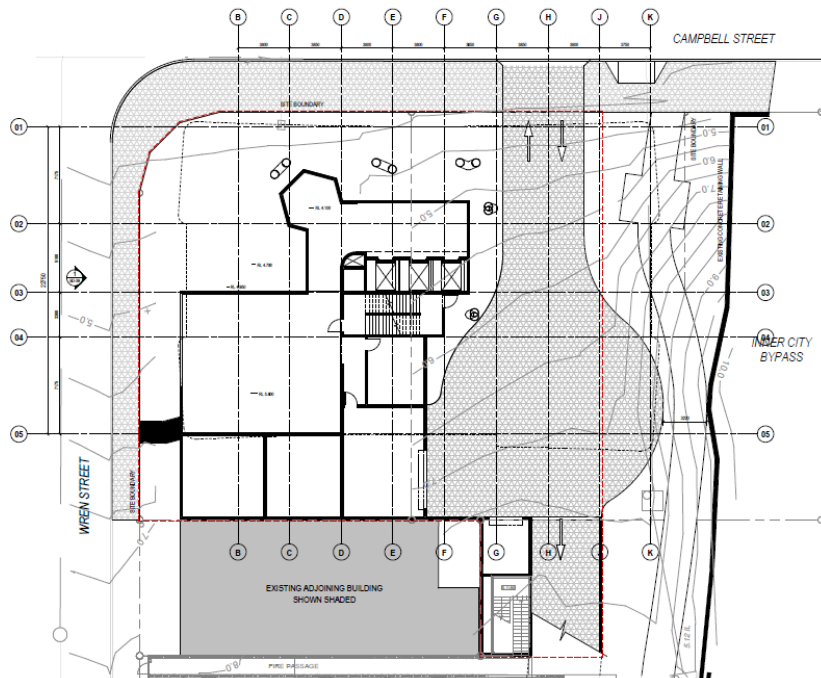


14.0102.1

SD-02

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07 3251 1234
www.thomsonadsett.com.au

PRELIMINARY



2 FLOOR PLAN - GROUND LEVEL
1:100



CAMPBELL STREET HOTEL

SCHEMATIC DESIGN

ONR CAMPBELL AND WREN STREET,
BRISBANE

AUSCOM PROJECTS PTY LTD

FLOOR PLAN - GROUND LEVEL

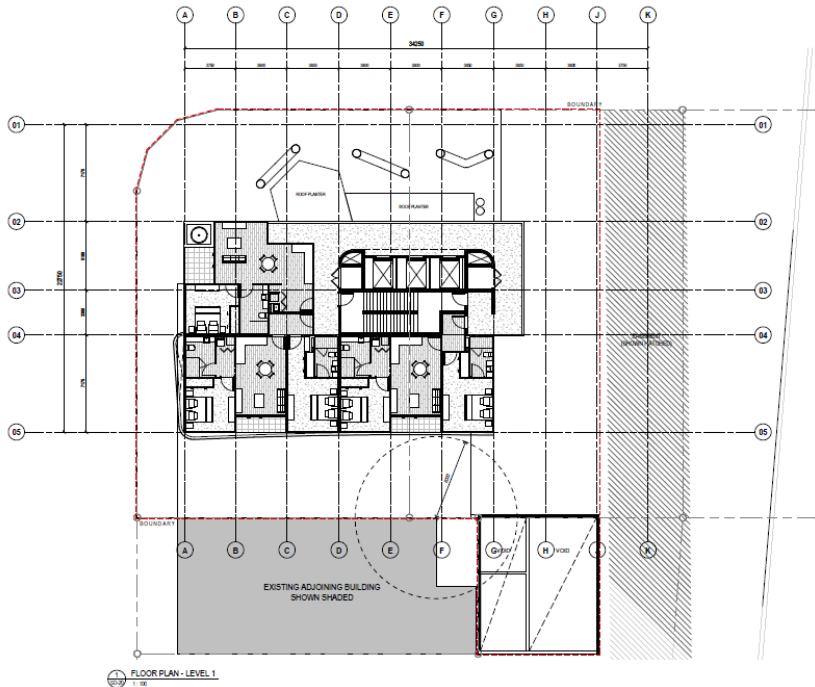


14.0102.1

SD-03

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07 3251 1234
www.thomsonadsett.com.au

