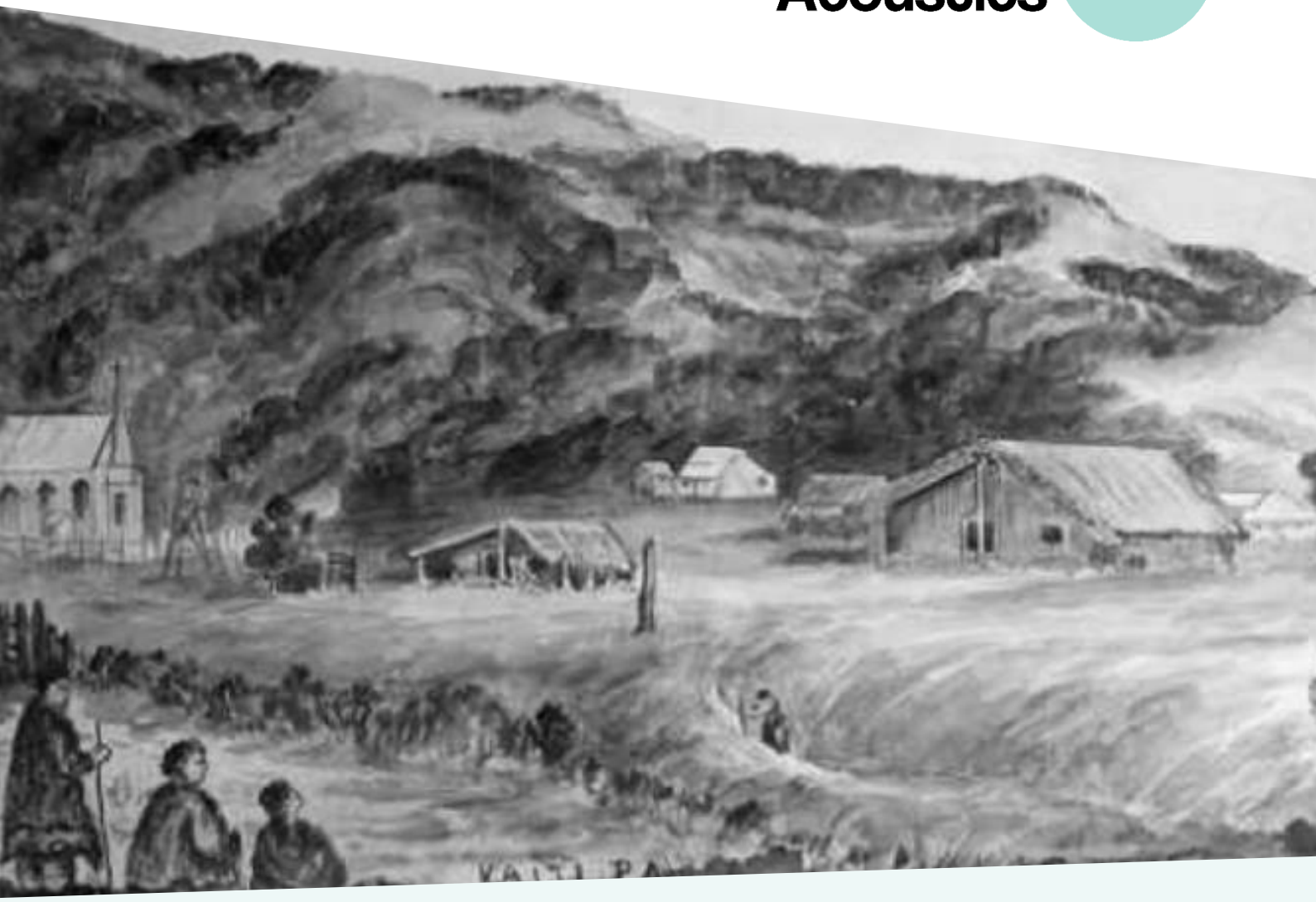
Bladon Bronka Acoustics



# TE PANUKU TU

## Acoustic Report – Resource Consent

Project No. 21093

Date: 9/09/2021
Client: Isthmus Group Ltd
Revision: 1.4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# Contents

# 1. Introduction

Bladon Bronka Acoustics Ltd (BBA) has been appointed by Isthmus Group Ltd to assess the noise from the proposed multi-function community centre at the summit of Titirangi Reserve (Te Taumata o Titirangi). The centre will be used for community and learning activities in addition to evening events for functions, Kapahaka, Education, Manaakitanga, tourism and observatory activities.

The acoustic assessment is required to support the project's Resource Consent application to Gisborne District Council (GDC), with noise emissions assessed to the closest receivers against the noise limits of the Tairāwhiti Resource Management Plan (TRMP). An assessment of potential noise effects with respect to section 16 of the Resource Management Act is also required.

## 1.1. Proposed Site, Activities and Surrounds

The proposed site is located at the summit of Titirangi Reserve, south-east of Gisborne town centre and port and south-west of the residential suburban Kaiti area.

The location of the proposed site and surrounding areas is presented below in Figure 1.


**Figure 1. Proposed site and surrounding areas**

The closest noise-sensitive sites to the proposed development are the Poho-O-Rawiri Marae and residential dwellings to the northeast on Ranfurly Street, Queens Drive, Cambridge Terrace and Oxford Street within the General – Residential Zone, in addition to the dwellings on Kaiti Beach Road to the south within the Rural - Residential Zone as shown in Figure 2 below.

