



MARSHALL DAY
Acoustics



405 EVANS ROAD, LYNDBURST
ENVIRONMENTAL NOISE ASSESSMENT

Rp 003 R01 2014408ML | 18 January 2017



Project: **405 EVANS ROAD, LYNDHURST**

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Australia**

Attention: **Victoria Cook**

Report No.: **Rp 003 R01 2014408ML**

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1.0 INTRODUCTION

Villawood are proposing to develop land at 405 Evans Road, Lyndhurst, as a residential estate to be known as Aquarevo.

Planning Permit PlnA00983/14 was issued for the site by City of Casey on 7 June 2016. The permit includes conditions relating to environmental noise, and Marshall Day Acoustics (MDA) has been commissioned by Villawood to prepare a noise assessment to address the relevant permit condition.

An assessment of railway noise at this site was originally provided in MDA report Rp 001 2014408ML *Evans Road, Lyndhurst – Railway Noise Impact Report* dated 23 September 2014. Since that time, Planning Permit PlnA00983/14 was issued by City of Casey on 7 June 2016, and a letter from MDA dated 15 July 2016 addressed the permit conditions. This report provides further detail regarding the railway noise assessment, and also provides comment regarding mitigation of noise from any future extension of Glasscocks Road within the subject site.

Acoustic terminology used in this report is described in Appendix A.

2.0 SITE AND PROJECT DESCRIPTION

2.1 Site location and surroundings

The proposed development site is currently open grassland and is bounded by the Cranbourne rail line to the east, with existing residential buildings to the north, south and west.

An aerial photo of the site is shown in Figure 1.



Figure 1: Proposed site and surroundings

Base image: Google Maps

The proposed development plan is included as Appendix B.

3.0 PERMIT CONDITIONS

Planning Permit PInA00983/14 was issued for the site by City of Casey on 7 June 2016. The following permit conditions pertain to environmental noise:

Condition 1(u) requires:

Submission of an amended acoustic report prepared by a suitably qualified and experienced person which demonstrates compliance with relevant policies and requirements (such as VicTrack's Passenger Rail Infrastructure Noise Policy and VicRoads Traffic Noise Reduction Policy 2005) for lots abutting the Cranbourne railway line and future Glasscocks Road.

Condition 1(v) requires:

Incorporation of any changes and/or annotations and the like required to be implemented as part of any recommendations contained within the amended Acoustic report referred to in Condition 1 (u).

Condition 7(d) requires:

A restriction applying to any lot abutting the Cranbourne Railway Line (as shown on the Lyndhurst Lynbrook Development Plan), that does not allow the construction of any dwelling on lots abutting the railway line, unless it complies with the noise attenuation recommendations contained within the amended Acoustic Report referred to above (or otherwise agreed to by VicTrack and Council).

Condition 7(e) requires:

A restriction applying to any lot abutting (the future) Glasscocks Road, that does not allow the construction of any dwelling on lots abutting Glasscocks Road, unless it complies with the noise attenuation recommendations contained within the amended Acoustic Report referred to above (or otherwise agreed to by VicRoads and Council).

4.0 ROAD TRAFFIC NOISE ASSESSMENT

4.1 VicRoads Policy

VicRoads has an internal policy which is used to determine entitlement to noise barriers. Since October 1997, this policy has been known as the *Traffic Noise Reduction Policy*. The Policy recommends noise level objectives for traffic noise in Victoria.

Applicability

Guidance on interpretation of VicRoads policy is provided in VicRoads Road Design Note RDN 6-1 *Interpretation and application of VicRoads traffic noise reduction policy 2005* dated July 2010. Section 6 of RDN 6-1 describes the situations in which VicRoads will expect others to take responsibility for noise mitigation (referred to as 'exceptions'). Table 1 details the exceptions and explains why none of the exceptions apply in the case of Glasscocks Road.

Table 1: Applicability of VicRoads policy exceptions to Glasscocks Road

Exception	Description	Applicability
1	Dwellings on land where such land use is non-conforming	Does not apply, as the residences will be built on land zoned as residential.
2	New buildings or subdivisions abutting existing roads	Does not apply, as there is no existing road.

