Regional Rail Link Authority

# Regional Rail Link

## Response to Peer Review

RRL-2000-EAC-REP-0003

9 December 2010

Revision B

KBR ARUP

Regional Rail Link Authority

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## Response to Peer Review

December 2010

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# Contents

# 1 Introduction

The Minister for Planning has decided that an Environment Effects Statement under the *Environment Effects Act 1978* is not required for the Regional Rail Link Section 2. However, the Minister's decision includes several conditions, including the requirement for the preparation of a Noise Impact Management Report (NIMR) (document RRL-2000-EAC-REP-0001) and a peer review report prepared by an independent specialist.

The Regional Rail Link Authority (RRLA) commissioned Dr Rob Bullen of Wilkinson Murray Pty Ltd to provide a peer review of the technical aspects of the noise prediction and modelling as presented in Section 6 - 9 of the NIMR.

Dr Bullen reviewed the technical aspects of the assessment in consultation with the project acoustic engineers during the preparation of the noise model and following the release of the preliminary report. His initial review was documented in Wilkinson Murray's report *Regional Rail Link Peer Review of Acoustic Assessment, Report No. 10150-1 Ver A*, dated October 2010.

Subsequently, the NIMR was updated to respond to the issues raised during the review, where possible, and this work was re-reviewed by Dr Bullen. Wilkinson Murray's subsequent review was documented in *Regional Rail Link Peer Review of Acoustic Assessment, Report No. 10150-2 Ver A*, November 2010.

This report forms the response to the comments made during the Peer Review process and documented in Wilkinson Murray's peer review reports.

Comments from the peer reviewer are shown in *grey italics*, with responses following.

# 2 Response to Initial Review (October 2010)

## 2.1 Ambient Noise Measurements

*Peer Review* *The purpose of these measurements was to "document the existing noise levels adjacent to the corridor and broadly describe the major contributions to the existing noise climate". Measurements were undertaken at 16 locations, which are considered broadly representative of the areas likely to be affected by noise from the proposal. The measurement methodology used industry-standard practices. Measurement periods vary from 3 to nearly 7 days. While a period of 7 days is generally required for formal assessment purposes, these periods are considered adequate for the stated purpose.*

Response The ambient noise level measurements have generally been undertaken over a period of between 3–7 days (depending primarily on whether the measurement period spans a weekend). The period of 7 days that Dr Bullen refers to is presumably based on the requirements of the NSW EPA which recommends a longer measurement period (7 days) than is commonly used in Victoria for ambient noise measurements undertaken for transport infrastructure projects. VicRoads recommend a minimum measurement period of 24 or 48 hours, depending on the number of locations measured[1].

*Peer Review* *There is no mention in the report of meteorological conditions, which may render measurement data unreliable – typically data are excluded from consideration if the wind speed exceeds 5 m/sec or it is raining. I would suggest that any such periods be noted or marked in some way in the results.*

Response The unattended noise monitoring has been conducted to provide a baseline with which future noise levels can be compared. It has no influence on the predictions that have been conducted. Furthermore, unattended noise monitoring has inherent uncertainties due to the nature of the measurements (nobody is present to identify sources of noise). Meteorological data was not obtained since it is difficult to apply it to specific noise measurements as this data is usually from weather stations that are somewhat remote from, and more exposed than, the measurement locations themselves. The ambient measurements have been undertaken over a longer duration than recommended by VicRoads (see above) in order to minimise the influence of adverse meteorological effects. Due to the limited value of the unattended noise monitoring, a detailed discussion of the results in the body of the report was not considered to be warranted. As noted above, the main purpose of the measurements was to document the baseline noise levels, against which future construction and operational noise levels can be compared.

*Peer Review* *Results are presented only in an appendix, with no summary measures and only very general comments in the main text. The general comments are in regard to audibility of sources, which was presumably determined at the time of deployment and/or removal of the loggers. Some details of how long operators were listening for would be helpful. In particular I am surprised that there was "no existing freeway, rail or aircraft noise" at the location at 4 Manor Road, Little River, which appears to be about 350m from an existing rail line. Some comment on the reason for some very high maximum noise levels at sites like 830 Leakes Road could also be useful.*

Response The reason for the unusually high maximum noise levels at 830 Leakes Road is not known, however, it is possible that it is due to truck movements related to nearby construction sites.

