Mordialloc Bypass EES
Noise and Vibration Assessment

Mike Dowsett
WSP Acoustics

Mike Dowsett

- Technical Director at WSP
- Part of the Specialists management and leadership team
- 29 years of experience working in acoustics
- Worked on thousands of projects throughout career across a range of industry sectors including environmental and transport
- Managed an international office, spending four years as South East Asia regional manager
- 20 years of business management experience and 9 years as a board director
Work conducted to date

- Develop assessment methodology, taking into account relevant policies, standards and guidelines as per the EES Scoping Requirements
- Develop noise and vibration criteria
- Establish existing noise environment via noise monitoring
- Model future traffic noise levels (2031)
- Develop noise mitigation options
- Prepare noise and vibration impact assessment
- Develop Environmental Performance Requirements
- Conduct further work in response to submissions and queries raised
Study area and receivers

Receiver zones in the vicinity of the Freeway include:
- Residential
- Industrial
- Parkland
- Wetlands
Noise monitoring: 5 residential locations in Zone 1

Noise monitoring: 2 residential locations & 5 open-space locations in Zone 2
Noise monitoring: 6 residential locations in Zone 3

Noise monitoring example
Noise Policies and Guidelines

Construction Noise and Vibration
• EPA Noise Guidelines (Publication 1254)

Operational Noise
• VicRoads Traffic Noise Reduction Policy 2005

Conclusions – Construction phase

– Construction noise and vibration targets have been established in accordance with EPA, VicRoads, Australian and international standards
– Preliminary construction noise predictions indicate that the construction activities are likely to have adverse impacts if they are carried out without any noise mitigation or management measures
– General noise control measures have been recommended to reduce the construction risks to a low rating, including EPR NV2, which requires development of a Construction Noise and Vibration Management Plan (CNVMP) to manage construction noise and vibration impacts
– Construction noise and vibration modelling will be required once a Contractor has been appointed
Project Objective Noise Levels (PONLs) from EPRs

<table>
<thead>
<tr>
<th>NV1</th>
<th>Noise and vibration (design)</th>
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<tbody>
<tr>
<td></td>
<td>Noise and vibration impacts on residents during operation must be minimised by the inclusion of appropriate noise attenuation measures and road surface specifications in the design. Road traffic noise emissions must comply with the Project Objective Noise Levels:</td>
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<tr>
<td></td>
<td>• 63dBA L_{A,20y} for the new bypass, and</td>
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<tr>
<td></td>
<td>• 68dBA L_{A,20y} for the Mornington Peninsula Freeway works</td>
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<td>• For noise-sensitive receivers as defined in the VicRoads Traffic Noise Reduction Policy.</td>
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</table>

**BUILDING TYPES**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Category A</td>
<td>Residential dwellings, aged persons homes, hospitals, motels, caravan parks and other buildings of a residential nature</td>
</tr>
<tr>
<td>Category B</td>
<td>Schools, kindergartens, libraries and other noise-sensitive community buildings</td>
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Note that parks, wetlands, commercial buildings and industrial buildings do not have traffic noise levels nominated for compliance

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**Noise modelling: CoRTN**

- Future Traffic Volumes
- Percentage HV
- Speed
- Surface type

**CoRTN 1988**

Noise Level L_{10,18H} dBA

The CoRTN method is accepted by MRPV and VicRoads as a suitable traffic noise assessment tool, and is a conservative modelling technique
Noise modelling: SoundPlan

SoundPlan is accepted by MRPV and VicRoads as a suitable traffic noise assessment tool.

Noise mitigation by road surface treatment

- Open Graded Asphalt (OGA) is proposed for all pavement types on the Mordialloc Bypass, including the new ramps.
- The surface correction adopted is in accordance with VicRoads Road Design Note RDN 06-01.
- OGA pavement road surface correction = -3dBA.
- Low-noise pavement types such as OGA may degrade over time, so must be well maintained to not compromise acoustic performance.
Noise barriers to residential areas

Example showing height and extent of noise barriers

Multi-function fauna barrier

2-3m high in some parkland & wetland areas

Example of Multifunction Fauna Barrier (MFB), fauna fencing and noise barriers in parkland / wetland area
Conclusions – Operational noise

- Traffic noise levels have been predicted for the design year 2031
- Predictions indicate that noise levels are likely to exceed the Project objectives unless noise mitigation measures are included
- Project Objective Noise levels (PONLs) apply in accordance with EPR NV1 and the VicRoads Traffic Noise Reduction Policy (TNRP)
- Noise barriers have been designed to achieve the PONLs at all areas, with heights up to 6m
- The assessment indicates that the road design can achieve the PONLs through implementation of OGA and noise barriers along the alignment
- Operational noise and vibration risks are reduced to a low rating with the application of EPR NV1
Further work – noise to wetlands

