

Bladon Bronka Acoustics

Waikato Racing Hub, Pencarrow Road – Acoustic Report, Substantive Application

Project No. 26037

Date: 1/10/2026
Client: Waikato Thoroughbred Racing
Revision: 1.4

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1. Qualification and Experience

1. My name is Matthew Bronka. I am the director and a principal acoustic consultant at Bladon Bronka Acoustics Ltd (BBA). I have had 18 years' experience in the field of Acoustics
2. I obtained a Diploma in Acoustics and Noise Control in 2010 (Institute of Acoustics, UK) and a BA (Hons) in Creative Music and Audio Technology in 2008 (Brunel University).
3. I am a member of the Acoustic Society of New Zealand and the company representative of BBA's membership to the Association of Australasian Acoustical Consultants.
4. I have provided many acoustic assessments for Resource Consent applications across New Zealand, including the prediction, measurement and assessment of noise and vibration effects for a wide range of sectors.
5. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing this report. Other than when I state I am relying on the advice of another person, this report is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

2. Introduction

Bladon Bronka Acoustics Ltd (BBA) has been appointed to provide an acoustic assessment of the proposed Waikato Racing Hub (WRH) at Pencarrow Road, Tamahere. The acoustic report is required as part of the Substantive Fast Track Resource Consent Application.

This acoustic report considers the noise emissions to the neighbouring receivers around the site, including the PA sound system and vehicle noise, in addition to construction noise and vibration. The proposed residential and commercial activities on site are also considered with respect to reverse sensitivity. The report assesses noise emissions against the permitted limits set out in the Waikato District Plan – Operative in Part (WDC-OP) and considers the potential effects with respect to S16 of the RMA.

2.1. Site and Proposal

An aerial showing the project site extents is presented in Figure 10 of Appendix A, with detailed receivers and corresponding addresses shown in the following Figure 11 to Figure 17.

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The proposed site is located within a predominantly rural area to the south of SH1, with Pencarrow Road to the west, Hooker Road to the south, and Duncan Road to the east. The surrounding receivers include mainly residential lifestyle blocks. The project site and all surrounding receivers are zoned as GRUZ – General Rural Zone in accordance with the WDP-OP as shown in Figure 9 of Appendix A.

A masterplan site layout is presented in Figure 1 below, showing the following general areas:

Main Areas:

- Main Thoroughbred Track and Inner Training Track
- Harness Track
- Back Track
- Slow work track and pool

North and West Areas:

- Main Northern Entry (Pencarrow Road)
- Bloodstock Precinct with Function/Auction Space
- Commercial Development along Pencarrow Road
- Main Thoroughbred Boulevard Entrance (Pencarrow Road)
- Main Function and Events Building
- Main car park
- Race Tie-ups
- Outdoor Events Zone and Marquee
- Main Harness Events Building
- Events Car Park

South-west Area:

- Residential – Senior Living Area

South-east Area:

- Residential Lifestyle Blocks

North-east Areas:

- Trainers Zone
- Float and Trailer Parking
- Trainers Entry (Duncan Road)

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Figure 1. Proposed WRH Masterplan Site Layout

WRH are proposing to have the following general operations:

Table 1. WRB Proposed Activities

Info.	Thoroughbred Racing	Harness Racing	Special Events (Functions in Main Events Building)
Operational Times	1230 – 1730 Monday to Saturday	1730 – 2130 Monday to Saturday	0700-2130
Large events	1 per year 6000 spectators	2 per year 3000 spectators	Unspecified number of events (will only occur on non-race days) 500 guests
Medium events	10 per year 1700-3000 spectators	8 per year 500 spectators	-
Small Events	29 per year 750-1500 spectators	40 per year 250 spectators	-

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Info.	Thoroughbred Racing	Harness Racing	Special Events (Functions in Main Events Building)
Total events per year	40	50	Unspecified number of events (will only occur on non-race days)
Training	Monday to Sunday 0430-0930 Unlimited times per year Approx. 80-250 attendees per day	Monday to Sunday 0500-11am Unlimited times per year Approx. 90 attendees per day	-
Trials	Monday to Saturday 1230 – 1730 20 per year Approx. 150 spectators	-	-

The proposed site will incorporate the following key noise-generating sources and reverse sensitivity considerations:

Operational Noise:

- PA system and crowd noise for the Main Thoroughbred Racetrack covering the outdoor areas of the main events building and main outdoor events area (daytime periods only)
- PA system and crowd noise for the Harness Racetrack covering the Harness Events outdoor areas (daytime and evening periods)
- Low-level PA noise for the Tie Ups Bay (race information only, not typical PA levels)
- Car parking and vehicle noise
- Internal amplified music for Special Events in the main events building (day and evening periods)
- Commercial Area Activity Noise

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Reverse Sensitivity

- Potential reverse sensitivity effects from the residential activity in the Senior Living and Lifestyle Block to the WRH and State Highway

Construction Noise and Vibration

- Predominantly comprising earthworks for site levelling, roading and general construction activities related to buildings

WRH have confirmed that all areas of the development will be closed at 9:30pm on any day, with staff clear-up / exit up to 10pm.

The site will not incorporate any events with external amplified music/speech other than the raining PA announcements. The Special Events in the Main Events building will incorporate amplified music/speech internally with open doors.

The site will not be used for additional festivals or functions that may involve external amplified music/speech, or noise-generating activities other than the racetrack activities previously described.

2.2. Receivers

A list of the residential receiver sites surrounding the proposed WRH is presented below (see maps shown in Appendix A). All receivers are currently used for residential activity and are within the GRUZ – General Rural Zone of the WDC.

Table 2. Receivers surrounding the WRH site

West	South	East	North
644 Pencarrow	480 Pencarrow Road	18 Duncan Road	110 Duncan Road
643 Pencarrow Road	14 Hooker Road	47 Duncan Road	112 Duncan Road
635B Pencarrow Road	20 Hooker Road	70 Duncan Road	104A/B/C Duncan Road
635A Pencarrow Road	34 Hooker Road	71A Duncan Road	104A Duncan Road
605 Pencarrow Road	48A Hooker Road	77 Duncan Road	537 Hautapu Road
599 Pencarrow Road	62 Hooker Road	93 Duncan Road	78 Hautapu Road
587 Pencarrow Road	70 Hooker Road	108 Duncan Road	
4 Summerfield Lane	72 Hooker Road		
5 Summerfield Lane	82 Hooker Road		
563 Pencarrow Road	100 Hooker Road		
535 Pencarrow Road	101 Hooker Road		
557 Pencarrow Road			

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West	South	East	North
531 Pencarrow Road			
525 Pencarrow Road			
511C Pencarrow Road			
526 Pencarrow Road			

3. Criteria

3.1. WDP-OP Operational Noise Limits

The permitted noise limits for the GRUZ are set out in Rule Noise R8 of the WDC-OP, as shown below.

NOISE-R8	Noise - general	
GRUZ - General rural zone	**(1) Activity status: PER** **Where:** (a) Noise measured at the notional boundary on any other site in the GRUZ - General Rural Zone must not exceed: (i) 50dB L_{Aeq}, 7am to 7pm every day; (ii) 45dB L_{Aeq}, 7pm to 10pm every day; (iii) 40dB L_{Aeq} and 65dB L_{Amax}, 10pm to 7am the following day. (b) Noise measured within any site in any zone, other than the GRUZ - General rural zone, must meet the permitted noise levels for that zone. (c) Noise levels must be measured in accordance with the requirements of New Zealand Standard NZS 6801:2008 "Acoustics - Measurement of Environmental Sound". (d) Noise levels must be assessed in accordance with the requirements of New Zealand Standard NZS 6802:2008 "Acoustic - Environmental noise".	**(2) Activity status where compliance not achieved: DIS**

Based on the proposed activities and operational times, the key noise limits applicable to the project are:

- Daytime 7am to 7pm: 50dB L_{Aeq}
- Evening 7pm to 10pm: 45dB L_{Aeq}
- Applicable within the notional boundary (20m from the façade of a dwelling or other building used for a noise-sensitive activity, or the legal boundary where this is closer) of any site within the GRUZ

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3.2. WDP-OP State Highway Reverse Sensitivity

Part 4, APP1, 8 of the WDP-OP provides the reverse sensitivity requirements for noise-sensitive spaces in close proximity to the State Highway as shown below. For this project, this only applies to potential commercial boardroom use in the commercial area on the northern part of the site.