*Peer Review* *Understanding of the existing environment, and its variability between locations, would be aided by presenting summary noise measures for each location in the main text. I suggest these could be measures of ambient levels – for example overall LAeq in day and night periods – and measures of background level – say "lowest repeatable" LA90 levels for the same time periods - for each location.*

Response A summary table of measured noise levels has been added to the report (Table 7).

1 *Interpretation and application of VicRoads Traffic Noise Reduction Policy 2005*, VicRoads Road Design Note, RDN6-1b, December 2007.

## 2.2 Operational Railway Noise Predictions

*Peer Review* *The Nordic prediction method for rail noise is an established methodology and has been well validated (although not extensively in Australia), and its predictions are accepted as reliable, given appropriate input data.*

Response Observation.

*Peer Review* *Predicted numbers and types of train operations for the two scenarios studied were supplied by others and are accepted. (Note: In Table 6 why is "Maximum train length" for a Locomotive train on West Werribee to Deer Park marked "n/a"?)*

Response The maximum train length for locomotives has been added to the NIMR. However, since the predicted maximum noise level for the locomotive source is not dependent on the length, it is not relevant.

*Peer Review* *The reference source noise levels are based on levels from the NSW Rail Noise Database. With respect to this I would offer the following comments.*

*I am not sure exactly what items in the NSW database were used to produce the source levels in Table 8, but the locomotive levels appear reasonable.*

Response The source noise levels for Victorian vehicles are based on the noise levels documented in the NSW rail noise database documented by Rail Access Corporation (now RailCorp)[2]. The overall A-weighted noise level corrections ($K_{type}$) for some NSW rolling stock documented in the model are provided below.

**Table 1 Typical rail vehicle source level type corrections.**

| Train Type | Type Correction ($K_{type}$) (dB) | |
|---|---|---|
| | $SEL/L_{Aeq,passby}$ | $L_{Amax}$ |
| Wagon | -4.7 | 4.4 |
| Locomotive - 90 class | 3.2 | 3.2 |
| Locomotive - 422 class | 4.2 | 5.4 |
| Locomotive - C class | 8.9 | 9.5 |
| Locomotive - CLP class | -0.2 | 2.1 |
| Locomotive - NR class | 5.4 | 5.9 |
| Multiple - XPT | 3.6 | 4.7 |
| Multiple - Endeavour | -0.9 | 0.8 |

For the purposes of the RRL modelling, type corrections have been selected on the basis of similarity to the NSW rolling stock. For example, noise levels from V/locity and Sprinter vehicles are expected to be similar to that of NSW XPT or Endeavor vehicles, since the V/Locity cars are an evolution of Xplorer design.

The overall A-weighted noise level corrections for train type ($K_{type}$) that have been used in the model are as follows, and are comparable to the range of corrections for similar rolling stock shown above.

2 *Rail Noise Database: State II Noise Measurements and Analysis*, Rail Access Corporation Report 00091 Version A, August 2000.

**Table 2 Rail vehicle source level type corrections used in the noise prediction model**

| Train Type | Type Correction ($K_{type}$) (dB) | |
|---|---|---|
| | SEL/$L_{Aeq,passby}$ | $L_{Amax}$ |
| Locomotive | 5 | 5 |
| Wagon | -4.7 | 4.4 |
| DMU (V/Locity, Sprinter) | 2 | 3 |

*Peer Review* *The value quoted for "Passenger Wagon" is not in fact an SEL – it is an $L_{Aeq}$ value over the time of the passby (assuming it comes from the database level for "Wagons" at 100m). The SEL then depends on the time taken to pass, which depends on the number of wagons and the speed. This assumes that $L_{Aeq}$ is calculated close to the train, where it can be assumed that SEL = $L_{Aeq}$ + 10 log(Seconds to pass). The SEL can then be projected to the required distance using a line source calculation. Given that the train lengths involved are of the order of 100m, calculating SEL directly at 100m may lead to inaccuracies. However, for the train lengths considered here, the SEL will be dominated by the locomotive, so inaccuracies in the level from the wagons are not critical.*

Response The source level for Wagons has been used as a Sound Exposure Level rather than an $L_{Aeq,passby}$, and the tables in the report have been updated to reflect the correct parameter. As noted by the peer reviewer, this does not result in any significant inaccuracy in the Phase 1 (2014) prediction results, and Wagons are not used at all in the Phase 4 (2030) model. There are therefore no changes to the outcome.

