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New Brighton Golf Club

Report for New Brighton Golf Club, Rezoning Studies

Acoustic Assessment
Revisions

June 2011

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. Introduction

A new site layout has been developed for the New Brighton Golf Club Located at Moorebank NSW. GHD previously conducted a noise assessment (February 2011) for the development which:

- Identified key noise catchment areas and noise sensitive receivers.
- Quantified the ambient local noise environment.
- Determined project specific noise goals for the proposed development operations and noise generated from additional traffic generated by the facility.
- Identified principal noise sources and their potential impacts on sensitive receptors.
- Provided in-principle mitigation and management recommendations to reduce noise impacts at sensitive receivers.

This report provides an update to the previous acoustic assessment (Report 154387.doc) conducted by GHD for New Brighton Golf Club Ltd.

This report addresses changes involving the site layout and inclusion of a 4 metre high noise barrier along the M5 Motorway site boundary. It should be noted that a building design and configuration has not been finalised, therefore this report does not include detailed analysis of façade noise reduction through building elements such as walls and windows.

1.1 Scope

The scope of work is as follows:

- Initial desk top review of the revised site layout and drawings.
- Based on the new site layout, revise the previously conducted noise model using Computer Aided Noise Abatement (Cadna-A) software to predict sound pressure levels from traffic noise sources at sensitive receivers.
- Undertake noise modelling to include the provision of a 4 metre high noise barrier. (Note, the previous acoustic assessment conducted by GHD in November 2009 for the rezoning application included a 3 metre high noise barrier).
- Preparation of a report outlining the results of the revised noise impact assessment and in-principle mitigation recommendations to reduce noise impacts at sensitive receivers. This also includes recommendations for any further studies required.

2. Criteria Summary

The following external and internal criteria have been adopted for the project.

2.1 Road Traffic Noise Criteria

2.1.1 External Criteria

The ECRTN states that in assessing noise levels at residences, the noise level is to be determined at 1m from the most exposed façade at a height of 1.5 m. This criterion includes an allowance for noise reflected from the façade of the building (façade correction). When measuring in a free-field location a correction factor of 2.5 dB(A) should be added to the measured value.

The ECRTN's category 7 criteria are provided in Table 2-1.

Table 2-1 ECRTN Road Traffic Noise Criteria L_{Aeq}

Situation	Day (7am –10pm) dB(A)	Night (10pm – 7am) dB(A)	Where Criteria are Already Exceeded
7. Land use developments with potential to create additional traffic on existing freeways/arterial roads	$L_{Aeq(15hr)}$ 60	$L_{Aeq(9hr)}$ 55	Where feasible and reasonable, noise levels from existing roads should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicle; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

2.1.2 Internal Criteria

Additionally, the DoP's *Development Near Rail Corridors and Busy Roads – Interim Guideline* supports road provisions of the State Environmental Planning Policy (Infrastructure) 2007 (the 'Infrastructure SEPP').

Clause 102 of the Infrastructure SEPP states the following:

- If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following LA_{eq} levels are not exceeded:
  - In any bedroom in the building: 35 dB(A) at any time 10pm-7am.
  - Anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40 dB(A) at any time.

3. Noise Modelling

3.1 Noise Model Revision

This noise model revision includes changes involving the site layout and inclusion of a 4 metre high noise barrier along the M5 Motorway site boundary.

3.2 Noise Modelling Software

Acoustic modelling was undertaken using Computer Aided Noise Abatement (CadnaA) to predict the effects of traffic noise on the proposed development.

CadnaA is a computer program for the calculation, assessment and prognosis of noise propagation. CadnaA calculates environmental noise propagation according to ISO 9613-2, *"Acoustics – Attenuation of sound during propagation outdoors*". Ground absorption, reflection, terrain and relevant shielding objects are taken into account in the calculations.

Traffic noise modelling was conducted using the CadnaA program and The United Kingdom Department of Environment's *Calculation of Road Traffic Noise* (CoRTN).