Exception	Description	Applicability
3	New buildings or subdivisions abutting any road zone on any planning scheme.	Does not apply, as there is no road reserve, and the proposed development will not introduce a road reserve. The land set aside for the future road will become council land, and will be passed on to Council as a balance lot, not a road reserve.
4	Buildings or subdivisions abutting any proposed road zone where the planning approval for the subdivision was obtained after the commencement of the exhibition period to set aside land for a future road.	Does not apply, as no exhibition period has commenced to set aside land for a future road.

Thus, in this case, none of the exceptions apply. It is understood that mitigation of road traffic noise from the future Glasscocks Road would be given consideration to, by the relevant authority in charge of the development of this road as planning for this development progresses.

Criteria

VicRoads' policy sets traffic noise objectives for certain noise-sensitive buildings, including dwellings. The primary objective is that noise levels should not exceed 63dB $L_{A10(18h)}$ at the most exposed facade of a noise-sensitive building for traffic conditions 10 years after construction. Where it is not desirable to erect high noise barriers, noise-sensitive buildings must be designed and constructed to meet the recommended noise levels set out in Australian Standard AS2107 *Acoustics - Recommended design sound levels and reverberation times for building interiors*.

4.2 Possible future noise mitigation

In order to predict traffic noise levels, data is required concerning the alignment, traffic conditions such as speed, volume and composition, and the type of road surface. However, planning for the future extension of Glasscocks Road is in the very preliminary stages. No concept design has yet been prepared and funding has not been secured. Thus, none of the information required is currently available, and it is not possible to predict future noise levels.

However, MDA has prepared noise barrier recommendations for VicRoads on a new arterial road in Point Cook, and our findings on that project may give an indication of the possible future mitigation requirements for this project.

Details of the road are as follows:

- Single carriageway, but with sufficient room in the road reserve for future duplication
- Expected to carry approximately 25,000 vehicles per day 10 years after opening, with 5% heavy vehicles
- 70 km/h posted speed
- Surface type: dense-graded asphalt (this is the most common road surface type for urban arterials).

In this case MDA found that noise barriers 2-3 m high would be sufficient to achieve compliance with VicRoads' traffic noise objective of 63 dB $L_{A10(18h)}$. Thus, no acoustic treatment of dwellings was required.

Future provision of noise barriers can be achieved with the layout given in the current development plans. No changes to the plan are required, and no restrictions on title are required in relation to noise mitigation.

In addition it is expected that the extension of Glasscocks road will involve a road bridge over the rail line. However, it is noted that the development has been designed to leave sufficient space for this to be constructed, if required.

It is understood that mitigation of road traffic noise from the future Glasscocks Road, including any required road over rail bridge, would be given consideration to, by the relevant authority in charge of the development of this road as planning for this development progresses.

5.0 RAILWAY NOISE CRITERIA

5.1 Passenger Rail Infrastructure Noise Policy

The Victorian *Passenger Rail Infrastructure Noise Policy* was released in April 2014. Section 5 of the policy sets out the conditions under which transport bodies must apply the policy. This is the relevant policy when assessing environmental noise from trains in Victoria.

The policy sets 'Investigation Thresholds' for the assessment of noise. These are noise levels, which if exceeded, indicate that noise mitigation should be considered. It states that:

In considering changing land use near an existing passenger rail corridor, transport bodies and planning authorities should consider the receivers set out in Table B in Attachment 2. Transport bodies and planning authorities should consider whether the noise level produced at these receivers will exceed the Investigation Thresholds for the periods specified in Table B in Attachment 2. [Table B of Attachment 2 is reproduced below as Table 2 in this report.]

If an assessment shows the Investigation Thresholds are not exceeded, noise impacts should be considered a secondary matter. This means no further action need be considered under this policy.

The Investigation Thresholds are defined in terms of:

- $L_{Aeq,16h}$ – equivalent continuous daytime (6am-10pm) noise level
- $L_{Aeq,8h}$ – equivalent continuous night-time (10pm-6am) noise level
- L_{Amax} – maximum noise level. The policy specifies that maximum noise levels should be assessed in terms of the 95th percentile. This is the maximum noise level exceeded by only 5% of train passbys. Maximum noise levels will be lower than this for 95% of passby events.

Investigation Thresholds for the redevelopment of land near existing rail infrastructure are presented in Table 2. Under the policy, if noise levels from trains affecting a new residential estate exceed these values, noise mitigation must be considered. If the noise levels do not exceed these values, noise mitigation does not need to be considered.