*Peer Review* *A minor point – SEL stands for "Sound Exposure Level", not "Single Event Level".*

Response The reference to SEL has been updated to reflect the Sound Exposure Level, although it is noted that this is relevant to the noise from Single Events.

*Peer Review* *Results of the validation measurements are reassuring. However it would be useful to include more details of the measurements – particularly distance from the track, site conditions and whether the measurements were free-field or at a façade. (Results from the NSW database are all for free-field conditions.)*

Response The report has been updated to reflect that the validation measurements have been taken at either 10 m or 15 m from the nearest track centreline in the free-field, depending on the level of access to the track wayside, and corrected to the reference distance.

*Peer Review* *Other items of prediction the methodology appear to be sound and consistent with generally-accepted good practice.*

Response Observation.

*Peer Review* *Train speeds assumed through stations [should be addressed] (I believe no reduction is assumed);*

Response The report has been updated to reflect that since some trains are expected to operate express services, train speeds through the stations have been assumed to be as for the surrounding track. This means that the predictions of average noise level in the vicinity of the stations results in are expected to be conservative, since some trains will slow down and stop at the stations.

*Peer Review* *Whether points or crossings have been included [should be addressed] (I believe they have not);*

Response The report has been updated to reflect that an increase in source noise level of +10 dB to account for impact noise from points and crossings has been applied at locations where these features are included in the track design.

*Peer Review* *The type of track (presumably ballasted) and rail (continuously welded?) [should be confirmed];*

Response The trackform is described in the report, no changes have been made.

*Peer Review* *Whether the track contains any curves likely to give rise to squeal;*

Response The report has been updated to reflect that no noise level penalty has been applied to account for general curving noise (eg. flanging or grinding) or wheel-squeal in tight-radius curves as they are not applicable since the track alignment has been designed with large-radius curves that are not subject to these effects.

*Peer Review* *Measures assumed in the calculations that will provide mitigation – notably details of the major cutting through Wyndham Vale.*

Response The arrangements are described in the report, no changes have been made.

*Peer Review* *It should also be noted that there is no allowance in the calculations for train idling or passing loops.*

Response The report has been updated to reflect that no allowance has been made for train idling in stabling areas or passing loops, since their potential usage is not sufficiently defined at this stage, and operational railway noise from these areas is unlikely to significantly influence the prediction results.

*Peer Review* *The predicted noise levels themselves, given all the above assumptions, appear to be reasonable on the basis of some hand calculations.*

Response Observation.

*Peer Review* *The level of detail provided in the maps in Appendix E is considered good. However they are slightly difficult to navigate because although a key map is provided at the beginning, the individual maps are not labelled with their sheet number.*

Response The noise contour plots in Appendix E of the NIMR now include a reference to the key-map.

## 2.3 Construction Noise and Vibration

*Peer Review* *The methodology used for prediction of construction noise is again standard, using the CONCAWE algorithms. Some sound power levels used for construction equipment differ from those I believe would be typical – notably I would use a lower sound power level for a tipping dump truck, and higher for dozer (at least while pushing or reversing). However the overall sound power level for a set of equipment is close to the value I would have assumed.*

Response Observation.

*Peer Review* *With respect to the comment (bottom of page 36) that "all equipment has been assumed to be operating simultaneously", it is not clear whether this refers to all equipment in a scenario such as "road realignment", or all equipment for all scenarios at one location–for example "road realignment" and "rail at grade" occurring simultaneously, using different equipment. In either case, depending on the parameters used for assessment this assumption may be overly conservative. For example if the relevant parameter is LAeq,15min then it is unlikely that all equipment would operate for the entire 15 minutes. If equipment represents a single scenario, I presume the noise contours in Appendix E represent the worst-case scenario for each of the locations considered. This should be clarified.*

Response For the construction noise modelling, all equipment for a particular construction scenario is assumed to be operating simultaneously. This has been clarified in the report. Construction noise levels are reported as instantaneous sound pressure levels (SPL), rather than 15-minute $L_{Aeq}$ levels, since it is not known how long the equipment will operate for any particular operation. Hence they are considered to be 'worst case'.

*Peer Review* *The first paragraph of Section 9.1.3 refers to "driven piles", and this is also mentioned in Section 9.2, but Table 11 includes only a bored piling rig. If driven piles are to be used, noise levels could be significantly higher than predicted, so either a commitment should be made to use only bored piling or noise levels from a pile driver should be included.*

Response The construction noise modelling is based on source levels for a large bored piling rig since impact or driven piling is not likely to be required for the construction of the RRL.

