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## **ACT Planning and Land Authority**

### Molonglo Valley Development Road Traffic Noise Assessment

November 2008

*Revision 0*



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## Glossary

dB	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels.
$L_N$	Statistical sound measurement recorded on the linear scale.
$L_{AN}$	Statistical sound measurement recorded on the "A" weighted scale.
$L_{A10}$ (Time)	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
$L_{A10}$ (1 hour)	The $L_{A10}$ level measured over a 1-hour period.
$L_{A10}$ (18 hour)	The arithmetic average of the $L_{A10}$ levels for the 18-hour period between 0600 and 2400 hours on a normal working day. It is a common traffic noise descriptor.

# 1. Introduction

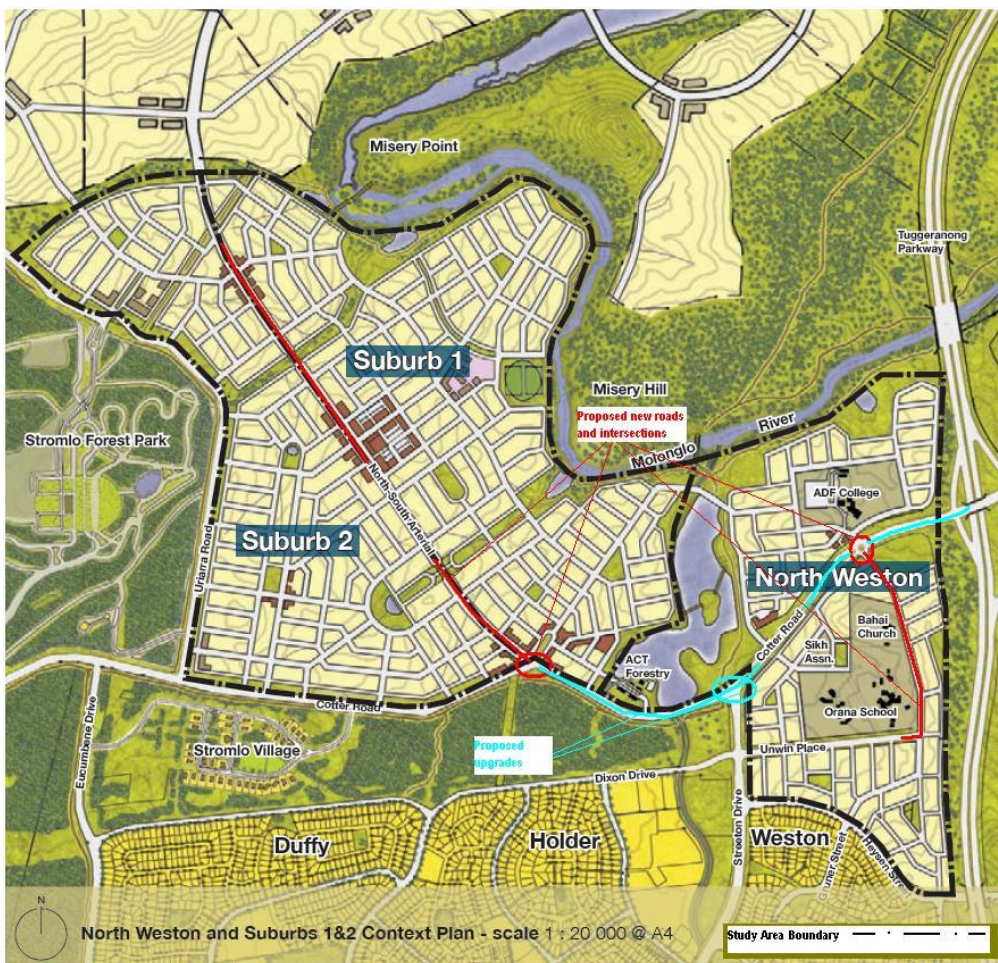
GHD was commissioned by the Australian Capital Territory Planning and Land Authority (ACTPLA) to prepare a traffic noise impact assessment for Stage 1 concept design of the proposed Molonglo Valley development.

