

Railway Noise Assessment

Jack Hills to Oakajee

Prepared For



Oakajee Port and Rail

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1 INTRODUCTION

Oakajee Port and Rail Pty Ltd (OPR) proposes to construct an open-access rail network from the proposed port at Oakajee to the mine sites east of Geraldton, terminating at the Jack Hills mine site. The proposed railway will incorporate a mainline of approximately 530km, and two spur lines; a 21km spur to join or crossover the existing WestNet (Mullewa) line for future connection of mines south of Mullewa and a 10 km to 15km spur line to the Weld Range.

Noise resulting from operation of the rail network has been predicted to noise sensitive premises located within 10 km of the proposed alignment and the results compared against relevant Western Australian transport noise criteria. In addition, comment on the likely impact of ground-borne vibration resulting from train passbys is provided.

Noise from the railway once it passes into the port area is addressed in the assessment of noise from the port.

Appendix C contains a description of some of the terminology used throughout this report.

2 CRITERIA

Noise from the operation of railways is exempt from the *Environmental Protection (Noise) Regulations 1997*. For noise sensitive premises adjacent to railways, the *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (SPP 5.4) produced by the Western Australian Planning Commission (WAPC) are the most relevant criteria. In addition, the Environmental Protection Authority (EPA) may consider the preliminary draft *EPA Statements for EIA No. 14 - Road and Rail Transportation Noise Version 3 (May 2000)* [draft EPA Guidance No.14], for areas with particularly low existing background noise levels. Both documents are described below.

2.1 State Planning Policy 5.4

The criteria contained within the SPP 5.4 are shown below in *Table 2.1*

Table 2.1 - External Noise Exposure Criteria for Noise Sensitive Land Uses

| Time Period | External Noise Exposure Level Criteria (dB) | |
|-----------------------------|---|------------------------------|
| | Noise "Target" | Noise "Limit" |
| Day Time 6.00am – 10.00pm | L _{Aeq,16hour} 55dB | L _{Aeq,16hour} 60dB |
| Night Time 10.00pm – 6.00am | L _{Aeq,8hour} 50dB | L _{Aeq,8hour} 55dB |

Note: The 5 dB difference between the outdoor noise "Target" and the outdoor noise "Limit", as prescribed by *Table 2.1*, represents an acceptable "margin" for compliance, provided that best practical efforts have been made to reduce noise. Normally, it is practicable to achieve outdoor noise levels within this acceptable margin.

The implementation of noise control measures is determined to be reasonable and practicable with reference to:

- ❑ The effectiveness of the proposed measure(s) including a comparison of predicted noise levels with or without the specified measure(s);
- ❑ The estimated cost of the measure(s) and, if applicable, the distribution of such costs between the owner/developer and the agency responsible for the relevant transport infrastructure;
- ❑ The amenity impacts of the measure(s) including appearance, access, surveillance and security, landscape/streetscape, vegetation etc;
- ❑ Traffic safety;
- ❑ Community acceptance; and
- ❑ Practicability of proposed amelioration measure(s) also requires that there are no unreasonable physical, legal or financial impediments to their implementation.

2.2 Draft EPA Guidance No. 14

Under the draft EPA Guidance No. 14, a noise rating is applied depending on existing noise levels at the noise sensitive receiver. The noise ratings are reproduced below in *Table 2.2*

Table 2.2 – Draft EPA Guidance No. 14 Noise Amenity Ratings

| Rating | Existing L _{Aeq,T} (Day) (0700 to 2200) | Existing L _{Aeq,T} (Night) (2200 to 0700) |
|--------|---|---|
| N0 | ≤ 50 | ≤ 40 |
| N1 | 51 - 55 | 41 - 45 |
| N2 | 56 - 60 | 46 - 50 |
| N3 | 61 - 65 | 51 - 55 |
| N4 | 66 - 70 | 56 - 60 |
| N5 | ≥ 70 | ≥ 60 |

Section 5.1 of the draft guidance identifies the acceptable land uses for each noise amenity rating (N) and these are presented in *Table 2.3*.

Table 2.3 Acceptable Land Uses - Section 5.1 of Draft EPA Guidance No. 14

| Rating | Acceptable | Conditionally Acceptable | Unacceptable |
|--------|-------------|-------------------------------|------------------|
| N0 | Residential | None | None |
| N1 | Residential | None | None |
| N2 | Open space | Residential, Open space | None |
| N3 | None | Residential units, Open space | Residence + yard |
| N4 | None | Residential units, Open space | None |
| N5 | None | None | Open space |

The objectives of the draft EPA Guidance No. 14 are -

- (i) that the noise levels inside noise-sensitive premises associated with the proposed traffic should meet acceptable levels, or that the degree of increase in noise levels should be of low significance; and
- (ii) that the noise emissions of the vehicles associated with a specific proposal should comply with “best practice”.

3 METHODOLOGY

3.1 Site Measurements

The purpose of background noise measurements are to identify the impact of noise level increases over low background noise levels.

Ambient noise measurements were carried out between the 14 and 27 November 2009 using un-manned noise data loggers. These dates did not include any activity related to the proposal. The measurements were conducted outdoors with the microphone at least 3 metres from any reflecting surface other than the ground, and at a height of at least 1.2 metres above the ground. The noise levels were logged continuously over a period of two weeks, which included two weekends, using sample periods of 15 minutes duration.