The proposed development has been modelled based on available data at the time of assessment and, as such, should be used for comparison purposes only.

3.3 Ground Contours and Buildings

Digital terrain contours and cadastral data were provided by the Client and utilised in the model.

Since the proposed development is at Masterplan Stage only, building footprints and details are not known at this stage, therefore the lot layouts were used within the noise model. Only single storey receivers were modelled 1.5m above ground level.

3.4 Noise Models

The traffic noise model was first verified with measured traffic noise data along the M5 Motorway to ensure predicted noise levels were accurate. This formed a base onto which the traffic noise model could be adjusted to include the projected 10 Year future traffic volumes.

3.5 Model Configuration

The following assumptions were made with regard to the model configuration:

- A general ground absorption coefficient of 0.5 was used throughout the model;
- The roads were set to have a ground absorption coefficient of zero (reflective);
- For daytime, atmospheric conditions of 20°C and 70% humidity were used; and
- Due to the close proximity of the residential receivers, and the minor extent of prevailing winds that would enhance M5 Motorway noise across the site, all noise models were assessed under neutral meteorological conditions.

3.6 Noise Source Details

The following presents a summary of the traffic noise parameters used in this assessment.

3.7 Traffic Data

AADT traffic data (Dec 2007) for the M5 Motorway was obtained from the Ernst & Young Report titled *The Economic Contribution of Sydney's toll roads to NSW and Australia 2008.* The following outlines the parameters used in the modelling:

- Traffic volumes for year 2009 were calculated by using 3% growth per annum.
- Heavy vehicle volumes were assumed to be 5%.
- Traffic speed was based on the posted speed limit of 70 km/hr.
- Road surface was assumed to be bitumen asphalt.

Table 3-1 presents the traffic data used in the assessment.

Table 3-1 Traffic Movement

	M5 Motorway Traffic Volumes	
	AADT	18hr (6am – midnight)
Traffic Survey (Year 2007)	116,000	109,040
Predicted traffic (Year 2009)	123,064	115,680
Predicted traffic (Year 2019)	155,894	146,540

3.8 Traffic Noise Model Validation

Outputs of the traffic noise model were validated against the $L_{A10,\ 18hr}$ noise levels measured during the monitoring period and site visits. Site monitoring was measured at approximately 1-metre from a shipping container, in effect, simulating a building facade. A comparison of the measured and predicted free-field noise levels is presented in Table 3-2.

Table 3-2 Comparison of Monitoring Results and Prediction Results $L_{A10,\ 18hr}$ dB(A)

Location	Measured Results $L_{A10,\ 18hr}$	Modelled Results[1] $L_{A10,\ 18\ hr}$	Difference
Southwest corner of site exposed to M5 Motorway	70.4	69.2	- 1.2

[1] Modelled results includes 2.5 dB(A) facade reflection.

These results show a close correlation between the measured and modelled results, with variations of less than 2 dB(A). Therefore the traffic noise model is considered to be a valid approximation of the measured acoustic environment.

4. Assessment of Potential Noise Impacts

4.1 External Traffic Noise

4.1.1 Predicted Traffic Noise Contribution from Existing Roadways

Predicted noise levels from traffic were assessed at 1 metre from each façade based on a standard setback of 5m, therefore, a façade reflection correction factor of 2.5 dB(A) is inclusive of all predicted noise levels as per ECRTN guidelines.

As the CoRTN model outputs are $L_{A10(18hr)}$ values, these need to be converted to $L_{Aeq(15hr)}$ and $L_{Aeq(9hr)}$ to suit the ECRTN criteria.