## 1.1 Project Overview

The proposed project involves a new land development in the Molonglo Valley. Stage 1 of the project involves an assessment of the first two suburbs of the Molonglo Valley development.

The aim of this desktop noise impact assessment is to assess the potential impact of road traffic noise, at concept stage, from the proposed North-South Arterial Road on the proposed adjacent residential areas within the Molonglo Valley development.

Figure 1-1 shows Stage 1 of the proposed Molonglo Valley development as well as the existing suburbs of Duffy, Holder and Weston.



**Figure 1-1 Molonglo Valley Development**



## 1.2 Scope of Works

The scope of works for the traffic noise impact assessment is set out below:

- ▶ Desktop review to identify key environmental noise catchment areas and noise sensitive receivers using aerial photography;
- ▶ Determination of project specific noise goals for the operation of the Molonglo Infrastructure Stage 1 project with consideration to the publication; ACTPLA's *Draft Noise Management Guidelines* 1996 (NMG);
- ▶ Generation of one noise model using Computer Aided Noise Abatement (Cadna-A) software to predict sound pressure levels emanating from the Molonglo Infrastructure Stage 1 project for the 2021 traffic conditions. Only the North-South Arterial Road corridor was considered in the noise model; and
- ▶ Reporting of results and provision of in-principle mitigation measures (setbacks, noise barriers and/or architectural treatment) to reduce noise impact at potential receivers where required.

## 1.3 Limitations

This report has been prepared for ACT Procurement Solutions. The purpose of the report is to provide an independent review of impact of traffic noise from the North-South Arterial Road within the proposed Molonglo Valley development.

It is not the intention of the assessment to cover every element of the acoustical environment, but rather to conduct the assessment with consideration to the prescribed work scope.

In conducting this assessment and preparing the report, current guidelines for noise were referred to. This work has been conducted in good faith with GHD's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.



## 2. Road Traffic Noise Criteria

Road traffic noise criteria are sourced from the ACTPLA's NMG and shown in Table 2-1. The objective of the criteria is to protect future occupants of development areas from excessive levels of traffic noise.

**Table 2-1 Maximum External Traffic Noise Level  $L_{A10}$  (18 hour) dB(A) (Source ACTPLA)**

Land Uses	Maximum Noise Level at a Point 1m in Front of the Building Façade <sup>(1)</sup>
Residential and community facilities.	63
Private open space <sup>(2)</sup> .	58
Commercial facilities.	75

1. The acceptable traffic noise levels incorporate an allowance for reflection from the facade of the building under investigation. In cases where the building is not yet built, measurements should be taken at a distance of one metre in front of the proposed building facade, and 2.5 dB(A) added to the measurement to allow for future facade reflection.
2. This criterion is also applied to useable private outdoor space of attached houses or apartments. Where the outdoor space is divided into two or more separate areas, at least one of these areas should meet this criterion. Measurements should be taken at a point one metre from the nearest boundary of the area of identified private open space at a height of 1.2 - 1.5 metres above ground level.

The criterion for maximum noise levels from traffic on roads at the nearest new residential buildings is 63 dB(A)  $L_{10}$  (18 hour) at one metre in front of the facade or the proposed facade closest to the road which is the main source of traffic noise.

The ACTPLA's NMG states that if the external noise goals are not achievable through appropriate set-back distances and barriers from the nearest major road, then the internal noise levels recommended in *Australian Standard 2107: Acoustics - Recommended design sound levels and reverberation times for building interiors* should be aimed for. In doing so, there may be requirements for the use of external noise attenuation measures or by appropriate noise attenuation treatments incorporated to the proposed buildings.

To protect the amenity of residential areas and to allow residents relatively quiet enjoyment of their private open space (i.e. backyards, courtyards, and similar areas), an additional criterion has been set. This provides for a maximum of 58 dB(A)  $L_{10}$  (18 hour), measured one metre in front of the nearest boundary of the private open space on residential blocks where the front of the residence does not address (face) the road which is the source of the traffic noise.