8. - State Highway and Rail Corridor Noise Control Boundary

8. State Highway and Rail Corridor Noise Control Boundary

The State Highway and Rail Corridor Noise Control Boundary overlays shown on the planning maps identify areas that have the potential to experience high noise levels from road and rail traffic. New buildings and alterations to habitable rooms in buildings used for sensitive land uses are required to demonstrate that adverse noise effects have been appropriately managed by demonstrating compliance with the standards specified in section 8.1.

8.1 Standards for permitted activities within the State Highway and Rail Corridor Noise Control Boundary overlays

(1) Prior to the construction or alteration of, or change of use within, any building to which this standard applies, a design report shall be submitted to the Council demonstrating compliance with the maximum indoor design noise levels specified in Table 28, applying the assumptions in sections 8.1(2) and 8.1(3) below. Alternatively, the design report may be substituted with confirmation that the construction or alteration of, or change of use within, the building will meet the construction schedule requirements in Table 29.

Table 28 – Maximum indoor design noise levels for state highway and rail corridor noise

Type of Noise Control Boundary	Activity	Rail Corridor maximum indoor design noise level	State Highway maximum indoor design noise level
State Highway and Rail Corridor	Bedrooms	35 dB $L_{Aeq\ (1hour)}$	40 dB $L_{Aeq\ (24hour)}$
	Lecture rooms / theatres, music studios, assembly halls	35 dB $L_{Aeq\ (1hour)}$	35 dB $L_{Aeq\ (24hour)}$
	Conference rooms, drama studios, libraries and designated sleeping rooms for children aged 6 years or younger in schools, early childhood centres or tertiary institutions	40 dB $L_{Aeq\ (1hour)}$	40 dB $L_{Aeq\ (24hour)}$
	Sensitive activities in hospitals including overnight medical care, wards, clinics, consulting rooms, theatres, nurses' stations	40 dB $L_{Aeq\ (1hour)}$	40 dB $L_{Aeq\ (24hour)}$
	Places of assembly including churches, places of worship and marae	35 dB $L_{Aeq\ (1hour)}$	35 dB $L_{Aeq\ (24hour)}$
	Other habitable rooms	40 dB $L_{Aeq\ (1hour)}$	40 dB $L_{Aeq\ (24hour)}$

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(2) For State Highways, the design road noise is to be based on measured or predicted external noise levels plus 3 dB*.

(3) For the Rail Corridor:

(a) The source level for railway noise is 70 $L_{Aeq(1h)}$ at a distance of 12 metres from the nearest track; and

(b) The attenuation over distance is:

(i) 3 dB per doubling of distance up to 40 metres and 6 dB per doubling of distance beyond 40 metres; or

(ii) As modelled by a Suitably Qualified and Experienced Acoustic Consultant using a recognised computer modelling method for freight trains with diesel locomotives, having regard to factors such as barrier attenuation, the location of the dwelling relative to the orientation of the track, topographical features and any intervening structures.

Roof/ceiling	Ceiling cavity infill of fibrous insulation, batts or similar (minimum density of 7 kg/m3)	
	Ceiling penetrations, such as for recessed lighting or ventilation, shall not allow additional noise break-in	
	Roof type and internal ceiling lining complying with either Options A, B or C below:	
	Option A - Skillion roof with light cladding: surface mass up to 20 kg/m2 of roof cladding	Internal lining of minimum 25 kg/m2 plasterboard, such as two layers of 13 mm thick high-density plasterboard
	Option B - Pitched roof with light cladding: surface mass up to 20 kg/m2 of roof cladding.	Internal lining of minimum 17 kg/m2 plasterboard, such as two layers of 10 mm thick high-density plasterboard
	Option C - Roof with heavy cladding: surface mass between 20 kg/m2 and 60 kg/m2 of roof cladding	No requirements additional to New Zealand Building Code

Glazed areas	Aluminium frames with full compression seals on opening panes	
	Glazed areas shall be less than 35% of each room's gross floor area	
	Either: • double-glazing with: o a laminated pane of glass at least 6 mm thick; o a cavity between the two panes of glass at least 12 mm deep; and o a second pane of glass at least 4 mm thick Or · any other glazing with a minimum performance of Rw 33 dB	
Exterior doors	Exterior door: · within the state highway noise effects area with a line-of-sight to any part of the state highway road surface; or · within the railway corridor noise effects area with a line-of-sight to any point 3.8m directly above the formed railway track.	Solid core exterior door, minimum surface mass 24 kg/m2, with edge and threshold compression seals; or other doorset with minimum performance of Rw 30 dB