Table 2 of Austroads Inc document titled *"Modelling, Measuring and Mitigating Road Traffic Noise"* (2005) AP-R277/05 outlines factors for simple conversion between road traffic noise descriptors. For example, the conversion factor between $L_{A10(18h)}$ to $L_{Aeq(15hr)}$ and $L_{Aeq(9hr)}$ is as follows:

$$L_{Aeq(15hr)} = L_{A10(18hr)} – 2.2dB(A)$$

$$L_{Aeq(9hr)} = L_{A10(18hr)} – 5.1dB(A)$$

Modelling results are based on available information provided and should only be used as a guide for comparative purposes.

4.1.2 Model Results – No Mitigation

The predicted model results and sound pressure level contours for the projected 2019 traffic conditions are contained within the previous acoustic assessment and have been replicated in Appendix A of this report and summarised below in Table 4-1. The results are given as a range of noise levels representing the noise levels experienced at approximately 5 metres within the southern boundary of the development site near the M5 motorway.

Table 4-1 Projected Traffic Noise (Year 2019) Results dB(A)L_{eq} - No Mitigation Measures

Period	Criteria	Results
Daytime $L_{Aeq\ (15hr)}$ dB(A)	60	67-72
Night-time $L_{Aeq\ (9hr)}$ dB(A)	55	64-69

Table 4-1 indicates the predicted external traffic noise is expected to exceed the noise ECRTN criteria during daytime by 7-12 dB(A) and during night-time by 9-14 dB(A).

Given the predicted traffic noise results are expected to exceed the external noise criteria, reasonable and feasible noise mitigation measures are required to minimise noise impact at the nearest receivers.

4.1.3 Model Results – With Mitigation

The predicted traffic noise results for Year 2019 with a 4.0 metre acoustic barrier installed along the southern boundary of the development site compared to the ECRTN external noise criteria are shown below in Table 4-2.

Table 4-2 Projected Traffic Noise (Year 2019) Results dB(A)L_{eq} - With Mitigation

Period	Criteria	Results
Daytime $L_{Aeq\ (15hr)}$ dB(A)	60	57-63
Night-time $L_{Aeq\ (9hr)}$ dB(A)	55	54-60

Table 4-2.indicates that even with a 4.0 metre barrier installed along the southern boundary of the proposed development, the predicted traffic noise levels are still expected to exceed the ECRTN criteria. As such, further noise mitigation is required at affected ground floor receivers and it is considered that architectural treatments would also be necessary to enable compliance with the internal noise criteria.

Figure 1 and Figure 2 display the predicted model results and sound pressure level contours for the projected 2019 traffic conditions with mitigation measures in place. These figures address the modified site layout and an increase in the height of the barrier along the southern site boundary adjacent to the M5 Motorway from 3 metres to 4 metres.