Measurements and analysis were conducted in accordance with the *Environmental Protection Authority: Guidance for the Assessment of Environmental Factors - Draft Guidance No. 8: Guidance for Environmental Noise* (EPA Guidance No. 8).

The measurement locations, detailed below and shown graphically in *Figure 3.1*, were chosen to represent the changing conditions along the railway.

- Location 1 Lot 429 White Peak Road, Oakajee
- Location 2 Lot 328, 210 Wells Road, Oakajee
- Location 3 Lot 3062, 2499 North West Coastal Highway, Oakajee
- Location 4 1183 East Chapman Rd, East Chapman..

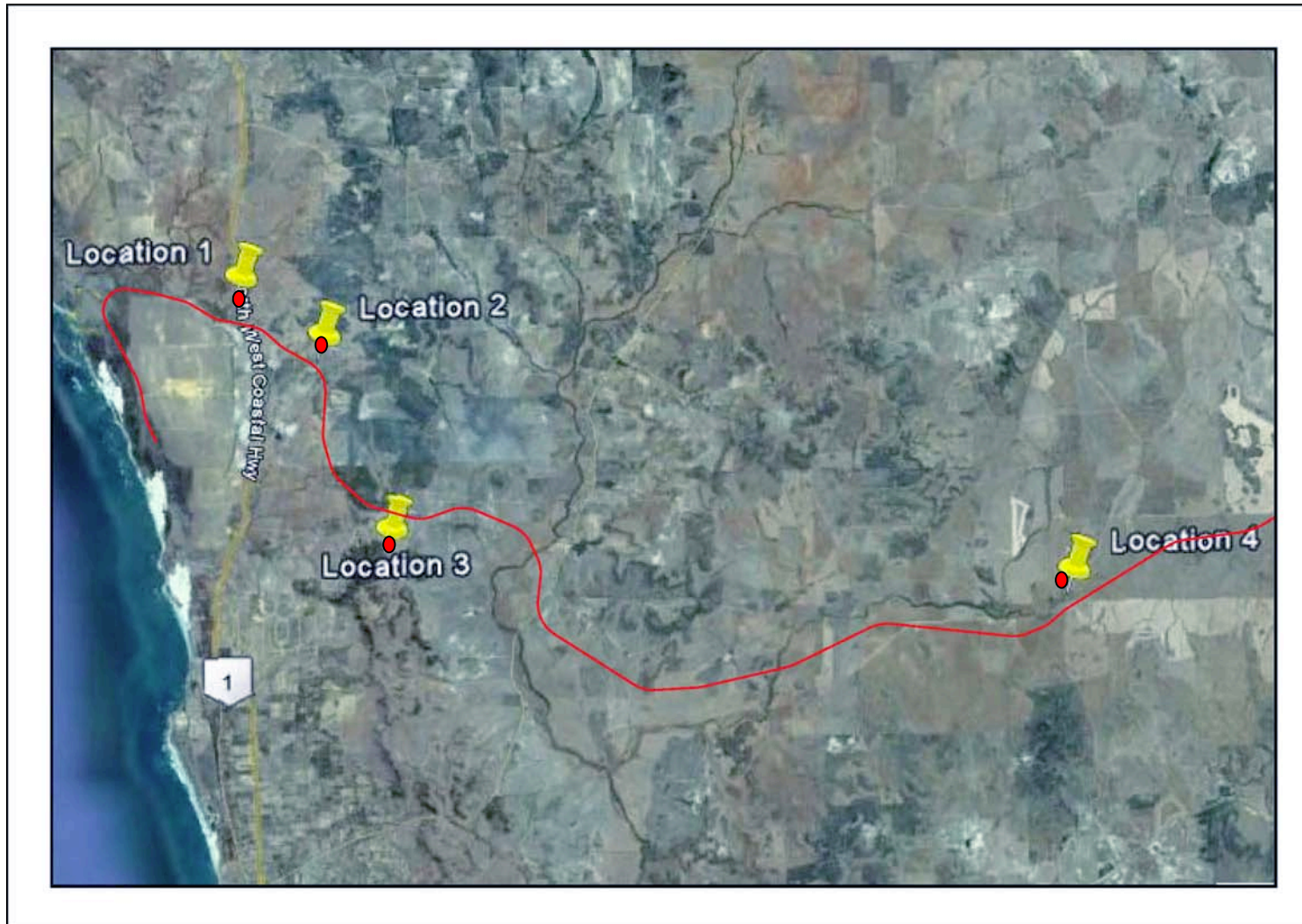


Figure 3.1 Noise Monitoring Locations

3.2 Noise Modelling

Railway noise has been predicted using a modified version of the Nordic Rail Prediction Method (Kilde Rep. 130) algorithm. The Nordic Rail Prediction Method (Kilde Rep. 130) algorithm is for generic train types in Europe and requires modification to align with measured noise levels of locomotives and wagons used in the Pilbara. In addition, to accurately predict the effect of barriers (hills or buildings), the noise source height of the locomotive was raised from the standard 0.5 metres above the railhead to 4.0 metres.

Input data required in the model are:

- 3-dimensional topographical data;
- Location of noise sensitive premises;
- Railway alignment; and
- Train Configuration.

3.2.1 Topographical Data

Topographical data was provided by OPR. The contours are in 5-metre intervals and cover the noise sensitive premises 10 km either side of the alignment.

3.2.2 Train Configuration

The variables used to predict the noise level from the operation of the railway are provided in *Table 3.1*.

