**Before a Panel Appointed by the**

**Dunedin City Council**

**In the Matter of** the Resource Management Act 1991 (**RMA**)

**And**

**In the Matter of** Proposed Variation 2 of the Second Generation Dunedin District Plan – Appeals Version (**2GP**)

# Brief of Evidence of **Brendon Shanks** on behalf of Dunedin City Baptist Church

(Submission 239 – GF08)

Dated 5th August 2022

***Brief of Evidence of Brendon John Shanks***

1. My full name is Brendon John Shanks. I am a Senior Consultant at Marshall Day Acoustics based in Dunedin, though operating throughout New Zealand.

2. I hold the degrees of Bachelor of Science and Bachelor of Music from the University of Otago. I am a member of the Acoustical Society of New Zealand and the Institute of Acoustics (UK). I have 14 years' experience, specialising in acoustics. Throughout this time, I have worked on environmental noise and building projects in New Zealand and the UK.

3. Although not necessary in respect of council hearings, I can confirm I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note dated 1 December 2014 and agree to comply with it. I agree to comply with it while giving oral evidence before the hearing panel.

4. I have prepared a noise assessment report in relation to this matter which I attach as Appendix 1. Except where I state that I am relying on the evidence of another person, this assessment report is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

Date: 5 August 2022

Brendon Shanks

**Appendix 1: Noise Assessment Report.**

MARSHALL DAY Acoustics

# 19 MAIN SOUTH ROAD, CONCORD
# PROPOSED PLAN CHANGE – NOISE ASSESSMENT

Rp 001 20220708 | 3 August 2022

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Project: **19 MAIN SOUTH ROAD, CONCORD – PLAN CHANGE**

Prepared for: **Dunedin City Baptist Church**
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Report No.: **Rp 001 20220708**



## Document Control

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## 1.0 SUMMARY

The Dunedin City Baptist Church proposes to rezone the site at 19 Main South Road, Concord, from 'Hill Slopes Rural' to 'General Residential 2' in the Dunedin City Council Second Generation District Plan (2GP). This would allow future subdivision of the site and development of residential buildings.

The site is located adjacent to State Highway 1 (SH1). We have assessed the road traffic noise received across the site to determine the suitability for residential development and provide controls to manage reverse sensitivity effects.

Figure 1 shows the location of the site and the surrounding roads.

**Figure 1: Site location**


Our assessment shows that areas of the site that are far enough away from SH1 may be developed without any specific noise controls. In other areas, development would be acceptable provided the construction of dwellings controls noise to provide a suitable internal noise environment. Noise levels in parts of the site that are close to SH1 would be inappropriate for residential development due to the elevated traffic noise levels.

A noise barrier along the motorway could mitigate traffic noise and reduce the area of the site where no residential development or controls would be required.

We consider that rezoning the site to 'Residential' would be acceptable, provided no development occurs within the high noise "Buffer area" and development in the "Effects area" achieves suitable internal noise levels. A detailed assessment of a proposed subdivision would be required at resource consent stage to refine where specific controls should be applied.

## 2.0 NOISE AND VIBRATION GUIDANCE AND CONTROLS

There are several guidelines and controls that are relevant to the proposed rezoning of this site.

### 2.1 The 2GP includes façade sound insulation requirements near a State Highway

The 2GP (rule 9.3.1) requires that dwellings constructed within 40m of a State Highway are designed to provide a set sound insulation performance for the building façade. The façade must be designed to achieve a minimum of $D_{nT,w} + C_{tr} > 30$. This includes consideration of walls, doors, glazing, and roof construction.

All doors and windows must be closed to achieve the required sound insulation performance. Therefore, any dwellings within this zone would need to include mechanical ventilation to provide fresh air. The 2GP includes details on the level of ventilation that is required (Rule 9.3.1-5).

The façade performance from this rule will typically provide suitable internal noise levels consistent with the levels required in Section 2.2.1.

The 2GP façade design requirement is independent of the traffic noise level at the dwelling. Therefore, mitigation measures, such as a noise barrier will not remove this requirement.