All noise sensitive receivers will benefit from large separation distances of 250m in addition to screening of the building due to the summit topography.


**Figure 2. Proposed Site (red dot) and surrounding area – District Plan Zoning**

The site is also located just outside the 55dB $L_{dn}$ port noise contour as presented below.


**Figure 3. Site location outside the 55dB $L_{dn}$ port noise contour (site shown as red dot)**

The concept landscape plan and building layout of the proposed centre is presented below in Figure 4 and Figure 5 below.


**Figure 4. Proposed site layout (concept design)**

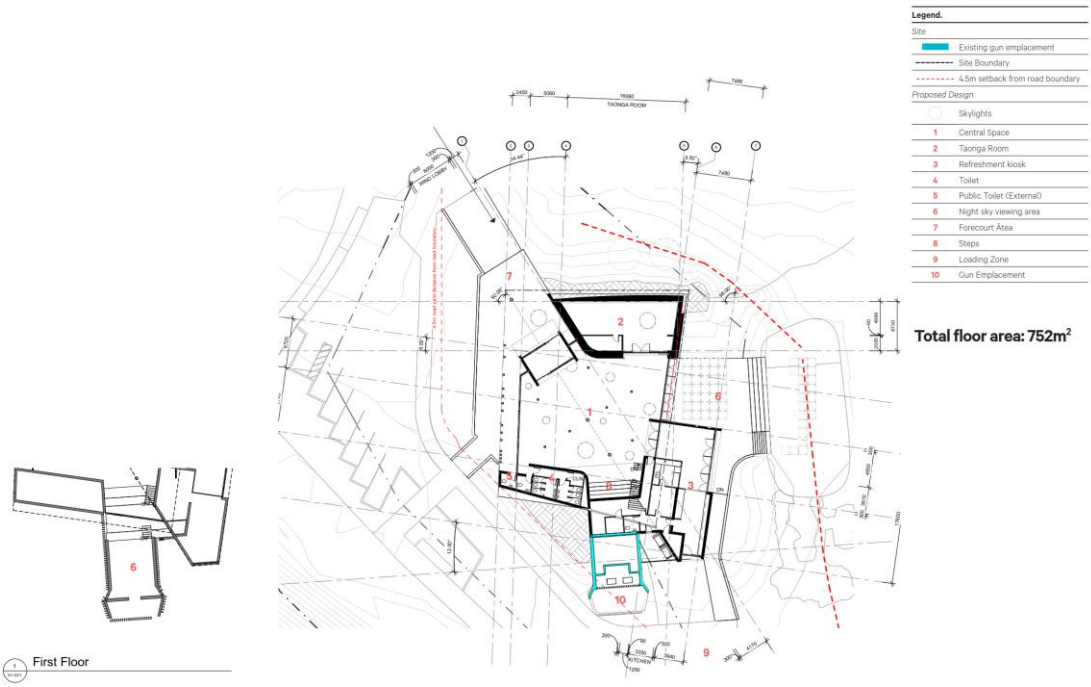


**Figure 5. Proposed multi-function space building layout (concept design)**

## 1.2. Proposed activities

The following activities are proposed and are categorised as noise-generating activities or quiet activities (therefore need not be considered in terms of noise effects) as follows:

Noise generating activities

- Functions with internal amplified music (high level) - ~150 guests, operating daytime to midnight, 10-20 events a year expected;
- Kapahaka with amplified speech/music internally or externally– ~150 guests, operating 9am to 12am, 4-8 events per year;
- Education / Wananga events amplified speech/music (low level), ~90 guests, operating 9am to 5 pm, 30-50 events per year;

Quiet activities

- Art exhibitions, internally and externally, ~100 guests, 9am - 12am, 4-8 events per year
- Manaakitanga and Kiosk ~25 guests, 9am - 5pm, operating background music only, daily events;
- Observatory / Sunrise / Stargazing, ~30-60 guests, 5am - 12am, 20-40 events per year
- Tourism

For all events, guests will either drive or walk to the site themselves or use a shuttle bus.

# 2. Criteria

## 2.1. Tairawhiti Resource Management Plan

The applicable noise rules of the TRMP are presented below:

***C11.2.15 Rules for Noise***

*C11.2.15.1 General Rules and Standards for Permitted Activities*

*The following general rules shall apply to all permitted activities with respect to noise (excluding vibration):*

*A. All Zones*

1. *At any boundary where the zones differ, the appropriate noise limit shall be the lowest average maximum noise level (L10) permitted by either zone.*
2. *Outdoor activities associated with educational institutions conducted on the site of the institutions between 7am and 9pm shall not exceed a maximum of the noise standard at the boundary of the zone in which it is being received, increased numerically by 10dBA.*
3. *Noise associated with emergency warning devices used by emergency services shall be exempt from all rules contained in C11.2.15.1.*

*B. Residential and Neighbourhood Reserve Zones*

1. *The average maximum noise level (L10) and maximum noise level (Lmax) as measured at or within the boundary of any site zoned residential or at, or within the boundary of any site zoned Neighbourhood Reserve shall not exceed the following limits:*

| Residential Zones and Neighbourhood Reserves | Monday to Saturday | | | | Sundays and Public Holidays | | | |
|---|---|---|---|---|---|---|---|---|
| | Average Maximum Noise Level ($L_{10}$) dBA | | | ($L_{max}$) dBA | ($L_{10}$) dBA | | | ($L_{max}$) dBA |
| | Day 7am-6pm | Evening 6pm-10pm | Night 10pm-7am | Night 10pm-7am | Day 7am-6pm | Evening 6pm-10pm | Night 10pm-7am | Night 10pm-7am |
| *Front sites adjacent to arterial, principal roads, front and rear sites adjacent to railway lines or commercial or industrial zones.* | *55* | *50* | *45* | *70* | *50* | *45* | *45* | *70* |
| *All other sites* | *55* | *45* | *40* | *65* | *45* | *45* | *40* | *65* |