PRELIMINARY



FLOOR PLAN - LEVEL 1
1:50

CAMPBELL STREET HOTEL

SCHEMATIC DESIGN
 0/19 CAMPBELL AND WREN STREET,
 BRISBANE
 AUSCOM PROJECTS PTY LTD

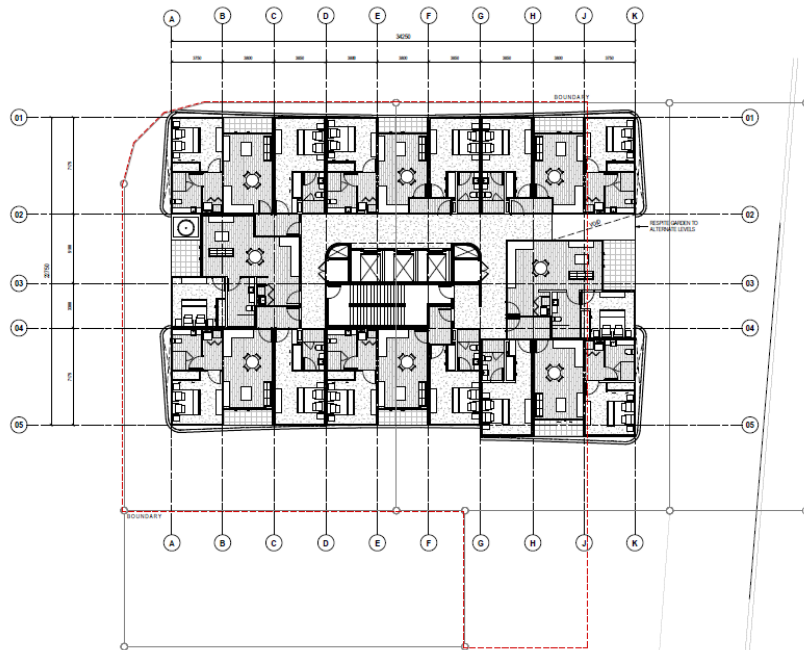
FLOOR PLAN - LEVEL 1



14.0102.11	SD-05