To predict this private open space noise level would require the proposed residential buildings to be input to the model, which would account for shielding and reflection of sound from the structures. As information regarding the proposed residential buildings was not available at the time of this assessment, only the 63 dB(A)  $L_{A10}$  (18 hour) noise goal has been assessed.



### 3. Noise Modelling

Acoustic Modelling was undertaken using the Computer Aided Noise Abatement (Cadna-A) software to predict the effects of road traffic noise generated by the North-South Arterial Road on the proposed residential areas. Cadna-A is a program for the calculation of noise levels. CadnaA calculates environmental noise propagation according to ISO 9613-2, “Acoustics – Attenuation of sound during propagation outdoors”.

Noise modelling was conducted with consideration to The United Kingdom Department of Environment’s *Calculation of Road Traffic Noise* (CoRTN).

Noise modelling was undertaken with the information that was available at the time of this assessment.

Using the physical properties of traffic volume and mix, ground topography, road gradient, air and ground absorption and source and receiver height, scenarios were modelled using CoRTN to predict the  $L_{10}$  (18 hour) noise indices.

The Austroads Research Report, “*An Approach to the Validation of Road Traffic Noise Models*” (2002) provides guidance on applying conversion factors to noise levels generated by CoRTN for Australian roads. The results of the ARRB Transport Research study are shown below in Table 3-1.

**Table 3-1 Australian Road Conversions – ARRB Study – Austroads 2002**

	With Facade	No Facade
Mean	1.7 dB	0.7 dB
Standard Deviation	2.5 dB	1.8 dB
Number of Sites	41	63

Source: Saunders et al 1983

Correction factors were applied to the predicted results to incorporate the ARRB façade corrections for Australian roads, as well as the 2.5 dB(A) façade correction for reflection, as per ACTPLA guidelines.

#### 3.1 Model Configuration

##### 3.1.1 Traffic Input Data

At this stage, the proposed building layouts and road designs for surrounding roads are not known, therefore only the North-South Arterial Road has been considered.

The CoRTN calculation method calculates traffic noise emissions levels based on traffic flows, heavy vehicle percentages, vehicle speeds, road gradients and road pavement types. The CoRTN calculation method requires 18-hour traffic counts (6 am to 12 am midnight). As there were no 18-hour counts available it was assumed that the 18-hour traffic flows were 94% of the Average Annual Daily Traffic (AADT) flows provided.



The traffic data for the North-South Arterial Road used as input to the model (18-hour predicted traffic flows) as supplied by GHD Canberra is shown in Table 3-2. Traffic volumes were provided for 10-year after project completion (2021). The traffic volumes along the North-South Arterial Road has been divided into 5 portions, A to E, to account for changes in traffic flows at intersections.

**Table 3-2 10-year Projected (2021) North-South Arterial Road Traffic Flows**

North-South Arterial Road	2021 AADT Traffic Flows (Veh/Day)	2021 Predicted 18-Hr Traffic Flows (Veh/18Hr)
Portion A	15,170	14,260
Portion B	9,820	9,231
Portion C	26,730	25,126
Portion D	31,000	29,140
Portion E	44,670	41,990

The traffic speed along the North-South Arterial Road was modelled at 70 km/hr. Traffic was modelled as including 5% heavy vehicles.

A road surface texture depth of 5 mm was assumed for all road surfaces.

### 3.1.2 Noise Modelling Set-up

The following data has been supplied and used in the noise model:

- ▶ Three dimensional terrain model of the North-South Arterial Road and surrounding areas;
- ▶ The noise grid has been modelled at 1.5m;
- ▶ Road designs and routes have been supplied electronically and modelled in Cadna-A;
- ▶ A ground absorption coefficient of 0.5 has been used in this assessment; and
- ▶ All traffic information, including respective road speed limits, traffic counts and heavy vehicle percentage was based on information provided at the time of this assessment.