Table 3.1 Input Data for Assessment of Railway Noise

| Parameter | Value |
|---|--|
| Locomotive maximum noise level at 15m | 92 dB(A) |
| Wagons maximum noise level at 15m | 86 dB(A) |
| Locomotives | 3 |
| Train Speed | 80 km/h on main line |
| Height of Locomotive | 4 metres above rail head |
| Number of Wagons (10.5m overall length) | 240 |
| Number of Train Movements per day | Oakajee Port to Chainage 88000 = 16 Movements Chainage 88000 to Mt Weld Junction = 10 Movements Mt Weld Junction to Jack Hills = 4 Movements |

Note: Trains assumed to be evenly distributed throughout a 24-hour period.

The noise level used for the locomotives is equivalent to full power (Notch 8). Although the locomotives alone have minimal influence on the $L_{Aeq (Day)}$ and $L_{Aeq (Night)}$ levels, assuming full power would be considered as a conservative approach. However, for receivers located

within 100 metres of the railway, the locomotive power setting used in the modelling would be more critical and may be adjusted for assessments to individual premises, particularly for the assessment of the L_{Amax} level.

4 RESULTS

4.1 Background Noise Measurements

The background noise level data, presented graphically in *Figures 4.1 to 4.4*, shows the L_{Aeq} , and L_{A90} noise levels, together with the wind direction relative to the measurement location and the railway.

As required under EPA Guidance No. 8, background noise levels have been determined by extracting from the full data the “ L_{90} ” of the L_{A90} noise levels. This is used to determine whether the noise from the project is likely to be audible over the background noise level at a particular receiver location during a particular time period. From analysis of the results the following “ L_{90} ” of the L_{A90} noise levels have been determined:

Location 1 Lot 3062, 2499 North West Coastal Highway, Oakajee

- 0600-2200 hours (Day) = L_{A90} 30 dB
- 2200-0600 hours (Night) = L_{A90} 26 dB

Location 2 Lot 328, 210 Wells Road, Oakajee

- 0600-2200 hours (Day) = L_{A90} 28 dB
- 2200-0600 hours (Night) = L_{A90} 24 dB

Location 3 Lot 429 White Peak Road, Oakajee

- 0600-2200 hours (Day) = L_{A90} 27 dB
- 2200-0600 hours (Night) = L_{A90} 26 dB

Location 4 1183 East Chapman Rd, East Chapman

- 0600-2200 hours (Day) = L_{A90} 29 dB
- 2200-0600 hours (Night) = L_{A90} 23 dB

It can be seen that the noise levels vary throughout the day and are influenced by such things as wind in trees, local noise sources (noise from general activities) and road traffic. For example, the wind conditions on the 18 November 2009, were reported as being as high as 63 km/h, and this can be seen at all locations as a significant increase in noise levels.

The lowest background levels (the “ L_{90} ” of the L_{A90} noise levels) occur during the night-time period of 2200-0600 and the results indicate that background levels at all locations are relatively low, which is consistent for a rural setting.

4.2 Noise Modelling

The results of the noise modelling to noise sensitive premises adjacent to the proposed rail alignment are compared against the SPP 5.4 criteria and presented in *Table 4.1*.

It should be noted that due to the limitations of GIS data, the building use (residential or otherwise) associated with the noise receivers included in this assessment would require verification by a visual survey.

Although the SPP 5.4 does not consider the maximum noise level (L_{Amax}), it is often used to assess the risk of sleep disturbance from train pass-bys. Sleep disturbance is a complex subject, however, it is generally not considered to be a significant risk for external maximum noise levels below L_{Amax} 75 dB.

In addition to the results presented in *Table 4.1*, the $L_{Aeq (Night)}$ noise level contours are provided for the overall alignment and within the Chapman Valley area, which has a denser population than the rest of the railway. These are presented in *Figures 4.5 and 4.6*.

To ensure that the chosen railway alignment is the best option in terms of minimising impacts to existing noise sensitive receivers. It was determined that the proposed railway alignment (centre alignment) results in the least number of noise sensitive receivers predicted to exceed the SPP 5.4 criteria. This assessment is included in *Appendix A*.