*Peer Review* *The second paragraph of Section 9.1.3 indicates "Construction equipment has been modelled as separate point sources, placed at approximately 6 m intervals", but the results in Appendix E appear to show only noise levels from the 18 specific sites described in Table 10. Noise due to construction of the rail line itself should be addressed in some form – if not through contours, then at least as a statement of typical noise levels likely to be experienced at various distances from the corridor, and the likely duration of the noise.*

Response Regarding the noise contours for general track construction works, the decision has been made to show this as noise contours from a typical work-site, rather than show hypothetical contours along the whole route alignment, since that could give the mistaken impression that noise would be generated along the whole alignment for the whole construction period. This approach has been described in the report.

*Peer Review* *Without commenting on criteria, it is common practice to discuss maximum noise levels from construction equipment wherever they may be used at night, to assist in evaluation of potential sleep disturbance. Unless it can be assumed that work will not be undertaken at night, I believe some discussion of maximum noise levels is required.*

Response As presented, the noise contours represent the 'reasonable worst case' noise levels expected near to typical construction works. While noise levels from short-term individual events may exceed the SPL levels on occasion, the $L_{Aeq,15min}$ noise level from construction works is not expected to be higher than the SPL predicted. EPA Noise Control Guidelines (publication 1254) assessment criteria are based on the average ($L_{Aeq}$) noise level, not the maximum noise level ($L_{Amax}$).

*Peer Review* *The recommendations in Table 12 for "safe working distances" from construction equipment are considered reasonable.*

Response Observation.

*Peer Review* *With respect to blasting, and again without commenting on criteria, given the distance between the rail corridor and residences in Wyndham Vale I would be surprised if standard blast methods could achieve the criteria in Table 3 at all residences while still providing the required fragmentation. Some mention should be made of possible alternative methods such as PCF, or else treatment of residences or relocation of residents, should standard blast design not be acceptable. The use of small trial blasts to determine a local site law before proceeding with large-scale blasting should also be required.*

Response Independent blast experts retained for the project have developed concept blast designs, and have indicated that it is expected that the noise and vibration criteria are likely to be achievable while still providing the required fragmentation.

# 3 Response to Final Review (November 2010)

## 3.1 Ambient Noise Measurements

*Peer Review* *We remain of the view that assessment and reporting of the ambient noise levels should be performed somewhat more rigorously that is the case in the final report, in particular with respect to removal of data recorded under adverse meteorological conditions. If, as noted in the response to our original comments, "the main purpose of the measurements is to document baseline noise levels, against which future construction and operational noise level can be compared" then in that comparison a 1dB error in the ambient noise level is as important as a 1dB error in the source noise level.*

Response Potentially adverse weather data has not been used to flag or mark the noise measurement data in the NIMR as noted in Section 2.1. Meteorological data for the measurement period, is sometimes sourced from the nearest BOM weather station (Laverton). However there remains a concern that it may not be 'representative' of the local conditions, so it has not been applied in this instance.

## 3.2 Operational Railway Noise Predictions

*Peer Review* *The erroneous source level used for wagons in the Phase 1 results would result in a small under-prediction of total LAeq noise levels. This may not have an important impact on the results, but should be rectified in any further modelling.*

Response A review of the use of SEL as $L_{Aeq}$ source noise levels for locomotive wagons showed a negligible difference in overall predicted noise level. Updated modelling has not been undertaken for Section 2, however, the source levels for the modelling have been for Section 1. The use of SEL source levels does not affect the Phase 4 calculations in any case, since there are no locomotives or wagons in the 2030 fleet mix.

## 3.3 Construction Noise and Vibration

*Peer Review* *The updated report still contains no indication of short-term construction noise levels occurring during construction of the track. As indicated in my original comments, this does not need to be done through contours – a statement (accompanied by a table) of typical noise levels at various distances, and an indication of the duration of the noise, would provide warning that residents along the proposed route can expect to hear construction noise at some stage during the works.*

Response It is quite difficult to provide a description of the construction noise which accurately reflects the likely 'short-term' outcomes, without being overly conservative. This is particularly so, since the future construction methodology, equipment and detailed programme is yet to be determined, since it will depend, to some extent, on the selected contractor.

The current description of potential construction noise impacts provides a reasonably transparent and understandable description of the likely construction noise impacts will be experienced. It is important to realise that there are no noise limits for short-term construction works, carried out in 'normal working hours' in Victoria.