Appendix G – Acoustic Assessment

MARSHALL DAY Acoustics

PLAN CHANGE 13
ACOUSTIC ASSESSMENT

Rp 001 r04 2016839H | 19 July 2022

MARSHALL DAY Acoustics

Level 2, 24 Garden Place
PO Box 19039
Hamilton 3244
T: +64 7 834 3022
www.marshallday.com

Project: **PLAN CHANGE 13:**
TE RAPA RACECOURSE MEDIUM DENSITY RESIDENTIAL PLAN CHANGE
ASSESSMENT OF ACOUSTIC EFFECTS

Prepared for: **Bloxam Burnett & Olliver Ltd**
PO Box 9041
Hamilton 3240

Attention: **John Olliver**

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1.0 INTRODUCTION

1.1 Overview

The Waikato Racing Club Incorporated (WRCI) propose to rezone part of the Te Rapa Racecourse (the site) by way of private plan change.

The project is Plan Change 13: Te Rapa Racecourse Medium Density Residential Plan Change.

This report forms part of the private plan change application. This report:

- Contains a review of the relevant acoustical performance standards applicable to the existing site
- Recommends appropriate acoustical performance standards for the proposed new zoning
- Provides an assessment of potential noise effects of sound from the proposed rezoning to adjacent sites, between lots within the proposed re zoning, and
- Considers the potential reverse sensitivity issues.

Appendix A provides a glossary of acoustical terminology.

1.2 Proposed Plan Change

The proposal for the plan change is described in the application documentation.

The Indicative Concept Plan for the site is reproduced in Figure 1 to give an indication of the proposed layout.

The proposed plan change is to accommodate the following.

- A residential area accessed via Ken Browne Drive and Sir Tristram Ave. The Indicative Concept Plan considers a variety of dwelling typologies including:
  - Two to three-storey dwellings along the eastern development area with the intention of providing a relatively continuous acoustic 'barrier' between the proposed residential zone and the industrial uses and Te Rapa Road to the east
  - Potentially higher building forms on the western edge of the proposed residential zone and facing the racing club
  - Generally, a medium density multi-unit and apartment typology
- An integrated wetland and Open Space between the racecourse operational area and the residential area

Sound emissions from activities in these proposed areas need to be controlled to other adjacent zones and between adjacent lots within the same zone.

The acoustical considerations for the proposed rezoning are:

- Sound emissions to adjacent zones
- Sound propagation between lots within the proposed residential zone
- Sound emission from existing neighbouring zones received in the proposed residential zone, and
- Sound emissions from the racecourse received in the proposed residential zone

Figure 1: Te Rapa Racecourse Proposed Site Concept Plan (Source: Chow:Hill)

2.0 SITE DESCRIPTION

2.1 Zoning and Surrounding sites

Te Rapa Racecourse is currently zoned Major Facilities Zone under the Hamilton City District Plan (HCDP).

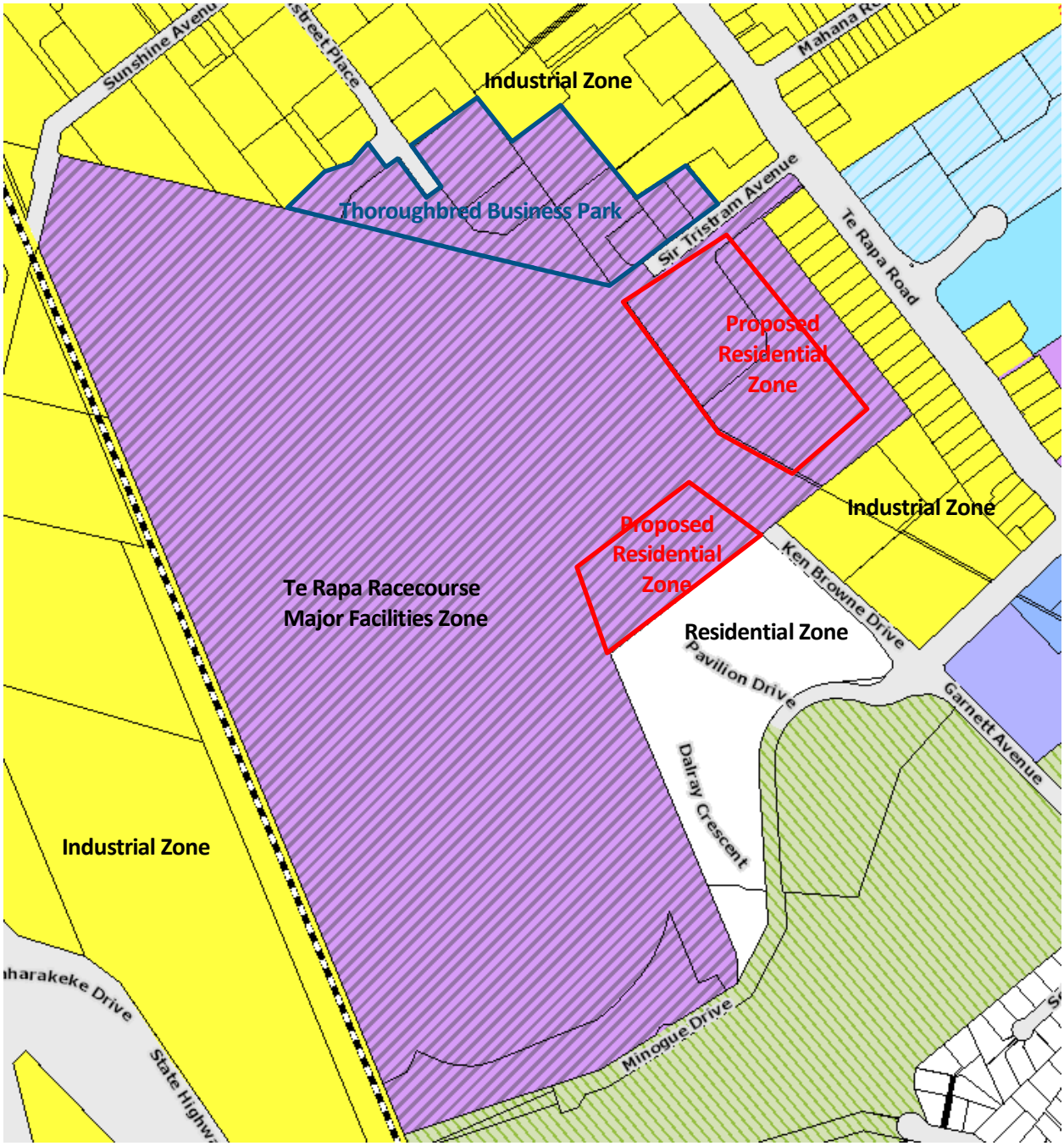
Part of the Major Facilities Zone site is designated as Thoroughbred Business Park which allows business activities associated with the racing industry as a Permitted Activity including light industrial activity, service industrial activity, warehouses, ancillary offices to the above activities, ancillary retail to the above activities and trade and industry training facilities. The area designated as Thoroughbred Business Park is described in figure 17.3 of the HCDP and reproduced in Figure 2.

It is worthy to note that '*Ancillary Residential (residential centres, managed care facilities, rest homes, apartments, single dwellings, visitor accommodation)*' is a Permitted Activity in Major Facilities Zones, subject to the noise rules contained in Chapter 25 of the HCDP (discussed in Section 3.0).

The site is bounded by Industrial zoned land to the north and east, a mixture of Industrial and Residential zones to the south and the existing Te Rapa Racecourse (The Waikato Racing Club building/grandstand and the racecourse itself) to the west, which as mentioned above is zoned Major Facilities Zone.

Figure 2 provides a visual summary of the zoning and features around the site. Refer also to the HCDP planning map No: 26A attached in Appendix B.

Figure 2: zoning and features around the site



It is noted that the activities on the industrial zoned land adjacent the site are typically 'light industry' in nature, they presently include:

- Offices/showroom for group home builders
- Automotive workshop
- Panel beater and car painters
- Motorcycle and scooter showrooms and service
- A day-care/kindergarten
- A scuba diving retailer
- An outdoor equipment retailer

- A car yard
- Bathroom specific building product supplier
- Veterinary clinic
- A furniture retailer
- A mixed-use development (apartments above high bay garage/storage)
- Commercial offices/depot (Fire engineers and Ultra-fast fibre)

The HCDP definition for Light Industry is:

> *'manufacturing, warehouse, bulk storage, service and repair activities which do not involve the use of heavy machinery, are carried out indoors and are unlikely to give rise to significant adverse effects beyond the site and are generally of a small scale. They include printing works, furniture manufacture, car repairs, light engineering, tradesmen's depots and the like.'*

2.2 Ambient sound environment

2.2.1 Witnessed noise monitoring of the existing sound environment

Traffic noise from Te Rapa Road and light industrial activity from the adjacent zones is the predominant sound source received on the site.

Measurements in two locations on site (MP1 &MP2 detailed in Table 1 were performed on 2 February 2017 between 14:00 and 15:00hrs.

The measurements followed the New Zealand Standard NZS 6801:2008 "Acoustics – Measurement of environmental sound", with the 15-minute duration at all locations.

Calibration checks were carried out prior to and post the survey period with no notable change in level.

Table 1: Summary of Witnessed Ambient Sound Level Measurements

Measurement Position	Date, Time and Duration	Measured Noise Levels (dB)				Notes
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}	
MP1	2 Feb 17 1400 15 min	45	47	48	57	Traffic on Te Rapa Road dominant ambient sound source, children at play, birds, insects and occasional wind in trees
MP2	2 Feb 17 1430 15 min	47	50	51	63	Traffic on Te Rapa Road dominant ambient sound source, light industry, birds, insects and occasional wind in trees

2.2.2 Logger measurements

Furthermore, three sound level monitoring devices (loggers) were deployed for a period of fourteen days between 26 April 2018 to 10 May 2018 to establish the ambient sound level environment. These included measurements on 28 April 2018 and 5 May 2018 when racing events were held at the Racecourse.