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PRELIMINARY



FLOOR PLAN - LEVEL 4-19 TYPICAL
1:50

CAMPBELL STREET HOTEL

SCHEMATIC DESIGN
 0/19 CAMPBELL AND WREN STREET,
 BRISBANE
 AUSCOM PROJECTS PTY LTD

FLOOR PLAN - LEVEL 4-19 TYPICAL



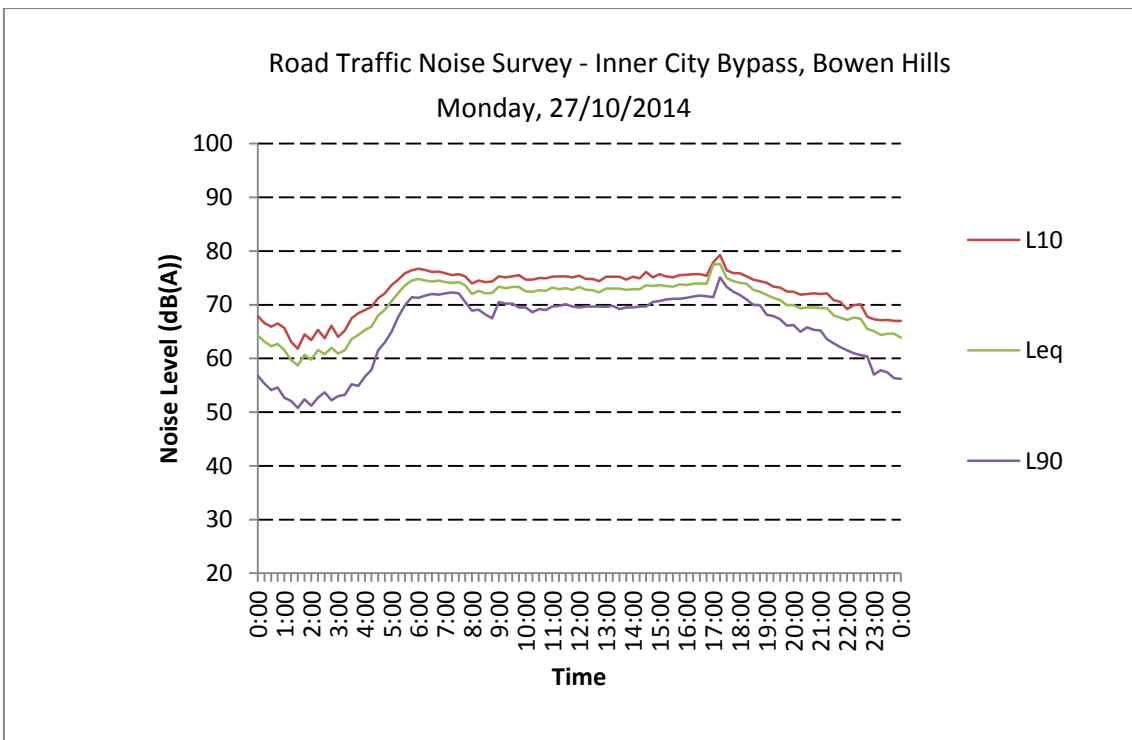