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(4) If opening windows must be closed to achieve the design noise levels in Table 28 or if a building is constructed in accordance with the construction schedule in Table 29, the building must be designed, constructed and maintained with a mechanical ventilation system that:

(a) For habitable rooms located within the State Highway or Rail Corridor Noise effects area containing a residential activity, achieves the following requirements:

(i) Provides mechanical ventilation that can operate continuously to satisfy clause G4 of the New Zealand Building Code and that provides at least 1 air change per hour, but no less than 7.5L/s per occupant;

(ii) Provides cooling and heating that is controllable by the occupant and can maintain the inside temperature between 18°C and 25°C when assessed using a 2.5% design weather condition for the applicable location. An acceptable design weather set would include IRHACE Yearbook 2009 NIWA weather data; and

(iii) A HVAC system installed in compliance with (4)(a)(i) and (ii) above, must not generate more than 35 dB $L_{Aeq(30s)}$ when measured 1 metre away from any grille or diffuser. The noise level must be measured after the system has cooled the rooms to the temperatures in (4)(a)(ii), or after a period of 30 minutes from the commencement of cooling (whichever is the lesser).

(b) Alternatively, in lieu of section (4)(a) above, a design verified by a suitably qualified and experienced HVAC expert stating the design proposed will provide ventilation and internal space temperature controls to meet or exceed the outcomes described in parts (4)(a).

(5) A commissioning report must be submitted to the Council prior to occupation of the building demonstrating compliance with all of the mechanical ventilation system performance requirements in 8.1(4).

**The State Highway Noise Effects Area is based on national road-traffic noise modelling by AECOM. The inputs for key parameters are as follows:*

- **Date of input datasets:** 2021 (generally reflecting 2020/21 conditions)
- **Traffic volumes (AADT):** CoreLogic National Road Centreline dataset; 24h traffic data entered in CRTN as 18h traffic
- **Heavy vehicles (%HV):** CoreLogic National Road Centreline dataset
- **Speed:** CoreLogic National Road Centreline dataset; Posted speed limit
- **Road surface:** Surface types as recorded in NZTA RAMM database; Surface corrections in accordance with NZTA Guide to state highway road surface noise, including a -2 dB correction from CRTN to a reference AC-10 surface.
- **Bridge locations:** CoreLogic National Road Centreline dataset; Height interpolated from start and end points
- **Terrain:** LIDAR where available; NZ School of Surveying 15 m nationwide DEM in other areas; Data combined in GIS to produce 1 m×1 m DEM for noise model
- **Building footprints:** LINZ NZ Building Outlines dataset
- **Building heights:** Where available, calculated from DSM median height minus DEM median height, otherwise: 6 m residential / 8 m commercial
- **Noise barriers:** None modelled

3.3. WDC-OP Construction Noise Limits

The permitted construction noise limits are specified within Rule Noise R4 of the WDP-OP as shown below.

NOISE-R4	Noise - construction	
All zones	**(1) Activity status: PER** **Where:** (a) Noise from any construction, maintenance, or demolition activity that is measured, assessed and managed in accordance with the requirements of NZS6803:1999 'Acoustics - Construction Noise'.	**(2) Activity status where compliance not achieved: RDIS** (a) Effects on amenity values; (b) Hours and days of construction; (c) Noise levels; (d) Timing and duration; and (e) Methods of construction.

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As construction activities are expected to take place between the hours of 0730 – 1800 Monday to Saturdays, the following noise limits specified within NZS 6803: 1999 are applicable for "long term" projects lasting longer than 20 weeks:

- 70 dB $L_{Aeq(30min)}$ and 85 dB L_{Amax}
- Measured and assessed at 1m from the receiver façade in accordance with the methodology stated within NZS 6803: 2008

3.4. Construction Vibration

Construction vibration limits are not provided within the WDP-OP, however Appendix I Vibration provides an overview of typical vibration levels and associated effects (applicability to operational or construction vibration is not specified).

In the absence of specific construction vibration limits within the WDP-OP, the following vibration limits are recommended based on similar rules in other NZ district Plans:

- Building Damage: DIN 4150-3 Line 2 (Residential)
- Human Amenity:
  - PPV 2mm/s at all times, or
  - PPV 5mm/s for no longer than 3 days in total, with prior notice

3.5. 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.