## 3.2 Results

Figure 3-1 below shows the predicted results of the traffic noise modelling. Results indicate that the 63 dB(A)  $L_{A10}$  (18 hour) traffic noise goal should be met at most of the future residential properties along the North-South Arterial Road alignment.

For the majority of the North-South Arterial Road, the 63 dB(A)  $L_{A10}$  (18 hour) noise contour is contained within approximately 40 – 60 m of the alignment. However, towards the southern end of the proposed roadway, near the existing Cotter Road and Weston suburb, the 63 dB(A)  $L_{A10}$ , (18 hour) reaches up to 150 m from the roadway edge. Therefore, where residential buildings are proposed to be located within close proximity (less than 150 m) of the North-South Arterial Road, the ACTPLA's noise goal may be exceeded and appropriate measures may be required to mitigate traffic noise levels to meet the ACTPLA criterion. As a result, in-principal recommendations for noise mitigation have been provided in Section 4 of this assessment.



Predicted results also indicate that 2021 noise levels at the existing community facilities such as ADF College, Bahai Church and Orana School are below the ACTPLA's traffic noise criterion.

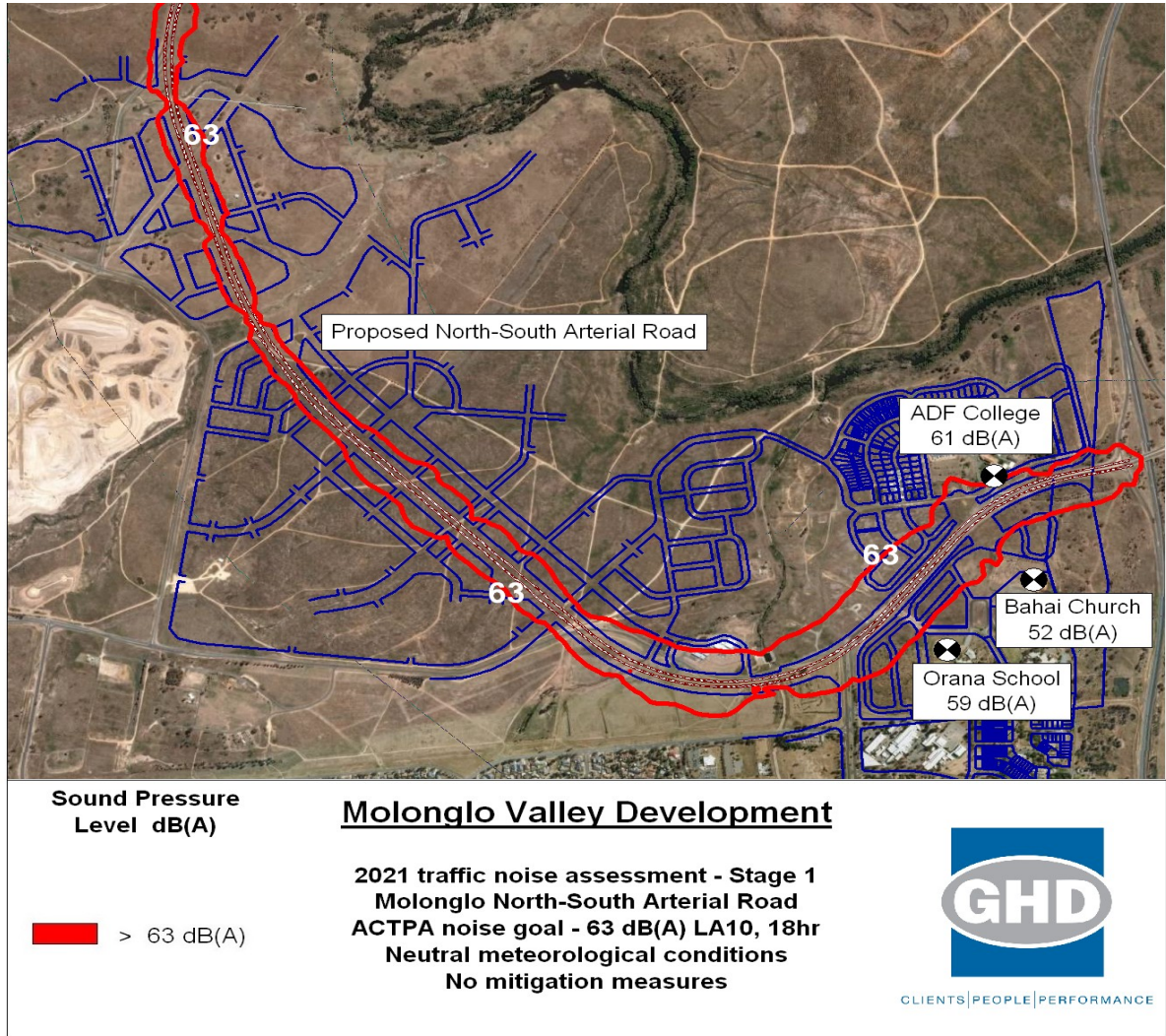


Figure 3-1 Predicted Traffic Noise Contours – North-South Arterial Road – dB(A)  $L_{A10}$ , (18 hour)



## 4. Recommendations

The ACTPLA outlines three practical methods for reducing traffic noise to acceptable levels. These are:

- ▶ Adequately separating sensitive receivers from roads (using set-back requirements or buffer strips);
- ▶ The construction of noise mounds or other noise attenuation structures between roads and adjacent buildings; and
- ▶ Including acoustic features in the building structure.

General mitigation measures for reducing road traffic noise are also referenced from the Roads and Traffic Authority's (RTA) *"Environmental Noise Management Manual"* (ENMM) (2001) and from Austroads *"Modelling, Measuring and Mitigating Road Traffic Noise"* (2005). These include the following:

- ▶ Controlling noise at the source;
- ▶ Controlling the noise path between the source and the receivers; and
- ▶ Controlling noise at the receiver by improving building components to reduce the noise transmission to the interior.