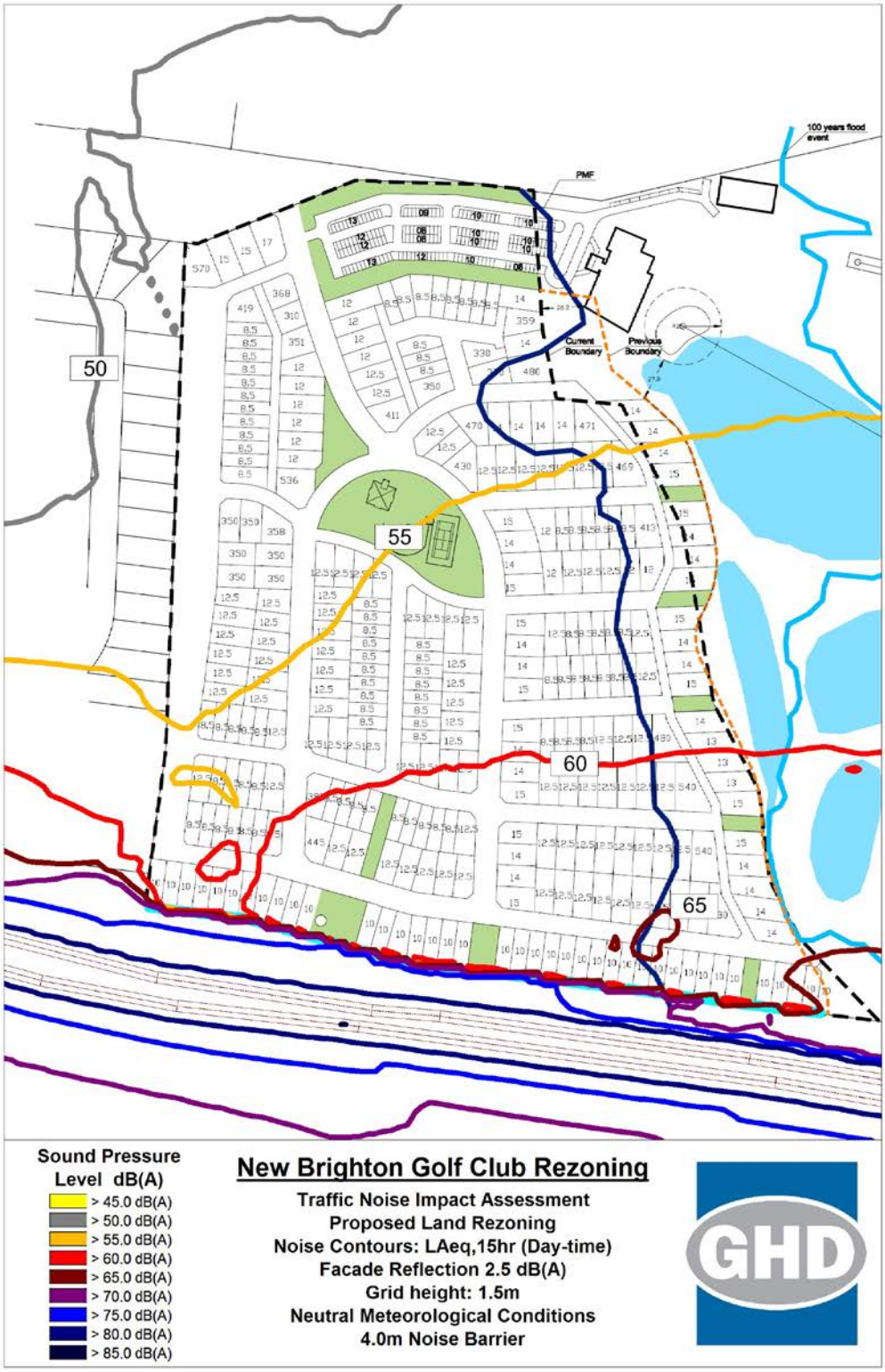

Figure 1 Projected (2019) Traffic Noise Daytime $L_{Aeq\ (15hr)}$ dB(A) – With 4m Barrier Mitigation