Table 4.1 Predicted Noise Levels to Noise Sensitive Receivers

| Receiver ID | Predicted Noise Levels | | Location | | Coordinates (GDA 94) | | Comment |
|-------------|--------------------------|-------------------|-----------------------------|--------------|----------------------|---------|-----------------------------------|
| | L _{Aeq} (Night) | L _{Amax} | Address | Suburb | X | Y | |
| 1 | 62 | 82 | LOT 6088 | YUNA | 337014 | 6854031 | Exceeds SPP 5.4 "Limit" Criteria |
| 2* | 62 | 82 | 148 CAREY RD | WHITE PEAK | 270513.9 | 6831992 | Owned by WA Land Authority |
| 3* | 59 | 77 | 144 CAREY RD | WHITE PEAK | 270720.2 | 6831810 | Owned by WA Land Authority |
| 4 | 58 | 75 | 59 EASTOUGH-YETNA RD | YETNA | 275922.2 | 6829671 | Exceeds SPP 5.4 "Limit" Criteria |
| 5 | 56 | 79 | 479 CHAPMAN RD | EAST CHAPMAN | 282442.2 | 6826303 | Exceeds SPP 5.4 "Limit" Criteria |
| 6* | 56 | 73 | 3325 WHITE PEAK RD | WHITE PEAK | 270603.1 | 6833155 | Owned by WA Land Authority |
| 7* | 55 | 78 | LOT 328 | | 270143.6 | 6834782 | Owned by WA Land Authority |
| 8 | 54 | 71 | 12 NEWMARRACARRA RD | KOJARENA | 290515.6 | 6828470 | Exceeds SPP 5.4 "Target" Criteria |
| 9 | 54 | 70 | 2134 VALENTINE RD | NORTH ERADU | 313813.7 | 6839175 | Exceeds SPP 5.4 "Target" Criteria |
| 10 | 53 | 69 | 150 LORIMER RD | DURAWAH | 297349 | 6832089 | Exceeds SPP 5.4 "Target" Criteria |
| 11* | 52 | 70 | 327 WHITE PEAK RD | WHITE PEAK | 271176.5 | 6830860 | Owned by WA Land Authority |
| 12 | 51 | 66 | LOT 14 | | 535743.4 | 6997657 | Exceeds SPP 5.4 "Target" Criteria |
| 13* | 51 | 68 | 2499 NORTH WEST COASTAL HWY | OAKAJEE | 267937.4 | 6836395 | Owned by WA Land Authority |
| 14 | 51 | 66 | 694 BADGEDONG RD | WANDANA | 346022.2 | 6874640 | Exceeds SPP 5.4 "Target" Criteria |

* Denotes properties owned by the WA Land Authority. Residential use of these properties will be restricted if transportation noise levels are considered to be unacceptable.

Table 4.1 (cont) Predicted Noise Levels to Noise Sensitive Receivers

| Receiver ID | Predicted Noise Levels | | Location | | Coordinates (GDA 94) | | Comment |
|-------------|--------------------------|-------------------|--------------------------|--------------|----------------------|---------|------------------------------------|
| | L _{Aeq} (Night) | L _{Amax} | Address | Suburb | X | Y | |
| 15 | 51 | 67 | 1682 VALENTINE RD | NORTH ERADU | 311420.7 | 6835696 | Exceeds SPP 5.4 "Target" Criteria |
| 16* | 51 | 67 | LOT 9782 | | 270194.3 | 6834387 | Owned by WA Land Authority |
| 17 | 51 | 66 | 1183 CHAPMAN RD | EAST CHAPMAN | 288299.1 | 6827925 | Exceeds SPP 5.4 "Target" Criteria |
| 18 | 50 | 66 | 1829 PETER RD | AMBANIA | 324958.3 | 6841937 | Complies SPP 5.4 "Target" Criteria |
| 19 | 50 | 66 | 145 SCOTT RD | EAST CHAPMAN | 284793.5 | 6828138 | Complies SPP 5.4 "Target" Criteria |
| 20 | 50 | 65 | 1065 CHAPMAN RD | EAST CHAPMAN | 287184.6 | 6828282 | Complies SPP 5.4 "Target" Criteria |
| 21* | 50 | 67 | LOT 2 | | 269111.4 | 6835137 | Owned by WA Land Authority |
| 22 | 50 | 66 | 278 MORRELL RD | NARRA TARRA | 277427.1 | 6827593 | Complies SPP 5.4 "Target" Criteria |
| 23 | 50 | 64 | LOT 9372 | | 344801.9 | 6871461 | Complies SPP 5.4 "Target" Criteria |
| 24 | 50 | 65 | LOT 1081 | | 340859.4 | 6864903 | Complies SPP 5.4 "Target" Criteria |
| 25* | 50 | 65 | 289 WHITE PEAK RD | WHITE PEAK | 270778.8 | 6830780 | Owned by WA Land Authority |
| 26 | 50 | 64 | LOT 27 | | 558834.2 | 7020679 | Complies SPP 5.4 "Target" Criteria |
| 27 | 49 | 64 | 282 BURTON WILLIAMSON RD | NORTH ERADU | 319960.4 | 6840611 | Complies SPP 5.4 "Target" Criteria |
| 28* | 49 | 65 | 291 CAREY RD | WHITE PEAK | 269757.7 | 6833941 | Owned by WA Land Authority |

* Denotes properties owned by the WA Land Authority. Residential use of these properties will be restricted if transportation noise levels are considered to be unacceptable.