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4. Noise Surveys

BBA has carried out on-site noise surveys of early-morning training at Cambridge Racecourse and a typical race-day event at Te Rapa Racecourse to inform the assessment and evaluate the typical noise levels from the PA, crowd, and horses.

A long-term noise survey of the existing SH1 was not carried out due to long-term roadworks along the length of the highway next to the site, with slow-moving traffic and single lanes. As this is not representative of the noise environment expected for the project design, noise predictions have been relied upon.

Equipment details and calibration dates are presented below, with certificates available upon request.

Table 3. Measurement Equipment Details and Laboratory Certification

Equipment	Make / Model	Serial number	Laboratory calibration date	Laboratory calibration expiry date
Sound level meter	NTi Xl2	A2A-15981-E0	08/07/25	08/07/27
Microphone	Nti M2230	8434		
Pre-amp	Nti MA220	A17328		
Hand-held calibrator	Pulsar 105	84450	29/5/2026	29/5/2027

Noise measurements were captured on 22 August 2026 between 05:00-15:00hrs. Weather conditions for the day were generally conducive to noise measurements, with wind speeds of approx. 1-4m/s (W or WNW), 30-50% oktas cloud cover, and temperatures of 10-16°C.

A summary of the noise measurement results for each activity is presented below, with a typical 15-minute race measurement shown in Figure 2.

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Table 4. Noise Survey Summary

No.	Description	Noise Measurement	Measurement Photo
1	Horse Training, 1-4 x galloping horses passing on a sand track at a 10 m distance. Approx. 20 passes. Predominant background bird, road, rail noise. 06:02-07:02am	49dB $L_{Aeq(1\ hour)}$ 2 x horse pass-by at 10m: 53dB $L_{Aeq(10seconds)}$ 65dB L_{AFmax}	
2	In stands, full race replay on screens and PA with some crowd noise. 11:20 – 12:20	Race: 68dB $L_{Aeq(15min)}$ 63dB $L_{Aeq(1hr)}$ 81dB L_{AFmax}	
3	Full race: grass audience area in front of stands, ~10m from PA speaker at ~3 m above ground, stands with 30% capacity, PA announcements for horse entry procession and full race, galloping horses when passing, crowd cheers near end of race, PA announcement of race results. 13:12 – 14:12 Measurement time history of a typical 15-minute race is shown in Figure 2.	Race: 75dB $L_{Aeq(15min)}$ 70dB $L_{Aeq(1hr)}$ 100dB L_{AFmax}	

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No.	Description	Noise Measurement	Measurement Photo
4	Full race, ~250m to the side of stands and PA coverage area, PA announcements for horse entry procession and full race, galloping horses when passing, crowd cheers near end of race, PA announcement of race results (background noise from birds and freight train approx. 40-45dB L_{Aeq}. 14:15-15:15pm	Race: 50dB $L_{Aeq(15min)}$ 44dB $L_{Aeq(1hr)}$ 79dB L_{AFmax}	
5.	17m from Pencarrow Road edge, 550m from SH1 (roadworks and slow-moving traffic, indicative only) 09:05-10:05am	57dB $L_{Aeq(1hr)}$ 79dB L_{AFmax}	