### 2.2 Waka Kotahi has guidance to manage reverse sensitivity effects

Waka Kotahi have developed a guidance document to help manage the effects on noise sensitive land near a State Highway (*Guide to the management of effects on noise sensitive land use near to the state highway network*) (Guide) and protect the road network against potential reverse sensitivity effects.

Reverse sensitivity can occur when a sensitive activity is introduced close on an existing noisy activity. In this case, the existing activity is SH1 and the new residential land is a potential new sensitive receiver. Reverse sensitivity refers to the susceptibility of the noise source to complaint from the new land use, e.g. residents complaining about traffic noise, which in turn may lead to restrictions being placed on the original noise source.

#### 2.2.1 The Guide defines “Buffer” and “Effects” areas

The Guide introduces the idea of “Buffer area” and “Effects area”. The intention is that there should be no sensitive activity within the Buffer area and suitable controls on any sensitive activity in the effects area.

These areas should be defined in terms of the following noise levels:

- Buffer area — Traffic noise level greater than 64 dB $L_{Aeq\,(24\,hour)}$
- Effects area — Traffic noise level between 55 dB $L_{Aeq\,(24\,hour)}$ and 64 dB $L_{Aeq\,(24\,hour)}$

We note that the Waka Kotahi Guide uses 57 dB $L_{Aeq\,(24\,hour)}$ as the on-set of the Effects area. We support using 55 dB $L_{Aeq\,(24\,hour)}$ to ensure that buildings without façade controls can achieve 40 dB $L_{Aeq\,(24\,hour)}$ inside (assuming a 15 decibel reduction through an open window).

The Waka Kotahi performance standards state that, in rural areas, no sensitive activity should be located inside a Buffer area, providing setback from State Highways.

In the Effects area, buildings containing new noise sensitive activities may be allowed, but need to be designed and constructed to achieve reasonable indoor acoustic amenity. The guidance recommends a maximum internal noise level of 40 dB $L_{Aeq\,(24\,hour)}$ in living spaces and sleeping areas.

#### 2.2.2 Vibration will be acceptable provided road surface is well maintained

The Waka Kotahi Guide also contains comments on traffic vibration levels.

Based on the predicted Buffer area (where development would not take place) vibration from SH1 will be acceptable, provided the road surface is well maintained (as it is currently). Maintenance of