Table 4.1 (cont) Predicted Noise Levels to Noise Sensitive Receivers

| Receiver ID | Predicted Noise Levels | | Location | | Coordinates (GDA 94) | | Comment |
|-------------|--------------------------|-------------------|--------------------------------|--------------|----------------------|---------|------------------------------------|
| | L _{Aeq} (Night) | L _{Amax} | Address | Suburb | X | Y | |
| 29 | 49 | 62 | LOT 6093 | | 332516.9 | 6843678 | Complies SPP 5.4 "Target" Criteria |
| 30 | 49 | 66 | 60 EASTOUGH-YETNA RD | YETNA | 276504.4 | 6830359 | Complies SPP 5.4 "Target" Criteria |
| 31 | 49 | 64 | 290 WHITE PEAK RD | WHITE PEAK | 270939.1 | 6830635 | Complies SPP 5.4 "Target" Criteria |
| 32 | 48 | 65 | 360 WHITE PEAK RD | WHITE PEAK | 271520.1 | 6830422 | Complies SPP 5.4 "Target" Criteria |
| 33 | 48 | 62 | 469 WANDINA RD | NUNIERRA | 365092 | 6888054 | Complies SPP 5.4 "Target" Criteria |
| 34 | 48 | 62 | LOT 9557 | | 344211.6 | 6870979 | Complies SPP 5.4 "Target" Criteria |
| 35 | 48 | 64 | 7856 GERALDTON-MOUNT MAGNET RD | TENINDEWA | 341349.7 | 6832714 | Complies SPP 5.4 "Target" Criteria |
| 36 | 48 | 63 | 242 WHITE PEAK RD | WHITE PEAK | 270724.9 | 6830439 | Complies SPP 5.4 "Target" Criteria |
| 37 | 48 | 62 | 177 SCOTT RD | EAST CHAPMAN | 284415.3 | 6828559 | Complies SPP 5.4 "Target" Criteria |
| 38 | 48 | 62 | 400 ANGELS RD | EAST CHAPMAN | 282379.6 | 6827261 | Complies SPP 5.4 "Target" Criteria |
| 39 | 47 | 61 | 119 BURTON WILLIAMSON RD | NORTH ERADU | 316135.2 | 6841070 | Complies SPP 5.4 "Target" Criteria |
| 40 | 47 | 61 | 675 CHAPMAN RD | EAST CHAPMAN | 283958.8 | 6827786 | Complies SPP 5.4 "Target" Criteria |
| 41 | 47 | 63 | 404 CHAPMAN RD | EAST CHAPMAN | 281634.4 | 6825224 | Complies SPP 5.4 "Target" Criteria |
| 42 | 47 | 63 | 1172 CHAPMAN VALLEY RD | NARRA TARRA | 275592.9 | 6827015 | Complies SPP 5.4 "Target" Criteria |

*** Denotes properties owned by the WA Land Authority. Residential use of these properties will be restricted if transportation noise levels are considered to be unacceptable.**

Table 4.1 (cont) Predicted Noise Levels to Noise Sensitive Receivers

| Receiver ID | Predicted Noise Levels | | Location | | Coordinates (GDA 94) | | Comment |
|-------------|--------------------------|-------------------|--------------------------------|----------------|----------------------|---------|---|
| | L _{Aeq} (Night) | L _{Amax} | Address | Suburb | X | Y | |
| 43 | 47 | 64 | 53 NEWMARRACARRA RD | EAST CHAPMAN | 288897.9 | 6828339 | Complies SPP 5.4 "Target" Criteria |
| 44 | 47 | 64 | 111 CHAPMAN VALLEY RD | NARRA TARRA | 276827 | 6830263 | Complies SPP 5.4 "Target" Criteria |
| 45 | 47 | 63 | 581 CHAPMAN RD | EAST CHAPMAN | 283200.4 | 6825821 | Complies SPP 5.4 "Target" Criteria |
| 46 | 47 | 60 | 1803 TENINDEWA RD | TENINDEWA | 335320.3 | 6849176 | Complies SPP 5.4 "Target" Criteria |
| 47 | 47 | 63 | 275 NEWMARRACARRA RD | EAST CHAPMAN | 290550.2 | 6829670 | Complies SPP 5.4 "Target" Criteria |
| 48 | 47 | 61 | 187 TENINDEWA RD | TENINDEWA | 340544.3 | 6835200 | Complies SPP 5.4 "Target" Criteria |
| 49 | 46 | 61 | 422 NEWMARRACARRA RD | NORTHERN GULLY | 292155.4 | 6830447 | Complies SPP 5.4 "Target" Criteria |
| 50 | 46 | 62 | 61 EASTOUGH-YETNA RD | YETNA | 276426.7 | 6830688 | Complies SPP 5.4 "Target" Criteria |
| 51 | 46 | 60 | LOT 1 | | 269426 | 6836033 | Complies SPP 5.4 "Target" Criteria |
| 52 | 46 | 62 | 372 BURTON RD | AMBANIA | 320958.1 | 6842540 | Complies SPP 5.4 "Target" Criteria |
| 53 | 46 | 59 | 1801 TENINDEWA RD | TENINDEWA | 335292.4 | 6848940 | Complies SPP 5.4 "Target" Criteria |
| 54 | 46 | 61 | 1116 DURAWAH NORTHERN GULLY RD | DURAWAH | 296502.6 | 6832987 | Complies SPP 5.4 "Target" Criteria |
| 55 | 46 | 59 | 426 WHITE PEAK RD | YETNA | 271983 | 6829540 | Complies SPP 5.4 "Target" Criteria |

4.3 Ground Vibration

The propagation of vibration energy through the ground is highly dependent on ground types and in particular, the presence of rock formations. The closest premises to the proposed railway is located at a distance of 57 metres from the track. From ground-borne vibration measurements undertaken in the Pilbara region (Figure 4.7), which consisted of sand soil types, Lloyd George Acoustics considers that the risk of annoyance from vibration is minimal at this distance. Therefore annoyance from ground-borne vibration is unlikely to occur for this proposed railway.