The three monitoring locations are shown in Figure 3 below. The location of:

- LP1 is the same as the position used in our 2017 measurement campaign,

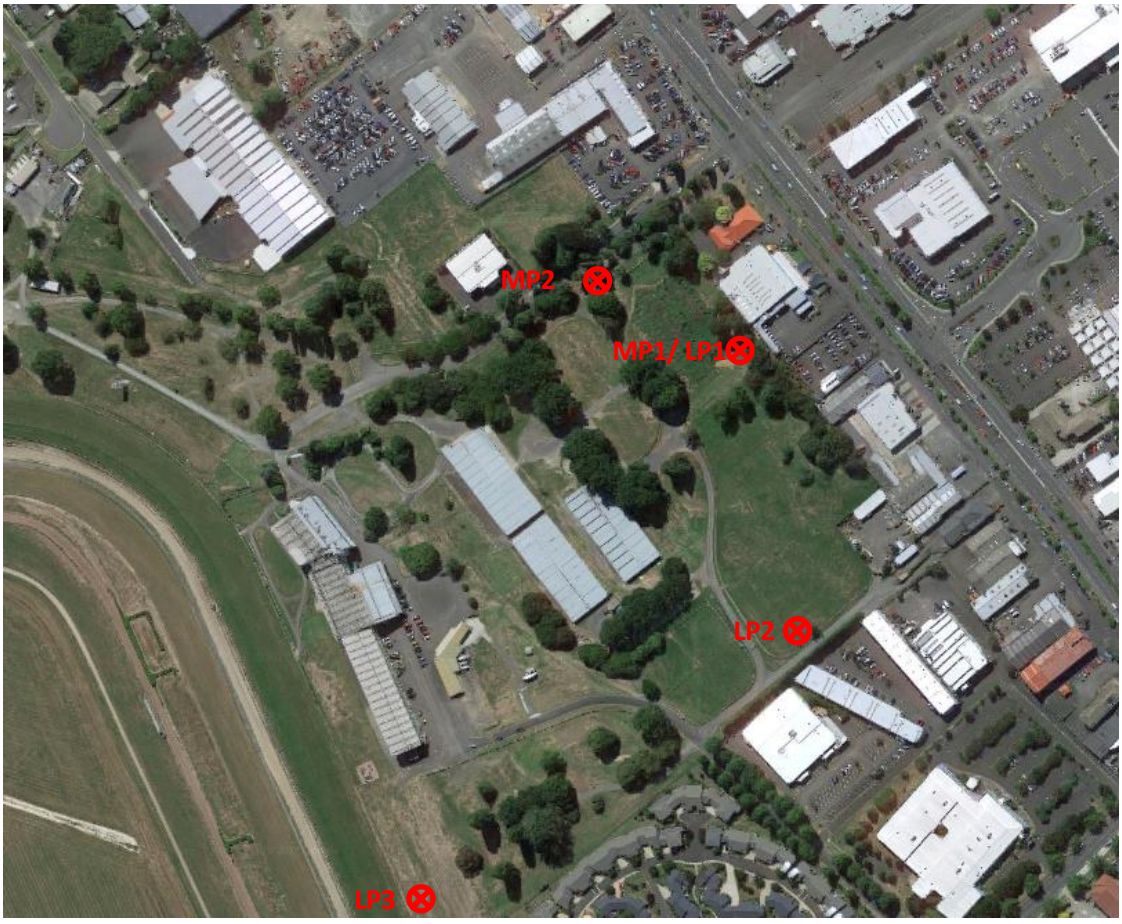
- LP2 is adjacent to the southern boundary, aligned with the middle of the adjoining Industrial Zone boundary,
- LP3 is adjacent to the Te Rapa Racecourse, on the boundary of the proposed Residential zone most exposed to the Racecourse itself.

The measurements followed the New Zealand Standard NZS 6801:2008 "Acoustics – Measurement of environmental sound", with 15-minute intervals at all locations derived during post-processing.

Calibration checks were carried out prior to and post the survey period with no notable change in level.

The weather conditions during the surveys were generally fine and within the acceptable window for environmental noise surveys; except for a period of rain on the evening of 28 April 2018 and morning of 29 April 2018 which has been excluded from the analysis.

Figure 3: Measurement Positions



A summary of the average sound levels measured by the logger on 'typical' days (26 &27 April 2018, 29 April 2018 to 4 May 2018, and 6 May 2018 to 10 May 2018) are provided overleaf.

Table 2: Summary of Average Ambient Sound Level on 'typical' days – Logger Measurements LP1

Measurement Position	Time Period	Measured Noise Levels (dB)			
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}
LP1	0600 – 0700	37	48	53	62
	0700 – 2000	40	51	56	79
	2000 – 2300	35	44	48	64
	2300 – 0600	32	43	50	67
	24 hour	33	49	55	79

Table 3: Summary of Average Ambient Sound Level on 'typical' days – Logger Measurements LP2

Measurement Position	Time Period	Measured Noise Levels (dB)			
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}
LP2	0600 – 0700	36	47	51	64
	0700 – 2000	39	48	52	74
	2000 – 2300	34	45	47	79
	2300 – 0600	30	43	48	74
	24 hour	32	47	51	79

Table 4: Summary of Average Ambient Sound Level on 'typical' days – Logger Measurements LP3

Measurement Position	Time Period	Measured Noise Levels (dB)			
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}
LP3	0600 – 0700	40	49	53	62
	0700 – 2000	40	51	56	79
	2000 – 2300	34	44	48	64
	2300 – 0600	33	43	49	65
	24 hour	33	49	54	79

A summary of the average sound levels in the daytime period (0700-2000) measured by the logger on the 'race' days of 28 April and 5 May 2018 are provided overleaf.

2.2.3 Measured sound levels on 'race' days at LP1

Table 5: Summary of Average Ambient Sound Level at LP1 on 'race' day – 28 April 2017

Measurement Position	Time Period	Measured Noise Levels (dB)				Notes
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}	
LP1	0700 – 2000	47	56	59	75	Sound levels recorded during race events (1200 1700) ranged between 52-63 $L_{Aeq\ (15min)}$

Table 6: Summary of Average Ambient Sound Level at LP1 on 'race' day – 5 May 2017

Measurement Position	Time Period	Measured Noise Levels (dB)				Notes
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}	
LP1	0700 – 2000	41	47	49	71	Sound levels recorded during race events (1200 1700) ranged between 45 -50 $L_{Aeq\ (15min)}$

2.2.4 Measured sound levels on 'race' days at LP2

Table 7: Summary of Average Ambient Sound Level at LP2 on 'race' day – 28 April 2017

Measurement Position	Time Period	Measured Noise Levels (dB)				Notes
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}	
LP2	0700 – 2000	45	52	55	69	Sound levels recorded during race events (1200 1700) ranged between 49-57 $L_{Aeq\ (15min)}$

Table 8: Summary of Average Ambient Sound Level at LP2 on 'race' day – 5 May 2017

Measurement Position	Time Period	Measured Noise Levels (dB)				Notes
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}	
LP2	0700 – 2000	41	47	49	76	Sound levels recorded during race events (1200 1700) ranged between 42 -54 $L_{Aeq\ (15min)}$

2.2.5 Measured sound levels on 'race' days at LP3

Table 9: Summary of Average Ambient Sound Level at LP3 on 'race' day – 28 April 2017

Measurement Position	Time Period	Measured Noise Levels (dB)				Notes
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}	
LP3	0700 – 2000	45	60	56	88	Sound levels recorded during race events (1200 1700) ranged between 49-69 $L_{Aeq\ (15min)}$

Table 10: Summary of Average Ambient Sound Level at LP3 on 'race' day – 5 May 2017

Measurement Position	Time Period	Measured Noise Levels (dB)				Notes
		L_{A90}	L_{Aeq}	L_{A10}	L_{Amax}	
LP3	0700 – 2000	41	61	55	87	Sound levels recorded during race events (1200 1700) ranged between 44-71 $L_{Aeq\ (15min)}$

2.2.6 Typical sound levels

Based on the 2018 noise surveys we consider that the existing ambient sound levels on typical days are relatively moderate. Not only is the existing ambient sound environment moderate, but there is also an appreciable reduction in sound levels during the typical night-time period (23:00 to 06:00), which shows there is little night activity. This is generally typical of mixed use or commercial activity rather than industrial.

2.2.7 Race day sound levels

During 'race' days the recorded sound levels at LP1 and LP2 demonstrate there is a minor variance relative to the typical daytime average. The differences between the typical daytime sound levels and the race day daytime levels ranges between -4 to +5 decibels.

The sound levels recorded during the race day events, which occurred between 1200 and 1700hrs ranged 45-63 dB $L_{Aeq\ (15mins)}$ at LP1 and 42-57 dB $L_{Aeq\ (15mins)}$ at LP2. We note that the levels recorded at these locations would be influenced by race day activities that occur near the measurement position (within the plan change area) that would obviously not occur if the plan change were to go ahead.

At LP3 the recorded sound levels on race day were 9 to 10 dB L_{Aeq} above the typical daytime ambient level. The sound levels recorded during between 1200 and 1700hrs ranged 44-71 dB $L_{Aeq\ (15mins)}$ with an average level over the race activity period of 60 dB $L_{Aeq\ (1200\text{-}1700)}$. We note that the nature of the racing activity noise is such that the high levels of sound are sporadic throughout the event and only occur in the daytime period.

2.2.8 Future sound environment potential

It can be seen from the measured sound levels that the existing ambient sound levels are relatively moderate. The adjoining Industrial zones are not generating a level of sound emissions close to the HCDP permitted limit of 65 dB L_{Aeq} between Industrial zoned sites at any time day or night (HCDP Rule 25.8.3.7c). Not only is the existing ambient sound environment considered as moderate, but there is also a significant reduction in sound levels during the typical night-time period (23:00 to 06:00hrs), which shows there is little night activity. This is considered generally typical of mixed use or commercial activity rather than industrial.

3.0 ACOUSTICAL PERFORMANCE STANDARDS

3.1 Overview

The proposal is to rezone the site under a private plan change. The plan change process affords the opportunity to prescribe new rules for the new zones which are appropriate for the proposed new zoning and its neighbours.

It is prudent to examine the noise performance standards which presently apply to the site and its neighbours.