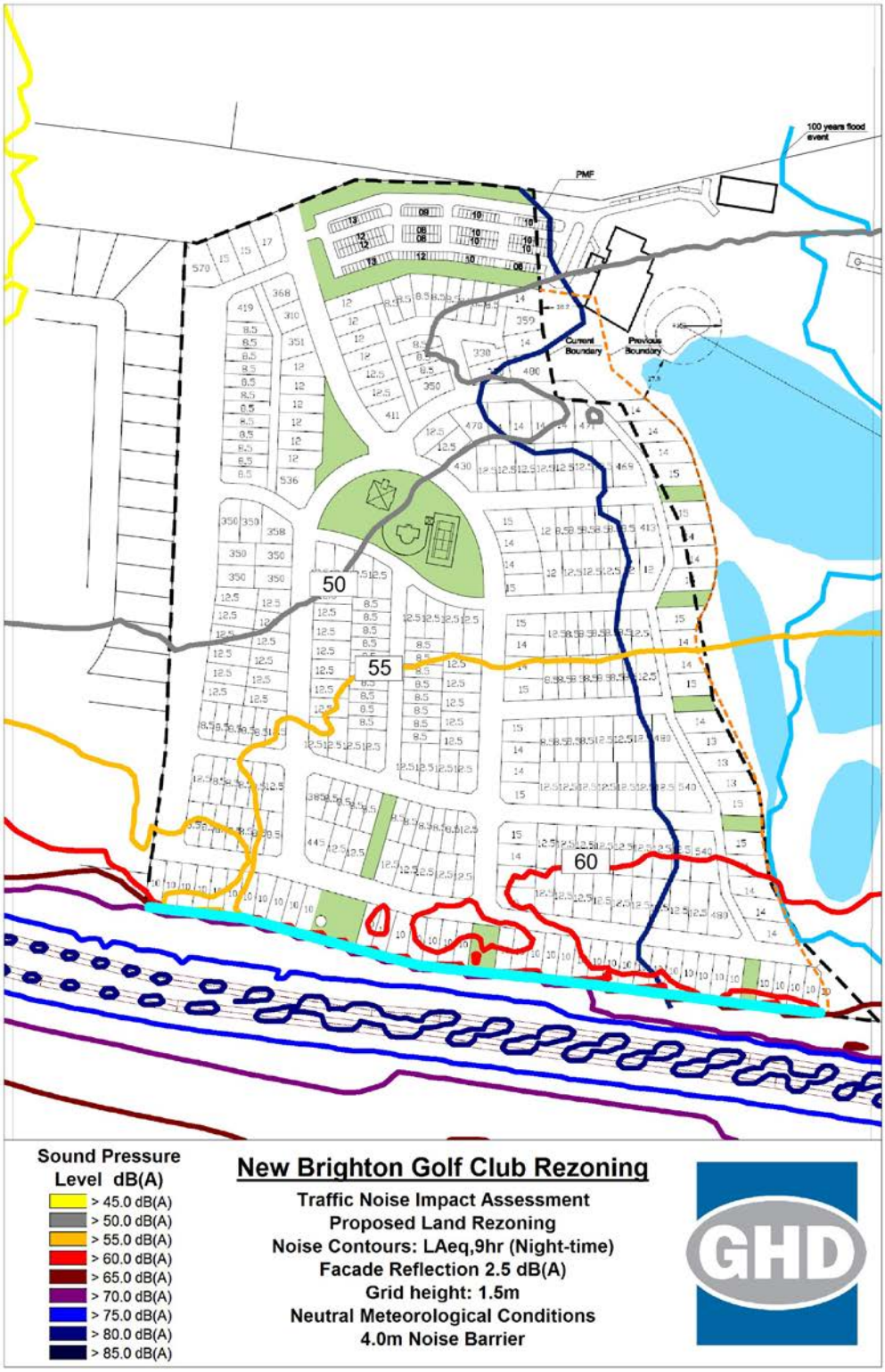

Figure 2 Projected (2019) Traffic Noise Night-time $L_{Aeq\ (9hr)}$ dB(A) – With 4m Barrier Mitigation

4.2 Internal Noise

A stated in Section 4.1 of this report, the DoP internal noise requirements are as follows:

- If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:
  - In any bedroom in the building: 35 dB(A) at any time 10pm-7am.
  - Anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40 dB(A) at any time.

Based on the predicted noise levels given in Table 4-2 and the criteria for bedrooms shown above, the façade of the proposed dwellings are required to attenuate external traffic noise levels by 17 to 23 dB(A) during daytime and 18 to 25 dB(A) during night-time.

The attenuation requirements shown above may be reduced by approximately 5 dB if the bedrooms are not exposed to the M5 Motorway (e.g. bedrooms located on northern side of the dwellings).

5. Recommended Mitigation Measures

5.1 Traffic Noise - Noise Mitigation Measures

Traffic noise model results indicate the proposed new residential development to be located in close proximity to the M5 Motorway are expected to exceed the site specific ECRTN traffic noise goals, therefore GHD suggest that all feasible[1] and reasonable[2] noise control options should be investigated.

