BGMA Pty Ltd

ABN 55 101 186 805
Consulting Acoustical Engineers

Unit 21 / 12 Meadow Crescent,
Meadowbank NSW 2114
Ph: 02 98090745 Mob: 0405 493 726
Email: bgma1@bigpond.com

Reference: BGMA 161102

Thursday 10th November 2016

Jennifer French

"Glenfield Farm"
88 Leacocks Lane,
Casula NSW 2170

Re: **Moorebank Intermodal Terminal & Intermodal Precinct Noise Impact**

The proposal for Stage 2 of the Moorebank Intermodal Terminal (Moorebank Precinct (West)) has arrived, and yet again "Glenfield Farm" has not rated a mention.

Acoustically, the home located at "Glenfield Farm" will be one of the most affected, visually & acoustically by the development in this part of the suburb of Casula. "Glenfield Farm" is also one of the residences that is least able to handle the acoustic impacts of the development.

BGMA Pty Ltd has been asked to review the Noise & Vibration Assessment. The report contains a number of flaws and inconsistencies.

Rather than dissect the report in detail, I intend to comment on each section and to highlight the areas that are defective, but first a short description of the site.

"Glenfield Farm"

There is a house at "Glenfield Farm" that has been there for near on 200 years. In 1809, Dr Charles Throsby was granted the land by the then colonial governor at that time, Governor Lachlan Macquarie. Dr Throsby then built the house, and made it a home in about 1817. He named his farm after his birthplace in England. The nearby township of Liverpool was only seven years (1810), and it had only been four years since a road from Sydney Cove had been completed in 1813.

This house, this home, was built on a ridgeline, with the rear of this home looking out to the south-east across the Georges River, while the front of this home looked out to north-west, over what would become the residential suburb of Casula. Today this home is on the eastern side of Leacock's Lane, which was named after James Leacock, who lived there from 1920 to 1974.

This home at "Glenfield Farm" still sits on this ridgeline, overlooks Glenfield Creek and the Georges River on one side, and the modern suburb of Casula on the other side. The home is still a privately owned, having been purchased from the NSW Historic Houses Trust on 3rd of July 2013.

On the side overlooking the Georges River, the land drops away within the first 100 metres of the rear of the home, dropping about 28 metres down to Glenfield Creek and across the river flats to the Georges River about 450 metres further away.

A single-track railway line was installed across the river flats, later to become known as the Main Southern Line, when the railway that had reached Liverpool (about 4.5 km to the north) in 1856, and was extended through to Campbelltown (about 14.5 km to the south) in 1858.

In those early days, this line was served by Locomotive No. 1 which now resides in the Powerhouse Museum.

The Main Southern Line (now double track), was joined by the Southern Sydney Freight Line (SSFL) in 2013.

The Main Southern Line is between 220 and 224 metres of the rear of the home.

The double-track Southern Sydney Freight Line (SSFL) is between 240 metres and 246 metres of the rear of the home.

In this part of Casula, this residence and another on the same side of Leacocks Lane are the only two fully exposed to the Moorebank Precinct and its associated rail link.

What is rather strange is the lack of attention that has been paid to "Glenfield Farm" and this part of Casula.

"Glenfield Farm" & the Intermodal

Moorebank Avenue is lies about 1,450 metres to the east of "Glenfield Farm".

Moorebank Precinct (East) and Moorebank Precinct (West) lies to the east & west of Moorebank Avenue.

Moorebank Avenue is about 2.275 kilometres long, north-south.

"Glenfield Farm" is about 1 kilometre from the Moorebank Precinct (West).

Within the precinct, the precinct railway marshalling area will lie along the western side of Moorebank Avenue, between Moorebank Precinct (East) & Moorebank Precinct (West).

The rail lines connecting the marshalling area to the Sydney Freight Line will pass across the bottom of Moorebank Precinct (West), across the Georges River and then head in a northerly direction.

To join the Southern Sydney Freight Line (SSFL), the line splits with two (2) connections to the Southern Sydney Freight Line.

The first connection arcs gentle to the north to connect to the Southern Sydney Freight Line.

The second connection arcs tightly toward the south, joining the Sydney Freight Line, almost directly in front of the "Glenfield Farm" residence.

Intermodal Impacts on "Glenfield Farm"

The Noise & Vibration Impact Assessment (October 2016) was prepared by Wilkinson Murray Pty Ltd as Report 15324 Version D.