A means of controlling noise at the source is using Open Grade Asphalt which has high absorption properties, however Open Grade Asphalt is mostly effective when vehicle speed are in excess of 80 km/hour. It also has a shorter life expectancy than Dense Grade Asphalt and is therefore not considered to be the most appropriate option in mitigating traffic noise for the North-South Arterial Road.

Improving building structures to reduce sound transmissions may be practical in some situations however can be expensive and should be used in conjunction with other mitigation measures.

Barriers can be very effective in reducing noise levels at the receivers at the ground level, however are not as effective for multi story buildings as high barriers need to be installed to remove the line of sight between the road and the multi story receiver. Barriers are only effective when they intersect the path between the predominant noise source and receiver.

It is GHD's understanding that ACTPLA's intention is that the property developers within the proposed residential areas will address noise attenuation requirements and that no attenuation measures will be built within the road reserve.



## 5. Conclusions

GHD was commissioned by ACT Procurement Solutions to prepare a desktop traffic noise impact assessment for the potential impacts of the proposed North-South Arterial Road on proposed adjacent residential areas.

At concept design stage, the predicted noise results should be used as a guide to provide an indication as to what areas of the proposed development may need more attention to noise mitigation measures at the detailed design stage.

A 63 dB(A)  $L_{10(18-hr)}$  contour plot has been produced for the projected (2021) traffic flows along the North-South Arterial Road. Predicted results indicate that the ACTPLA's traffic noise goal may be exceeded at some parts of the proposed residential areas adjacent to the North-South Arterial Road.

Predicted 2021 traffic noise levels at the existing community facilities adjacent to Cotter Road show compliance with the ACTPLA's criteria.

With potential for possible traffic noise goal exceedences, recommendations for road traffic noise mitigation measures have been outlined in Section 4 of this report.



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### Document Status

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