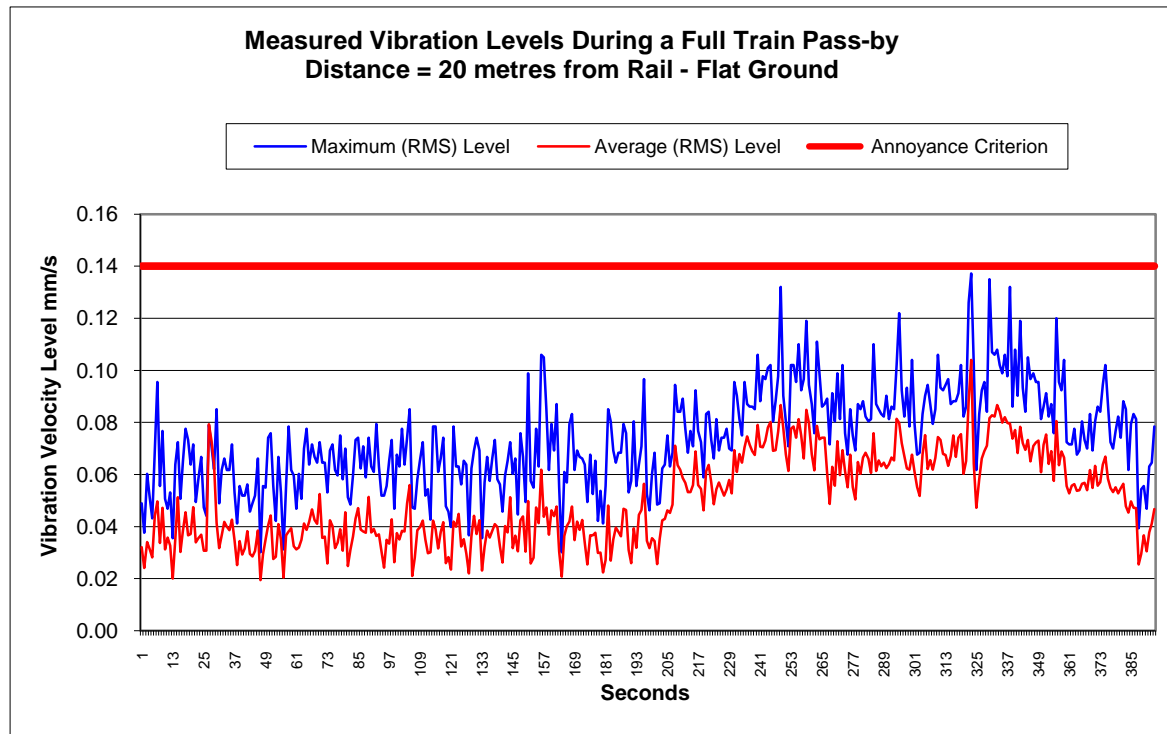


Figure 4.7 Results of Vibration Measurements Undertaken in the Pilbara

5 DISCUSSION

The results show that three noise sensitive receiver locations are predicted to exceed the SPP 5.4 “Limit” criteria and seven receivers are predicted to be within the margin between the “Target” and “Limit” criteria. All other receivers are predicted to comply with the SPP 5.4 “Target” criteria and require no further action.

For the residential premises predicted to exceed the SPP 5.4 “Limit” criteria, mitigation measures to reduce the external noise levels will be thoroughly investigated. These measures will take the form of barriers to reduce the external noise level to, at least, below the “Limit” criteria and upgrades to the facade of the house to achieve acceptable internal noise levels. Suitable upgrades to building facades are detailed in the SPP 5.4 guidelines and these “deemed to comply” treatments have been reproduced in *Appendix B* of this assessment.

Should it be determined that it is not practicable to achieve an external noise level below the SPP 5.4 "Limit" criteria, then other management measures such as property purchase, "deemed to comply package B" or specifically designed building facade upgrades will be investigated.

For residential premises predicted to exceed the SPP 5.4 "Target" criteria but still below the "Limit" criteria, the use of the "deemed to comply package A" facade upgrades will be investigated.

It is anticipated that any noise control management will be determined following a visual assessment of the property and discussions with the property owners.

Although not policy in Western Australia, where receivers are situated in very quiet environments, the impact of transportation noise levels may be assessed against the draft EPA Guidance No. 14. For rural residential premises, "acceptable" night noise levels are stated as a Noise Amenity Rating N0, or less than $L_{Aeq (Night)}$ 40 dB. Residential premises receiving a noise levels up to a Noise Amenity Rating N3 (equal or less than $L_{Aeq (Night)}$ 50 dB) would be "conditionally acceptable" providing acceptable internal noise levels are achieved. The Transportation noise levels would be considered as "unacceptable" above $L_{Aeq (Night)}$ 50 dB. Based on these criteria, 10 noise sensitive premises would receive transportation noise levels considered as "unacceptable" and would require purchase. All remaining noise sensitive premises assessed (and probably more) would be considered "conditionally acceptable" and may require facade treatments to ensure acceptable internal noise levels.

When considering the maximum noise levels, the three receivers predicted to exceed the SPP 5.4 "Limit" criteria are also predicted to receive a maximum noise level above L_{Amax} 75 dB. Although a highly subjective response, these residents may experience sleep disturbance issues. However, these high maximum noise levels are likely to be addressed through any treatment used under the SPP 5.4.

6 REFERENCES

Environmental Protection (Noise) Regulations 1997

Environmental Protection Authority (2000), - *Draft EPA Statements for EIA No. 14 (Version 3) - Road and Rail Transportation Noise*, May 2000.

Environmental Protection Authority (2007), - *Guidance for the Assessment of Environmental Factors Draft Guidance No. 8: - Environmental Noise*, May 2007.