In **Section 1.1 "Report Purpose"** on **Pages 4 & 5,** the report is described as an updated assessment of noise & vibration

- to clearly demonstrate that at each stage a best practice facility (terminal, warehousing and rail link including locomotives and rolling stock), to minimise noise emissions at the terminal and rail link, will be adopted;
- to consider the need for an automatic rolling stock wheel defect detection and response system;
- to include a framework for on and off-site noise monitoring during operation, and
- be in accordance with: NSW Industrial Noise Policy (EPA 2000), Interim Construction Noise Guideline (DECC 2009), Assessing Vibration: a technical guide (DEC 2006), the Rail Infrastructure Noise Guideline (EPA 2013), Development Near Rail Corridors and Busy Roads Interim Guideline (DoP 2008), and the NSW Road Noise Policy 2011.

What is missing is a requirement to compliance to the "Protection of Environment Operations Act" (1997).

This document refers to 'offensive noise', noise that "by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances", interfere "unreasonably with the comfort or repose of a person who is outside the premises from which it is emitted".

Depending of which part of the project is examined, a different set of requirements fall into place.

The assessment needs to look to the central spine of the Precinct along Moorebank Avenue, where trains are slow moving, where freight is loaded & unloaded, and to the warehousing on either side of the central spine. There are road traffic noise implications to the north (to the M5) due to the road traffic entering & leaving, but there are important rail noise implications to the south west, where the project connects to the Southern Sydney Freight Line (SSFL).

In assessing the impacts, there are three (3) major residential areas identified: the suburb of Wattle Grove to the east, the suburb of Glenfield to the south-west, and Casula to the west.

At the northern end of the site, the Precinct is pinched between the northern end of Casula and a westward extension of the northern end of Wattle Grove into an industrial area.

At the southern end of the site, the Precinct lies between the southern end of Casula and the main body of the suburb of Wattle Grove. At this southern end, the Precinct is also approaching the suburb of Glenfield.

In the original noise logging, three (3) points were measured, focussing on the warehousing area, and the central spine, but **NOT** on the rail link to the SSFL.

The second potion of Casula, the area containing "Glenfield Farm", was overlooked.

For the impacts on Casula to be adequately addressed, Casula needs to be viewed not as one receiver area BUT as two.

Even then, the topography of Casula needs to be considered.

Any reference to Casula noise impacts is quite meaningless, without reference to which part of Casula is being referred to.

The northern end of Casula begins at the M5 (the South Western Motorway) extending about 1.5 kilometres south between the Hume Highway and the Georges River. About 125 metres further south (1.75 kilometres from the M5), the southern portion starts, extending a further 1.4 kilometres south from the intersection of Leacocks Lane and the Hume Highway.

Within the southern area part of Casula, Leacocks Lane essentially follows the eastern edge of Casula following the ridgeline that overlooks the Georges River. At some time in the past, the river has cut into the eastern side of the ridge, creating a sharp drop-off to the river flats.

Most of the modern suburb of Casula lies to the west and behind the ridgeline, and Leacocks Lane, BUT there are residences on the ridgeline overlooking Georges River, the rail connection to the Precinct and to the Precinct beyond. "Glenfield Farm" is one of these residences.

Any reference to the 'background' noise level of 'Casula' refers ONLY to the northern end of Casula close to the M5.

The environmental 'background' logging from the suburbs of Wattle Grove & Glenfield would give a far better indication of noise conditions around the southern portion of Casula than the 'Casula' measurement point.

"Glenfield Farm" is only just over a kilometre about Precinct, and about 245 metres from the Rail Link to the Precinct.

In Section 6.1 "Operational Noise Criteria" in Table 6-1, Page 24, the "**Intrusiveness Criteria**" indicates environmental 'background' noise levels for Casula to be **39** dB(A) by day, **39** dB(A) in the evening, and **33** dB(A) at night.

These 'background' noise levels relates to the northern end of Casula, **NOT** to the southern end of Casula, around "Glenfield Farm".

Based on viewing the data and years of environmental noise measurement, the environmental 'background' noise levels in the southern section of Casula (around "Glenfield Farm") are more likely to be **35** dB(A) by day, **35** dB(A) evenings, and **33** dB(A) at night.

These lower, and more representative, 'background' noise levels (around "Glenfield Farm") will affect interpretation of acoustic impacts to this the southern portion of Casula **and to "Glenfield Farm" in particular**, for the assessment of compliance to:

- Construction noise impact limits
- Operational noise impact limits
- Rail noise impact limits

The continued use of these (what I believe to be) quite erroneous environmental 'background' noise levels renders any compliance or non-compliance assessment of this southern portion of Casula invalid.

