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Acoustics



**OHINEWAI STRUCTURE PLAN**  
**PROPOSED RE-ZONING ACOUSTIC ASSESSMENT**

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**Project:** **AMBURY PROPERTIES LIMITED  
OHINEWAI STRUCTURE PLAN PROPOSED RE-ZONING ACOUSTIC  
ASSESSMENT**

**Prepared for:** **Ambury Properties Limited  
Private Bag 93315  
Otahuhu  
Auckland 1640**

**Attention:** **John Olliver and Sam Foster (c/- BBO)**

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## 1.0 INTRODUCTION

Marshall Day Acoustics has been engaged to provide advice on the acoustic matters relating to the Ambury Properties Limited submission on the Proposed Waikato District Plan. The submission seeks to rezone a 178 hectare site that is currently zoned *Rural*. It would apply a mix of zonings suitable for *Industrial, Business and Residential* use as well as an area of green/open space within the site.

This assessment provides an analysis of the noise effects that could potentially arise as a result of the proposed changes sought by the submission.

This report should be read in conjunction with the Section 32 report prepared by BBO.

## 2.0 SUMMARY OF LAND AND SURROUNDS

The site subject to the proposed Ohinewai Structure Plan and Re-Zoning is approximately 178ha in size and comprises the landholdings of 231 Tahuna Road, 52, 56 & 58 Lumsden Road, Ohinewai. Ohinewai is located in a strategic location within the 'Golden Triangle' and is approximately 85km south of Auckland and 40km north of Hamilton.

State Highway 1 (SH1) and the North Island Main Trunk railway are near to the site and adjacent to the closest receivers. There are two large sawmills located 2.5km to the north on Lumsden Road. Trucks from these mills travel past the site to access SH1.

The land is best described as alluvial plains, although the topography of the site and surrounds undulate somewhat, especially to the south and east. The Waikato River is located one kilometre to the west. The site is currently largely undeveloped and is operating as a dairy farm.

The nearest receivers are a group of eight dwellings located at 41 to 85 Lumsden Road, to the south-west of the site. These dwellings are between Lumsden Road and the Waikato Expressway and main trunk line. The main trunk line and expressway are adjacent to the western boundary of these dwellings.

The notified version of the Proposed District Plan includes the site in the Rural Zone. The Ambury Properties Limited submission seeks to apply a mix of zonings suitable for *Industrial, Business and Residential* use with allowance for an *Open Space* network on the periphery of these zones, which is identified in the proposed Ohinewai Structure Plan.

The following figures show information related to the site, surrounds, zoning and other planning matters.