The site is subject to the noise and vibration rules within Chapter 25 of the HCDP. The HCDP rules are reproduced in Appendix C.

A summary and discussion on the rules applicable to the site, as it currently exists, follows.

3.2 Construction Noise and Vibration

HCDP Rules 25.8.3.2 and 25.8.3.3 specify the most recent version of the New Zealand Standard for construction noise (New Zealand Standard NZS 6803: 1999 *"Acoustic– - Construction Noise"*) and the German standard DIN 4150-3:1999 *"Structural Vibration– - Effects of Vibration on Structures"* as the performance standards for assessment of construction noise and vibration.

These standards are appropriate for construction activities in all zones.

3.3 Sound Emissions from Site

Rule 25.8.3.9 of the HCDP applies to the site as it currently exists.

In summary, the rule restricts site sound emissions from the Major Facilities Zone to Residential zone receivers to the following:

Time of day	**Noise level received in Residential Zone**	
	dB $L_{Aeq\ [15\ min]}$	**dB L_{AFmax}**
0700 – 2300 hours	55	-
2300 – 0600 hours	40	75
0600 – 0700 hours	45	75

The rules above apply on all days except for six days per calendar year when the following standards shall apply.

Time of day	**Noise level received in Residential Zone**	
	dB $L_{Aeq\ [15\ min]}$	**dB L_{AFmax}**
1000 – 2300 hours, or 1000 hours on 31 December - 0030 hours 1 January (New Year's Eve)	75 70 at 63Hz 65 at 125Hz	85

The above "temporary event" noise rules apply provided that:

- The noise event does not exceed four hours' duration, except on two of the six occasions when the duration of the noise event must not exceed seven hours, exclusive of practice and sound checks.
- Practice or testing involving the use of electronic sound amplification must not exceed two hours
- The public is notified at least 14 days before the noise event with specific information about the events nature, dates, times, contact details and alternative dates due to cancellation.

None of the noise rules apply to crowd noise from events.

Furthermore, the HCDP specifies that the standard does not apply in relation to noise received from the Te Rapa Racecourse at some specified residential sites on Minogue Drive.

The HCDP stipulates that sound shall be measured in accordance with New Zealand Standard NZS 6801:2008 "Acoustics – Measurement of environmental sound" and assessed in accordance with New Zealand Standard NZS 6802:2008 "Acoustics– Environmental Noise" at any point within the notional boundary any other site.

It is noted that the sound emissions from the Major Facilities Zone do not have any nominated performance standard for sound received in an Industrial zone.

3.4 Sound Received on The Site

As discussed in Section 2.2 the predominant source of noise received on the site is from other activities external to the site; neighbouring light industry and traffic on Te Rapa Road. The HCDP does not provide rules for noise received on a Major Facilities Zone site.

It is noted that the neighbouring Industrial Zone has a rule that applies between Industrial Zone sites, limiting their sound emissions to 65 dB L_{Aeq} at any time, day or night. Whilst it appears that current levels are lower than this, it is permitted by the HCDP.

The Major Facilities Zone allows for Ancillary Residential as a Permitted Activity. However, the HCDP noise rules do not address the potential for noise effects on receivers in such dwellings. There are no noise rules for sound received in the Major Facilities Zone.

The HCDP does, via Rule 25.8.3.10, provide for new and altered buildings to be used for noise-sensitive activities within:

- The Central City Zone, Business 1 to 7 Zones, Industrial Zone, Te Rapa North Industrial Zone, the Te Rapa Dairy Manufacturing Site Noise Emission Boundary, Rototuna Town Centre Zone and the Te Awa Lakes Business 6 Zone and the Te Awa Lakes Major Facilities Zone.
- Sites near existing and proposed transport corridors that carry high traffic volumes,
- Sites near a railway line,

Noise-sensitive activities are defined in the HCDP as:

'residential activities (including residential accommodation in buildings which predominantly have other uses such as commercial or industrial premises), marae, spaces within buildings used for overnight patient medical care, and teaching areas and sleeping rooms in buildings used as educational facilities. For the purpose of this definition educational facilities includes tertiary institutions and schools, and premises licensed under the Education (Early Childhood Services) Regulations, and playgrounds which are part of such facilities and located within 20m of buildings used for teaching purposes.'

Whilst the Te Rapa Racecourse, and other Major Facilities Zones (apart from Te Awa Lakes), are not referenced with respect to Rule 25.8.3.10, the site under consideration is adjacent an Industrial Zone which is referenced. MDA considers that the rule provides a relevant guide for noise sensitive ancillary residential activities in a Major Facilities Zone.

Where a noise sensitive activity is proposed to be located within the zones outlined above or near to an existing corridor that carries high traffic volumes, Rule 25.8.3.10 requires that an indoor noise performance standard is met. The noise performance standard for bedrooms is 35 dB $L_{Aeq\ 24\ hour}$. The noise performance standard for other habitable spaces is 40 dB $L_{Aeq\ 24\ hour}$. This effectively means that the noise sensitive activity needs to ensure its building design would achieve compliance with these standards.

4.0 PROPOSED ZONING AND ACOUSTICAL PERFORMANCE STANDARDS

4.1 Overview

The proposed plan change incorporates a Medium Density Residential Zone with a 'Te Rapa Racecourse Precinct' overlaying it. The Precinct plan will provide for site-specific layout of land uses and infrastructure.

This section discusses appropriate acoustical performance standards that would complement the proposed zoning.

4.2 Proposed Medium Density Residential Zone

The HCDP rule 25.8.3.7a requires that sound emissions from any other site (other than a Major Facilities, Knowledge, Open Space, Ruakura Logistics and Ruakura Industrial Park Zones) must not exceed the following levels any point within the boundary of a Residentially zoned (including Medium Density zones) site:

Time of day	Limit ($L_{Aeq\ [15\ min]}$)	Limit (L_{AFmax})
0600 – 0700 hours	45 dB	75 dB
0700 – 2000 hours	50 dB	-
2000 – 2300 hours	45 dB	-
2300 – 0600 hours	40 dB	75 dB

The noise limits provided in this rule are generally considered to be appropriate for the proposed Medium Density Residential Zone.

However, applying this rule to the proposed Medium Density Residential zone may provoke a reverse sensitivity issue with the neighbouring Industrial zone users. Reverse sensitivity means the legal vulnerability of an established activity to complaint from a new land use nearby, such as residential activities. The 'sensitivity' may result in the existing activity having to restrict its activities or mitigate it's operations so as not to impact on the new activity.

As currently written the HCDP allows Industrial Zone activities to generate 65 dB L_{Aeq} between Industrial zoned sites, and limits Industrial Zone sound emissions to 50 / 45 / 40 dB L_{Aeq} received at Residential zones. There are no rules pertaining to Industrial Zone noise emissions onto Major Facilities Zones. Therefore, in this circumstance many of the Industrial zoned neighbours adjacent the Te Rapa Racecourse are generally unencumbered with respect to emitting noise to the Te Rapa Racecourse site, particularly at night. Applying the Rule 25.8.3.7 to the proposed Residential zone on the site would represent a theoretical 15- 25 dB reduction in the level of sound which these sites are presently allowed to generate.

However, note that the requirement to generate no more than 65dB L_{Aeq} between Industrial zoned sites effectively means that is the controlling limit for the Industrial sites at their rear boundaries anyway.

It is prudent to note that the current ambient sound environment, made up of sources not only in the Industrial Zone, but also on Te Rapa Road, more distant roads and natural sounds, has been measured below the noise limits in Rule 25.8.3.7. On this basis, the currently established activities in the Industrial zones neighbouring the site are anticipated to comply with the Rule 25.8.3.7 limits on Residential zones.

4.2.1 Amenity Protection Area

The HCDP planning maps describe many areas within Hamilton where an Industrial Zone abuts a Residential Zones. Typically, at this type of interface an Amenity Protection Area overlay exists.

Amenity Protection Area is defined in the HCDP as:

> *'an area within an Industrial Zone adjacent to the boundary with residential sites or other sensitive areas. The extent of Amenity Protection Areas is indicated on the Planning Maps. Amenity Protection Areas provide greater control with respect to building height, site*

coverage, hazardous facilities, landscaping and screening within the Industrial area in order to minimise adverse effects on the amenity of residential sites, or other sensitive areas, adjacent to land zoned Industrial.'

The HCDP provides an explanation for its policy on Amenity Protection Area:

'Industrial activities can generate adverse amenity effects beyond the boundaries of the zone. These can have a particular impact on residential and open space areas where expectations for amenity are far higher.

The Amenity Protection Area is a key mechanism to protect residential sites where they are adjacent to land within the Industrial Zone. Industrial properties covered by the Amenity Protection Area are subject to additional standards. Enhanced management of noxious or offensive activities where they are near residential land uses is also a key aspect of the provisions.'

The extent of the Amenity Protection Area is typically one lot depth, and generally around 50 to 75 meters. The HCDP Chapter 25.5 Landscaping and Screening describes some of the additional standards Industrial properties covered by the Amenity Protection Area are subject to, including Rule 25.5.3:

'Where a site is wholly or partially within the Amenity Protection Area, a 1.8m high close-boarded or similar solid fence or wall, and a 5m wide buffer strip shall be required along any side or rear boundary with a Residential or Special Character Zone'

Whilst it is beyond the scope of the proposed plan change to apply an Amenity Protection Area overlay to the Industrial Zone properties adjacent the site, it is worth noting that the combination of the noise Rule 25.8.3.7 and in combination with a 1.8m high barrier, and a 5m wide buffer strip, is applied by Hamilton City Council as a means to minimise adverse effects (including noise) on the amenity of residential sites, or other sensitive areas, adjacent to land zoned Industrial.

Figure 4: Indicative Example of Amenity Protection Area overlay (red cross hatch)

4.2.2 External-to-Internal Noise Limits

Rule 25.8.3.10 of the HCDP requires that an indoor noise performance standard is met where noise sensitive activities are located in particular (and typically noisy) zones or are adjacent high noise routes and rail lines. The noise performance standard for bedrooms is 35 dB $L_{Aeq\ 24\ hour}$. The noise performance standard for other habitable spaces is 40 dB $L_{Aeq\ 24\ hour}$.