The section covering Operational Noise (Section 7) was interesting.

Unless you understand, the NSW Industrial Noise Policy (INP) document, Section 7 of the Noise & Vibration Assessment is quite confusing, as it mixes $\mathbf{L_{Aeq,15min}}$ noise levels with $\mathbf{L_{Aeq,period}}$ noise levels.

The most important results to look for are the impacts under "Adverse" weather conditions.

In winter, this area would be subject to the early morning Mittagong Drainage Flow, as chilled air from the Mittagong area flows through this area heading north into the western suburbs of Sydney, and where it merges with the Blue Mountain Drainage Flow and the Hawkesbury Drainage Flow, accumulating the depression between the Blue Mountains and the Prospect Ridge.

The Tables in Section 7 could be quite confusing to the Layman.

The former, the **LAeq,15min** noise results, relates to noise **"Intrusiveness" criteria**, while the latter, the $\mathbf{L_{Aeq,period}}$ results, relate to **"Amenity" criteria**.

The former is the current 'background' noise of an area PLUS 5 dB for limiting noise introduces in to the existing noise environment.

The latter is a 'cap' on the noise growth within any area.

The change from **LA90** noise levels to **LAeq** noise levels, in the 2000 Industrial Noise Policy document, introduced a whole set of problems to **"Amenity" criteria**. When measuring **LAeq** noise levels, it can be very easy for the readings to be contaminated by extraneous noise events in the immediate vicinity of the noise loggers.

Care and experience is required to pick locations that minimise these extraneous noises.

For suburban areas the "Amenity" noise limits are 55 dB(A) by day, 45 dB(A) evening, and 40 dB(A) at night.

These limits are daytime 'energy averaged' over 11 hours (7 am to 6 pm), evening 'energy averaged' over 4 hours (6 pm to 10 pm), and night time 'energy averaged' over 9 hours (10 pm to 7 am).

There is a procedure for calculating appropriate site specific $\mathbf{L_{Aeq,period}}$ limits to ensure the overall limits are not exceeded. These procedures appear to have been ignores.

There appears to have been an assumption made that the Moorebank Precinct will be the only "industry" to occupy this area between these suburbs, and thus, it can take to whole $\mathbf{L_{Aeq,period}}$ allocation.

In Section 7, the "Amenity" noise limits allowed appear as 54 dB(A) in the day period, 45 dB(A) in the evening period, and 40 dB(A) in the night time period.

Meanwhile, the $L_{Aeq,15min}$ "Intrusiveness" noise limits appear to have been set at 40 dB(A) by day, 40 dB(A) in the evening, and 37 to 38 dB(A) at night, for Glenfield & Wattle Grove, **BUT** at 44 dB(A) by day, 44 dB(A) in the evening, and 38 dB(A) at night, for any part of Casula.

It would be appear that for "Glenfield Farm", and the southern portion of Casula, that far more appropriate LAeq,15min "Intrusiveness" noise limits would be noise limits of 40 dB(A) by day, 40 dB(A) in the evening, and 38 dB(A) at night.

Despite the lack of any tabulated noise levels relevant to the "Glenfield Farm" area, there were noise contour plots in Appendix A (Figure A-1, Figure A-2, Figure A-3 & Figure A-4) that could be used to ascertain whether "Glenfield" Farm would be adversely affected by 'general' Operational Noise.

The noise contour plots indicate that the impact on "Glenfield" Farm will be within acceptable levels, even with adjusted limits.

The section covering Construction Noise (Section 10) was also interesting.

Again any assessment of Construction Noise will need to take into account the actual noise levels in the southern part of Casula, particularly around "Glenfield Farm", rather than assuming a measurement at the northern end of Casula is representative of the entirety of Casula.

I would therefore suggest that the "first trigger point" close to the home at "Glenfield Farm" be $L_{Aeq,15min}$ noise level of 54 dB(A) by day (7 am to 6 pm), and 45 dB(A) in the evening (6 pm to 10 pm), and 43 dB(A) at night (10 pm to 7 am) [weekdays].

Again despite the lack of any tabulated noise levels relevant to the "Glenfield Farm" area, the available information appears to indicate that the impact on "Glenfield" Farm will be within acceptable limits, even with adjusted limits.

Area of Greatest Concern

The section covering Rail Noise (Section 8) was all over the place.

Unlike previous rail noise assessments, this provided more detailed descriptions of potential freight train make up and frequency, which had been absent in previous reports.