Table 2: Investigation Thresholds for changing allowable land use near an existing rail corridor

Time	Type of receiver	Investigation Thresholds		
Daytime (0600-2200)	Residential dwellings including aged person homes, hospitals, motels, caravan parks, and other buildings where people sleep. Noise sensitive community buildings including schools, kindergartens, libraries	65dB $L_{Aeq,16h}$	or	85dB L_{Amax}

Time	Type of receiver	Investigation Thresholds		
Night-time (2200-0600)	Residential dwellings including aged person homes, hospitals, motels, caravan parks, and other buildings where people sleep.	60dB $L_{Aeq,8h}$	or	85dB L_{Amax}

5.2 Internal noise levels

We understand City of Casey has requested that noise mitigation recommendations be provided that go beyond the requirements of the *Passenger Rail Infrastructure Noise Policy*.

The NSW Department of Environment Climate Change and Water (now the Office of Environment and Heritage) document, *NSW Road Noise Policy*, March 2011, undertook a literature review of noise-based sleep disturbance studies and found (p. 35):

- *Maximum internal noise levels below 50-55dB L_{Amax} are unlikely to cause awakening reactions*
- *One or two noise events per night, with maximum internal noise levels of 65-70dB L_{Amax} are not likely to affect health and wellbeing significantly.*

Based on these findings, MDA recommends the following internal design criteria:

- Bedrooms: 55dB L_{Amax}
- Other living areas: 60dB L_{Amax} .

These limits have been adopted in a number of decisions made by the Victorian Civil and Administrative Tribunal (VCAT) regarding acceptable internal noise levels for residences adjacent to railway lines dating back to *Kilker v Stonnington CC [2004] VCAT 341*. The 55dB L_{Amax} criterion has also been specified by Public Transport Victoria (PTV). For example, in relation to a residential development in Braybrook in 2012.

6.0 TRAIN NOISE MEASUREMENTS

6.1 Measurement location

Railway noise levels at the site were measured using a Rion NL-31 precision integrating sound level meter fitted with a weatherproof windshield. The microphone was mounted on a pole at a height of approximately 1.5 m above ground level. The measurement location, shown in Figure 2, was on the boundary between the subject site and the railway reserve, at a distance of 20 m.

Measurements were obtained using the 'F' response time and A-weighting frequency network. The equipment was calibrated before and after the survey and no significant calibration drifts were observed.

The location was chosen because:

- It was away from nearby streets, minimising any influence by extraneous noises
- The site is flat and the railway tracks are at grade. Thus, train noise levels at this location would be identical to train noise levels measured anywhere along the boundary between the subject site and the rail reserve.

The measurement procedure and location are in accordance with the *Passenger Rail Infrastructure Noise Policy*.

Consecutive 15-minute measurements of environmental noise levels were obtained between 4:15 pm on Tuesday 9 September and 1:15 pm on Tuesday 16 September 2014.

The prevailing environment was characterised by typical rural noise sources. Distant road traffic on surrounding roads was audible. Train pass-bys on the adjacent rail line were dominant when they occurred.