Figure 1: Proposed Waikato District Council Zonings

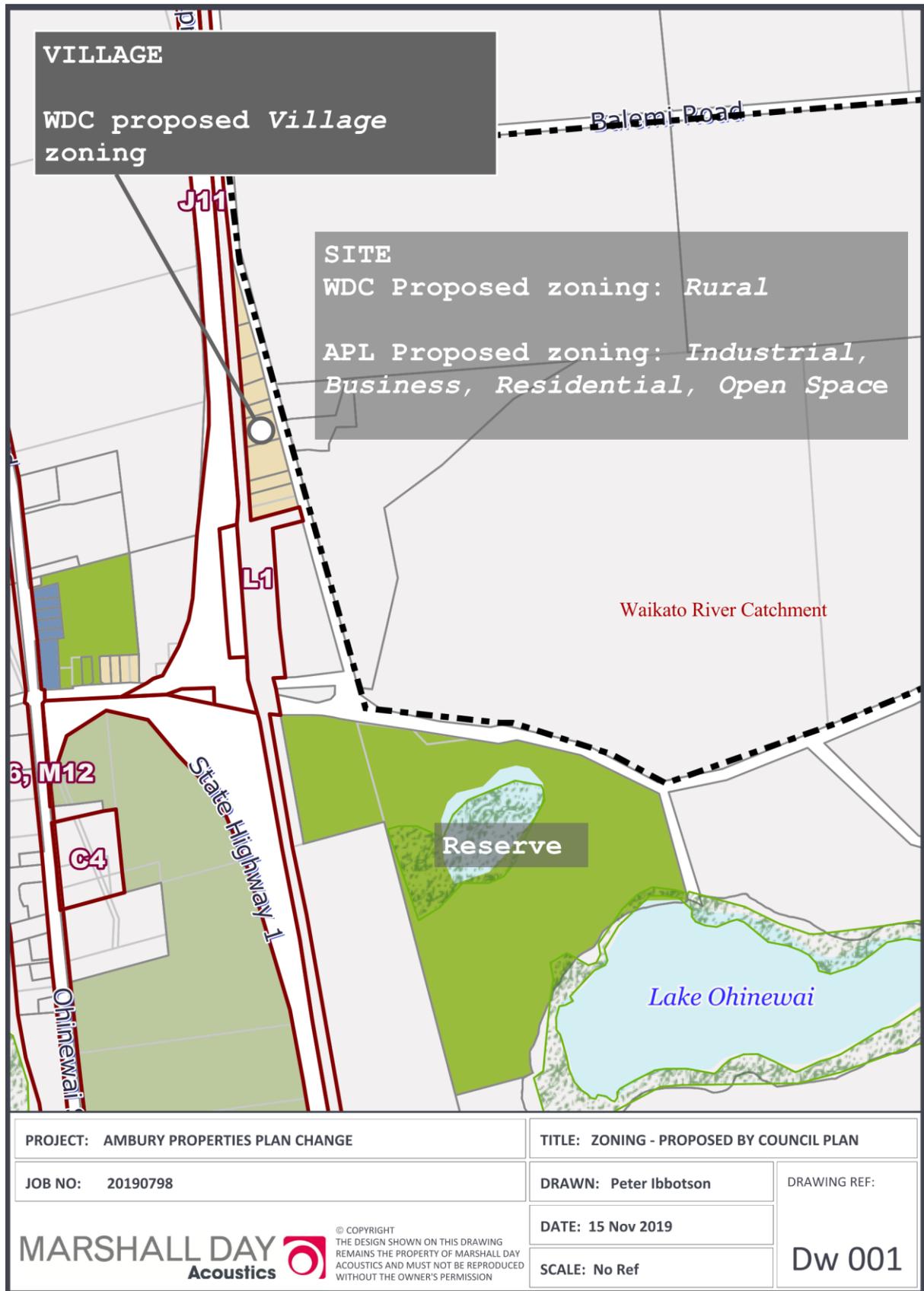


Figure 2: Site and Surrounds

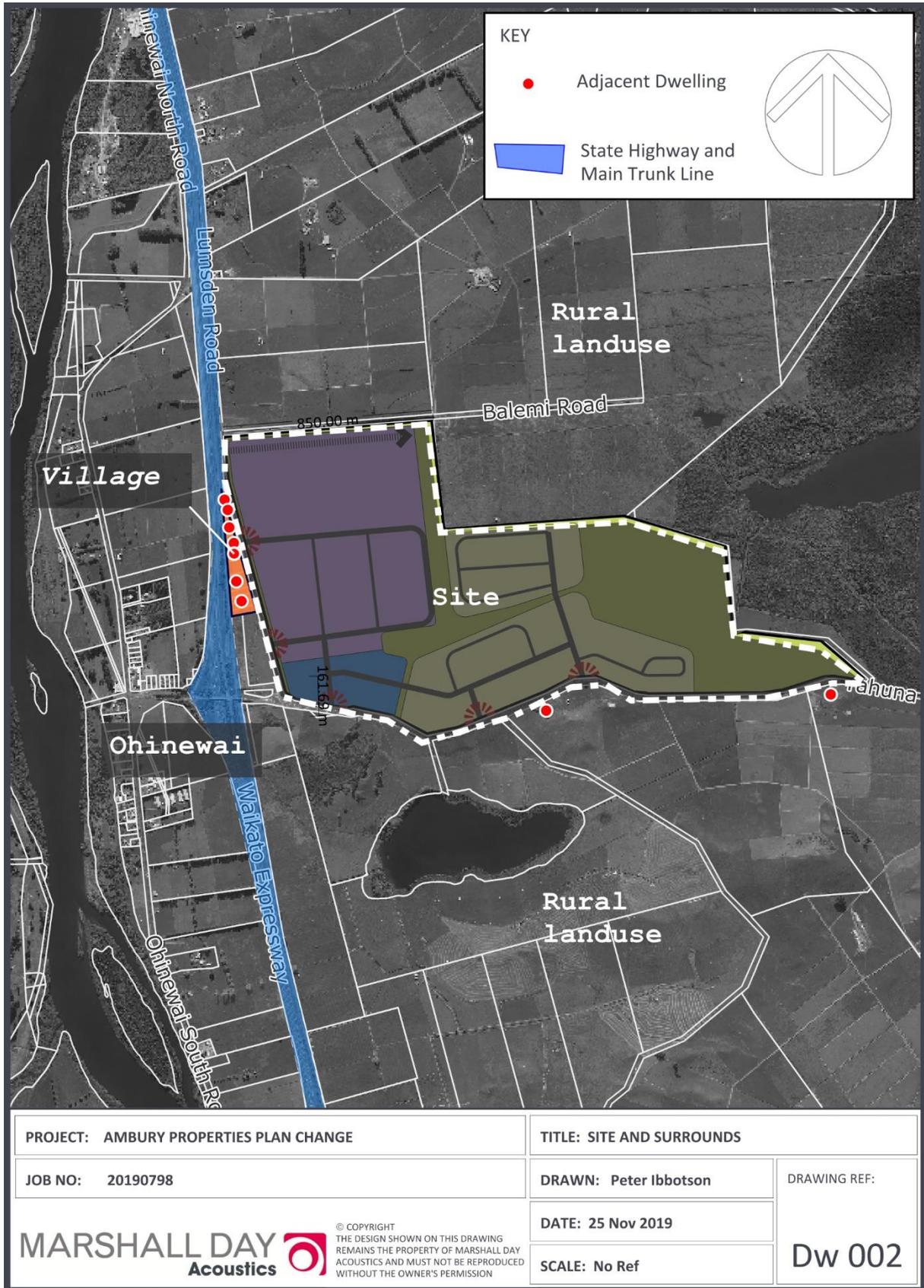


Figure 3: Illustrative Zoning

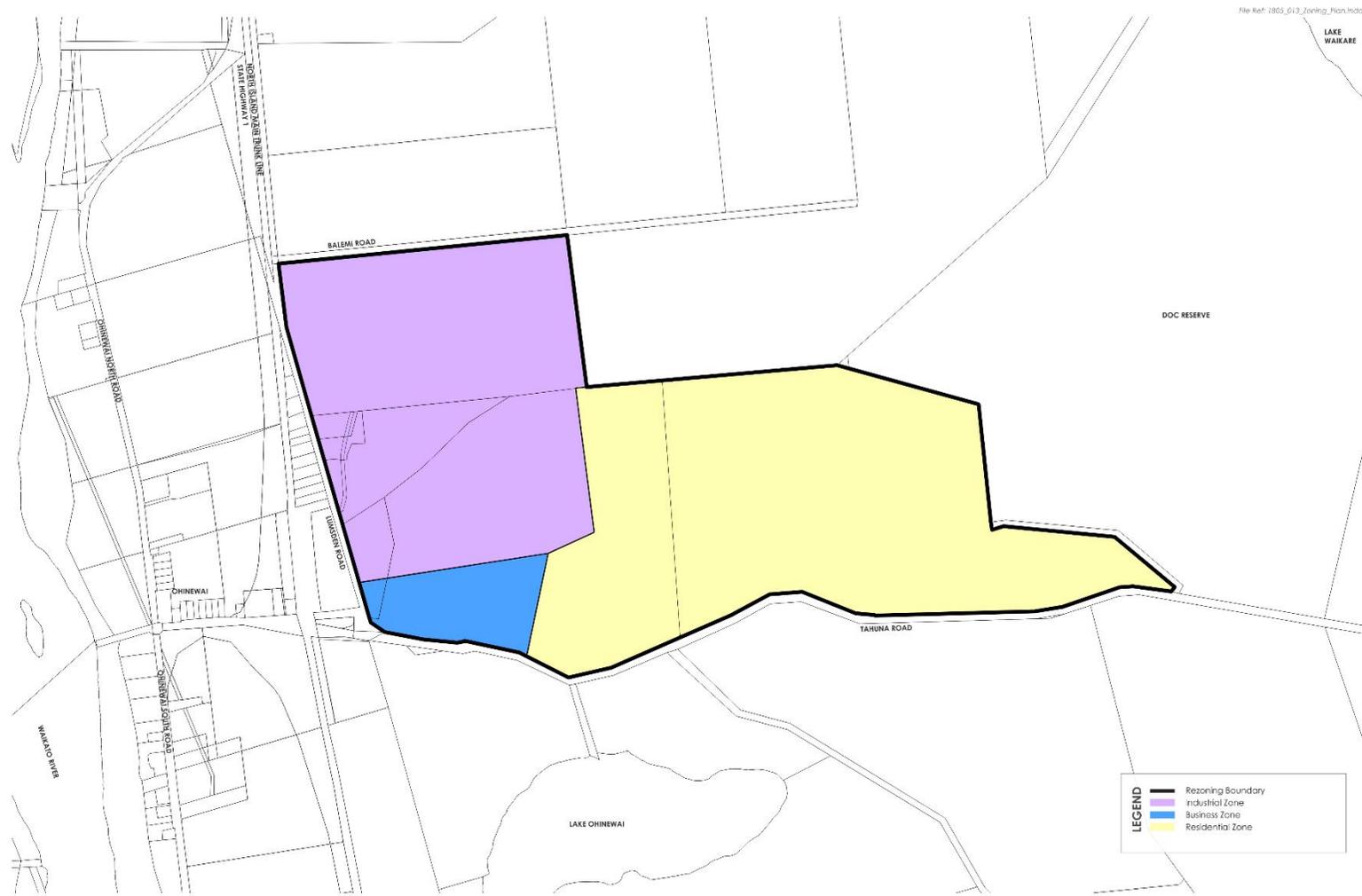


Figure 4: Structure Plan

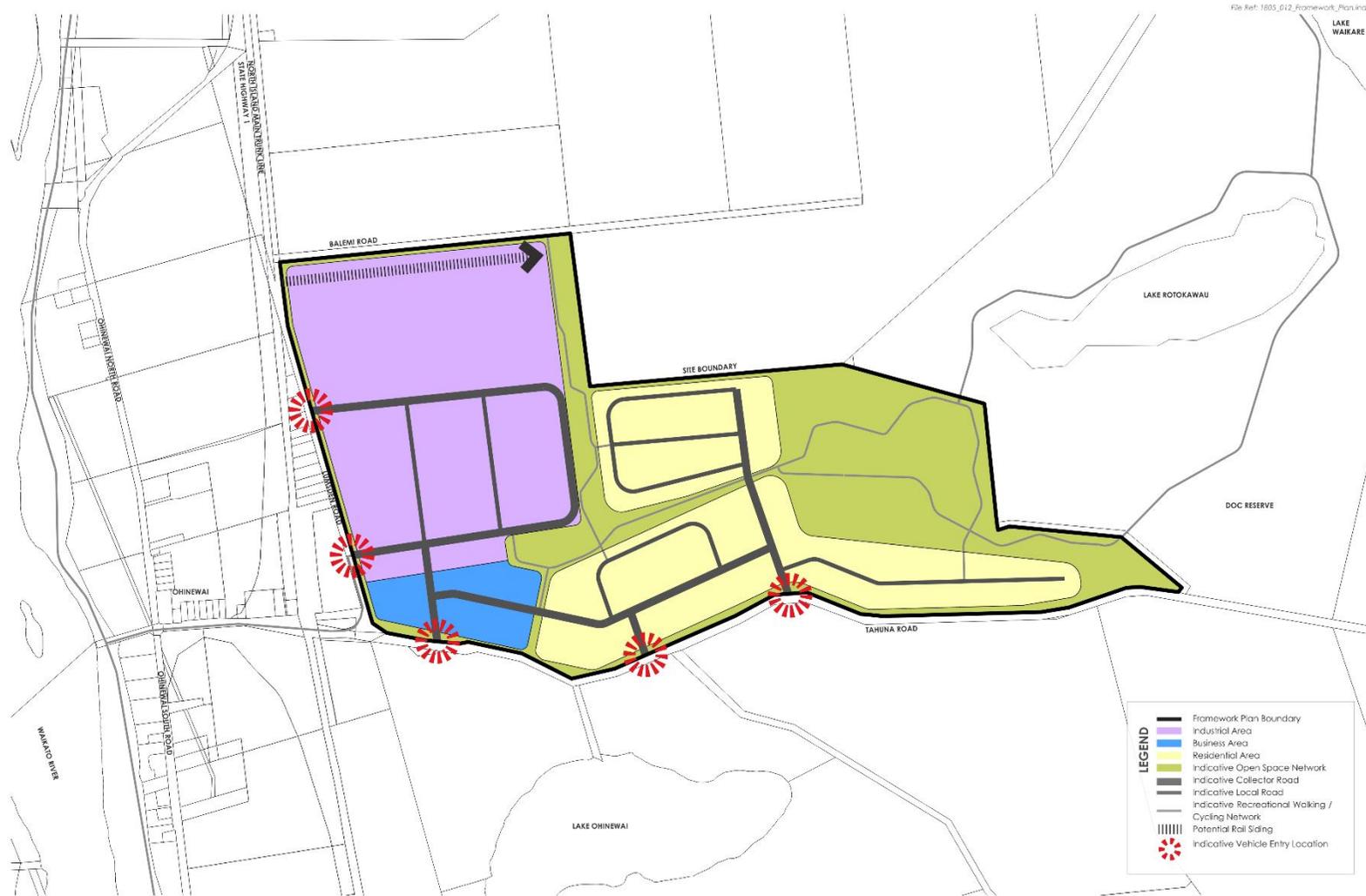


Figure 5: Illustrative Masterplan



### 3.0 DISTRICT PLAN RULES

The rezoning submission seeks to adopt the noise provisions from the Proposed Waikato District Plan with no change to the rules.

The relevant noise rules are presented in the following sections.

A discussion of the differences between the Operative and Proposed District Plan is included in Appendix B. In summary, the rules in the Proposed District Plan are consistent with the latest standards/guidance and are in line with most current district plans in New Zealand.