These internal noise criteria are consistent with the '*design sound levels for Residential Buildings-houses and apartments in inner city areas or entertainment districts or near major roads'* contained in *Australian/New Zealand Standard AS/NZS 2107:2016"Acoustics - Recommended design sound levels and reverberation times for building interiors"*.

Applying an internal noise performance standard to new noise sensitive activities in the proposed Medium Density Residential Zone is one way to address the potential reverse sensitivity issues associated with the site. However, the internal noise performance standards have an associated development cost which is relative to the level of sound incident upon each building, and the extent of the effects area for noise.

4.2.3 Sound Insulation (Effects) Area Extent

The level of sound inside a building is dependent on:

- The level of sound incident upon the building envelope
- The sound insulation performance building envelope construction
- The location and orientation of a dwelling relative to the Industrial zones

The sound level inside the dwellings will typically be 15 decibels lower than the external incident level on the façade with windows slightly ajar (i.e. 100mm). Therefore, dwellings exposed to greater than 50 dB L_{Aeq} would require some mitigation to achieve the 35 dB L_{Aeq} criterion for bedrooms detailed in HCDP Rule 25.8.3.10.

Based on the existing ambient sound levels described in Section 2.2, the 24-hour L_{Aeq} is less than 50 dB. On this basis, there is currently no effects area on the proposed residential zone.

However, based on the HCDP permitted level of 65 dB L_{Aeq} between Industrial zones and the practical constraints of existing residential zoned land on the western side of Ken Browne Drive a level of 50 dB L_{Aeq} could potentially, and legally, be incident on the façades of properties up to 145 m from the Industrial zone boundary. On this basis 145 m may be considered the suitable extent of the Effects Area.

The Effects Area may be reduced where effective acoustical screening is used to reduce the noise level received at the building façades. Furthermore, infill residential buildings and structures may benefit from screening provided by other buildings or fences located between the Industrial Zones and the building receiving the noise, such as the proposed apartment/multi-unit typology of the proposed residential zone.

The HCDP's Amenity Protection Area discussed above (and its requirement for a 1.8m high barrier on the boundary, and a 5m wide buffer strip) is the Hamilton City Council's measure to minimise adverse effects on the amenity of residential sites, or other sensitive areas, adjacent to land zoned Industrial. The same measures could be inversely applied to the proposed Residential Zone, and the typical depth of the Amenity Protection Area overlay (40-50 meters) could be applied to the proposed Residential Zone as the extent of area requiring sound insulation.

MDA consider it is reasonable that the extent of the 'Effects Area' is around 60m from the existing Industrial zone based on:

- An existing ambient sound environment which is less than 50 dB $L_{Aeq\ 24\ hours}$

- Applying the HCDP's Amenity Protection Area concept (which is of a similar size, requires a setback and a 1.8m high barrier on the boundary)
- A building typology which creates further acoustical screening to the residential receivers deeper inside the proposed Residential zone

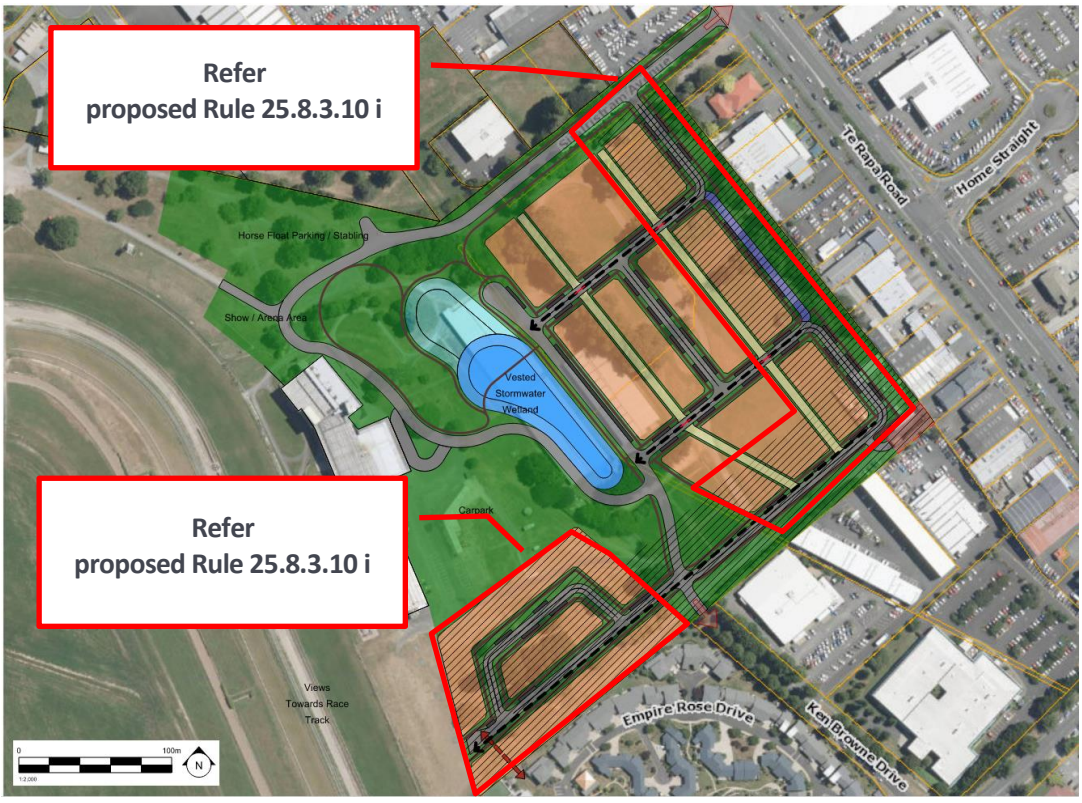
In addition, in order to replicate the approach of the Amenity Protection Area more closely, it is recommended that a noise limit of 65 dB L_{Aeq} be applied to adjoining Industrial Zoned sites in relation to their boundaries with the site. As set out above this will have minimal practical impact as the activities must already comply with that standard at their other boundaries.

4.2.4 Noise from the Racecourse

We acknowledge that the location of the proposed development adjacent to the racecourse may be part of the appeal of the development to future residents. As such it is reasonable to expect that most potential residents will have realistic expectations of racecourse noise.

Despite this, based upon the measured levels detailed in Section 2.2.2, we consider it is prudent to adopt similar sound insulation and internal noise performance standards which are recommended for the proposed Medium Density Residential Zone adjacent to the existing Industrial zones and apply them to the habitable spaces adjacent the racecourse (indicated by cross hatch 'Noise Sensitive Area' in Figure 1 – also refer Figure 6).

Figure 5: Proposed 'sound insulation' zones



General Cost of Sound Insulation Requirements

In some instances, beyond the typical building envelope requirements of the Building Code, no additional mitigation would be required. However, in other instances, where the noise level incident upon the building is higher, mitigation may be required which would result in additional treatments and cost, such as:

- mechanical ventilation,
- air conditioning,

- additional plasterboard linings,
- thicker glazing

The following sections identify three mitigation categories based on road traffic noise only. Road traffic noise is generally more consistent in character, whereas noise from industrial activities can have a less predictable character. Regardless the following is provided as a guide to help understand sound mitigation via the building envelope. Experience of indicative costs is also included where available.

We have determined three typical categories of dwelling treatment required depending on the external noise environment:

1. *No mitigation and open windows (≤ 50 dB $L_{Aeq\ 24hr}$)*

   The internal noise level is typically controlled by contributions though open windows, rather than the sound insulation performance of individual façade elements. The internal noise level with open windows is typically 15 decibels lower than the external level. Therefore, no mitigation is required where the external noise environment does not exceed 50 dB $L_{Aeq\ 24hr}$.

   As no mitigation is required, there are no building improvement costs.

2. *Mechanical fresh air ventilation and air conditioning with windows closed (50 – 60 dB $L_{Aeq\ 24hr}$)*

   For a standard modern dwelling with closed windows, the internal noise level is typically 25 decibels lower than the external level. However, to enable the windows to be closed, a mechanical fresh air ventilation system (as a minimum) and air conditioning (for thermal comfort) should be provided. This level of mitigation should apply where the external noise environment is between 50 – 60 dB $L_{Aeq\ 24hr}$.

   While MDA is not able to provide accurate costs of such systems, our experience from similar projects found these systems add $10,000 -$15,000 to the overall cost of a dwelling (assuming these features are not already incorporated into the dwelling design).

3. *Specialised façade improvements (> 60 dB $L_{Aeq\ 24hr}$)*

   In addition to the Category 2 measures above an acoustic expert should be engaged to advise on suitable façade constructions on a case-by-case basis. Improvements may include additional wall and ceiling plasterboard linings, and high-performance glazing.

The direct costs of upgrading the sound insulation are wide ranging and dependant on a number of variables. Accordingly, we are not able to provide an indicative cost estimate.

Table 11 summarises the zones for which the mitigation categories are predicted to apply.

Table 11: Sound Insulation Mitigation (road traffic noise)

Category	External Noise Level (dB $L_{Aeq\ 24hr}$)	Indicative Setback (m) from road carriageway	Sound Insulation Mitigation
1	≤ 50	≥200m	No mitigation required
2	50 – 60	40 – 200m	Install mechanical ventilation and air conditioning system(s) to enable windows to be closed at any time (specification to be prepared by others, such as a suitably qualified mechanical engineer)
3	> 60	<40m	Engage an acoustic expert to advise on suitable façade constructions on a case-by-case basis

Note the glazing type (e.g. single pane 'float' or 'double glazing') has little bearing on the categorisation above. Of more relevance are the pane(s) thickness, spacing, size and location.

Ventilation and Thermal Comfort

The HCDP rule has a condition relating to ventilation where the acoustical performance criteria can only be met with windows closed. The ventilation requirement is a minimum New Zealand Building Code requirement and does not address thermal comfort.

4.2.5 Outdoor amenity in areas adjacent Industrial Zone

MDA recommend that outdoor living areas for the lots along the industrial zoned boundaries (east and south) are located at the front of the dwellings – away from the Industrial zone, rather than at the rear- where they would be adjacent the Industrial zone. The potential exists for noise to be generated on the adjoining industrial sites which would result in unacceptably high noise levels from an outdoor amenity point of view at the rear of the lots. Providing outdoor living areas at the front of the units would allow the spaces to be screened by the dwellings which would reduce the noise levels.