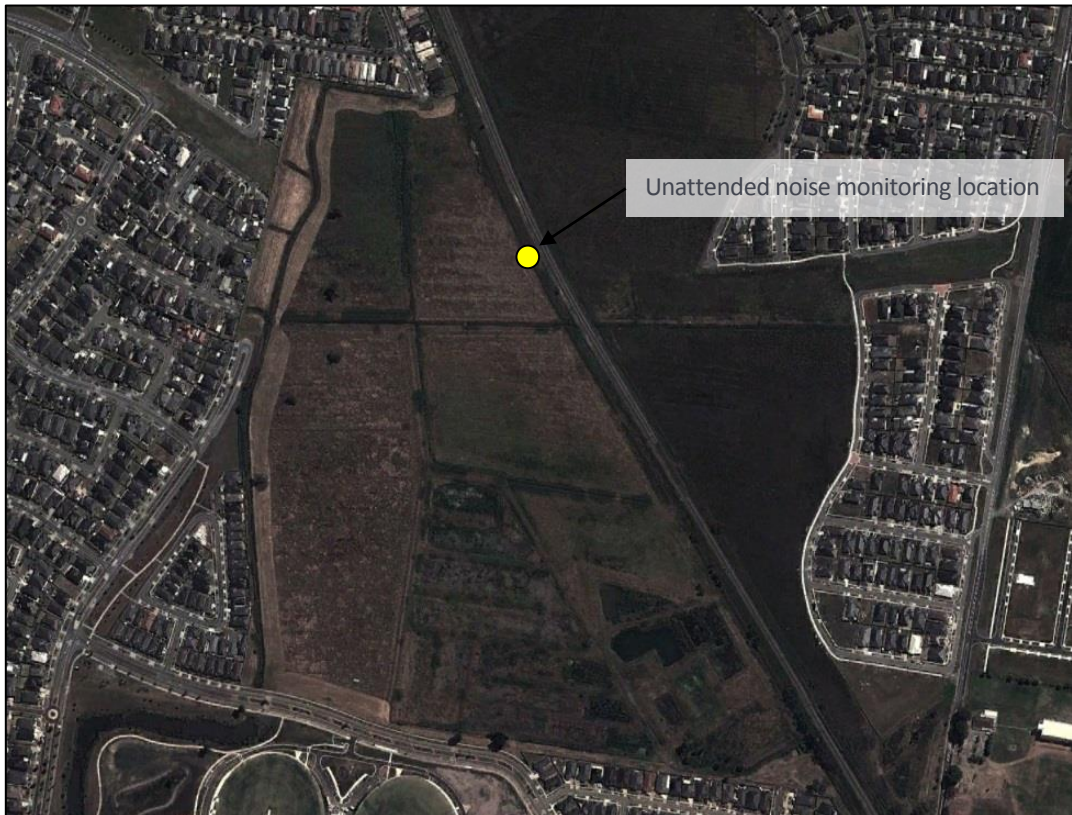


Figure 2: Unattended noise measurement location

Note that a reanalysis of the data has resulted in insignificant differences between the results presented in this report and the MDA letter dated 15 July 2016. This is because in the previous analysis, the 15-minute time periods were combined into half-hour periods for presentation purposes, and the analysis was conducted on the half-hour values rather than the original 15-minute data. The results presented in the present report are derived from the original data. The differences are not significant and do not affect the assessment outcomes.

6.2 Average noise levels

Expressed in terms of the environmental noise indices used in the *Victorian Passenger Rail Infrastructure Noise Policy*, the average measured noise levels are as shown in Table 3. As noted in Appendix A, L_{Aeq} noise levels are commonly referred to as average noise levels. Further details regarding the measured noise levels are provided in Section 9.0 and Appendix E.

Table 3: Average measured noise levels, dB

Date	Day $L_{Aeq,16h}$	Night $L_{Aeq,8h}$
Wednesday, 10 September 2014	54	51
Thursday, 11 September 2014	54	52
Friday, 12 September 2014	55	50
Saturday, 13 September 2014	54	50
Sunday, 14 September 2014	55	52

Date	Day L _{Aeq,16h}	Night L _{Aeq,8h}
Monday, 15 September 2014	56	51
Tuesday, 16 September 2014		49
Highest	56	52

The bottom row of the table shows the highest measured values. The highest measured values were used in the assessment of the measured noise levels provided in Section 7.0.

6.3 Maximum noise levels

The *Victorian Passenger Rail Infrastructure Noise Policy* requires that maximum noise levels be measured in terms of the 95th percentile maximum noise level. As detailed in Section 4.0, the 95th percentile maximum noise level is the maximum noise level exceeded by only 5% of noise events.

Expressed in terms of the environmental noise indices used in the *Victorian Passenger Rail Infrastructure Noise Policy*, the maximum measured noise levels are as shown in Table 4. Further details regarding the measured noise levels are provided in Section 9.0 and Appendix E.

Table 4: 95th percentile maximum noise levels, dB L_{Amax}

Date	Day	Night
Wednesday, 10 September 2014	80	80
Thursday, 11 September 2014	81	79
Friday, 12 September 2014	83	79
Saturday, 13 September 2014	81	79
Sunday, 14 September 2014	82	81
Monday, 15 September 2014	83	81
Tuesday, 16 September 2014	-	77
Entire measurement period	82	80

The bottom row of the table shows the 95th percentile maximum noise levels over the entire measurement period. The 95th percentile maximum noise levels over the entire measurement period were used in the assessment of the measured noise levels provided in Section 7.0.