***Figure C11.3 – Standards for Noise in the Residential and Neighbourhood Reserve Zones***

*C. Industrial, Port, Commercial, Inner Residential and Suburban Commercial zones*

*1. The average maximum noise level (L10) as measured at or within the boundary of any industrial, port, commercial or Suburban Commercial zone shall not exceed the following limits:*

| Generic Zone | Average Maximum Noise Level ($L_{10}$) dBA |
|---|---|
| *Industrial and Port* | *75* |
| *Commercial* | *70* |
| *Suburban Commercial* | *65* |

***Figure C11.4 – Standards for Noise in the Industrial, Port, Commercial and Suburban Commercial Zone***

*…*

*D. Rural Zones*

*1. The average maximum noise level ($L_{10}$) and maximum noise levels ($L_{max}$) as measured at or within the boundary of any site zoned Rural Residential, Rural Lifestyle or the notional boundary of any dwelling zoned Rural Production, Rural General, and shall not exceed the following limits.*

| Zone | Average Maximum Noise Level ($L_{10}$) dBA | | ($L_{max}$) dBA |
|---|---|---|---|
| | Day 0600-2100 | Night 2100-0600 | Night 2100-0600 |
| *Rural* | *55* | *45* | *70* |

***Figure C11.6 – Rules for Noise in the Rural Zone***

*…*

*E. Heritage Reserve Zones*

*1. The average maximum noise level ($L_{10}$) and maximum noise level ($L_{max}$) arising from any zone as measured at or within the boundary of any site zoned Heritage Reserve shall not exceed the following limits:*

| Zone | Average Maximum Noise Level ($L_{10}$) dBA | | ($L_{max}$) dBA |
|---|---|---|---|
| | Day 0600-2100 | Night 2100-0600 | Night 2100-0600 |
| *Heritage Reserve* | *50* | *50* | *50* |

***Figure C11.7 – Rules for Noise in the Heritage Reserve Zone***

*…*

***C11.2.15.2 Rules and Standards for Noise for Construction Activities- All Zones***

*A. Long Term Construction*

*1. Emissions of construction noise shall not exceed 168 calendar days in any 12 month period.*

*2. The construction activity shall comply with the noise limits specified in Figure C.11.*

*B. Shorter Term Construction Noise Standards*

*1. Emission of construction noise shall not exceed 15 calendar days in any 12 month period.*

2. *Noise limits specified in Figure C11.9 may be exceeded by 5 dBA except for residential zone between 6pm - 7am and rural zone dwellings between 6pm – 6am. Tairāwhiti Resource Management Plan – Part C (C9-C11) Last Updated 26 February 2019 75*
3. *The background sound level (L95), average maximum noise level (L10) and maximum noise level (Lmax) arising from any zone as measured at or within the boundary of any site zoned residential, commercial, Suburban Commercial, industrial, port or reserve or the notional boundary of any dwelling in a rural zone shall not exceed the following limits:*

| ***Construction & temporary activity noise measured within the*** | ***Time period*** | ***Average Maximum Noise Level (dBA)*** | | |
|---|---|---|---|---|
| | | $L_{95}$ | $L_{10}$ | $L_{max}$ |
| *Residential Zone* | *Mon – Sat 7am-6pm* | *60* | *75* | *90* |
| | *All other times* | *Refer to Figure C11.3* | *Refer to Figure C11.3* | *Refer to Figure C11.3* |
| *Commercial and Suburban Commercial Zones* | *Mon – Sat At all times* | *60* | *75* | *90* |
| | *All other times* | *-* | *Refer to Figure C11.4* | *-* |
| *Industrial and Port Zones* | *Mon – Sat At all times* | *-* | *90* | *-* |
| | *Sun & Public Holidays At all times* | *-* | *Refer to Figure C11.4* | *-* |
| *Rural Zone* | *Mon-sat 0600-6pm* | *60* | *75* | *90* |
| | *All other times* | *Refer to Figure C11.6* | *Refer to Figure C11.6* | *Refer to Figure C11.6* |
| *Reserves Zone* | *Mon-Sat At all times* | *60* | *75* | *90* |
| | *Sun & Public Holidays At all times* | | *Refer to Figure C11.3m C11.7 and C11.8* | *Refer to Figure C11.3m C11.7 and C11.8* |

***Figure C11.9 – Rules for Construction Noise in All zones***

…

***C11.2.15.8 Method of Assessment of Noise***

*A. General Noise Assessment*

1. *All measurements shall be taken in accordance with:*
   a) *NZS6801:1991 "Measurement of Sound";*
   b) *NZS 6802:1991 "Assessment of Environmental Sound"; NZS 6802:1999 "Acoustics –Assessment of Environmental Sound" and*
   c) *NZS 6803P:1984 "The measurement and Assessment of Noise from Construction, Maintenance and Demolition Work", NZS6803:1999 "Acoustics – Construction Work"*