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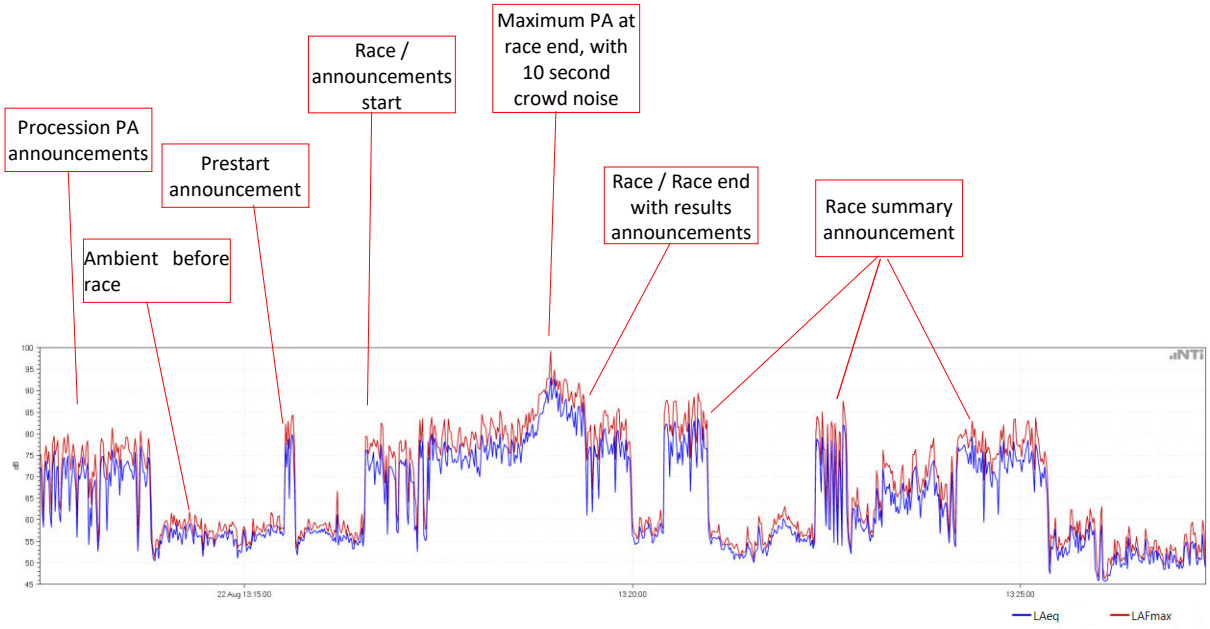


Figure 2. 15-minute noise measurement of full procession, race, results from PA and crowd – Grass audience area, 1-second logging (Measurement 3)

5. Operational Noise Emissions

The operational noise emissions for the site have been modelled using CadnaA 3D noise modelling software, which calculates in accordance with ISO 9613-2: 2024. Ground contours, site parcels and buildings for the surrounding areas have been sourced from the LINZ database, with the project site ground contours and building outlines from the project architects, Design Group Stapleton Elliot, and the civil engineers/planners - BCD Group.

5.1. PA System / Crowd - Racedays

The key noise-generating activity at WRH events is the PA system for announcements during horse entrance processions, the race, and race results. The WRH event areas (Thoroughbred and Harness) will not incorporate large stands with raked seats, but will rely on ground-level audience areas outside and around the events building. A PA system is also required at lower levels in the Horse Tie Ups areas for information only (non-entertainment coverage).

The noise measurements from the Te Rapa Raceday demonstrate the following maximum PA noise levels for audience areas:

- 75dB $L_{Aeq(15min)}$ at 10m distance from PA speakers across a typical race including entrance procession, race, and results (including short period of crowd noise)

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- 1-2 races within a 1-hour period
- Approx. 10 races occur for both a Thoroughbred and Harness race day.

The noise measurements shown above and the measured spectrum have been used for the PA system in the outdoor audience areas of the Main Events and Harness Events buildings.

For the horse tie-ups area, PA system levels will be much lower, for race-wear information only, and are expected to reach 60 dB $L_{Aeq(15min)}$ at a distance of 10m.

Typical PA loudspeaker directivities for audience areas have been assumed (Penton MSH60T) at 3m above ground level, at spacings of ~20m, facing approx. 30° down from horizontal positions towards audience areas. As crowd noise generally occurs only for a short period (~10 seconds) on the final home stretch of the race and is over 10 dBA below the PA noise (over a 15-minute period), noise from the crowd has been included within PA noise sources. The coverage areas represent the busiest race days required for large audience areas as a conservative approach. Many quieter races or trial days may incorporate PA coverage over a smaller area, resulting in reduced noise emissions.

In the absence of detailed PA system information, the following areas have been proposed to incorporate PA system coverage for the audience during Thoroughbred or Harness races, in addition to quieter PA for the tie-down areas. These coverage areas are presented below in a red dashed outline.