7.0 TRAIN NOISE ASSESSMENT

7.1 Assessment location

As shown in Appendix B, an existing sewer is to be retained near the boundary between the subject site and the railway reserve. The presence of this sewer will result in an easement which means that dwellings cannot be built less than 8-10 m from the boundary.

Nevertheless, this assessment has been conducted in terms of the noise levels measured on the boundary. This has resulted in a conservative assessment, as the boundary is closer to the trains than the facades of the dwellings, and so noise levels on the boundary are higher than noise levels at the facades.

Figure 3 shows the measurement location overlaid on the building envelope plan. The building envelopes are the hashed areas and represent the nearest points on the site where a dwelling can be constructed.

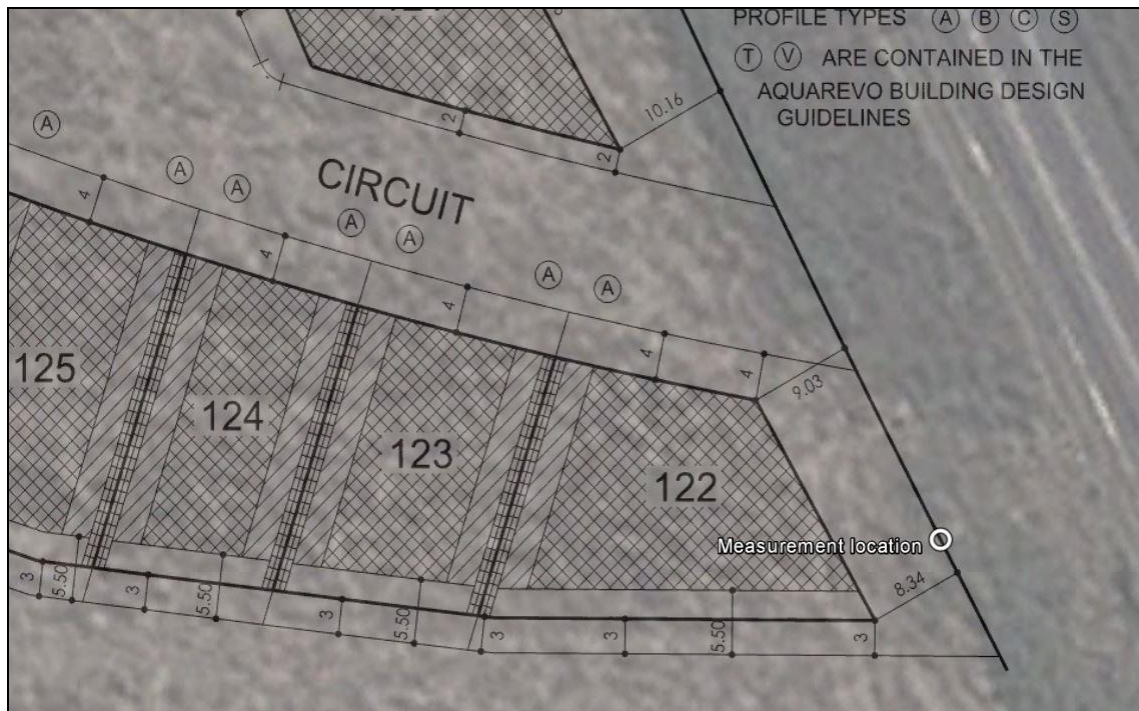


Figure 3: Detail showing the measurement location relative to the future dwelling façades

Although the house lots shown in the figure are those nearest the measurement location, the sewer easement affects all the lots adjacent to the railway reserve, so in all cases, the dwelling façades will be further from the trains than the measurement location.

7.2 Average noise levels

Table 5 compares the highest measured average noise levels with the Investigation Thresholds determined in accordance with the *Victorian Passenger Rail Infrastructure Noise Policy*.

Table 5: Average noise levels, dB

	Daytime $L_{Aeq,16h}$	Night-time $L_{Aeq,8h}$
Highest measured value	55	52
Investigation Threshold	65	60

As shown, the measured noise levels do not exceed the relevant Investigation Thresholds. Therefore no noise mitigation is required.

7.3 Maximum noise levels

Table 6 compares the highest measured 95th percentile maximum noise levels with the Investigation Thresholds determined in accordance with the *Victorian Passenger Rail Infrastructure Noise Policy*.