   *And*

   d) *Draft New Zealand Standard DZ 6808:1997, Acoustics -The assessment and measurement of sound from wind turbine generators.*
   e) *NZS 6809:1999 " Acoustics – Port Noise Management and Land Use Planning"*
2. *Where it is not practicable to assess and/or measure noise outside:*
   a) *internal noise will be measured in accordance with New Zealand Standards; and*
   b) *the rules for internal noise for each respective zone will be the relevant noise rules for that zone numerically reduced by 10dBA.*

3. *Where noise is of a type which is intermittent and/or varying over long time intervals, then the relevant noise performance standards are considered to be exceeded when:*

| Zone | Time | Assessment Provisions |
|---|---|---|
| *Rural* | *DAY*<br>*Mon – Sat 0600-1900* | *The logarithmic average of three measurement periods (22 minutes duration) exceeds the specified limit* |
| | *EVENING*<br>*Mon – Sat 1900-10pm*<br>*Sun & Public Holidays 6pm-10pm* | *The logarithmic average of two measurement periods (12 minutes duration) exceeds the specified limit* |
| | *NIGHT*<br>*At all other times* | *1 measurement period (10 minutes duration) exceeds the specified limit* |
| *All other zones* | *DAY*<br>*Mon – Sat 7am-6pm* | *The logarithmic average of three measurement periods (22 minutes duration) exceeds the specified limit* |
| | *EVENING*<br>*1900-10pm*<br>*Sun & Public Holidays 6pm-10pm* | *The logarithmic average of three measurement periods (12 minutes duration) exceeds the specified limit* |
| | *NIGHT*<br>*All other times* | *1 measurement period (10 minutes duration) exceeds the specified limit* |

***Figure C11.13 – Assessment for intermittent/varying noise over long time intervals***

***B Method for Assessment of Noise - Reserves***

1. *Where more than one type of zone is bounding the reserve, rules shall be set in accordance with the more lenient of the noise rules applicable.*
2. *Where Amenity and Recreation Reserves share a common boundary with another reserve, noise rules will be established on a case-by-case basis as the need arises using the Act.*

Due to the large separation distances, construction vibration limits are expected to be achieved with a large factor of safety and need not be considered further.

## 2.2. Resource Management Act 1991

The Resource Management Act 1991 (RMA) is the principal legislation regarding land use. Section 16 (1) of the RMA describes the overarching duty to limit noise emissions as follows:

***Duty to avoid unreasonable noise***

*(1) Every occupier of land (including any premises and any coastal marine area), and every person carrying out an activity in, on, or under a water body or the coastal marine area, shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level.*

# 3. Construction noise

The proposed site is situated over 250m away from the closest noise sensitive receivers (residential) to the south on Kaiti Beach Road and over 450m away from the receivers (residential + Marae) to the northeast on Ranfurly Street, Queens Drive, Cambridge Terrace and Oxford Street. The site is, however, surrounded by the Heritage Reserve Zone on all sides although no noise sensitive receivers are situated here.

Constructions works will take place between the daytime hours 7am – 6pm Monday to Saturday and are considered "long term" due to the expected construction duration exceeding 15 days but not exceeding 168 days.

The most stringent noise criteria for the surrounding area are the 60dBA $L_{95}$ / 75dBA $L_{10}$ limits for receivers within the Residential and Rural Zone in addition to the Heritage Reserve Zone.

Source noise levels for the proposed construction activities, and the setback distances required to comply with the most stringent limits, are provided below assuming no noise barrier screening is provided. As construction activities are typically assessed using the most up to date $L_{Aeq}$ parameter in accordance with NSZS 6803: 1999, $L_{95}$ levels have been calculated assuming a -5dB correction (to account for the plant being used 30% of the assessment period) and $L_{10}$ levels calculated with a +3dB correction applied to the $L_{Aeq}$ level.

**Table 1. Construction noise activities and compliance distances**

| Activity | Source noise reference (BS 5228) | SPL dB $L_{Aeq}$ noise level at 10m | Compliance distance required to achieve TRMP limits | |
|---|---|---|---|---|
| | | | 60 dBA $L_{95}$ | 70dB $L_{10}$ |
| 23 ton excavator | BBA measurement | 71 | 20 | 16 |
| Rotary bored piling rig | BS 5228: 2009 C3 17 | 76 | 35 | 28 |
| Lorry | BayLfu Study | 58 | 4 | 4 |
| Concrete pump and mixer | BS 5228: 2009 C4 28 | 75 | 32 | 25 |
| 18 ton Vibratory roller | BS 5228: 2009 C2 38 | 73 | 25 | 20 |
| Mobile crane | BS 5228: 2009 C4 46 | 67 | 13 | 10 |
| Generator | BS 5228: 2009 C4 80 | 60 | 6 | 4 |

With all noise sensitive receivers (residential and Marae) located over 250m away, the maximum permitted construction noise limits of 60dBA $L_{95}$ and 70dB $L_{10}$ will be achieved with a factor of safety.

For the Heritage Reserve Zone areas surrounding the site on all sides exceedances of the limits are to be expected for up to 35m separation distance or less. These exceedances are expected to last for up to 1-2 months occurring intermittently across the daytime periods during the earthworks stage only.

Construction noise effects to the Titirangi Reserve areas are not considered to cause any significant impact to visitors and users due to the large size of the Titirangi Reserve (allowing visitors to enjoy significantly reduced construction noise levels in other areas) and the temporary nature of the construction noise for a short duration only.

# 4. Operational Noise Assessment

Noise emissions from the proposed centre have been predicted to the closest receivers using internationally recognised 3D noise modelling software CadnaA (Computer Aided Noise Abatement) Version 2018. The software calculates noise propagation in accordance with *ISO 9613-2: Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation*. Calculation settings for the software include C0 = 0 for slightly enhanced meteorological noise propagation, G = 1 for absorptive grassy areas and inclusion of building reflections.