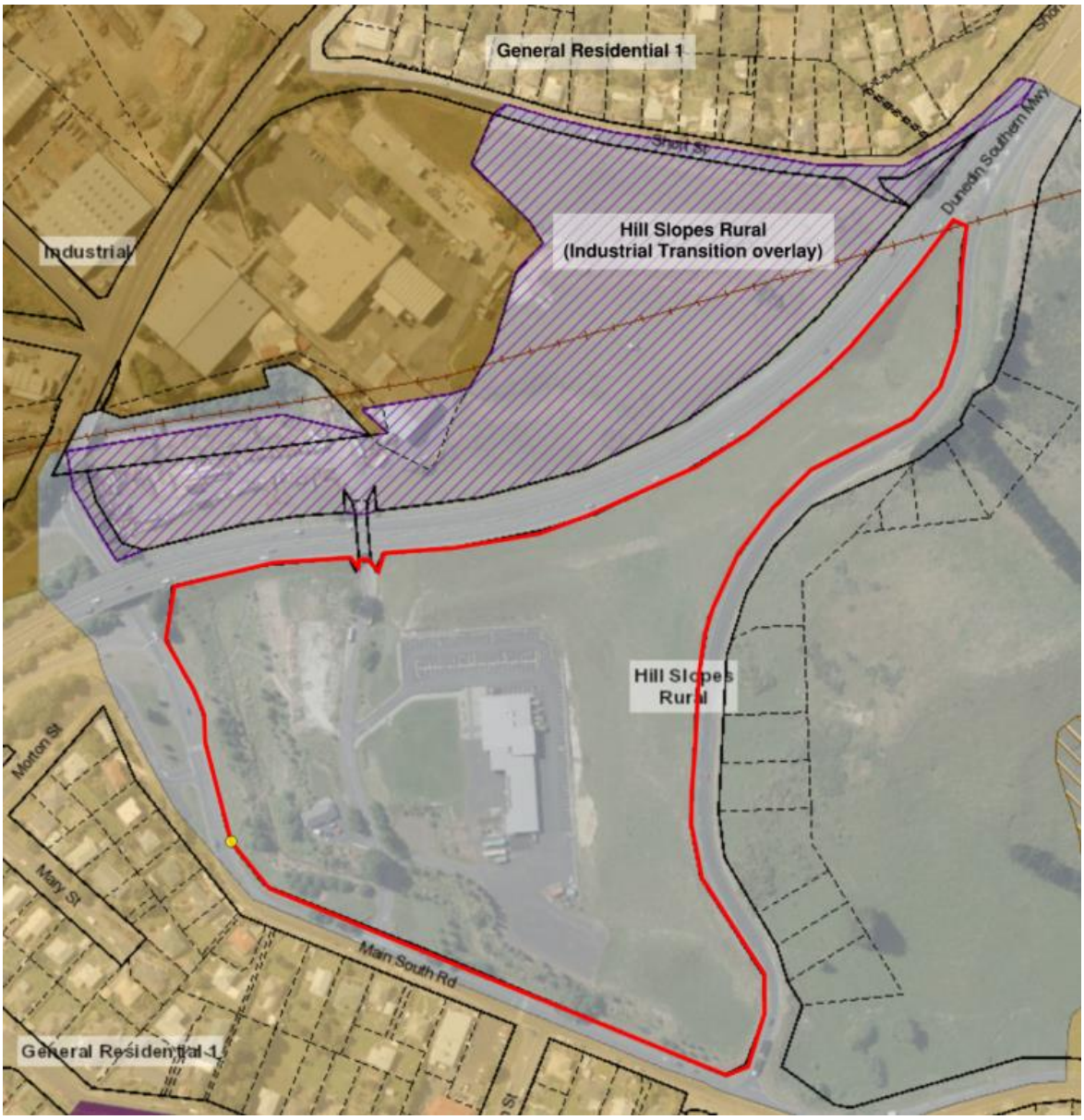
the road surface is the responsibility of Waka Kotahi. Therefore, it is not appropriate to impose unreasonable restrictions on the landowner on the basis of poorly maintained roads.

We consider that traffic vibration will be well controlled by Waka Kotahi's ongoing maintenance of SH1 and the separation distance of potential new dwellings and the traffic lanes.

## 2.3 Noise from nearby sites

The site on the opposite side of SH1 are zoned 'Rural Hill Slopes' with an "Industrial Transition" overlay, as shown in Figure 1. Beyond that the sites are zoned 'Industrial' or 'General Residential 1'.

**Figure 2: 2GP Zones**




Noise from the existing Industrial zoned site is currently constrained by the boundary with the Hill Slopes Rural site to the north of SH1. Assuming compliance with the noise limits at that boundary, the noise levels at the proposed residential site will be significantly less than the road traffic noise level.

The Industrial Transition overlay indicates land that has been identified as potential future industrial use. While proposed residential plan change would bring potential development closer to this

overlay, this site is not currently zoned as an industrial site. Therefore, this does not constitute a reverse sensitivity effect.

Noise from sites to the north of SH1 will be mitigated by the requirement for a set back from the edge of SH1 due to traffic noise. In addition, dwellings will be constructed to provide protection against road traffic noise. This will also offer protection against future industrial noise sources.

## 3.0 PREDICTED NOISE LEVELS

We have predicted the traffic noise level from SH1 and surrounding roads using 3D noise modelling software (SoundPLAN). This has identified indicative areas where residential development should be avoided or where building façade controls would apply.

### 3.1 Noise modelling inputs

We have used the following inputs for the noise modelling.

#### 3.1.1 Road data

Road data has been taken from the 'mobileroad.org' website.