There appears to be a 'disconnect' within the EIS, between the "Acoustic" section of the EIS and the "Rail" section of the EIS.

In **Section 8.2 "Rail Noise Prediction Methodology" Page 39** of the Noise Impact Assessment prepared by Wilkinson Murray Pty Ltd is the following statement:

> "Between the Proposal site and the SSFL, it is expected that typical average trains speeds will be approximately 35 km/h, however the speed limit on the Rail link is 60km/h.
>
> Due to the relatively low train speeds, no corrections have been applied for turnouts and crossovers".

In **Section 2.1 "Rail Link"** on **Page 6** of the Rail Access Report (October 2016) prepared by AECOM Australia Pty Ltd is the following statement:

> The proposed rail alignment has been designed in accordance with ARTC standards to a design speed of 60 km/h, which is consistent with the design and operational speed of that section of the SSFL.
>
> The design speed was discussed and agreed with ARTC in order to allow a 1,800 metre long train to enter the rail Link at line speed from the SSFL, and be completely clear of the SSFL prior to the train slowing

Whether this 60 km/h entry and exit speed to and from the SSFL was considered acoustically, is unknown.

> If the 1.8 km long trains are maintaining 60 km/h until the final wagon has left train the SSFL, it will only have the length of Moorebank Avenue to slow down.

The southern area of Casula, and "Glenfield Farm", in particular, will be impacted by railway noise as freight trains enter and leave the SSFL "at speed".

When locomotives and freight wagons are within the boundary of the Precinct, it is dealt with under the *Industrial Noise Policy*.

> Under the NSW *Industrial Noise Policy*, (INP) the noise limits are in terms of an $L_{Aeq,15min}$ noise limit of 40 dB(A) [daytime], 40 dB(A) [evening] and 38 dB(A) [night]. As I understand this has already been addressed in the operational noise.
>
> When locomotives and freight wagons are outside of the boundary of the Precinct, it is dealt with under the *Rail Infrastructure Noise Guideline*.

> Under the NSW *Rail Infrastructure Noise Guideline*, (RING), the noise limits or "trigger levels" are in terms of a 15-hour $L_{Aeq,15hr}$ noise limit of 65 dB(A) [daytime/evening], and 9-hour $L_{Aeq,9hr}$ noise limit of 60 dB(A) [night], but only if the development increases the existing $L_{Aeq,15hr}$ or $L_{Aeq,9hr}$ by 2 dB (or more).
>
> A second set of "trigger points" are a L_{AFmax} of 80 dB(A) from a new rail line development, or a L_{AFmax} of 85 dB(A) from redevelopment of an existing line. These latter "trigger points" are of concern in terms of "sleep disturbance".

In **Section 8.2.1 "Sources of Rail Noise", Page 40** the "worst-case" 24-hour period is finally described as involving the following trains accessing the Precinct over a 24-hour period:

- Two trains (up to 900 metres in length), consisting of 1 locomotive and 38 wagons;
- Two trains (up to 1,500 metres in length), consisting of 4 locomotives and 62 wagons;
- Two trains (up to 1,800 metres in length), consisting of 4 locomotives and 74 wagons.

The Main South Line is about 220 metres from the "Glenfield Farm" residence.

> A recent review of commuter traffic through Casula Station indicates that daytime traffic consists of about 264 commuter trains between 7:00 am and 10:00 pm, and 46 trains between 10:00 pm and 7:00 am.
>
> Based on my own calculations, the home on "Glenfield Farm" would be exposed to a "day time" commuter train $L_{Aeq,15hr}$ noise level of **48** dB(A) and a "night time" commuter train $L_{Aeq,9hr}$ noise level of about **42** dB(A) for L_{Amax} noise levels, both by day and by night, of 55 dB(A).

Continuing my calculations, if I assume that two 1.8 kilometre freight trains enter the site within the night time period, then I use the "night time" $\mathbf{L_{Aeq,9hr}}$ noise limit of 60 dB(A).

I estimate (using typical locomotive & wagon noise levels) that the component "night time" $\mathbf{L_{Aeq,9hr}}$ noise contribution, externally to the rear of the home at "Glenfield Farm", would be about **56 to 58** dB(A). I also estimate the L_{Amax} noise levels (externally) to be about **68** dB(A).

These calculations are conditional on there being NO anomalous noises being produced by the freight train or wagons.