Western Australian Planning Commission (WAPC), - *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning*

APPENDIX A

Comparison of Alternative Railway Alignments

APPENDIX B

Deemed-to-Satisfy Construction Standards

Noise insulation – “Deemed to Comply” packages for residential development

The following “deemed-to-comply” Packages outline noise insulation measures that are designed to ensure that the indoor noise standards in the Policy are achieved for residential developments in areas where outdoor noise levels will exceed the *target* noise levels by up to 8 dB(A).

The deemed-to-comply specifications are intended to simplify compliance with the noise criteria, and the relevant Package should be required as a condition of development. However, this should not remove the option to pursue alternative measures or designs. Departures from the deemed-to-comply specifications need to be accompanied by acoustic certification from a competent person, to the effect that the development will achieve the requirements of the Policy.

Superior construction standards, such as those specified in the “deemed-to-comply” packages, are now becoming more prevalent in residential buildings; and do not significantly increase the cost of building. A similar standard of construction has been recommended by the Western Australian Planning Commission for new housing in areas forecast to be seriously affected by aircraft noise.¹ That recommendation followed a comprehensive assessment of the efficacy and costs of noise attenuation measures, taking into account the recent changes in industry building standards as well as changes to the *Building Code of Australia*.

Where transport noise levels are more than 8 dB above the noise *target*, i.e. 3 dB above the noise *limit*, or where noise-sensitive development other than residential is proposed, a Detailed Assessment should be prepared by a competent person. The report should specify the level of noise reduction required and the noise insulation measures needed to comply with the Policy. The approval may require that the construction drawings be checked for compliance with the Detailed Assessment, and that follow-up verification be carried out to certify compliance.

¹ Statement of Planning Policy No 5.1, *Land Use Planning in the Vicinity of Perth Airport* and the accompanying report on *Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport*, February 2004.

Package A: Noise levels within the *margin*

The following noise insulation package is designed to meet the indoor noise standards for residential developments in areas where noise levels exceed the noise *target* but are within the *limit*.

| Area type | Orientation | Package A measures |
|------------------------------------|---------------------------|--|
| Indoors | | |
| Bedrooms | Facing road/rail corridor | <ul style="list-style-type: none"> • 6mm (minimum) laminated glazing • Fixed, casement or awning windows with seals • No external doors • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/airconditioning² |
| | Side-on to corridor | <ul style="list-style-type: none"> • 6mm (minimum) laminated glazing • Closed eaves • Mechanical ventilation/airconditioning |
| | Away from corridor | No requirements |
| Living and work areas ³ | Facing corridor | <ul style="list-style-type: none"> • 6mm (minimum) laminated glazing • Fixed, casement or awning windows with seals • 35mm (minimum) solid core external doors with acoustic seals⁴ • Sliding doors must be fitted with acoustic seals • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/airconditioning |
| | Side-on to corridor | <ul style="list-style-type: none"> • 6mm (minimum) laminated glazing • Closed eaves • Mechanical ventilation/airconditioning |
| | Away from corridor | No requirements |
| Other indoor areas | Any | No requirements |
| Outdoors | | |
| Outdoor living area ⁵ | Facing corridor | <ul style="list-style-type: none"> • Minimum 2.0m high solid fence (e.g. Hardifence, pinelap, or Colorbond) • Picket fences are not acceptable |
| | Side-on to corridor | |
| | Away from corridor | No requirements |

² See section on Mechanical ventilation/airconditioning for further details and requirements.

³ These deemed-to-comply guidelines adopt the definitions of indoor spaces used in AS 2107-2000. A comparable description for bedrooms, living and work areas is that defined by the Building Code of Australia as a “habitable room”. The Building Code of Australia may be referenced if greater clarity is needed. A living or work area can be taken to mean any “habitable room” other than a bedroom. Note that there are no noise insulation requirements for utility areas such as bathrooms. The Building Code of Australia describes these utility spaces as “non-habitable rooms”.

⁴ Glazing panels are acceptable in external doors facing the transport corridor. However these must meet the minimum glazing requirements.

⁵ The Policy requires that at least one outdoor living area be reasonably protected from transport noise. The protected area should meet the minimum space requirements for outdoor living areas, as defined in the Residential Design Codes of Western Australia.

Package B: Noise within 3 dB above the *limit*

The following noise insulation package is designed to meet the indoor noise standards for residential developments in areas where transport noise levels exceed the noise *limit* but by no more than 3 dB (See Table 1 in the Policy).

| Area type | Orientation | Package B measures |
|------------------------------------|---------------------------|---|
| Indoors | | |
| Bedrooms | Facing road/rail corridor | <ul style="list-style-type: none"> • 10mm (minimum) laminated glazing • Fixed, casement or awning windows with seals • No external doors • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/airconditioning⁶ |
| | Side-on to corridor | <ul style="list-style-type: none"> • 10mm (minimum) laminated glazing • Closed eaves • Mechanical ventilation/airconditioning |
| | Away from corridor | No requirements |
| Living and work areas ⁷ | Facing corridor | <ul style="list-style-type: none"> • 10mm (minimum) laminated glazing • Fixed, casement or awning windows with seals • 40mm (minimum) solid core external doors with acoustic seals⁸ • Sliding doors must be fitted with acoustic seals • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/airconditioning |
| | Side-on to corridor | <ul style="list-style-type: none"> • 6mm (minimum) laminated glazing • Closed eaves • Mechanical ventilation/airconditioning |
| | Away from corridor | No requirements |
| Other indoor areas | Any | No requirements |
| Outdoors | | |
| Outdoor living area ⁹ | Facing corridor | <ul style="list-style-type: none"> • Minimum 2.4m solid fence (e.g. brick, limestone or Hardifence) • Colorbond and picket fences are not acceptable |
| | Side-on to corridor | |
| | Away from corridor | No requirements |

⁶ See section on Mechanical ventilation/airconditioning for further details and requirements.