Ground contours, site boundaries and existing buildings have been input into the model from GIS data provided by GDC Tairawhiti online maps.

## 4.1. Internal Amplified Music

The proposed multi-function space will host events playing internal amplified music within the central space. Full construction details are not yet available, however, the design team have indicated the following constructions are to be used:

**Glazing**: ≥8mm single glazing (31dB $R_w+C_{tr}$), assumed to cover ~80% of the exposed facade

**External walls**: lightweight timber/steel framed with insulation infill and plasterboard internal lining and metal/timber/fibre cement cladding (35dB $R_w+C_{tr}$) assumed to cover ~20% of the exposed facade

**Roof/ceiling**: 120mm PIR/Stonewool warm roof system, suspended ceiling with ~500mm cavity, 140mm polyester or fibreglass insulation (density 10-15kg/$m^3$), suspended plasterboard or timber ceiling layers: (45dB $R_w+C_{tr}$);

The space will incorporate an internal amplified sound system for bands/DJs typically expected to reach maximum reverberant noise levels of up to 95dBA $L_{10}$ during events with amplified music.

For amplified music, the spectrum shown in Table 2 below has been used to calculate the noise breakout of the venue assuming a maximum internal noise level of 95dBA $L_{10}$.

**Table 2. Amplified music spectrum, dB $L_{10}$**

| 63Hz | 125Hz | 250Hz | 500Hz | 1000Hz | 2000Hz | 4000Hz | 8000Hz |
|---|---|---|---|---|---|---|---|
| 8.6 | 8.6 | -1.4 | -1.4 | -6.4 | -11.4 | -16.4 | -18.4 |

It is understood that the building will incorporate mechanical ventilation/cooling allowing windows and doors to remain closed during events. The central space will also incorporate an entrance lobby/vestibule which will act as a buffer for noise when guests enter/exit the space. Doors are proposed on the eastern façade for access to the external viewing area which has the potential to cause increased noise emissions when used during events with amplified music.

The composite transmission losses and the effective radiating sound powers have been calculated in accordance with EN 12354-4: 2000 for each façade and roof with either closed or open windows/doors on the western facade. The exposed building elements that will be radiating noise during events with amplified music include the west facade, east facade and the roof.

Area noise sources for each of the facades and roof have been placed into the 3D noise model with their respective octave band sound powers.

In accordance with NZS 6802: 1991, a +5dB correction for Special Audible Characteristics has been applied due to the tonal/impulsive nature of the music. Similarly, daytime predictions have had a -5dB correction applied to account for averaging as events are expected to last approximately 3 hrs maximum (30% of the daytime period of 7am – 6pm for Residential Zone, 6am – 9pm Rural/Reserve Zone), not applicable during evening or night periods. $L_{max}$ levels have been calculated assuming a +3dB correction to $L_{Aeq}$ levels with no rating corrections applied, typical of music.

Due to the high number of receivers, noise levels have been predicted at the boundary of the closest receivers (experiencing highest noise levels) in each area, other receivers not listed are expected to receive the same or lower noise levels.

The predicted noise rating levels for each receiver area are presented in Table 3 of Appendix A with 3D noise modelling contours presented in Figure 6 and Figure 7 of Appendix B.

All predicted noise ratings at noise sensitive receivers (residential + Marae) are below the maximum permitted noise limits of the TRMP for the General Residential and Rural Residential Zones for both day, evening and night time periods, with western doors open or closed. The highest noise levels of 28-29dBA $L_{10}$ are predicted at the Cambridge Street and Oxford Street residential boundaries with evening and night time ratings of 33-34dBA $L_{10}$ when the eastern doors are open and approx. 15dBA lower with doors closed.

For the Heritage Reserve areas surrounding the site, exceedances of the 50dB $L_{10}$ limit (day and night time periods) are expected for a 100m radius when doors are open.

For events with internally amplified speech, noise emissions will be significantly lower due to the reduced internal reverberant noise levels of 70-75dB $L_{10}$ with significantly less low-frequency content.

## 4.2. External amplified music/speech

The centre will host events with amplified speech or music in the external areas during the daytime periods (functions/Kapahaka). These events will be hosted around the night sky viewing area or steps on the eastern side of the building (item 6 of Figure 4).

Noise levels of up to 80dBA $L_{10}$, when measured at 10m distance, are expected from an external PA system during amplified music, with lower noise levels for amplified speech.

To assess external amplified music, two point sources (two PA speakers) have been input into the 3D model at a height of 1.5m above ground. These incorporated the music spectrum shown in Table 2, calibrated to 80dBA $L_{10}$ at 10m, on the eastern side of the building in the night sky viewing area/steps.

Noise levels have been predicted to the closest receivers for events during the daytime periods only, incorporating a +5dB rating correction due to Special Audible Characteristics and a -5dB correction due to averaging across the daytime period (in accordance with NZS 6802: 1991).

The predicted noise rating levels for each receiver area are presented in Table 4 of Appendix A with 3D noise modelling contours presented in Figure 8 of Appendix B.

Noise predictions show that the daytime noise limits of 55dB $L_{10}$ and evening/night time noise limits of 45dBA $L_{10}$ (General Residential and Rural Residential Zones) are achieved for all receivers. The night-time noise limits of 40dBA $L_{10}$ (General Residential Zone only) are exceeded for the Cambridge Street and Oxford Street receivers by 1–2dB respectively, however, amplified music/speech will not occur during the night periods.