**Table 1: Road noise model inputs**

| Road section | Surface | Annual Daily Traffic | % Heavy vehicles |
|---|---|---|---|
| SH1 Northbound | PA10 30mm | 13,489 | 5% |
| SH1 Southbound | PA10 30mm | 13,202 | 5% |
| Main South Road Off ramp | Chip Grade 4/6 | 1,200 | 7.6% |
| Main South Road | Chip Grade 3/5 | 6,700 | 2.7% |

#### 3.1.2 Safety barriers

A concrete safety barrier is included on SH1 between the northbound and southbound lanes. This has been assumed to be 0.8m high.

#### 3.1.3 Ground absorption

We have assumed "soft ground" for the site and "hard ground" for the road areas.

#### 3.1.4 Terrain data

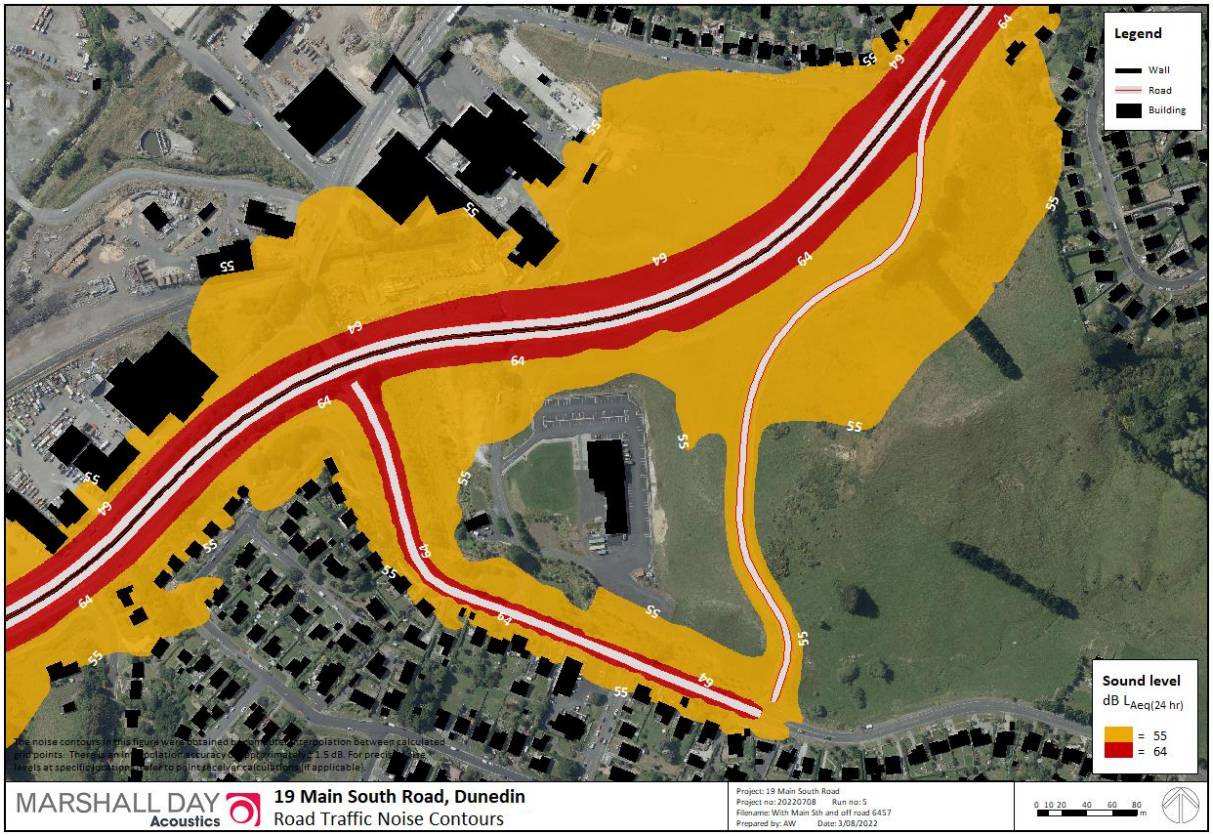
The terrain data used is a combination of 8m grid point data from the LINZ website and earthworks contours for the area around the existing church building (provided by Craig Horne Surveyors Ltd). The terrain data forms the basis of the road gradient which is predicted by SoundPLAN.