- There is no policy or standard in Victoria regulating noise to wetlands or acoustic requirements that must be achieved.
- Noise to wetlands is covered in Chapter 10 – Biodiversity and Appendix C – Flora and Fauna Impact Assessment of the EES.
- The Biodiversity report rates Operational noise risk as Medium regarding effects on threatened fauna species, once the multi-function fauna barrier is included.
- The Biodiversity report rates the overall residual impact on affected bird species as Minor.
- The Flora and Fauna Impact Assessment suggests an operational noise impact threshold of 60dBA $L_{10,18hr}$ regarding effects of noise on birds.
Further work – Noise to wetlands (continued)

- The California Department of Transportation published a report in June 2016 titled *Technical Guidance for Assessment and Mitigation of the Effects of Traffic Noise and Road Construction Noise on Birds*.

- The Caltrans Study notes that the peak hearing sensitivity of birds is in a region of the frequency spectrum where traffic noise is typically lower than at other parts of the frequency spectrum.

- Indications are that the hearing of birds is less sensitive than humans to typical traffic noise spectra.

- The Caltrans Study shows typical traffic noise spectra peaking at 1kHz, with significantly lower acoustic energy in the region of maximum bird hearing sensitivity in the range 2-4 kHz.

To assess the impact of traffic and construction noise on birds, the Caltrans Study utilises an approach based on four different zones, each with different noise levels and impacts.

Figure 5: Effects of Highway Noise on Birds

Categories of highway noise effects on birds with distance from the source. Zone 1 is closest to the source while Zone 4 is furthest away. Sound level decreases further from the source. See text for discussion.
Further work – Noise to wetlands (continued)

Operational
- Predictions of traffic noise indicate that there are no risks of Zone 1 (hearing damage) or Zone 2 (temporary threshold shift) occurrence
- Some of the wetland areas are predicted to be exposed to traffic noise levels above the indicated Zone 3 (masking) threshold of 60dBA

Construction
- Predictions of construction noise indicate that there are no risks of Zone 1 (hearing damage) or Zone 2 (temporary threshold shift) occurrence, provided that birds are at least 20m away from the construction site
- Some masking may occur due to construction noise, which is predicted to be above 60dBA in some wetland areas, noting that the Caltrans Study indicates that birds are less sensitive to construction noise than to traffic noise

Further work – Noise to parklands
- The noise assessment for the Project was conducted in accordance with the VicRoads TNRP, under which parkland is not considered a sensitive receiver and is therefore not covered for traffic noise mitigation treatment under the Policy
- This is consistent with precedents long-established in Victoria, where recreational open space is typically not provided with traffic noise control measures
- Whilst not a requirement under the VicRoads TNRP, it is noted that 30 of the 34 additional receivers studied in Braeside Park are predicted to experience traffic noise levels of 63dBA L_{10,18hr} or below, which is the VicRoads TNRP requirement for residential receivers
Further work – noise to wetlands and parklands

Predicted 60dBA traffic noise contour in parkland and wetland zones, with a 2m high multifunction barrier

Submissions relating to noise

Key issues identified

1. Noise to residential areas
2. Noise to wetlands
3. Noise to parklands
4. Noise to industrial/commercial properties
5. Concerns relating to effectiveness of traffic noise barriers
6. Concern that the Project Objective Noise Levels (PONLs) are not consistent with the traffic noise criteria provided in the 2018 guidelines developed by the World Health Organization (WHO)
Response to submissions – Noise to residential

Residential areas affected by the Project will be protected against traffic noise impact by the provision of mitigation measures as required to achieve the PONLs.

The reference design includes noise mitigation treatment to protect residential areas as follows:

– Low-noise Open Graded Asphalt (OGA) to all new road pavements on the proposed freeway and ramps
– Road traffic noise barriers up to 6m in height

The successful contractor would be required to design and construct the road to achieve compliance with the PONLs nominated in the VicRoads TNRP.

Response to submissions – Noise to industry

– Industrial and commercial properties are not considered sensitive receivers under the VicRoads TNRP and are therefore not covered for traffic noise mitigation treatment.
– This is consistent with precedents long-established in Victoria, where industrial and commercial properties are not provided with traffic noise control measures.
Response to submissions – Barrier effectiveness

- The barriers must achieve the required PONLs nominated in EPR NV1 – Noise and vibration (design)
- The noise mitigation treatment must be tested for performance and compliance with the PONLs as required by EPR NV3 – Traffic noise verification

Response to submissions – WHO Guidelines

- In 2018, the World Health Organization (WHO) Regional Office for Europe published the Environmental Noise Guidelines for the European Region
- The WHO Guidelines recommend noise criteria for a range of environmental noise sources, including traffic noise
- The WHO Guidelines are not applicable to this Project
- This Project is being assessed in accordance with current policy applicable in Victoria, i.e. the VicRoads TNRP, which came into effect in 2005 and has been used extensively for the assessment of traffic noise from road projects
- I am not aware of any proposal for the 2018 WHO Guidelines to be incorporated into any noise legislation or guidelines in Victoria
Response to submissions – WHO Guidelines (cont’d)