External noise mitigation in the form of a 4.0 metre noise barrier installed along the southern boundary of the development site was modelled, however the noise goals are still expected to exceed the ECRTN criteria. While a much higher barrier will offer increased noise mitigation, such a barrier would be impractical and detract from the local aesthetic values of the area. The RTA's *Environmental Noise Management Manual* (ENMM) acknowledges that noise barriers of increasing height become visually unacceptable and that a combination of noise mitigation options may be required to achieve an acceptable result based on feasibility and reasonableness.

Therefore for any proposed construction of residential premises within the predicted non-compliance area of the site, it is considered that architectural treatments would also be necessary to enable compliance with the internal noise criteria.

5.1.1 External Noise Mitigation

Noise barriers can be constructed from earth, concrete, masonry, wood, metal, and other materials. To effectively reduce sound transmission through the barrier, the material chosen must be rigid and sufficiently dense (at least 15 - 20 kilograms/square metre). All noise barrier types are generally equally effective acoustically provided they have this density.

Noise barriers do not completely block all noise, but they can reduce overall noise levels. To effectively reduce the noise coming around its ends, a barrier should extend past the last affected residence by approximately three times the distance from the residence to the source and by not less than 50 metres where space permits. A noise barrier should also be sealed and extend down to or below the ground level.

The first stage to mitigating noise intrusion is appropriate site planning, building design, and the use of insulation and sound absorbing materials in building construction could be utilised as outlined below for any proposed residences potentially affected by road traffic noise ingress.

5.1.2 Internal Noise Mitigation

Layout of the rooms in the building structure is important. Placement of less sensitive noise areas such as the bathroom, laundry, and the kitchen closer to the noise source shields the more sensitive areas such as the bedrooms, living rooms and studies. Building design should be conducted with these principles in mind to assist with achieving acceptable internal noise levels.

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[1] With reference to engineering practicality.

[2] A weighted analysis of factors such as: Costs and benefits of mitigation; Community comment; Aesthetic impacts; Existing & future noise levels at affected sensitive receivers; and, the overall benefit of the development.

Using building materials, which insulate or absorb sound in the floors, walls, ceilings and roofs is another way of keeping traffic noise out of the home. For example, adding thermal insulation to the ceiling can reduce noise levels by 7 to 8 decibels.

Noise affected zones should be defined and identified where building design needs to incorporate grades of architectural noise mitigation, to ensure that internal noise levels are acceptable. It is far more cost effective to install appropriate noise insulation at the building design stage.

It is also recommended that the internal amenity of the dwellings be protected by way of the provision of air-conditioning and mechanical ventilation to enable windows to be kept shut to limit traffic noise intrusion.

The extent of the acoustic treatment, in particular external facades, should be further developed during the detail designed stage of the project once building siting and the layout of internal spaces and materials is finalised. As a minimum, walls and floors should be designed with consideration to the Building Code of Australia (BCA) acoustic requirements.

If dwellings of two or more storeys are proposed it is likely that noise levels at the additional floors will be significantly higher than those at the ground floor due to reduced benefit from the 4 metre noise barrier. Therefore, where multiple storey dwellings are proposed additional acoustic treatment may be required to achieve the DoP internal noise goals.

6. Conclusion

GHD Pty Ltd (GHD) was commissioned by New Brighton Golf Club to provide a revised noise impact assessment as part of the rezoning studies for the proposed development.