### 3.2 Noise contours show the "Buffer" and "Effects" areas

We have generated noise contours at a height of 1.5m above ground across the site to indicate where the noise level is predicted to be 55 dB $L_{Aeq\ (24\ hour)}$ and 64 dB $L_{Aeq\ (24\ hour)}$. Figure 3 overleaf indicates where the "Buffer" and "Effects" areas are. These areas have been calculated without a noise barrier along the edge of SH1. Inclusion of a suitable barrier would reduce the Buffer and Effects areas.

The figures we have generated are intended to be indicative only. The terrain data used in the model is relatively coarse and the contours are at a height of 1.5m above the ground level. The noise level may change for receiver locations further above ground (e.g. for future double storey dwellings).

**Figure 3: Predicted Buffer and Effects areas**




## 4.0 RECOMMENDED CONTROLS

We recommend the following controls be applied to any Residential Plan Change on the site to manage reverse sensitivity effects.

### 4.1 A detailed noise assessment shall be conducted for future subdivision

If the site is subdivided, a detailed noise assessment must be conducted as part of the subdivision resource consent. This would include updated noise modelling to determine the likely noise levels at the proposed residential sites. This should include the possibility of multi-storey dwellings i.e. noise levels predicted at a height above ground that represents the façade of upper floors.

The predicted noise levels would be used to inform the potential façade controls required for each dwelling.

If a dwelling is constructed on the site prior to the site being subdivided, an assessment should be conducted for this individual dwelling.

### 4.2 Dwellings shall not be constructed in areas with noise levels above 64 dB $L_{Aeq\ (24\ hour)}$

We do not support any residential development where the external noise level exceeds 64 dB $L_{Aeq\ (24\ hour)}$. A buffer zone must be established between SH1 and any future dwellings.

### 4.3 Façade construction shall achieve a maximum internal noise level of 40 dB $L_{Aeq\ (24\ hour)}$

Based on the predicted noise levels in the detailed noise assessment conducted as part of the resource consent application for the subdivision, each dwelling should be designed and constructed to ensure that internal noise levels in living and sleeping areas do not exceed 40 dB $L_{Aeq\ (24\ hour)}$.

In addition, any dwellings within 40m of SH1 will need to comply with Rule 9.3.1 of the 2GP.

Where windows and doors are required to be closed to provide this internal noise level, suitable mechanical ventilation will be required.

Table 2 summarises the façade requirements.

**Table 2: Façade requirements**

| Dwelling location | Façade requirements |
|---|---|
| Within 40m of SH1 – Detailed assessment shows external noise level no greater than 64 dB $L_{Aeq\ (24\ hour)}$ | Compliance with 2GP rule 9.3.1<br>Maximum internal noise level of 40 dB $L_{Aeq\ (24\ hour)}$ in Living and Sleeping areas<br>Mechanical ventilation and cooling will be required |
| More than 40m from SH1 – Detailed assessment shows external noise level between 55 and 64 dB $L_{Aeq\ (24\ hour)}$ | Maximum internal noise level of 40 dB $L_{Aeq\ (24\ hour)}$ in Living and Sleeping areas<br>Mechanical ventilation and cooling will be required |
| More than 40m from SH1 – Detailed assessment shows external noise level less than 55 dB $L_{Aeq\ (24\ hour)}$ | No façade controls<br>No mechanical ventilation will be required |

## APPENDIX A GLOSSARY OF TERMINOLOGY

| | |
|---|---|
| **$L_{Aeq,24h}$** | The $L_{Aeq}$ sound level averaged over a 24-hour period from midnight to midnight. |
| **$D_{nT,w}$** | Weighted Standardised Level Difference. A single number rating of the sound level difference between two rooms.<br>$D_{nT,w}$ is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling |
| **$C_{tr}$** | A sound insulation adjustment, commonly used with the $R_w$ and $D_{nT,w}$ single number rating systems.<br>$C_{tr}$ adjusts for low frequency noise, like noise from traffic. $C_{tr}$ values typically range from about -4 to about -12. |
| **Sound insulation** | The ability of a material or construction to reduce sound travelling through it. |