Table 6: 95th percentile maximum noise levels, dB L_{Amax}

	Daytime	Night-time
Entire measurement period	82	80
Investigation Threshold	85	85

As shown, the measured noise levels do not exceed the relevant Investigation Thresholds. Therefore no noise mitigation is required.

7.4 Internal noise levels

Based on the measured noise levels, acoustic treatment of the dwellings on house lots adjacent to the railway would be required to comply with the internal noise criteria recommended in Section 5.2. Table 7 shows the minimum acoustic performance for the relevant building elements together with indicative treatments.

Table 7: Indicative noise mitigation treatment

Building element	Acoustic performance	Indicative acoustic treatment
Roof and ceiling	R _w 44	Colorbond steel roof with 13 mm plasterboard on 200 mm timber studs and 50 mm of Rockwool (33 kg/m ³).
External walls	R _w 43	6 mm CSR fibre cement board with two layers of 13 mm plasterboard on 100 mm timber studs and 50 mm of Rockwool (33 kg/m ³)
Windows	R _w 36	10.38 mm laminated glass with good-quality full perimeter acoustic grade seals which form an airtight seal on closure, and well-sealed frame and surrounds
External doors	R _w 30	40 mm solid core with good-quality full perimeter acoustic grade seals which form an airtight seal on closure, and well-sealed frame and surrounds

It is necessary for windows and doors to be closed to achieve the suggested indoor design criteria. Therefore, alternative ventilation paths may be required in accordance with the requirements of the Building Code of Australia and Australian Standard AS1668.2 on the assumption that the windows are not openable. Specialist advice should be sought from a mechanical engineer and the project building surveyor, regarding the ventilation requirements of the dwelling. Ventilation paths may need to be acoustically treated to limit noise break-in and ensure that the sound insulation performance of the building envelope is not compromised. Forms of suitable ventilation may include a ducted system with internal lining or an acoustically-rated trickle vent system such as a Silenceair or Titon Trimvent system or an approved equivalent.

House lots affected

The lots that would be affected by these recommendations are shown in Appendix C. No layout changes are required to the site development plan.

Dwellings built on lots deeper within the development site will be protected from train noise by the first row of dwellings, and compliance with the suggested design criteria would be achieved without acoustic treatment.

Restriction on title

We understand compliance with these requirements would be enforced through a restriction on title. Appendix D provides draft wording for the restriction.

To implement the restriction, house lot owners would send their house plans to an acoustic consultant who would then provide recommendations regarding acoustic treatment for their specific house plan. The recommendations would be added to the house plans, which would be checked by the acoustic consultant to confirm the recommendations had been properly described in the drawings. Following construction of the dwelling, the building inspector could then confirm the acoustic treatments were in accordance with the drawings.

8.0 CONCLUSION

Future mitigation of road traffic noise from Glasscocks Road

It is understood that mitigation of road traffic noise from the future Glasscocks Road, including any required road over rail bridge, would be given consideration to, by the relevant authority in charge of the development of this road as planning for this development progresses.

Future provision of noise barriers can be achieved with the layout given in the current development plans. No changes to the plan are required, and no restrictions on title are required in relation to noise mitigation.

Railway noise

The measured noise levels do not exceed the Investigation Thresholds determined in accordance with the *Victorian Passenger Rail Infrastructure Noise Policy*. Thus, noise levels at the facade of future dwellings built on the lots adjacent to the railway reserve would not exceed the Investigation Thresholds. Therefore no railway noise mitigation is required.

Compliance with internal noise criteria based on several VCAT decisions can be achieved by acoustic treatment of dwellings on house lots adjacent to the railway reserve.

9.0 ADDITIONAL DETAIL

City of Casey has requested additional detail regarding the measured noise levels.

Graphs showing the measured noise levels are provided in Appendix E.

Table 8 shows the number of times the maximum noise level was higher than 85dB L_{Amax} .