## 4.3. Traffic noise

Due to the large separation distances of over 250m to neighbouring sites, noise from traffic to/from the site is expected to meet the TRMP noise limits at all receivers with a large factor of safety.

## 4.4. Building Services Noise

As with traffic noise, noise from building services is expected to meet the TRMP noise limits at all receivers with a large factor of safety due to the large separation distances involved.

## 4.5. Reverse Sensitivity

The location of the site sits just outside (~30m east) of the 55dB $L_{dn}$ port noise contour as presented in Figure 3 and is therefore not subject to the reverse sensitivity noise rules of the TRMP. The site is also not classified as "noise sensitive" as it does not contain residential / school education activities.

Regardless of the noise rules not being applicable, the proposed façade constructions described previously and the use of a mechanical HVAC system to allow windows/doors to remain closed will ensure internal noise levels of 30dB $L_{Aeq}$ or lower are achieved internally, suitable for a range of learning and community activities. Therefore, any potential reverse sensitivity noise effects to the Port will be adequately controlled.

# 5. Assessment of effects

The only significant noise emissions from the proposed venue will be from internal amplified music/speech during functions/Kapahaka (day/evening/night up to midnight) or external amplified music/speech (day and evening periods).

The noise modelling exercise demonstrated that the TRMP noise limits for the General Residential Zone and Rural Residential Zone are achieved assuming a typical noise level and spectrum for internal amplified music during functions/Kapahaka events. This allows for the eastern façade doors to remain open during day/evening/night, or, for external amplified music during the day and evening periods.

For internal amplified music, maximum noise levels of 29dBA $L_{10}$ (non-rated) or less are expected within the boundaries of the closest receivers on Cambridge and Oxford Street. With an open window being used or natural ventilation providing 5-10dBA reduction of noise (assuming a music spectrum) this results in internal noise levels of approximately 19-24dBA $L_{10}$. During day and evening periods when most occupants will not be sleeping, this noise level is expected to be barely audible above typical background noise levels and not

expected to cause any disturbance to typical residential activities such as telephone conversation, TV/radio, rest and relaxation (not involving sleep).

During the night time periods after 10pm when residents are expected to sleep, there is a much higher sensitivity to noise, especially if it incorporates tonal or impulsive characteristics such as music. As amplified music is proposed up until midnight, receivers using open windows for ventilation/cooling may experience very slight disturbance to amplified music if it is just audible above the lower background noise levels. This can be mitigated by ensuring that the external doors on the eastern boundary remain closed for events with amplified music that operate past 10pm, resulting in maximum predicted boundary noise levels of 14dB $L_{10}$ a the most exposed receiver. This mitigates the risk of sleep disturbance, even where receivers utilise open windows for ventilation/cooling.

Restricting guests to internal areas of the venue between 10pm to midnight will also ensure any potential noise from occupants (singing/shouting during celebrations) is adequately controlled.

For external amplified music/speech operated during the day or evening periods only, amplified music is expected to reach external noise levels of up to 37dBA $L_{10}$ within the boundaries of the closest receivers on Cambridge and Oxford Street. This will result in audible music for residents when they are using the outside living areas (gardens) and slightly audible noise levels internally if open windows are being used for natural ventilation. This is not expected to cause any significant disturbance to daytime residential activities, but may be considered to cause a very slight annoyance during evening periods when rest and relaxation (not involving sleep) is expected, such as reading, TV, Radio, dining etc. It is therefore recommended to restrict external amplified music/speech to the daytime periods only i.e. between 9am to 6pm.

All other noise sources such as traffic or building services plant are expected to be significantly lower and inaudible to the identified receivers.

Amplified music (internally or externally) will be audible in the reserve areas surrounding the site owned and operated by Gisborne District Council are not expected to cause any significant impact on the acoustic amenity of the area as users of the reserve will experience no noise emissions from the development for the majority of the year, with only occasional amplified music/speech during events when in close proximity.

# 6. Recommendations

The following recommendations are made as conditions of consent:

1) The use of the internal amplified sound system in the main hall during function/Kapahaka is permitted between the hours of 9am to 12am (midnight) only.

Doors and windows of the main hall must be kept closed between the hours of 10pm to 12am (midnight) when the internal amplified sound system is in operation.

2) The use of an external amplified sound system is restricted to the external viewing deck or stair area on the eastern side of the building. The operation of an external amplified sound system is restricted to the daytime hours of 9am to 6pm only.
3) The include noise management measures within the Operational Management Plan that specifies the staff responsible, amplified sound system operation times and areas of use, and management of the venue with respect to conditions 1 and 2.

# 7. Conclusion

BBA has assessed the noise emissions, reverse sensitivity requirements and potential noise effects from the proposed Te Panuku Tu community centre at the summit of Titirangi Reserve, Gisborne. The development will be used for a range of community, education and ceremonial events incorporating amplified speech and music internally and externally.

The noise emissions have been assessed using 3D modelling techniques and Gisborne online mapping data to the closest affected receivers. This has considered the highest potential noise-generating activities including internal amplified music operating until midnight and external amplified music operating during the daytime only.

The noise emissions are predicted to be below the permitted limits of the TRMP for all noise-sensitive receivers within the General Residential Zone and Rural Residential Zone for all noise-generating activities. To control potential noise effects to receivers during more sensitive evening and night time periods, it is recommended ensure doors on the eastern façade remain closed between 10pm to midnight for events with internal amplified music or restrict external amplified music to the daytime period of 9am to 6pm only.