### 3.1 Proposed District Plan Noise Rules

#### 3.1.1 Industrial Zones

##### 20.2.3.1 Noise – General

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P1	Noise generated by emergency generators and emergency sirens.
P2	(a) Noise measured within any other site: (i) In an Industrial Zone must not exceed: a. 75dB (L <sub>Aeq</sub> ) 7am to 10pm; and b. 55dB (L <sub>Aeq</sub> ) and 85dB (L <sub>Amax</sub> ) 10pm to 7am the following day.
P3	(a) Noise measured within any site in any zone other, than the Industrial Zone and the Heavy Industrial Zone, must meet the permitted noise levels for that zone.
P4	(a) Noise levels must be measured in accordance with the requirements of <i>NZS 6801:2008 Acoustics - Measurement of Environmental Sound</i> . (b) Noise levels must be assessed in accordance with the requirements of <i>NZS 6802:2008 Acoustics - Environmental Noise</i> .
D2	Noise that does not comply with Rule 20.2.3.1 P2, P3 or P4.

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#### 3.1.2 Village Zones

##### 24.2.1 Noise - General

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P1	Noise generated by emergency generators and emergency sirens.
P2	(a) Noise measured within any other site in the Village Zone must not exceed: (i) 50dB (L <sub>Aeq</sub> ), 7am to 7pm, every day; (ii) 45dB (L <sub>Aeq</sub> ), 7pm to 10pm, every day; and (iii) 40dB (L <sub>Aeq</sub> ) and 65dB (L <sub>Amax</sub> ), 10pm to 7am the following day.
P3	(a) Noise levels must be measured in accordance with the requirements of <i>NZS 6801:2008 Acoustics - Measurement of Environmental Sound</i> . (b) Noise levels must be assessed in accordance with the requirements of <i>NZS 6802:2008 Acoustics - Environmental Noise</i> .
D1	Noise that does not comply with Rule 24.2.1 P1, P2 or P3.