Service areas at the rear would be acceptable.

4.2.6 Summary

The noise limits provided in Rule 25.8.3.7a are generally considered to be appropriate for activities within the proposed Residential Zone.

Furthermore, MDA considers that it is appropriate to require new sensitive activities to achieve minimum internal amenity standards for noise and thermal comfort. The performance standard in HCDP Rule 25.8.3.10 is considered generally appropriate for this development. However, MDA recommends the following additional points be considered for the proposed Medium Density Residential Zone:

- An 'Effects Area' 60m from any existing Industrial Zone, based upon the potential level of sound from the existing Industrial Zones incident upon dwellings and the proposed building typology in these areas, or
- Consult with existing Industrial Zone owners and
- Avoiding impact upon outdoor amenity via spatial design, using buildings as a screen between potentially noisy Industrial Zone neighbours and the outdoor living areas.

4.3 Existing Major Facilities Zone

It is understood that any new lots in the proposed Medium Density Residential Zone created by way of the plan change would not have any noise performance criteria for sound emissions from the Major Facilities Zone (Te Rapa Racecourse). This would be achieved by referencing the Precinct Plan in the list of exclusions in HCDP rule 25.8.3.9 d ii.

We are not aware of any Resource Consent Conditions pertaining to the already exempted sites on Minogue Drive. We understand from WRCI that no specific physical 'offset mitigation' was provided, rather an agreement/no complaints covenant (part of the sale and purchase agreement for the land formerly owned exclusively by WRCI) was formalised by way of the District Plan revision which now exempts the three existing properties.

Sound insulation and internal noise performance standards are proposed for the residential area adjacent to the racecourse. As such, any sound insulation provided to achieve the internal noise performance standard from typical racecourse activity would also reduce sound levels received within dwellings from the permitted racecourse temporary activities.

Rules 25.8.3.9c v & vi limit the frequency and duration of permitted 'temporary events'. These rules would not be affected by exempting the proposed residential zones from Rule 25.8.3.9 and the frequency and duration of events would still be limited.

The combination of the proposed internal noise performance standard and the limited frequency and duration of temporary events will mitigate against any serious adverse effects beyond temporary annoyance.

Therefore, the potential effect of the rule change (adding the proposed Precinct Plan to the list of exempted properties) is primarily one of reverse sensitivity; Where there are presently no residential dwellings, new residential activity is proposed. It is possible that residents of the new residential area complain about the noise from a long-established activity (the racecourse events). The risk to WRCI as the operator of the racecourse is that: if the proposed residential zones are not exempted, the noise emissions from the activities are assessed against a more restrictive performance standard than previously existed.

5.0 NOISE EMISSIONS FROM ACTIVITIES WITHIN THE PROPOSED PLAN CHANGE AREA

5.1 Neighbouring Residential Zones

Any noise emission from an activity within the proposed zones shall comply with the noise limits in Chapter 25 of the HCDP.

These limits are appropriate and consistent with other similar zoned areas for controlling noise in a peaceful residential environment.

6.0 SOUND RECEIVED IN PROPOSED ZONES FROM OTHER SITES (REVERSE SENSITIVITY)

6.1 Overview

With the proposed change in zoning there exists a potential for reverse sensitivity effects. The following parties may be vulnerable to reverse sensitivity noise effects from the proposed change in zoning:

- Owners and occupiers in the Industrial Zone adjacent the site
- The Waikato Racing Club

Each of these parties is addressed in the following sections

6.2 Noise received from Industrial Zone

Reverse sensitivity due to the proposed change in zone at the interface with the Industrial Zone properties is to be managed via:

- Residential building typologies at the periphery of the proposed development that provide acoustic screening for those receivers deeper within the proposed residential zone, and
- Noise performance standards which require any noise sensitive activities in the proposed Medium Density Residential Zone, within 60 meters of any existing Industrial Zone, to meet an internal noise criteria (in combination with ventilation and potentially thermal comfort standards) which also mitigates noise received from other external sources.
- A 1.8m fence along the boundary of any Industrial Zoned land adjoining the Medium Density Residential Zone.

6.3 Noise received from The Waikato Racing Club

Similar provision to the other Residential sites adjacent the Te Rapa racecourse -which are on land formerly owned by WRCI- any new lots in the proposed zones created by way of the plan change would not have any noise performance criteria for sound emissions from the Major Facilities Zone (Te Rapa Racecourse). This would not restrict the sound emissions from the Te Rapa Racecourse any further than the HCDP already permits.

However, these residential buildings would also be required to meet internal noise criteria (the same as those within 60m of the Industrial Zone).

7.0 SUMMARY

WRCI propose to rezone part of their land at the Te Rapa Racecourse by way of private plan change. MDA has been engaged to:

- Assess the relevant acoustical performance standards applicable to the existing site,
- Recommend appropriate acoustical performance standards for the proposed new zones,
- Provide an assessment of noise effects from sound between the proposed development areas to adjacent sites and between zones within the development site,
- Consider the potential reverse sensitivity issues.

The proposed new zones will be subject to the existing HCDP noise rules outside the development site. The types of activities expected in the proposed zones would typically have little problem complying with these limits.

MDA have recommended the existing HCDP zone specific noise performance standards for the proposed new zone. Included in these recommended standards are internal noise performance standards for noise sensitive activities subject to high levels of sound (from sources within the neighbouring Industrial Zone and from racetrack operation). An Industrial zone standard is recommended to apply to industrial activities adjoining the site, to fill a current 'gap' in the District Plan provisions. The proposed performance standards are those of the HCDP and considered by MDA to be appropriate.

Sound emissions from areas outside of the proposed new zones, received on the site, are currently well below the permitted level. Regardless the permitted level of sound emissions could be mitigated by the proposed building typology, and by adopting the HCDP noise performance standards including the internal noise criteria. These measures address reverse sensitivity from adjacent sites not owned by the WRCI.

A summary of the proposed text changes to Chapter 25 of the HCDP is provided overleaf.

With the recommended noise performance standards, the noise effects of the proposal are considered to be of little appreciable significance.

8.0 PROPOSED CHAPTER 25 CHANGES

The following are our recommend changes to Chapter 25 of the HCDP (with changes highlighted in red) to accommodate the proposed change in zoning:

25.8.3.7 Noise Performance Standards for Activities in all Zones Except Major Facilities, Knowledge, Open Space, Ruakura Logistics and Ruakura Industrial Park Zones

a)	Activities in all Zones except Major Facilities, Knowledge, Open Space, Ruakura Logistics and Ruakura Industrial Park Zones *and Industrial Zones that share a boundary with the Te Rapa Racecourse Medium Density Residential Precinct,* shall not exceed the following noise levels at any point within the boundary of any other site in the:	
	i.	Residential Zones
	ii.	Special Character Zone.

		Time of day	Noise level measured in $L_{Aeq\ [15\ min]}$	Noise level measured in L_{AFmax}
		iii. 0600 - 0700 hours	45 dB	75 dB
		iv. 0700 – 2000 hours	50 dB	-
		v. 2000 – 2300 hours	45 dB	-
		vi. 2300 – 0600 hours	40 dB	75 dB
		vii. 2300 - 0600, within that part of Te Awa Lakes Medium-Density Residential Zone located within 200m of the carriageway of the Waikato Expressway	45 dB	75 dB

b)	Activities in all zones except the Major Facilities, Knowledge and Open Space Zones shall not exceed the following noise levels at any point within the notional boundary of any other site in the Future Urban Zone

		Time of day	Noise level measured in $L_{Aeq\ [15\ min]}$	Noise level measured in L_{AFmax}
		i. 0700 - 2200 hours	55 dB	-
		ii. 2200 - 0700 hours	dB	75 dB

c)	Any activity within the Industrial and Te Rapa North Industrial zones shall not exceed a noise level of 65dBA ($L_{Aeq\ [15\ min]}$) at any point within the boundary of any other site within that zone. This standard does not apply to sites held in common ownership with the site containing the activity generating the noise. This standard applies to Stage 1A of the Te Rapa North Industrial Zone, but does not apply to the remainder of the Te Rapa North Industrial Zone until such time as the Deferred Industrial Zone overlay is removed.
d)	Activities in the Te Awa Lakes Business 6 Zone shall not exceed the following levels within any other Business 6 zoned site or within any site in the Te Awa Lakes Visitor Accommodation Overlay area.

		Time of Day	Limit ($L_{Aeq\ [15\ min]}$)	Limit (L_{AFmax})
		0700 - 2300 hours	60 dB	
		2300 - 0700 hours	55 dB	75 dB
			60 dB at 63 Hz L_{eq}	
			55 dB at 125 Hz L_{eq}	

	• The 63Hz and 125Hz octave band limits shall not apply to fixed mechanical plant. • Adjustments for noise containing Special Audible Characteristics in accordance with New Zealand Standards NZS 6802:2008 "Acoustics – Environmental Noise" only apply to A-weighted levels.	
e)	Application of this standard	
	i.	This standard does not apply to activities provided for by Rule 25.3.5.2(c) and 25.3.5.3(e).
	ii.	This standard does not apply to helicopter noise at helicopter landing areas, road traffic noise, or construction noise.
	iii.	This standard does not apply to residential activities, including the use of garden equipment (such as lawnmowers, chainsaws or wood chippers) ancillary to residential activities. Short duration use at reasonable times will usually be acceptable.
	iv.	This standard does not apply to noise from temporary emergency use of generators for continued power supply provided that the best practicable option to control the noise is adopted.
	v.	This standard does not apply to activities within the Te Rapa Dairy Manufacturing Site.
	vi.	This standard applies to all other activities, including home-based businesses, pool pumps, air conditioning units and domestic wind turbines.
f)	*Activities in Te Rapa Racecourse Precinct shall not exceed the noise levels in 25.8.3.7a iii, iv, v and vi at any point within the boundary of any other site in Te Rapa Racecourse Medium Density Residential Precinct.*	
g)	*Industrial Zones on Ken Browne Drive and Te Rapa Road that share a boundary with the Te Rapa Racecourse Medium Density Residential Precinct shall not exceed a noise level of 65dB L_{Aeq} at any point within the boundary of Te Rapa Racecourse Medium Density Residential Precinct*	
Note 1. The Te Rapa North Deferred Industrial Area, excluding Stage 1A, is assessed against the Future Urban noise standards until such time as the Deferred Industrial Zone overlay is removed.		