These controls have been recommended as conditions of consent to be included in a Noise Management Plan to be implemented by the development operators for events utilising an amplified sound system.

With the proposed conditions of consent implemented, the TRMP noise limits will be achieved for events at the centre and the effects from events will not exceed a reasonable level in terms of section 16 of the RMA for all receivers.

# Appendix A– 3D Noise model Predictions

**Table 3. 3D Noise model predictions and ratings – Internal Amplified Music**

| Receiver Area | Open doors on west facade | | | Closed doors on west facade | | |
|---|---|---|---|---|---|---|
| | 3D Noise model results dB $L_{10}$ / $L_{max}$ | Noise Rating - Day dB $L_{10}$ / $L_{max}$ | Noise Rating Evening/Night dB $L_{10}$ /$L_{max}$ | 3D Noise model results dB $L_{10}$ / $L_{max}$ | Noise Rating - Day dB $L_{10}$ / $L_{max}$ | Noise Rating Evening/Night dB $L_{10}$ /$L_{max}$ |
| Rafurly Street (residential + Marae) | 25 / 30 | 25 / 30 | 30 / 35 | 13 / 18 | 13 / 18 | 18 / 23 |
| Cambridge Terrace | 28 / 33 | 28 / 33 | 33 / 38 | 14 / 19 | 14 / 19 | 19 / 24 |
| Oxford Street | 29 / 34 | 29 / 34 | 34 / 39 | 14 / 19 | 14 / 19 | 19 / 24 |
| Endcliff Road | 26 / 31 | 26 / 31 | 31 / 36 | 10 / 15 | 10 / 15 | 15 / 20 |
| Kaiti Beach Road | 22 / 27 | 22 / 27 | 27 / 32 | 12 / 17 | 12 / 17 | 17 / 22 |

**Table 4. 3D Noise model predictions and ratings – External amplified music**

| Receiver Area | External amplified music | | |
|---|---|---|---|
| | 3D Noise model results dB $L_{10}$ / $L_{max}$ | Noise Rating - Day dB $L_{10}$ / $L_{max}$ | Evening/Night dB $L_{10}$ /$L_{max}$ |
| Rafurly Street (residential + Marae) | 31 / 36 | 31 / 36 | 36 / 41 |
| Cambridge Terrace | 36 / 41 | 36 / 41 | 41 / 46 |
| Oxford Street | 37 / 42 | 37 / 42 | 42 / 47 |
| Endcliff Road | 34 / 39 | 34 / 39 | 39 / 44 |
| Kaiti Beach Road | 29 / 34 | 29 / 34 | 34 / 39 |

# Appendix B– Noise Contours


**Figure 6. 3D noise model contours internal amplified music of 95dB $L_{10}$ (no rating corrections) – west façade doors open**