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### 3.1.3 Rural Zones

#### 22.2.1.1 Noise - General

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P1	Farming noise, and noise generated by emergency generators and emergency sirens.
P2	<p>(a) Noise measured at the notional boundary on any other site in the Rural Zone must not exceed:</p> <p>(i) 50dB (L<sub>Aeq</sub>), 7am to 7pm, every day;</p> <p>(ii) 45dB (L<sub>Aeq</sub>), 7pm to 10pm, every day; and</p> <p>(iii) 40dB (L<sub>Aeq</sub>) and 65dB (L<sub>Amax</sub>), 10pm to 7am the following day.</p>
P3	(a) Noise measured within any site in any zone, other than the Rural Zone, must meet the permitted noise levels for that zone.
P4	<p>(a) Noise levels must be measured in accordance with the requirements of NZS 6801:2008 <i>Acoustics - Measurement of Environmental Sound</i>.</p> <p>(b) Noise levels must be assessed in accordance with the requirements of NZS 6802:2008 <i>Acoustics - Environmental Noise</i>.</p>
D1	Noise that does not comply with Rule 22.2.1.1 P1, P2, P3 or P4.

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### 3.2 Construction Noise Limits

The Proposed Plan refers to New Zealand Standard NZS 6803: 1999 “*Acoustics - Construction Noise*”, and the limits are in line with this standard.

### 4.0 EXISTING AMBIENT ENVIRONMENT

Marshall Day Acoustics visited the site on 1 and 23 August 2019 to identify the existing noise sources in the area and measure the ambient noise levels.

The site and closest sensitive receivers are located in a high ambient noise area. This is due to:

- The Waikato Expressway, which is approximately 35m from the proposed *Village* zone dwellings. The expressway is beyond a timber acoustic fence (illustrated on Figure 6). The fence provides some screening, but the expressway is still a significant noise source.
- The North Island Main Trunk railway, approximately 20m from the houses on Lumsden Road

Figure 6 shows the locations of the ambient measurements discussed in the following sections.

Figure 6: Map of ambient measurement locations



The following sections summarise the existing noise environment.

#### 4.1 Noise logger measurements showed consistently high noise levels over the survey period

A noise logger was deployed on the public land just north of 85 Lumsden Road (MP1 on Figure 6 above). The logger recorded the ambient levels continuously from 1 – 8 August 2019.

The measurement results are summarised in Table 1.

Periods with high wind speeds (>5m/s) and heavy rain (>6mm/hour) have been removed from the measurements.

**Table 1: Summary of logger measurements**

Period	Type	Measured levels (dB)			
		L <sub>Aeq</sub> (15min)	L <sub>A10</sub> (15min)	L <sub>A90</sub> (15min)	L <sub>Amax</sub> (15min)
Daytime (7am – 10pm)	Average	68	64	53	78
	Range	51 – 79	51 – 72	40 – 63	51 – 100
Night-time (10pm – 7am)	Average	67	61	43	76
	Range	51 – 78	55 – 71	27 – 58	62 – 98

#### 4.2 Attended measurements confirmed the dominant noise sources

Attended measurements were undertaken at the three locations shown on the map on Figure 6.

The measurement results are summarised in Table 2.

The weather was fine for the 1 August measurements and overcast with light winds for the 23 August measurements. Each measurement was 15 minutes in duration.

**Table 2: Summary of attended ambient measurements**

Position	Date, time	Measured levels (dB)				Dominant source
		L <sub>Aeq</sub>	L <sub>A10</sub>	L <sub>A90</sub>	L <sub>Amax</sub>	
MP1	1 August 2019, 1:45pm	71	67	55	91	SH1, train movement
MP2	1 August 2019, 2pm	58	60	54	67	SH1
MP3	23 August 2019, 10am	64	64	56	84	Trucks on Lumsden Road

#### 4.3 Existing ambient noise levels are already well above the proposed noise limits

The measurements carried out show that the ambient and background noise levels are very high in the proposed *Village* zone to the west of the Ambury Properties site. The level of **ambient** noise during the daytime averages 68 dB L<sub>Aeq</sub> which is 18 decibels higher than the District Plan daytime noise limit of 50 dB L<sub>Aeq</sub>. Subjectively, the existing traffic noise level is around “four times louder” than would be permitted to be generated from activity on the Ambury Properties site.

The daytime **background** noise level is also high, with an average measured level of 53 dB L<sub>A90</sub>. Attended measurements confirmed high background noise levels at the proposed *Village* zone of 55 to 56 dB L<sub>A90</sub>. The background noise level can be thought of as a measure of the “quietest period” in any measurement. As the background noise levels are already higher than the level of noise that would be permitted to be generated from activity on the Ambury Properties site, we consider that if activity complies with the proposed Waikato District Zone rules at the *Village* zone then noise will result in a negligible effect on the existing level of amenity.

The same is true during the night period: the existing night-time ambient noise levels average 67 dB L<sub>Aeq</sub> and the existing background noise levels average 43 dB L<sub>A90</sub>. Night-time activity on the Ambury Properties site that complies with the 40 dB L<sub>Aeq</sub> noise limit at the *Village* zone would result in a negligible effect on the level of amenity that currently exists.

The existing background and ambient noise levels would support noise limits that are appreciably higher than proposed by the Waikato District Council. However it is not sought to alter the proposed *Village* noise limits at this or any other *Village* zone in the District. If in the future an activity is proposed on the subject site that is likely to breach the proposed Waikato District Council noise limits it would be necessary to seek resource consent for that activity. The existing background and ambient noise levels would likely be a matter for consideration as part of that application.