25.8.3.9 Noise Performance Standards for Activities in the Major Facilities Zone, Knowledge Zone and Open Space Zones

a)	Activities within the Major Facilities Zone, Knowledge Zone and Open Space Zones shall not exceed the following noise levels at any point within the notional boundary of any other site within the:	
	i.	Future Urban Zone
	Or, any point within the boundary of any other site in the:	
	ii.	Residential Zones

	iii.	Special Character Zone.		
		Time of Day	**Noise level measured in $L_{Aeq\ [15\ min]}$**	**Noise level measured in L_{AFmax}**
		iv. 0700 - 2300 hours	55 dB	-
		v. 2300 - 0600 hours	40 dB	75 dB
		vi. 0600 - 0700	45 dB	75 dB
	vii.	Rule 25.8.3.9(a) i shall not apply to the Knowledge Zone and the Ruakura Open Space Zone (excluding Lot 3 DPS 66853), in which case the application of night noise limit of Rule 25.8.3.9a)v shall be extended to apply between the hours of 2300 hours to 0700 hours.		
	viii.	Activities on any site within Te Awa Lakes Major Facilities Zone must not exceed $L_{Aeq[15min]}$ 65 dB at any point within the boundary of any other site within Te Awa Lakes Major Facilities Zone.		
b)	Rule 25.8.3.9(a) shall not apply to crowd noise from events.			
c)	For Seddon Park, Waikato Stadium, Claudelands Events Centre and Te Rapa Racecourse the noise standards outlined in Rule 25.8.3.9(a) shall apply except for six days per calendar year when the following standards shall apply.			
	i.	The noise (including practice or testing) does not exceed the following noise levels at any point within the boundary of any site in the: • Residential Zone • Special Character Zone		
		Time of Day	**Noise levels measured in $L_{Aeq\ [15\ min}$**	**Noise levels measured in L_{AFmax}**
		ii. 1000 - 2300 hours	75 dB 70 dB at 63Hz 65 dB at 125Hz	85 dB
		iii. On New Year's Eve these noise levels shall apply up to 0030 hours the following day (January 1).		
	iv.	Rule 25.8.3.9(c)i shall not apply to crowd noise from events.		
	v.	The noise event does not exceed four hours' duration, except on two of the six occasions when the duration of the noise event must not exceed seven hours, exclusive of practice and sound checks.		
	vi.	Practice or testing involving the use of electronic sound amplification must not exceed two hours.		
	vii.	The public is notified at least 14 days before the noise event, including information about:		

		• The nature of the noise event and the fact that the noise limits for general activities may be exceeded. • Proposed dates and start and finish time of the event itself, and the expected times of any testing or practice. • Contact details before and during the noise event • Contact details before and during the noise event. • Possible alternative dates in the event of postponement. ***Note*** 1. A suitable method for achieving compliance with this standard is the publishing of a public notice containing the required information in a newspaper with a circulation that covers the entire area affected by the proposal.
	viii.	Provide a noise management plan to Council at least one month before the event to demonstrate compliance with the relevant noise standards.
d)	Application of this standard.	
	i.	This standard does not apply to activities provided for by Rule 25.3.5.2(c) and 25.3.5.3(e).
	ii.	This standard does not apply in relation to noise received from the Te Rapa Racecourse *at any point within the Te Rapa Racecourse Medium Density Residential Precinct and at the* following existing sites on Minogue Drive. • Pt Lot 1 DP 311765 • Lot 5 DP 443687 • Section 3 SO 318174
	iii.	This standard does not apply to noise from helicopter noise at helicopter landing areas, road traffic noise, or construction noise.

25.8.3.10 Noise-sensitive Activities – Activities in all Zones except Ruakura Logistics Zone, Ruakura Industrial Park Zone and the Knowledge Zone

a)	The standards in Rule 25.8.3.10(e), (f) and (g) shall apply to the construction of new buildings to be used for noise-sensitive activities and to additions of habitable rooms to existing buildings, within:	
	i.	The Central City Zone, Business 1 to 7 Zones, Industrial Zone, Te Rapa North Industrial Zone, the Te Rapa Dairy Manufacturing Site Noise Emission Boundary, Rototuna Town Centre Zone and the Te Awa Lakes Business 6 Zone and the Te Awa Lakes Major Facilities Zone.
	ii.	All sites, near existing and proposed transport corridors that carry high traffic volumes, as defined in 25.8.3.10(b), and (c) below.
	iii.	All sites, near a railway line, as defined in 25.8.3.10(d) below.
	iv.	The Rototuna North East Character Zone, where the residential activity is within the 55dB $L_{Aeq(24hr)}$ contour line from the Waikato Expressway, established via subdivision in

		accordance with 23.6.12c, where habitable rooms are located outside of the 55dB $L_{Aeq(24hr)}$ contour, no acoustic treatment is required even if one or more boundaries of the lot is intersected by the noise contour.
b)		"Near existing and proposed transport corridors that carry high traffic volumes" applies to noise sensitive activities where the building line of the building containing the activity is within 40m of the nearest edge of the carriageway (not being a state highway) of:
	i.	Either: Any existing arterial transport corridor or any of the following collector transport corridors • Bader Street • Bankwood Road-South of Comries Road • Beerescourt Road • Brooklyn Road • Bryant Road • Cambridge Road • Clyde Street - East of Wairere Drive • Collins Road-West of Ohaupo Road • Comries Road • Grandview Road - Avalon Drive to Hyde Street • Knighton Road - Clyde Street to Ruakura Road • Maeroa Road - Ulster Street to Norton Road • Naylor Street - Grey Street to Wairere Drive • New Castle Road • Palmerston Street - Pembroke Street to Cobham Drive • Pukete Road • Rifle Range Road • Sandwich Road • Seddon Road - Tainui Street to Norton Road • Silverdale Road ***Note:*** For the avoidance of doubt, only the Collector or Arterial portion of the transport corridors listed above are covered by this rule.
		Or On transport corridors that carry an average annual daily traffic level (ADDT) of • 5,000 AADT where the posted speed limit is ≤50km/hr. • 2,000 AADT where the posted speed limit is >50km/hr.
	ii.	A designated transport corridor that predicted to carry an annual average daily traffic level (AADT) at the design year of at least:

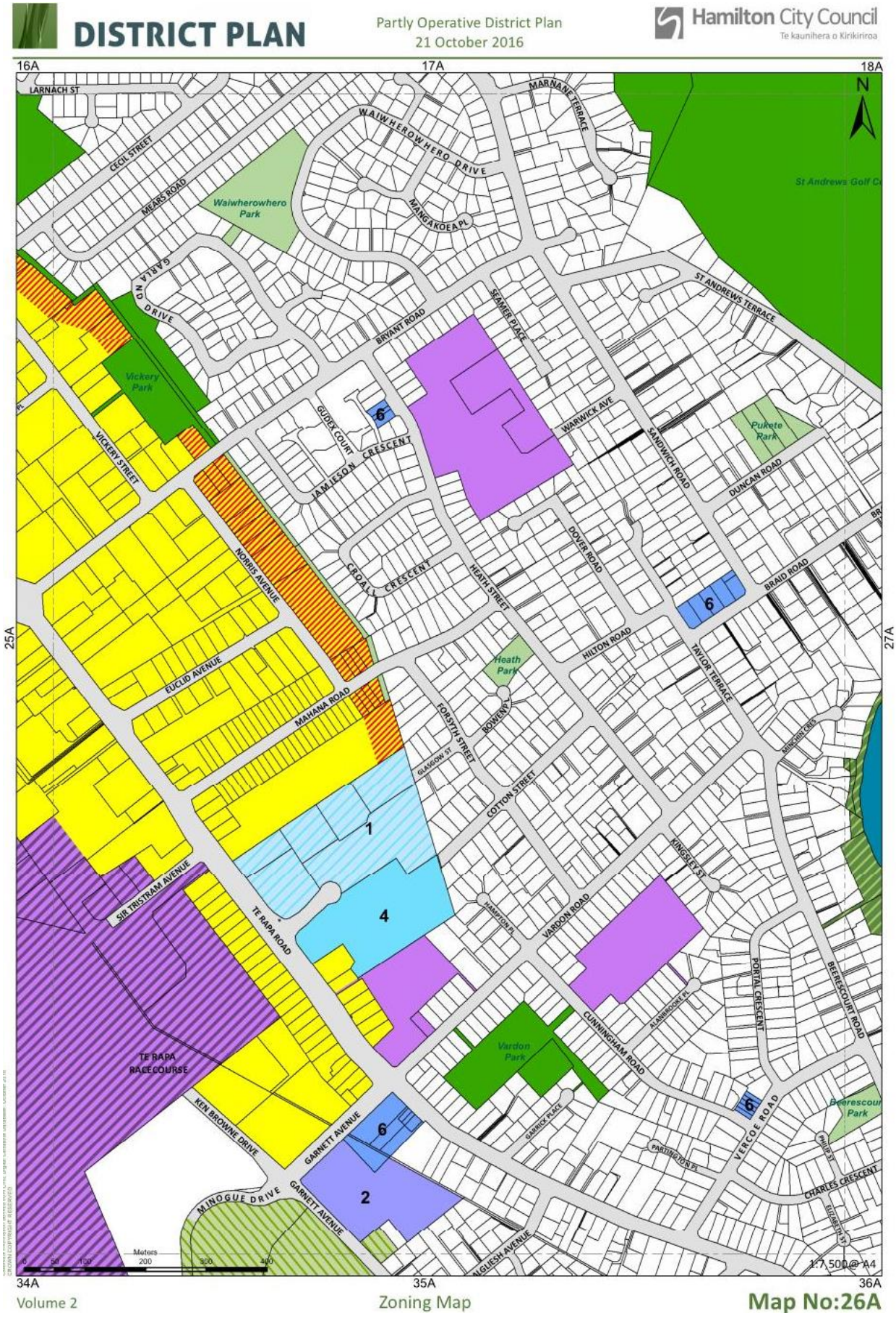
			• 5,000 AADT where the posted speed limit is ≤50km/hr. • 2,000 AADT where the posted speed limit is >50km/hr.
	iii.	a)	The nearest designation boundary if the location of the carriageway has not been confirmed in writing by the Requiring Authority or through an outline plan of works approval under s176A of the RMA; or
		b)	The nearest location of the carriage way confirmed if the location has been confirmed in writing by the Requiring Authority or through an outline plan of works approval under s176 of the RMA.
c)	"Near existing and proposed transport corridors that carry high traffic volumes" also applies to noise sensitive activities where the building line of the building containing the activity is within"		
	i.		100m of the Waikato Expressway (Designations E90, E90a, E99a and E81a), except that this standard does not apply to: 1. the land zoned Rototuna North East Character Zone - see Rule 25.8.3.10(iv) below; or 2. feeder roads serving the expressway interchanges where the noise sensitive activity is more than 100m from the Waikato Expressway proper or any of its interchanges; or
	ii.		80m of any other state highway where the speed limit is equal to or greater than 70km/hour, or where the speed limit is less than 70 km/hour and the AADT is at least 10,000 vehicle per day; or
	iii.		40m of any state highway where the speed limit is less than 70km/hour and the AADT is less than 10,000 vehicles per day;
	iv.		Where the distances specified in (i), (ii) and (iii) above shall be measured from the edge of the carriageway, or the designation boundary if the carriageway location has not been confirmed in writing by the Requiring Authority; and
	v.		Where the speed limit specified in (ii) and (iii) above shall be the posted speed limit in the case of an existing state highway, or the speed limit confirmed in writing by the Requiring Authority for a proposed state highway; and
	vi.		Where the AADT specified in (ii) and (iii) above shall be the current AADT for an existing state highway, or the predicted AADT in the design year confirmed in writing by the Requiring Authority for a proposed state highway.
d)	"Near a railway line" applies to noise sensitive activities where the building line of the building containing the activity is within 40m of the boundary of a designation for Railway Purposes (Designations F1 and F1a).		
e)	Where this standard applies (as defined by Rule 25.8.3.10(a) to (d) above) any habitable room in the building containing noise sensitive activity shall be protected from noise arising from outside the building by ensuring the building containing the noise sensitive activity is designed and constructed to meet an indoor design sound level of 35dB $L_{Aeq(24hr)}$ in bedrooms and 40dB $L_{Aeq(24hr)}$ in all other habitable rooms.		