Returning to the Noise & Vibration Assessment, on **page 41,** the report took a strange twist. First there is a predicted $\mathbf{L_{Aeq,Period}}$ noise level to No. 77 Leacocks Lane, Casula, followed by an estimated noise level increase to the rear of a supposed residence at the Lot No. 21 Leacock Lane, Casula.

Two points to be noted are:

- Lot No. 21 Leacocks Lane is a vacant block of land.
- No. 77 Leacocks Lane is actually No. 75-77 Leacocks Lane (being a set of townhouses). These townhouses are on the western side of Leacocks Lane, within the 'acoustic shadow' of the ridgeline.

The adjustment applied, between the townhouses at No. 75-77 and the supposed residence at Lot No. 22, appears to a guess, rather than any accurately calculated 'barrier effect' attenuation.

The two (2) homes that should have been addressed were the homes located on Lot No. 22 (No. 88 Leacocks Lane) & Lot No. 23 No. 90 Leacocks Lane).

"Glenfield Farm" (Lot No. 22) has an occupied home on it. The house on Lot No. 23 is also occupied.

Pages 42 & 43, then proceed to confuse matters further, talking about different ways of assessing 'sleep disturbance'.

They first apply the approach indicated to Councils of a noise limit of 'background plus 15 dB'.

My understanding is this is applicable where a short term noise event or short sharp sound intrudes on an otherwise bland 'background.

I have previously heard of this approach as being a way to dealt with the 'Startle Response' caused by a short shark sound.

They then approach $\mathbf{L_{Amax}}$ noise levels from a road traffic noise approach where there is a ramping up and a ramping down of a noise event as a vehicle passes.

The Road Noise Policy document advises that:

- Maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep
- One or two noise events per night, with maximum internal noise levels of 65-70 dB(A), are not likely to affect health and well-being, significantly.

I would suggest that an L_{Amax} noise limit (internally) of 55 dB(A) should be the appropriate limit to ensure sleep within the home at "Glenfield Farm" is not disturbed.

Having visited "Glenfield Farm", and touring this home with the current owner, I was able to examine the architectural features of the home.

The walls are of convict triple brick construction. The walls of the downstairs rooms have open vents, close to the ceiling, in each room.

As I understand, the ceilings are of tongue & grove planking, with shingle roof above.

Along the rear of the residence, the ceiling heights are lower allowing bedrooms below the roof.

The upstairs bedrooms have pairs of dormer windows (each window about 1 m by 0.6 m) facing the Precinct and the railway lines.

Having examined one of these upstairs bedrooms, I would estimate the 'inside to outside' noise attenuation with both dormer windows open to 50% of the window area, to be about 12 dB(A).

For an internal LAmax noise limit of 55 dB(A) inside these bedrooms, the external LAmax noise levels should not exceed 67 dB(A) to 69 dB(A).

It has to be noted that this is a 'heritage listed' building, so these windows would need to be open in summer to provide ventilation and some cooling.

Areas of Concern

As I understand, trains consisting of up to four locomotives, hauling up to 74 wagons will be entering the site at 60 km/h.

On entering the site from the south, the locomotives and wagons will immediately find themselves entering a curve with a radius of less than 300 metres.

The issue of 'wheel squeal' has been raised, but any discussion of this matter is immediately 'shut down'.

'Wheel squeal' comes in a variety of mechanisms.

As I understand, there is the type of 'wheel squeal' associated with braking, of braking block on wheel rim.

As I understand, there is the type of 'wheel squeal' associated with misalignment of wheel and rail.

Then, there is the type of 'wheel squeal' associated with tight bends in the track, usually referred to as 'curve squeal'.

This latter type of 'wheel squeal' is usually associated with bends of less than 300 metres radius.

I would strongly advise the author of the Noise & Vibration Assessment to read "Modelling Curve Gain in NSW" Acoustics Australia (2015) 43:pgs 245-250.

The study described within this paper was undertaken at Beecroft in Sydney.

This study indicated that on tight curves (300 metres or less) that the measured SEL values (used to calculate the LAeq values) were about 8 dB(A) higher through these curves, than on straight sections of track.

This study also indicated that on tight curves (300 metres or less), that the LAmax noise levels were about 20 dB(A) higher through the curves than on straight sections of track.

In October 2012, I undertook measurements of 'curve squeal' at Beecroft NSW on a curve of similar radius to the southern connection to the Southern Sydney Freight Line.

On that occasion, I was able to measure a $\mathbf{L_{Amax}}$ noise level of **108 dB(A)** at **28.5** metres from track side. The sound was shrill and rapidly varying.