Lastly, it is noted that the District Plan noise limits are at the lower range of noise limits that are normally applied to residential and rural areas throughout New Zealand. It is typical for noise limits in such areas around New Zealand to be between 50 to 55 dB L<sub>Aeq</sub> (daytime) and 40 to 45 dB L<sub>Aeq</sub> (night-time) to ensure an appropriate level of amenity is achieved, even in areas where ambient and background noise levels are much lower.

## 5.0 POTENTIAL SITE ACTIVITY AND COMPLIANCE WITH THE PROPOSED NOISE RULES

Noise from the potential *Industrial, Business, Residential and Open Space sites* has been shown to be entirely reasonable where it complies with the proposed zone limits (and in fact may still be reasonable if it exceeds the noise limits appreciably). Nonetheless, whether the potential activities in the proposed zones *can comply* with the Proposed District Plan noise rules still needs to be considered. The following sections discuss potential uses of the proposed zones and discuss the likely level of noise emission.

### 5.1 Potential Land Use

#### 5.1.1 Industrial

63 hectares of land at the north-western corner of the site may be developed for light industry (refer to Figure 3). This land will be located in proximity to the *Village* zone but will be well removed from rural receivers. Traffic access to this area will be via three access/egress locations at the northern, mid and southern ends of the western site boundary.

Potential land use is as follows:

- The north-western corner of the site (around 37 hectares) is proposed to be used for the Comfort Group Factory and associated rail siding. This area is shown as the “primary tenant (3)” on Figure 5.

The remainder of the *industrial* land may be used for light industry. The following examples are given of potential tenants (this list is non-exhaustive):

- Automotive servicing and repair
- Warehousing
- Manufacture of housewares
- Building products manufacture (e.g. doors, joinery, garage doors, kitchens)
- Building products sales
- Clothes manufacture or distribution
- Food products / packaging
- Machinery hire
- Other light industry or business use

#### 5.1.2 Business

An 8.7 hectare business zone would be located at the south-western corner of the site. Access would be via two locations at the south-west site corner.

The potential activities in this zone would be:

- Factory outlet shops and retail
- Service centre
- Local community shops
- Various community focused enterprises and facilities

#### 5.1.3 Residential

52 hectares of residential land is proposed on the eastern side of the site. Access would be via two locations from Tahuna Road on the southern boundary. The site masterplan suggests that this may be a mix of attached and free-standing homes, i.e. a medium to high density development.

## 5.2 Noise Emissions from Proposed Land Use

### 5.2.1 Industry - Sleepyhead Factory

The proposed Comfort Group factory is approximately 100,000m<sup>2</sup> and will be built in stages. Stage 1 is closest to sensitive receivers. A full acoustic assessment was carried out to assess the acoustic effects of the first stage of the factory. This included the evaluation of a detailed computer noise model.

The results of the assessment show that the factory would readily comply with the District Plan **daytime** noise limit of 50 dB L<sub>Aeq</sub> at the seven receivers within the proposed *Village* zone. Compliance with the proposed daytime noise limit by a margin of 8 to 20 decibels would be expected from the proposed operation. Ready compliance with the evening noise limit would also occur.

The results of the assessment show that night-time emissions from the factory would also comply with night-time noise limit of 40 dB L<sub>Aeq</sub>. However, at the closest receivers, compliance may only just be achieved. At receivers further away, compliance will be achieved by a greater margin, possibly by up to 10 decibels.

The factory may be expanded in the future as part of further development stages. This may increase noise emissions. If the extension proceeds, the factory will be extended to the west and any new noise sources will be located further from the *Village* zone. It is expected that ready compliance with the Proposed District Plan **daytime** noise limits will be achievable where the factory is extended to the west.

Future extension of the factory may mean that noise mitigation measures need to be implemented to ensure compliance with the **night-time** noise limit. Although the mitigation required depends upon the level and proposed location of any expansion, it is anticipated that compliance is practicably achievable with typical mitigation measures such as earth bunds or barriers, industrial building sound insulation or enclosure of external noise sources.

### 5.2.2 Industry - Other Industry

#### *Daytime*

Other potential industry activity on site is likely to predominantly operate during the daytime. Large openings in the closest industrial buildings are likely to face the internal site access roads (i.e. to the east) rather than the *Village* zone. Other industrial buildings to the west of the site are likely to be located some 350 to 600 metres from the *Village* zone which will mean that attenuation due to distance will be significant. A further buffer may also be included along the western boundary.

Activity occurring during the daytime on these allotments has been analysed based on other light industry activity that we have been previously involved with. Activity involving high internal noise levels (e.g. manufacture of prefabricated building components) with large open areas on the building façade and forklift and truck movements externally are expected to generate noise levels of less than 40 dB L<sub>Aeq</sub> at the *Village* zone. This is similar to the conclusions of the Sleepyhead foam and underlay factory resource consent assessment which demonstrated that noise levels at such distances would not be appreciably greater than this.

Based on this assessment it is considered that cumulative noise from daytime industrial activity would be able to comply with the Proposed District Plan **daytime** noise limits of 50 dB L<sub>Aeq</sub>. Compliance with the evening limit of 45 dB L<sub>Aeq</sub> is also practically achievable.