	Where only 25.8.3.10(a)iv applies, the outdoor noise level shall be the level incidental on the residential activity based on the noise level prediction parameters in Rule 23.6.12(c).	
f)	Compliance with Rule 25.8.3.10(e)i shall be achieved by:	
	i.	An acoustic design certificate that describes the proposed design of the building that will achieve compliance with the internal noise design standards in Rule 25.8.3.10(e); or
	ii.	An existing solid building or landform blocking the line of sight from all parts of all windows and doors of any new habitable room(s) to any part of the carriageway, or the designation if the carriageway location has not been confirmed in writing by the Requiring Authority, within the relevant distance specified in: 1. Rule 25.8.3.10 (b) for transport corridors that are not state highway, or 2. Rule 25.8.3.10 (c) for transport corridors that are state highway, and any habitable room is set back at least 40m from any part of the carriageway, or the designation if the carriageway location has not been confirmed in writing by the Requiring Authority.
g)	Where the internal noise design standards in Rule 25.8.3.10(e) can only be achieved in a habitable room with windows and doors closed, an alternative ventilation system shall be installed that complies with the requirements of Section G4 - Ventilation of the New Zealand Building Code 2011.	
h)	*Within Te Rapa Racecourse Medium Density Residential Precinct, any habitable room in a building constructed on a site within the Noise Sensitive Area identified on the Te Rapa Racecourse Medium Density Residential Precinct Plan (Figure XX) shall meet the following criteria:*	
	i.	*Any habitable room in a building shall be designed and constructed to ensure that the noise level from the Industrial zone is no greater than 35dB $L_{Aeq(24hr)}$ in any bedroom and 40dB $L_{Aeq(24hr)}$ in any other habitable room (the internal noise limits). The outdoor noise level incident upon the building shall be based upon the noise limit in 25.8.3.7 g*
	ii.	*A design report shall be prepared by a suitably qualified acoustic engineer approved by the Hamilton City Council, and provided to the Planning Guidance Manager, Hamilton City Council, that demonstrates the internal noise limits will be achieved*
	iii.	*For those rooms where windows and doors need to be closed to achieve the internal noise limit, an alternative ventilation system that complies with the requirements of Section G4 of the Building Code shall be installed. The ventilation system shall generate less than 35dB L_{Aeq} measured at 1 metre from the internal grill/diffuser.*

APPENDIX A GLOSSARY OF TERMINOLOGY

Frequency	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).
Hertz (Hz)	Hertz is the unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).
Octave Band	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.
Noise	A sound that is unwanted by, or distracting to, the receiver.
Ambient	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.
dB	Decibel 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 x log(P/Pr)
dBA	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.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
$L_{Aeq\ (t)}$	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.
$L_{A90\ (t)}$	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.
$L_{A10\ (t)}$	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_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to ability of a material to stop sound travelling through it.

APPENDIX B PLANNING MAPS



APPENDIX C RELEVANT SECTIONS OF THE HAMILTON CITY PARTLY OPERATIVE DISTRICT PLAN

25.8.3.1 Measurement and Assessment of Noise

a)	Noise levels shall be measured in accordance with NZS 6801:2008 "Acoustics – Measurement of Environmental Sound" and assessed in accordance with NZS 6802:2008 'Acoustics – Environmental Noise'. These apply unless otherwise stated.

25.8.3.2 Construction Noise

a)	All construction noise shall comply with the relevant noise levels stated in NZS6803: 1999, section 7.2 'Recommended numerical limits for construction noise' and shall be measured and assessed in accordance with NZS 6803:1999 'Acoustics – Construction Noise'.

25.8.3.3 Construction Vibration

a)	Construction vibration received by any building on any other site shall comply with the provisions of and be measured and assessed in accordance with German Standard DIN 4150-3:1999 Structural vibration – Effects of vibration on structures.

25.8.3.7 Noise Performance Standards for Activities in all Zones Except Major Facilities, Knowledge, Open Space, Ruakura Logistics and Ruakura Industrial Park Zones

a) Activities in all Zones except Major Facilities, Knowledge, Open Space, Ruakura Logistics and Ruakura Industrial Park Zones, shall not exceed the following noise levels at any point within the boundary of any other site in the:

i. Residential Zones

ii. Special Character Zone.

Time of day	Noise level measured in $L_{Aeq\ [15\ min]}$	Noise level measured in L_{AFmax}
iii. 0600 - 0700 hours	45 dB	75 dB
iv. 0700 – 2000 hours	50 dB	-
v. 2000 – 2300 hours	45 dB	-
vi. 2300 – 0600 hours	40 dB	75 dB
vii. 2300 - 0600, within that part of Te Awa Lakes Medium-Density Residential Zone located within 200m of the carriageway of the Waikato Expressway	45 dB	75 dB

b) Activities in all zones except the Major Facilities, Knowledge and Open Space Zones shall not exceed the following noise levels at any point within the notional boundary of any other site in the Future Urban Zone

Time of day	Noise level measured in $L_{Aeq\ [15\ min]}$	Noise level measured in L_{AFmax}
i. 0700 - 2200 hours	55 dB	-
ii. 2200 - 0700 hours	dB	75 dB

c) Any activity within the Industrial and Te Rapa North Industrial zones shall not exceed a noise level of 65dBA (LAeq [15 min]) at any point within the boundary of any other site within that zone. This standard does not apply to sites held in common ownership with the site containing the activity generating the noise. This standard applies to Stage 1A of the Te Rapa North Industrial Zone, but does not apply to the remainder of the Te Rapa North Industrial Zone until such time as the Deferred Industrial Zone overlay is removed.

d) Activities in the Te Awa Lakes Business 6 Zone shall not exceed the following levels within any other Business 6 zoned site or within any site in the Te Awa Lakes Visitor Accommodation Overlay area.

Time of Day	Limit ($L_{Aeq\ [15\ min]}$)	Limit (L_{AFmax})
0700 - 2300 hours	60 dB	
2300 - 0700 hours	55 dB	75 dB
	60 dB at 63 Hz L_{eq}	
	55 dB at 125 Hz L_{eq}	

- The 63Hz and 125Hz octave band limits shall not apply to fixed mechanical plant.
- Adjustments for noise containing Special Audible Characteristics in accordance with New Zealand Standards NZS 6802:2008 “Acoustics – Environmental Noise” only apply to A-weighted levels.

e) Application of this standard

i. This standard does not apply to activities provided for by Rule 25.3.5.2(c) and 25.3.5.3(e).

ii. This standard does not apply to helicopter noise at helicopter landing areas, road traffic noise, or construction noise.

iii. This standard does not apply to residential activities, including the use of garden equipment (such as lawnmowers, chainsaws or wood chippers) ancillary to residential activities. Short duration use at reasonable times will usually be acceptable.

iv. This standard does not apply to noise from temporary emergency use of generators for continued power supply provided that the best practicable option to control the noise is adopted.

	v.	This standard does not apply to activities within the Te Rapa Dairy Manufacturing Site.
	vi.	This standard applies to all other activities, including home-based businesses, pool pumps, air conditioning units and domestic wind turbines.

Note
1. The Te Rapa North Deferred Industrial Area, excluding Stage 1A, is assessed against the Future Urban noise standards until such time as the Deferred Industrial Zone overlay is removed.