- The traffic noise limits recommended in the WHO Guidelines are much more stringent than the VicRoads TNRP
- WHO recommended traffic noise limits are approximately 13dBA lower than current policy, being approximately 50dBA $L_{10,18hr}$ for residential properties affected by new roads
- This would effectively mean that for all the residential receivers, the future traffic noise level would need to be similar to, or quieter than, the existing noise levels
- It is relevant to note that the existing noise levels throughout much of Braeside Park are higher than the WHO recommended traffic noise level

Response to submissions – Parks Victoria office

- The reference design includes a multi-function fauna barrier from Governor Road to north of the Parks Victoria office, with a height in the range 2-3m
- The multi-function fauna barrier will be of solid construction that will attenuate traffic noise to the Parks Victoria office and immediate surroundings
- Traffic noise predictions show that the predicted traffic noise level outside in the vicinity of the Parks Victoria office is 63dBA $L_{10,18hr}$
- Although not a sensitive receiver, this is consistent with the PONLs applicable to residential receivers
Response to Evidence statement – Clarity Acoustics

PONLs (no more than +12dB increase)

Ross Leo recommends the PONL for residential receivers with an existing noise level of 50dBA $L_{10,18hr}$ or less should be limited to no more than +12dB, which is noted in the VicRoads TNRP as a consideration.

Response

– Application of the +12dB approach was considered by MRPV in developing the PONLs, and it was determined not to apply that requirement for the following reasons:
  • Targets established on previous freeways and arterial roads projects completed in the Greater Melbourne region
  • Consideration to the level of acoustic improvement that is likely to be achieved with the adoption of this criterion

PONLs (no more than +12dB increase) – continued

• Potential costs, visual and aesthetic impacts to the Project and surrounding environment with the adoption of this criteria based on indicative noise barrier heights and extents required
• There are particular concerns associated with the visual impact of high noise barriers, with the change in barrier height required in some areas being as high as 4.5m (7.5m high for +12dB target vs. 3m high for 63dBA target)

I consider the approach in the reference design to be appropriate and consistent with previous projects.
Response to Evidence statement – Clarity Acoustics

Traffic noise in recreational areas
Ross Leo recommends traffic noise limits in recreational areas, referencing the West Gate Tunnel Project IAC Report.

Response
- The applicable policy (VicRoads TNRP) does not provide traffic noise mitigation for recreational areas
- Traffic noise limits in recreational areas were not adopted for the WGTP, although traffic noise barriers were nominated in some areas in order to control noise levels in open spaces
- Some traffic noise protection is provided for Braeside Park with the inclusion of the multi-function fauna barrier
- Traffic noise levels in large areas of Braeside Park are predicted to comply with the $L_{10,18hr}$ noise limits proposed by Ross Leo

Response to Evidence statement – Clarity Acoustics

Limits on construction noise and vibration
Ross Leo recommends construction noise limits at sensitive receivers and in recreational areas.

Response
- The Noise and Vibration Impact Assessment and EPR NV2 both reference relevant guidance documents for managing the impact of construction noise (EPA Publications 1254 and 480) and construction vibration (BS 6472 and DIN 4150)
- EPR NV2 states that a Construction Noise and Vibration Management Plan (CNVMP) must be prepared in consultation with EPA Victoria
### Response to Evidence statement – Clarity Acoustics

**Limits on construction noise and vibration - continued**

- I consider that these reference documents and the consultation with EPA Victoria impose appropriate requirements on the contractor to control noise and vibration impact during construction.
- Largely similar outcomes to the specific EPRs proposed by Ross Leo can be achieved by the EPRs as currently documented (aside from construction noise to recreational areas, which are not covered by EPA 1254).

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### Response to Evidence statement – Clarity Acoustics

**Receiver height**

Ross Leo recommends that traffic noise limits at sensitive receivers should apply at all levels of the building, i.e. not only at ground level, referencing the West Gate Tunnel Project IAC Report.

**Response**

- Consistent with VicRoads guidance, the traffic noise modelling has been conducted at 1.5m above ground level, and does not consider upper levels of noise sensitive buildings of multiple storey construction.
- Note that traffic noise limits on the West Gate Tunnel Project apply at the lowest habitable level of noise sensitive buildings, not upper levels.
The EPRs relating to noise and vibration are consistent with other similar projects and are **appropriate** and **adequate** for the Project. It is recommended that NV1 should be modified to reflect that the design year 2031 shall be utilised for the purposes of conducting traffic noise modelling for the Project.