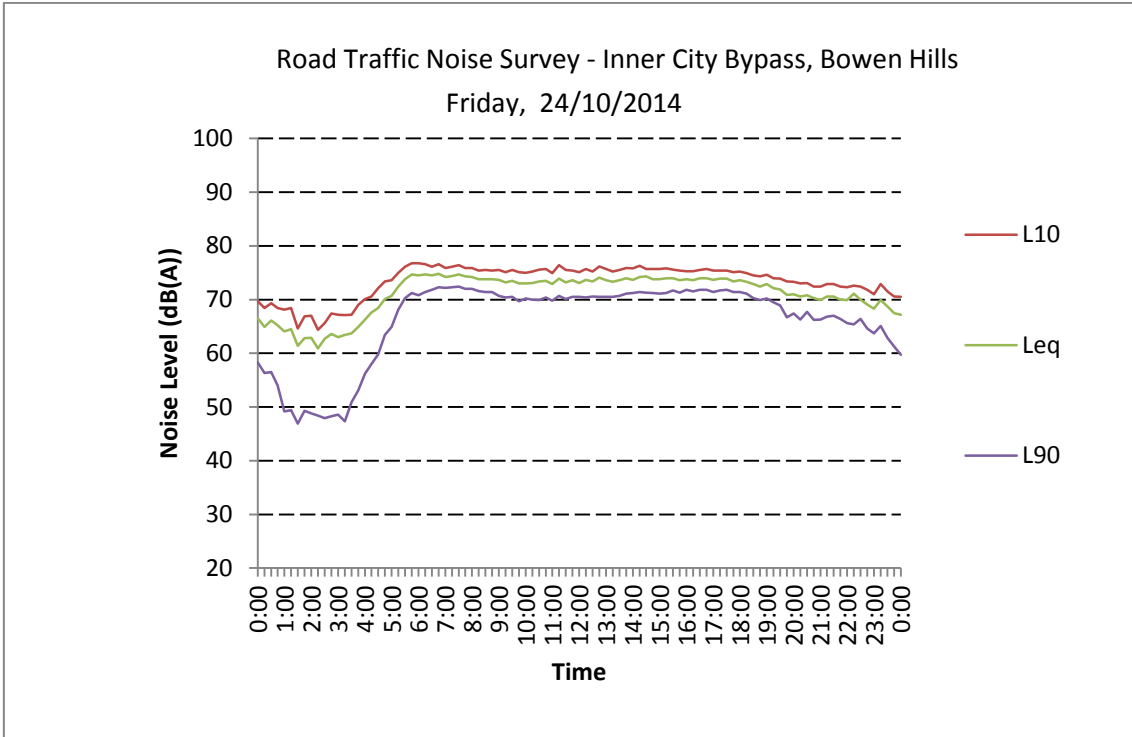
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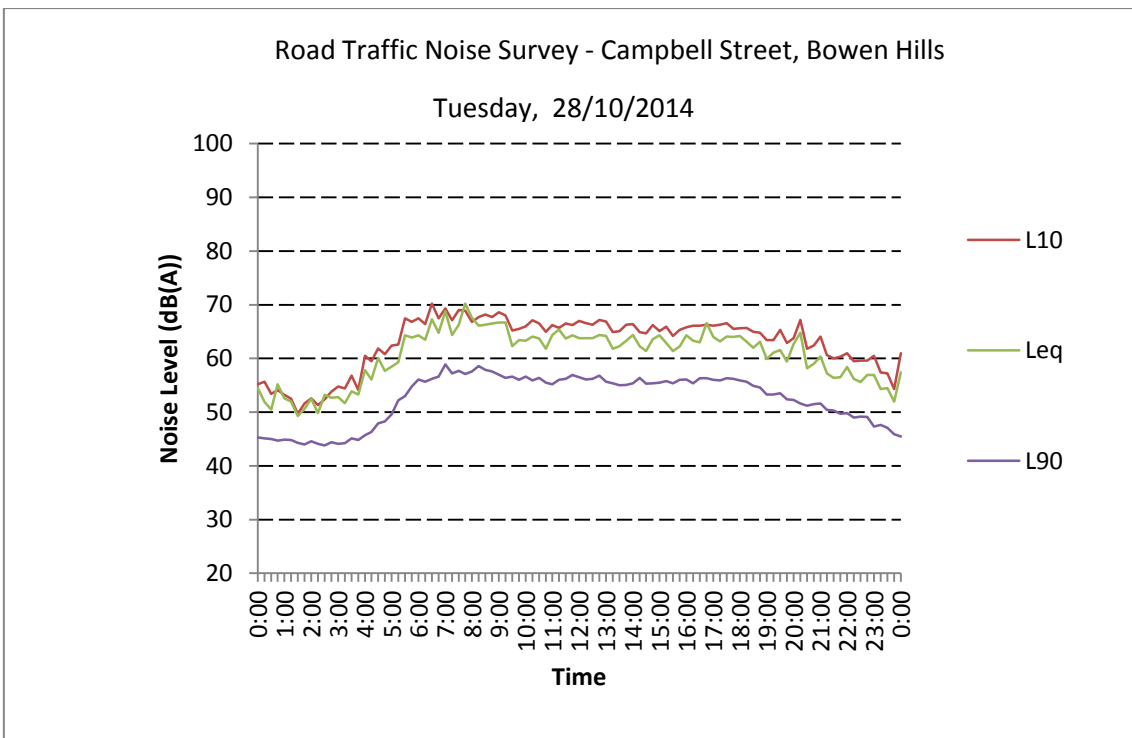
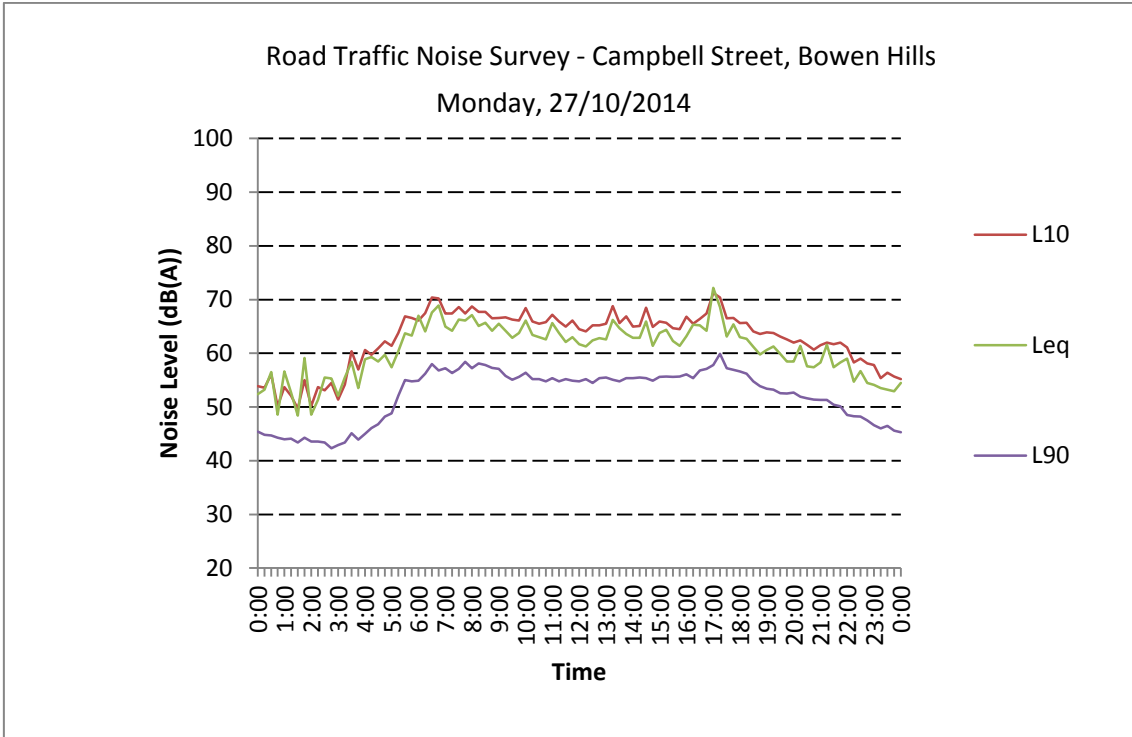
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PRELIMINARY