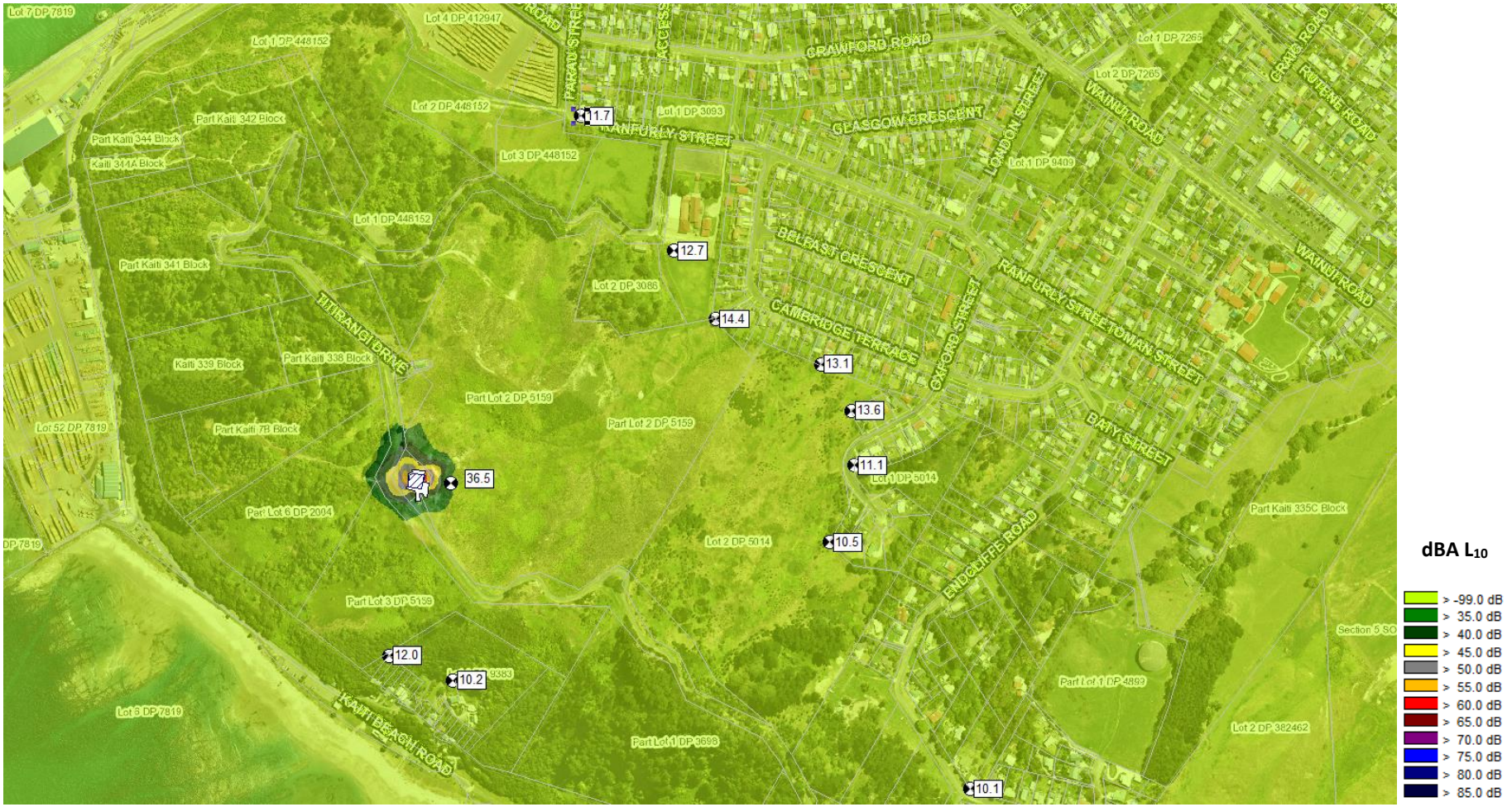


**Figure 7. 3D noise model contours internal amplified music of 95dB $L_{10}$ (no rating corrections) – west façade doors closed**

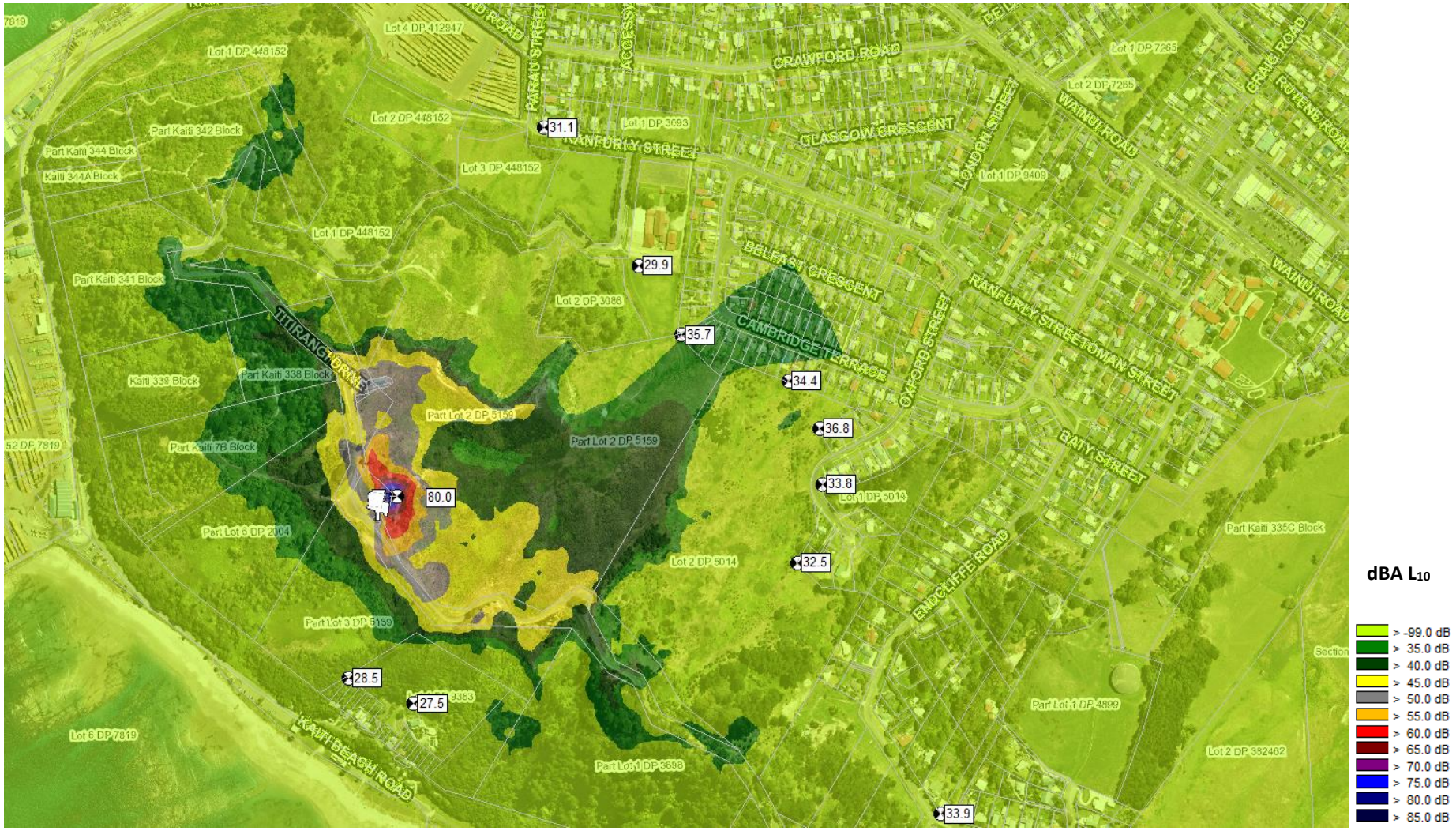


**Figure 8. 3D noise model contours external amplified music of 80dB $L_{10}$ at 10m (no rating corrections)**