It would appear that the paper published in 2015, essentially confirms my measurement from October 2012.

Should similar noise levels occur at Casula, the rear of the home at "Glenfield Farm" could expect $\mathbf{L_{Amax}}$ noise levels of up to 89 dB(A) external to the upstairs bedroom windows.

The concern would be that even applying an inside / outside noise attenuation of 12 dB(A) to the external noise levels, the internal $\mathbf{L_{Amax}}$ noise level could be 77 dB(A) or greater. This is about 22 dB greater than the level likely to cause 'sleep disturbance'.

It is claimed that one or two noise events per night, with $\mathbf{L_{Amax}}$ noise levels of 65-70 dB(A), are not likely to affect health and well-being (significantly) but the predicted $\mathbf{L_{Amax}}$ noise level exceeds even this criterion by 12 to 17 dB(A).

The common response would be "Well, close the window".

It may be possible to bring the internal levels down by closing windows **BUT** how much it could be reduced is limited by the Governor Macquarie era style window construction & by the Governor Macquarie style roof, neither of which can be altered.

In a building of modern construction, closing the windows could be a solution, compensating for lack of ventilation and cooling by adding insulation into the roof cavity, and by installation of ducted air conditioning, BUT these were not features of a Governor Macquarie era residence.

Another aspect of this type of 'curve squeal' is the nature of the sound. It is not a short sharp sound, that is here and gone in a moment. It is a long, drawn-out, 'shrill' sound that varies in pitch and intensity, a sound that could continue for a couple of minutes each time a train enters or leaves the spur line.

We've been repeatedly been assured that track "oilers" will fix the problem.

Despite numerous enquiries, including face-to-face questioning of those directly involved in research into this form of noise control, I have been unable to get any responses, as to the degree of noise reduction that can reliably be achieved, nor of the long-term 'guaranteed' minimum noise reduction produced by these devices.

The nearest I have ever come to an answer was to ask the question, face-to-face, only to have the researcher literally turn and run.

It has been my experience that unless a noise reduction device can be relied on to work with 100% effectiveness, 100% of the time, it is not acceptable as a noise reduction strategy.

Another comment in the Noise & Vibration Assessment report was that "cross-over" noise did not need to be considered due to the slow speed of the trains. The Rail Access report says the trains will be travelling at 60 km/h.

This begs the question:

At what speed should "cross-over" noise be considered, and by how much will it alter the rail noise impacts upon "Glenfield Farm"?

Closing Comments

"Glenfield Farm" is a privately owned home, owned & occupied by its current occupants.

"Glenfield Farm" is a home from another era, that can't be changed or altered.

"Glenfield Farm" needs to be recognised as 'sensitive location' of national historical significance that may struggle to adapt to the new acoustic environment imposed upon it.

Proof is required that the any noise mitigation measures proposed for the Rail Link will, and do, work prior to their installation, and that they will continue to work long term.

I would strongly recommend that a noise logger be installed at No. 88 Leacocks Lane, this being "Glenfield Farm". This should occur sooner, rather than later, to close the 'glaring gap' in the circle of monitoring locations.

I would strongly recommend that the results of any such noise logging be processed sooner, rather than later, and that they be included in this assessment, and any future associated assessment.

I would strongly recommend that this noise logger become one of an array of noise loggers monitoring construction noise and later operational noise, in particular any noise associated with the construction of the Rail Link, and subsequent rail operations.

> Noise loggers / monitors are currently available that can operate independently on their own solar power supply, with real-time remote access, and with all data downloadable without the need to visit site. This minimises any need to physically visit the logger / monitor except for occasional calibration visits.

I would strongly recommend that a $\mathbf{L_{Amax}}$ noise limit of no more than 70 dB(A) be applied to noise emissions impacting on "Glenfield Farm".

> Should the noise contain additional component liable to cause additional annoyance, the limit should be reduced to no more that 60 dB(A). This should be in consideration of the historical significance of this home, and the restrictions placed upon it, associated with it being a heritage listed building.

I trust that the enclosed information will be of assistance to you.

Brian Marston
Principal Consultant - BGMA Pty Ltd

Professional Affiliations & Qualifications

A practicing Acoustical Consultant		since 1981
Full member	*Institution of Engineers Australia (IEAust)* & CPEng	since 1986
Full member	*Australian Acoustical Society (AAS)*	since 1988
Full Member	*Acoustical Society of America (ASA)*	since 2007

A member of the international professional body of acoustical consultants, the *National Council of Acoustical Consultants* since 1999