Appendix B Unattended Noise Monitoring Graphs





Appendix C SoundPLAN noise modelling outputs

<p>Brisbane Model Assessed receiver levels 14BRA0181 Verification</p>	2
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Receiver	Usage	FI	L10(18h) dB(A)	
Receptor ICB	GR	GF	74.2	
Receptor Wern St	GR	GF	65.5	

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	<p>TTM Consulting (Qld) Pty Ltd Level 1 - 129 Logan Rd Woolloongabba, QLD 4102</p>	1
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SoundPLAN 7.3

Brisbane Model **2**
Assessed receiver levels
14BRA0181 Planning Horizon 2024

Receiver	Usage	Fl	Dir	L10(18h) dB(A)	
Proposed Development	GR	GF	S	62.2	
		1.FL		64.5	
		2.FL		66.3	
		3.FL		67.6	
		4.FL		68.8	
		5.FL		70.9	
		6.FL		72.8	
		7.FL		73.2	
		8.FL		73.2	
		9.FL		73.1	
		10.FL		73.0	
		11.FL		72.9	
		12.FL		72.7	
		13.FL		72.5	
		14.FL		72.3	
		15.FL		72.1	
		16.FL		71.9	
		17.FL		71.7	
		18.FL		71.5	
Proposed Development	GR	GF	E	67.3	
		1.FL		72.9	
		2.FL		76.5	
		3.FL		77.7	
		4.FL		78.2	
		5.FL		78.4	
		6.FL		78.3	
		7.FL		78.2	
		8.FL		77.9	
		9.FL		77.7	
		10.FL		77.4	
		11.FL		77.1	
		12.FL		76.8	
		13.FL		76.5	
		14.FL		76.2	
		15.FL		75.9	
		16.FL		75.6	
		17.FL		75.4	
		18.FL		75.1	
19.FL	74.8				
Proposed Development	GR	GF	N	69.4	
		1.FL		69.2	
		2.FL		69.0	