⁷ These deemed-to-comply guidelines adopt the definitions of indoor spaces used in AS 2107-2000. A comparable description for bedrooms, living and work areas is that defined by the Building Code of Australia as a "habitable room". The Building Code of Australia may be referenced if greater clarity is needed. A living or work area can be taken to mean any "habitable room" other than a bedroom. Note that there are no noise insulation requirements for utility areas such as bathrooms. The Building Code of Australia describes these utility spaces as "non-habitable rooms".

⁸ Glazing panels are acceptable in external doors facing the transport corridor. However these must meet the minimum glazing requirements.

⁹ The Policy requires that at least one outdoor living area be reasonably protected from transport noise. The protected area should meet the minimum space requirements for outdoor living areas, as defined in the Residential Design Codes of Western Australia.

Mechanical ventilation/airconditioning

Where outdoor noise levels are above the “target”, both Packages A and B require mechanical ventilation or airconditioning to ensure that windows can remain closed in order to achieve the indoor noise standards.

In implementing Packages A and B, the following need to be observed:

- evaporative airconditioning systems will not meet the requirements for Packages A and B because windows need to remain open;
- refrigerative airconditioning systems need to be designed to achieve fresh air ventilation requirements;
- air inlets need to be positioned facing away from the transport corridor where practicable;
- ductwork needs to be provided with adequate silencing to prevent noise intrusion.

Notification

Notifications on certificates of title and/or advice to prospective purchasers advising of the potential for noise impacts from road and rail corridors can be effective in warning people of the potential impacts of transport noise. Such advice can also bring to the attention of prospective developers the need and opportunities to reduce the impact of noise through sensitive design and construction of buildings and the location and/or screening of outdoor living areas.

Notification should be provided to prospective purchasers, and required as a condition of subdivision (including strata subdivision) for the purposes of noise-sensitive development or planning approval involving noise-sensitive development, where external noise levels are forecast or estimated to exceed the “target” criteria as defined by the Policy. In the case of subdivision and development, conditions of approval should include a requirement for registration of a notice on title, which is provided for under section 12A of the Town Planning and Development Act and section 70A of the Transfer of Land Act. An example of a suitable notice is given below.

Notice: This property is situated in the vicinity of a transport corridor, and is currently affected, or may in the future be affected, by transport noise. Further information about transport noise, including development restrictions and noise insulation requirements for noise-affected property, are available on request from the relevant local government offices.

APPENDIX C

Terminology

The following is an explanation of the terminology used throughout this report.

Decibel (dB)

The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.

Sound Pressure Level (L_p)

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

L_{ASlow}

This is the noise level in decibels, obtained using the A frequency weighting and the S time weighting as specified in AS1259.1-1990. Unless assessing modulation, all measurements use the slow time weighting characteristic.

L_{AFast}

This is the noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. This is used when assessing the presence of modulation only.

L_{Amax}

An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

L_{Aeq}

The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

L_{A90}

An L_{A90} level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the "background" noise level.

Background Noise

Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings,

etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.

Ambient Noise

Means the level of noise from all sources, including background noise from near and far and the source of interest.

Specific Noise

Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.

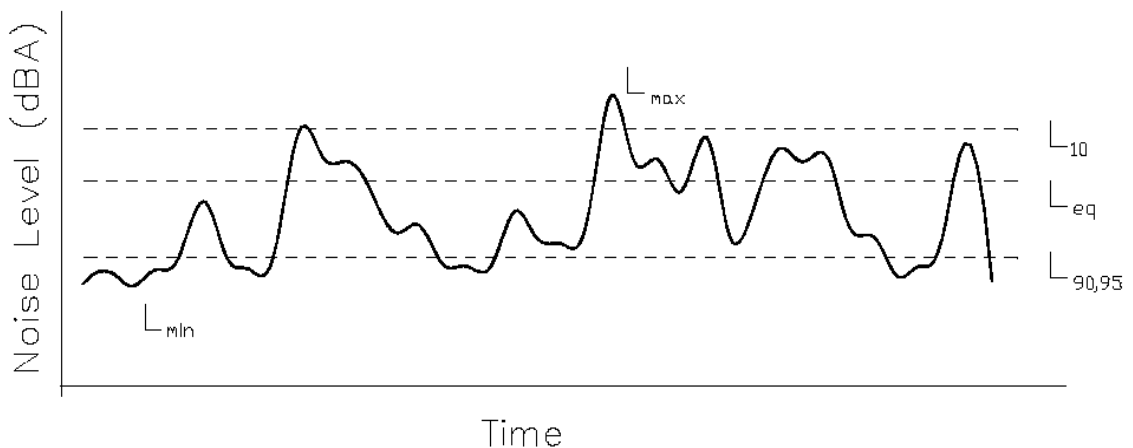
RMS

The root mean square level. This is used to represent the average level of a wave form such as vibration.

Vibration Velocity Level

The RMS velocity of a vibration source over a specified time period. Units are mm/s.

Chart of Noise Level Descriptors



Typical Noise Levels