### *Night-time*

The extent of night-time noise emissions will depend on the number of industries that operate in the industrial area at night as well as their location relative to the *Village zone*. In the theoretical worst-case situation where industrial activities (including Sleepyhead) are proposed to operate on the western side of the site during the night period, a breach of the Operative District Plan night-time rule at the *Village zone* is considered probable. Resource consent may therefore be required if such night-time activity was proposed to be established.

In that situation, the proposed operation would need to implement noise mitigation either to comply with the noise rules or to implement the “best practicable option” to ensure noise is *reasonable* as required by section 16 of the Resource Management Act. The following options would be considered:

- Noise mitigation by bunds or barriers may be required on the western boundary to comply with the Proposed District Plan zone rules;
- Structural noise mitigation may be required to ensure that noise emissions from the site comply with the night-time rules. This may involve enclosing sources, loading trucks indoors or designing buildings to reduce noise emissions; or
- Activity may need to be restricted at night. Adequate planning and due diligence prior to the establishment of the activity will preclude unsuitable activities establishing if they cannot comply.

Night-time truck access to the site would not technically breach the District Plan noise rules as roads would be vested in Council ownership. This is because vehicle movements on public roads is not assessed against the District Plan rules. In any event, given the presence of the Waikato Expressway, the proximity of the railway line, and the existing heavy traffic generated by the local sawmills, noise from some truck movements to the site at night via the northern accessway may not be significant in the context of the existing environment.

#### 5.2.3 Business

The *Business zone* is unlikely to generate significant noise. The main noise sources are likely to be passenger cars, occasional truck deliveries and standard mechanical plant. The *Business zone* is also well separated from the *Village zone* and any nearby *Rural* dwellings. Compliance with the proposed daytime and night-time District Plan noise rules should be readily achieved.

#### 5.2.4 Residential

The proposed *Residential zone* is well removed from the *Village zone*. The zone would be located across Tahuna Road from an existing *Rural* dwelling. The development of the site for high or medium density development is likely to change the character of the ambient environment at the existing dwelling from one that is currently rural in nature to one where residential noise is audible at times. The residential use of the proposed site can readily comply with the Proposed District Plan limits, however, and overall noise levels would still be reasonable and would not result in residential amenity being compromised.

### 5.3 Construction Noise

Industrial and commercial buildings and other site infrastructure would likely be constructed using concrete pours, crane operations, material deliveries and carpentry / metalwork tasks. It is expected that construction would occur during the daytime. Residential construction may require similar methods, albeit on a smaller scale for each dwelling. At this site, ground compaction may be required in places to prepare the site for building. Ground compaction machinery would require vibration to be considered.

Construction of buildings is likely to result in a protracted period of construction noise. However given the size of the site, much of the works are likely to be well removed from the *Village* dwellings on Lumsden Road and the *Rural* dwellings on Lumsden Road. For the vast majority of the site, compliance with the Proposed District Plan construction noise limits would be readily achieved and vibration levels would be sufficiently low to ensure that amenity was not affected unreasonably.

Construction activity occurring close to the adjacent dwellings will require noise and vibration to be managed. This may require the following noise management measures:

- Bulldozer, compactor use and significant articulated dump truck use occurring within 60m of dwelling façades may need to be attenuated via noise barrier or alternative lower noise methods used. Where this machinery is the only practicable method of completing works and noise barriers are not practicable, communication with adjacent dwelling residents and landowners will be required to determine ways that actual noise effects on amenity can be mitigated. This may involve the activity being scheduled for specific times of day and week, or other such methods as agreed with residents.
- Dynamic compaction (if required) should occur outside of 150 metres from dwelling foundations to reduce vibration impacts on amenity. Within this distance, alternative methods of ground preparation may be required, such as the use of vibrating rollers.

It is a standard approach to require the noise and vibration effects of construction to be managed in accordance with a noise and vibration management plan (CNVMP). A CNVMP would normally detail all required noise limits, mitigation measures and methods for communication and dealing with complaints.

The above distances are highlighted indicatively in Figure 7. It can be seen that the above constraints would be required over a small proportion of the overall site area.

**Figure 7: Construction Noise Management**



## 6.0 CONCLUSIONS

Marshall Day Acoustics has reviewed the Proposed Waikato District Council Plan with regard the Ambury Properties submission. The submission seeks to rezone a site that is currently zoned *Rural*. The submission seeks to apply a mix of zonings suitable for *Industrial, Business and Residential* use as well as an area of green/open space within the site. It is not proposed to change the noise rules in the Proposed District Plan.

The existing ambient and background noise levels at the adjacent *Village* zone are significantly elevated due to the nearby Waikato Expressway and North Island Main Trunk railway. Measurements show that the noise limits proposed for the *Village* zone are conservatively low and that compliance with these noise limits will ensure that negligible effects on the amenity of the zone would arise. Notwithstanding that the Proposed District Plan noise limits are conservatively low, the submission does not seek to alter (or increase) the proposed noise limits.