	TTM Consulting (Old) Pty Ltd Level 1 - 129 Logan Rd Woolloongabba, QLD 4102	1
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SoundPLAN 7.3

Brisbane Model Assessed receiver levels 14BRA0181 Planning Horizon 2024	2
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Receiver	Usage	Fl	Dir	L10(18h) dB(A)					
Proposed Development	GR	3.FL	W	69.2					
		4.FL		69.6					
		5.FL		69.9					
		6.FL		70.2					
		7.FL		70.5					
		8.FL		70.9					
		9.FL		71.1					
		10.FL		71.3					
		11.FL		71.3					
		12.FL		71.3					
		13.FL		71.2					
		14.FL		71.1					
		15.FL		71.0					
		16.FL		70.9					
		17.FL		70.7					
		18.FL		70.6					
		19.FL		70.4					
						GF		58.4	
						1.FL		59.8	
						2.FL		59.9	
		3.FL		60.2					
		4.FL		60.9					
		5.FL		61.3					
		6.FL		61.5					
		7.FL		61.7					
		8.FL		61.7					
		9.FL		61.8					
		10.FL		61.8					
		11.FL		61.9					
		12.FL		61.9					
		13.FL		61.9					
		14.FL		62.0					
		15.FL		62.0					
		16.FL		62.0					
		17.FL		62.0					
		18.FL		62.0					
		19.FL		62.0					

	TTM Consulting (Qld) Pty Ltd Level 1 - 129 Logan Rd Woolloongabba, QLD 4102	2
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SoundPLAN 7.3

Appendix D Sample Calculations

City Plan 2014 – onsite noise

Noise Source	Duration	Leq	Leq Level	Distance to Receivers	
				R1	R2
Car door	2	75	32	38	20
Car bypass	6	69	31	30	20
Car engine	3	72	31	38	20
Voice	450	65	46	38	20
Deliveries	60	85	57	55	33
waste collection	40	93	63	55	33

Noise level due to Distance loss

Car door				0	6
Car bypass				1	5
Car engine				-1	5
Voice				14	20
Deliveries				22	26
waste collection				28	33

Shielding

Car door				0	0
Car bypass				0	0
Car engine				0	0
Voice				0	0
Deliveries				0	20
waste collection				0	20

SubTotal - Noise Level at Receiver

Car door				0	6
Car bypass				1	5
Car engine				-1	5
Voice				14	20
Deliveries				22	6
waste collection				28	13

CALC based on number of events over the period

Activity	Events	Duration	R1	R2
Car door	3168		3504	12649
Car bypass	1584		2118	4766
Car engine	1584		1317	4755
Voice	44		1095	3953
Deliveries	2		317	9
waste collection	1		666	19

Noise Level at the Receiver

	R1	R2
Car door	35	41
Car bypass	33	37
Car engine	31	37
Voice	30	36
Deliveries	25	9
waste collection	28	13

Sleep Disturbance – Onsite Noise

Noise Source	Duration	Lmax	Lmax Level	Distance to Receivers	
				R1	R2
Car door	2	83	83	38	20
Car bypass	6	77	77	30	20
Car engine	3	75	75	38	20
Voice	450	70	70	38	20
Deliveries	60	86	86	55	33
waste collection	40	105	105	55	33

15 minute period (s)	900				
Distance					
Car door				51	57
Car bypass				47	51
Car engine				43	49
Voice				38	44
Deliveries				51	56
waste collection				70	75
Shielding					
Car door				0	0
Car bypass				0	0
Car engine				0	0
Voice				0	0
Deliveries				0	20
waste collection				0	20

Noise Level at Receiver				R1	R2
Car door				51	57
Car bypass				47	51
Car engine				43	49
Voice				38	44
Deliveries				51	36
waste collection				70	55