25.8.3.9 Noise Performance Standards for Activities in the Major Facilities Zone, Knowledge Zone and Open Space Zones

a)	Activities within the Major Facilities Zone, Knowledge Zone and Open Space Zones shall not exceed the following noise levels at any point within the notional boundary of any other site within the:			
	i.	Future Urban Zone		
	Or, any point within the boundary of any other site in the:			
	ii.	Residential Zones		
	iii.	Special Character Zone.		
		Time of Day	**Noise level measured in $L_{Aeq\ [15\ min]}$**	**Noise level measured in L_{AFmax}**
		iv. 0700 - 2300 hours	55 dB	-
		v. 2300 - 0600 hours	40 dB	75 dB
		vi. 0600 - 0700	45 dB	75 dB
	vii.	Rule 25.8.3.9(a) i shall not apply to the Knowledge Zone and the Ruakura Open Space Zone (excluding Lot 3 DPS 66853), in which case the application of night noise limit of Rule 25.8.3.9a)v shall be extended to apply between the hours of 2300 hours to 0700 hours.		
	viii.	Activities on any site within Te Awa Lakes Major Facilities Zone must not exceed LAeq[15min] 65 dB at any point within the boundary of any other site within Te Awa Lakes Major Facilities Zone.		
b)	Rule 25.8.3.9(a) shall not apply to crowd noise from events.			
c)	For Seddon Park, Waikato Stadium, Claudelands Events Centre and Te Rapa Racecourse the noise standards outlined in Rule 25.8.3.9(a) shall apply except for six days per calendar year when the following standards shall apply.			
	i.	The noise (including practice or testing) does not exceed the following noise levels at any point within the boundary of any site in the: • Residential Zone • Special Character Zone		

		Time of Day	Noise levels measured in $L_{Aeq\ [15\ min}$	Noise levels measured in L_{AFmax}
		ii. 1000 - 2300 hours	75 dB 70 dB at 63Hz 65 dB at 125Hz	85 dB
		iii. On New Year's Eve these noise levels shall apply up to 0030 hours the following day (January 1).		
	iv.	Rule 25.8.3.9(c)i shall not apply to crowd noise from events.		
	v.	The noise event does not exceed four hours' duration, except on two of the six occasions when the duration of the noise event must not exceed seven hours, exclusive of practice and sound checks.		
	vi.	Practice or testing involving the use of electronic sound amplification must not exceed two hours.		
	vii.	The public is notified at least 14 days before the noise event, including information about: • The nature of the noise event and the fact that the noise limits for general activities may be exceeded. • Proposed dates and start and finish time of the event itself, and the expected times of any testing or practice. • Contact details before and during the noise event • Contact details before and during the noise event. • Possible alternative dates in the event of postponement. ***Note*** 1. A suitable method for achieving compliance with this standard is the publishing of a public notice containing the required information in a newspaper with a circulation that covers the entire area affected by the proposal.		
	viii.	Provide a noise management plan to Council at least one month before the event to demonstrate compliance with the relevant noise standards.		
d)	Application of this standard.			
	i.	This standard does not apply to activities provided for by Rule 25.3.5.2(c) and 25.3.5.3(e).		
	ii.	This standard does not apply in relation to noise received from the Te Rapa Racecourse at the following existing sites on Minogue Drive. • Pt Lot 1 DP 311765 • Lot 5 DP 443687 • Section 3 SO 318174		
	iii.	This standard does not apply to noise from helicopter noise at helicopter landing areas, road traffic noise, or construction noise.		

25.8.3.10 Noise-sensitive Activities – Activities in all Zones except Ruakura Logistics Zone, Ruakura Industrial Park Zone and the Knowledge Zone

a)	The standards in Rule 25.8.3.10(e), (f) and (g) shall apply to the construction of new buildings to be used for noise-sensitive activities and to additions of habitable rooms to existing buildings, within:	
	i.	The Central City Zone, Business 1 to 7 Zones, Industrial Zone, Te Rapa North Industrial Zone, the Te Rapa Dairy Manufacturing Site Noise Emission Boundary, Rototuna Town Centre Zone and the Te Awa Lakes Business 6 Zone and the Te Awa Lakes Major Facilities Zone.
	ii.	All sites, near existing and proposed transport corridors that carry high traffic volumes, as defined in 25.8.3.10(b), and (c) below.
	iii.	All sites, near a railway line, as defined in 25.8.3.10(d) below.
	iv.	The Rototuna North East Character Zone, where the residential activity is within the 55dB LAeq(24hr) contour line from the Waikato Expressway, established via subdivision in accordance with 23.6.12c, where habitable rooms are located outside of the 55dB LAeq(24hr) contour, no acoustic treatment is required even if one or more boundaries of the lot is intersected by the noise contour.
b)	"Near existing and proposed transport corridors that carry high traffic volumes" applies to noise sensitive activities where the building line of the building containing the activity is within 40m of the nearest edge of the carriageway (not being a state highway) of:	
	i.	Either: Any existing arterial transport corridor or any of the following collector transport corridors • Bader Street • Bankwood Road-South of Comries Road • Beerescourt Road • Brooklyn Road • Bryant Road • Cambridge Road • Clyde Street - East of Wairere Drive • Collins Road-West of Ohaupo Road • Comries Road • Grandview Road - Avalon Drive to Hyde Street • Knighton Road - Clyde Street to Ruakura Road • Maeroa Road - Ulster Street to Norton Road • Naylor Street - Grey Street to Wairere Drive • New Castle Road • Palmerston Street - Pembroke Street to Cobham Drive • Pukete Road • Rifle Range Road • Sandwich Road

		• Seddon Road - Tainui Street to Norton Road • Silverdale Road ***Note:*** For the avoidance of doubt, only the Collector or Arterial portion of the transport corridors listed above are covered by this rule.	
		Or On transport corridors that carry an average annual daily traffic level (ADDT) of • 5,000 AADT where the posted speed limit is ≤50km/hr. • 2,000 AADT where the posted speed limit is >50km/hr.	
	ii.	A designated transport corridor that predicted to carry an annual average daily traffic level (AADT) at the design year of at least: • 5,000 AADT where the posted speed limit is ≤50km/hr. • 2,000 AADT where the posted speed limit is >50km/hr.	
	iii.	a)	The nearest designation boundary if the location of the carriageway has not been confirmed in writing by the Requiring Authority or through an outline plan of works approval under s176A of the RMA; or
		b)	The nearest location of the carriage way confirmed if the location has been confirmed in writing by the Requiring Authority or through an outline plan of works approval under s176 of the RMA.
c)	"Near existing and proposed transport corridors that carry high traffic volumes" also applies to noise sensitive activities where the building line of the building containing the activity is within"		
	i.	100m of the Waikato Expressway (Designations E90, E90a, E99a and E81a), except that this standard does not apply to: 1. the land zoned Rototuna North East Character Zone - see Rule 25.8.3.10(iv) below; or 2. feeder roads serving the expressway interchanges where the noise sensitive activity is more than 100m from the Waikato Expressway proper or any of its interchanges; or	
	ii.	80m of any other state highway where the speed limit is equal to or greater than 70km/hour, or where the speed limit is less than 70 km/hour and the AADT is at least 10,000 vehicle per day; or	
	iii.	40m of any state highway where the speed limit is less than 70km/hour and the AADT is less than 10,000 vehicles per day;	
	iv.	Where the distances specified in (i), (ii) and (iii) above shall be measured from the edge of the carriageway, or the designation boundary if the carriageway location has not been confirmed in writing by the Requiring Authority; and	
	v.	Where the speed limit specified in (ii) and (iii) above shall be the posted speed limit in the case of an existing state highway, or the speed limit confirmed in writing by the Requiring Authority for a proposed state highway; and	

	vi.	Where the AADT specified in (ii) and (iii) above shall be the current AADT for an existing state highway, or the predicted AADT in the design year confirmed in writing by the Requiring Authority for a proposed state highway.
d)	"Near a railway line" applies to noise sensitive activities where the building line of the building containing the activity is within 40m of the boundary of a designation for Railway Purposes (Designations F1 and F1a).	
e)	Where this standard applies (as defined by Rule 25.8.3.10(a) to (d) above) any habitable room in the building containing noise sensitive activity shall be protected from noise arising from outside the building by ensuring the building containing the noise sensitive activity is designed and constructed to meet an indoor design sound level of 35dB $L_{Aeq(24hr)}$ in bedrooms and 40dB $L_{Aeq(24hr)}$ in all other habitable rooms. Where only 25.8.3.10(a)iv applies, the outdoor noise level shall be the level incidental on the residential activity based on the noise level prediction parameters in Rule 23.6.12(c).	
f)	Compliance with Rule 25.8.3.10(e)i shall be achieved by:	
	i.	An acoustic design certificate that describes the proposed design of the building that will achieve compliance with the internal noise design standards in Rule 25.8.3.10(e); or
	ii.	An existing solid building or landform blocking the line of sight from all parts of all windows and doors of any new habitable room(s) to any part of the carriageway, or the designation if the carriageway location has not been confirmed in writing by the Requiring Authority, within the relevant distance specified in: 1. Rule 25.8.3.10 (b) for transport corridors that are not state highway, or 2. Rule 25.8.3.10 (c) for transport corridors that are state highway, and any habitable room is set back at least 40m from any part of the carriageway, or the designation if the carriageway location has not been confirmed in writing by the Requiring Authority.
g)	Where the internal noise design standards in Rule 25.8.3.10(e) can only be achieved in a habitable room with windows and doors closed, an alternative ventilation system shall be installed that complies with the requirements of Section G4 - Ventilation of the New Zealand Building Code 2011.	

25.8.3.12 Operational Vibration from Rail Lines – Activities in All Zones

a)	Any new building developed for a y within 20m of a boundary of a designation for railway purposes shall comply with Class C vibration limits in NS 8176E:2005 - Vibration and Shock: Measurement of Vibration in Buildings from Land Based Transport and Guidance to Evaluation of its Effects on Human Beings.
b)	Where Rule 25.8.3.12(a) applies a design report prepared by an acoustics engineer, demonstrating compliance with the vibration criteria, shall be submitted to the Council prior to construction of the building.
Note 1. Some properties more than 20m from a rail may experience vibration from passing trains. Factors such	

as soil ground conditions, distance from rail lines and building design will affect the amount of vibration received. For more information, professional advice can be sought from engineers before undertaking building work near the rail corridor.