Table 8: Number of times the maximum noise level was higher than 85dB L_{Amax}

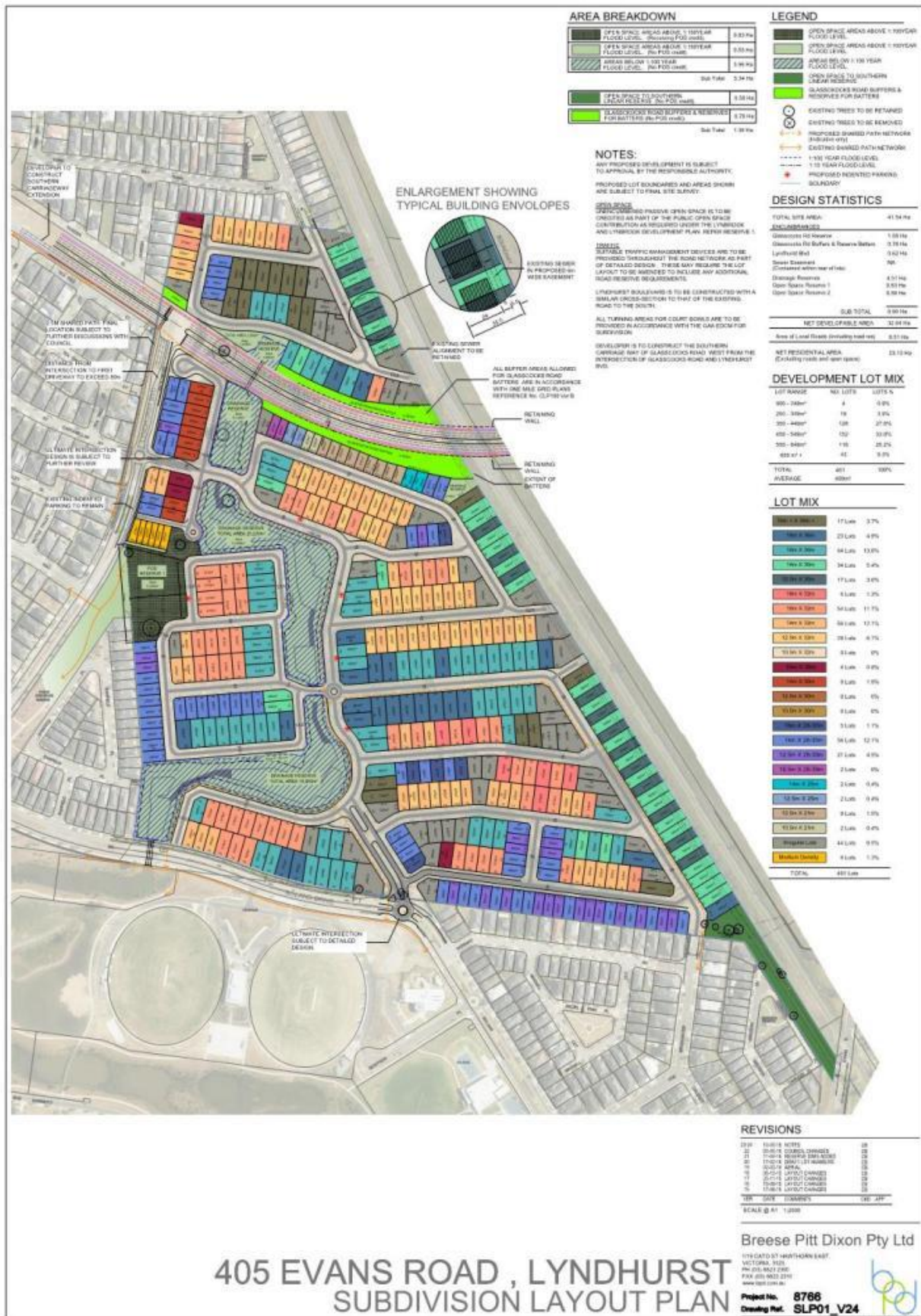
Date	Number of times the maximum noise level was higher than 85dB L_{Amax}
Wednesday, 10 September 2014	0
Thursday, 11 September 2014	0
Friday, 12 September 2014	2
Saturday, 13 September 2014	0
Sunday, 14 September 2014	1
Monday, 15 September 2014	1

There were four occasions during the 6 days of noise monitoring that maximum noise levels were higher than 85dB L_{Amax} . This demonstrates that use of the 95th percentile for determining compliance with the *Victorian Passenger Rail Infrastructure Noise Policy* means that very few events will have noise levels higher than the Investigation Thresholds.