Based on the revised noise model results, the following conclusions were made with consideration to the limitations given in Section 7:

- The predicted external traffic noise results with a 4.0 metre noise barrier installed on the southern boundary of the Site indicate that the barrier is expected to mitigate noise levels by approximately 10dB at the worst affected receivers within the site. With the barrier in place, the ECRTN external criteria are still expected to be exceeded at proposed Lot locations; however this noise barrier may form an integral component of an overall noise mitigation strategy particularly if the barrier also comprises a row of attached built form two storey townhouses sites parallel to the motorway and appropriately designed.
- GHD suggest that feasible and reasonable architectural noise control mitigation measures and options should be implemented with consideration to the DoP internal noise criteria.
- For buildings requiring noise mitigation measures, once the building designs have been finalised, detailed acoustic assessments should be conducted to determine specific requirements for construction and architectural treatments to meet the internal noise criteria.

7. Limitations

This Revised Noise Assessment ("Report"):

- Has been prepared by GHD Pty Ltd ("GHD") for the New Brighton Golf Club (NBGC).
- May only be used and relied on by NBGC.
- Must not be copied to, used by, or relied on by any person other than NBGC without the prior written consent of GHD;
- May only be used for the purpose of the scope of work outlined in Section 1.1 of this report (and must not be used for any other purpose).

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than NBGC arising from or in connection with this Report.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in 1.1 of this Report.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions"), including (but not limited to):

- Noise modelling assumptions detailed in Section 3 of this report.

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation of this Report.

GHD has prepared this Report on the basis of information provided by NBGC, which GHD has not independently verified or checked ("Unverified Information") beyond the agreed scope of work.

GHD expressly disclaims responsibility in connection with the Unverified Information, including (but not limited to) errors in, or omissions from, the Report, which were caused or contributed to by errors in, or omissions from, the Unverified Information.

8. References

- NSW DEC, Environmental Criteria for Industrial Noise Policy (INP), January 2000.
- NSW DEC Application Notes to the NSW Industrial Noise Policy, released 4th May 2006.
- DEC NSW, Environmental Criteria for Road Traffic Noise, Roads and Traffic Authority, Environmental Protection Authority, Chatswood, 1999.
- Australian Standards AS 3671:1989, Acoustics – Road traffic noise intrusion – Building siting and construction.
- NSW Department of Planning's Development Near Rail Corridors and Busy Roads – Interim Guideline.
- CadnaA Computer Aided Noise Abatement Manual, Version 3.5, Greifenberg 2005. CadnaA is a registered trademark of Datakustik GmbH, Greifenberg, Germany).

Appendix A

Model Results – No Mitigation


50.0
55.0
60.0
65.0
70.0
75.0
12
18
Sound Pressure Level dB(A)
> 40.0 dB(A)
> 45.0 dB(A)
> 50.0 dB(A)
> 55.0 dB(A)
> 60.0 dB(A)
> 65.0 dB(A)
> 70.0 dB(A)
> 75.0 dB(A)
> 80.0 dB(A)
> 85.0 dB(A)
New Brighton Golf Club Rezoning
Projected Year 2019 Traffic Noise
Proposed Land Rezoning
Noise Contours: LAeq,15hr (Day-time)
Facade Reflection 2.5 dB(A)
Grid height: 1.5m
Neutral Meteorological Conditions
No Mitigation Measures


50.0
55.0
60.0
65.0
70.0
75.0
12
18
Sound Pressure Level dB(A)
> 40.0 dB(A)
> 45.0 dB(A)
> 50.0 dB(A)
> 55.0 dB(A)
> 60.0 dB(A)
> 65.0 dB(A)
> 70.0 dB(A)
> 75.0 dB(A)
> 80.0 dB(A)
> 85.0 dB(A)
New Brighton Golf Club Rezoning
Projected Year 2019 Traffic Noise
Proposed Land Rezoning
Noise Contours: LAeq,9hr (Night-time)
Facade Reflection 2.5 dB(A)
Grid height: 1.5m
Neutral Meteorological Conditions
No Mitigation Measures

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	S.Ritchie	C Evenden	*C Evenden*	C Evenden	*C Evenden*	24/02/11
Final	S.Ritchie	C Evenden	*C Evenden*	C Evenden	*C Evenden*	07/06/11