An analysis of noise emission from the proposed zones has been carried out. This has shown that:

- Compliance with the Proposed District Plan **daytime** noise rules at the *Village* and *Rural* zoned properties is likely without significant noise mitigation being required.
- The extent of **night-time** noise emissions will depend on the number of industries that operate in the industrial area at night, as well as their location relative to the *Village* zone. In the theoretical worst-case situation where industrial activities (including Sleepyhead) are proposed to operate on the western side of the site during the night period, a breach of the Operative District Plan night-time rule at the *Village* zone is considered probable. Resource consent may therefore be required if such night-time activity was proposed to be established. In that situation, the proposed operation would need to implement noise mitigation. The following options would be considered
  - o Noise mitigation by bunds or barriers may be required to comply with the limit;
  - o Structural noise mitigation may be required to ensure that noise emissions from the site comply with the night-time rules. This may involve enclosing sources, loading trucks indoors or designing buildings to reduce noise emissions; or
  - o Activity may need to be restricted at night. Adequate planning and due diligence will avoid unsuitable activities establishing if they cannot comply.
- Night-time truck access to the site would not technically breach the District Plan noise rules as roads would be vested in Council ownership. This is because vehicle movements on public roads is not assessed against the District Plan rules. In any event, given the presence of the Waikato Expressway, the proximity of the railway line, and the existing heavy traffic generated by the local sawmills, noise from some truck movements to the site at night via the northern accessway may not be significant in the context of the existing environment.
- Construction noise and vibration can be managed to reasonable levels. Work occurring across the majority of the site will readily comply with the District Plan construction noise rules and will not result in unreasonable vibration effects on amenity.

The risk of unreasonable noise from the proposed activity is considered low given the high ambient and background noise levels. This is likely to be further demonstrated by future environmental noise analysis as part of any application for resource consent in the proposed zones.

The proposed change to the zoning on site is not considered to represent appreciable risk that the Proposed District Plan noise limits will be breached during the daytime or evening. During the night-time, activities operating on site need to be considered on a case-by-case basis to ensure that cumulative noise levels do not breach the Proposed District Plan noise limits (or are provided for by appropriate future resource consents).

## APPENDIX A GLOSSARY OF TERMINOLOGY

<b>Frequency</b>	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).
<b>Hertz (Hz)</b>	Hertz is the unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).
<b>Octave Band</b>	A range of frequencies where the highest frequency included is twice the lowest frequency. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.
<b>Noise</b>	A sound that is unwanted by, or distracting to, the receiver.
<b>Masking Noise</b>	Intentional background noise that is not disturbing, but due to its presence causes other unwanted noises to be less intelligible, noticeable and distracting.
<b>Ambient</b>	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
<b>Special Audible Characteristics</b>	Distinctive characteristics of a sound which are likely to subjectively cause adverse community response at lower levels than a sound without such characteristics. Examples are tonality (e.g. a hum or a whine) and impulsiveness (e.g. bangs or thumps).
<b>SPL or L<sub>p</sub></b>	<u>Sound Pressure Level</u> A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 µPa RMS) and expressed in decibels.
<b>dB</b>	<u>Decibel</u> The unit of sound level.  Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 µPa i.e. $dB = 20 \times \log(P/Pr)$
<b>dB<sub>A</sub></b>	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
<b>A-weighting</b>	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
<b>L<sub>Aeq</sub> (t)</b>	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.  The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
<b>L<sub>A90</sub> (t)</b>	The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level.  The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
<b>L<sub>A10</sub> (t)</b>	The A-weighted noise level equalled or exceeded for 10% of the measurement period. This is commonly referred to as the average maximum noise level.

The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.

$L_{AFmax}$

The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.

## APPENDIX B OPERATIVE VS. PROPOSED DISTRICT PLAN NOISE RULES

### B1 Operational Noise

The Proposed District Plan – notified July 2018 ('Proposed District Plan') noise rules are generally the same as the Operative District Plan noise rules. The Proposed District Plan differs slightly from the Operative District Plan in the following ways:

- The sensitive receiver sites to the south would be zoned *Village* instead of *Living*
- The noise limits use the  $L_{Aeq}$  assessment parameter instead of  $L_{A10}$

The use of  $L_{Aeq}$  in District Plans is appropriate.  $L_{Aeq}$  has been used by World Health Organisation as the basis assessing amenity for 20 years, and it has formed the basis for New Zealand Standards for over a decade. District Plan reviews throughout New Zealand have altered the assessment parameter from  $L_{A10}$  to  $L_{Aeq}$  and retained the same numerical limits without resulting in significant amenity issues arising.  $L_{Aeq}$  has several practical advantages and is the better assessment approach for assessing annoyance from short duration events that generate high levels of noise.

In most situations, the change in assessment parameter from  $L_{A10}$  to  $L_{Aeq}$  will mean little. For some time-varying sources, the permitted level of noise may be marginally louder with the limit as  $L_{Aeq}$ , however in subjective terms it may not be perceptible (or may only be *just perceptible*).

### B2 Construction Noise

The Operative Plan Rule 25.18 refers to Appendix N of the District Plan for the applicable rules for construction works in a Rural zone. The Proposed Plan refers to New Zealand Standard NZS 6803: 1999 "*Acoustics - Construction Noise*"

The proposed noise limits are very similar: both refer to the same version of NZS6803:1999. The only significant difference is that the Proposed Plan allows an evening shoulder period noise level of 70 dB  $L_{Aeq}$  and 85 dB  $L_{AFmax}$  between 1800 and 2000 hours (as is recommended by NZS6803) whereas the Operative Plan applies a more stringent noise level of 45 dB  $L_{Aeq}$  and 75 dB  $L_{AFmax}$  during this time.