APPENDIX A GLOSSARY OF TERMINOLOGY

A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
dB	Decibel. The unit of sound level.
L_{Aeq}	The A-weighted equivalent continuous sound level. This is commonly referred to as the average noise level and is measured in dB.
L_{Aeq,16h}	The L _{Aeq} noise level measured over a 16-hour period. For rail traffic noise measurements, the 16-hour period is usually 6 am - 10 pm (0600 - 2200hrs).
L_{Aeq,8h}	The L _{Aeq} noise level measured over a 8-hour period. For rail traffic noise measurements, the 8-hour period is usually 10 pm – 6 am (2200 - 0600hrs).
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. ‘Sound insulation’ refers to ability of a material to stop sound travelling through it.
R_w	<u>Weighted Sound Reduction Index</u> A single number rating of the sound insulation performance of a specific building element. R _w is measured in a laboratory. R _w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete.

APPENDIX B PROPOSED DEVELOPMENT PLAN



APPENDIX C HOUSE LOTS AFFECTED BY ACOUSTIC RECOMMENDATIONS



APPENDIX D DRAFT WORDING FOR IMPLEMENTING ACOUSTIC RECOMMENDATIONS

D1 Draft wording for permit condition 1 plan

The house lots shown in Section C5 below could be annotated as follows:

Acoustic treatment as per Appendix C of the acoustic report.

D2 Draft wording for any restrictions on titles

The following restriction could be applied to the house lots shown in Section C5:

Description of Restriction

The registered proprietor or proprietors for the time being of any lot on this plan must not construct a dwelling unless the dwelling is constructed in such a way to ensure internal bedroom noise levels will not exceed 55dB L_{Amax} during the night period from 10pm to 6am.

Note

The following provides guidance of specific construction requirements. It should be noted that noise propagation from the rail corridor to a house is subject to several variables including:

- *Distance of the house from the corridor;*
- *Degree of acoustic absorption local to both the corridor and the house;*
- *Obstacles between the corridor and house;*
- *Orientation of the house with respect to the corridor; and*
- *Whether the house is single or double storey.*

Furthermore it should be noted that the magnitude of noise intrusion to a room within a house is subject to several variables including:

- *Sound insulation performance and surface area of the external wall/s;*
- *Sound insulation and surface area of any windows and doors;*
- *Sound insulation and surface area of the roof/ceiling (as applicable);*
- *Sound insulation and surface area of the floor (as applicable);*
- *Degraded performance due to noise flanking paths (eg. untreated penetrations and poor acoustic seals fitted to operable elements);*
- *The volume of the room; and*
- *The reverberation time within the room.*

The following should not be interpreted as specific construction requirements applicable to any house lot to which this requirement has been applied suitable for discharge of the restriction. Rather the following should be interpreted as indicative construction requirements provided to assist stakeholders in understanding likely implications of the restriction. In proceeding with a proposal each applicant will be required to obtain a report from a suitably qualified acoustic consultant, demonstrating how their proposal will discharge the restriction. This report shall address the location of the lot, the orientation of the house on the lot and the specific built form of the proposed house (ie single storey or double construction).

Indicative construction requirements

The following sets out indicative construction requirements that may attenuate noise within bedrooms to not more than 55dB L_{Amax} for the night period from 10pm to 6am.

- *Roof/ceiling construction could have a weighted reduction index not less than R_w 44. This may be achieved with a Colorbond steel roof with 13 mm plasterboard on 200 mm timber studs and 50 mm of Rockwool (33 kg/m³).*
- *External walls could have a weighted reduction index not less than R_w 43. This may be achieved with 6 mm CSR fibre cement board with two layers of 13 mm plasterboard on 100 mm timber studs and 50mm of Rockwool (33 kg/m³).*
- *Windows could have a weighted reduction index not less than R_w 36. This may be achieved with 10.38 mm laminated glass with good-quality full perimeter acoustic grade seals which form an airtight seal on closure, and well-sealed frame and surrounds.*
- *External doors could have a weighted reduction index not less than R_w 30. This may be achieved with a 40 mm solid core door with good-quality full perimeter acoustic grade seals which form an airtight seal on closure, and well-sealed frame and surrounds.*
- *Ventilation in accordance with the Building Code of Australia and Australian Standard AS1668.2 on the assumption that the windows are not openable.*

APPENDIX E DETAILS OF NOISE MEASUREMENTS