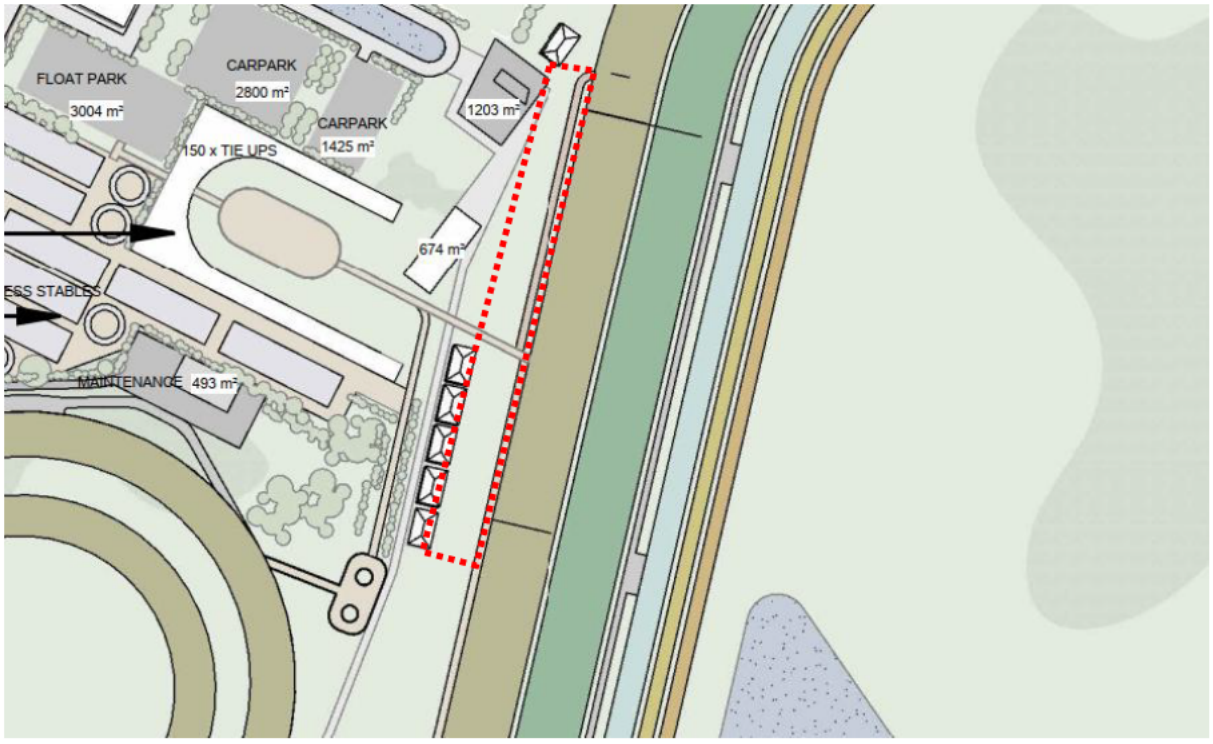


Figure 3. Main Events PA Coverage Area (11 speakers on edge of track facing southwest, approx. 30m centres)

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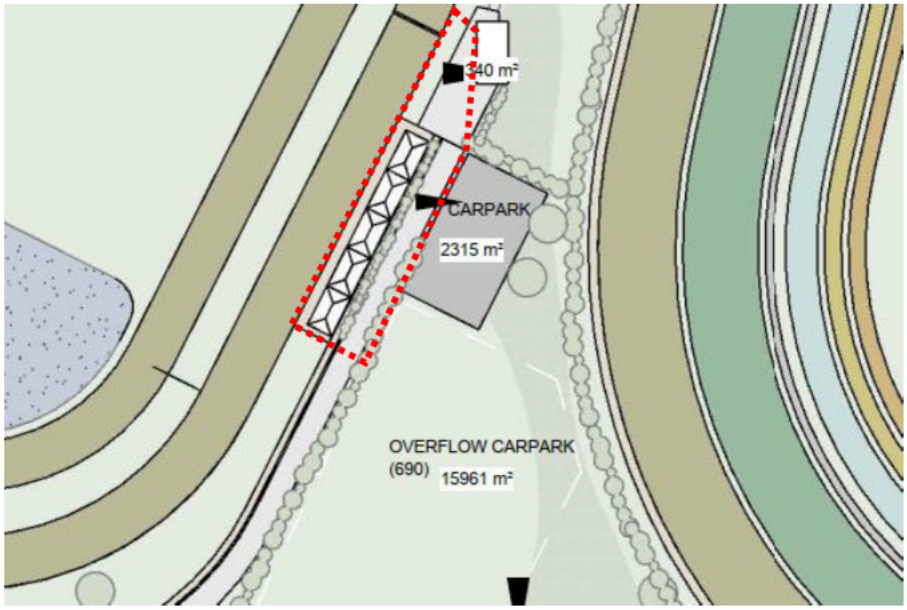


Figure 4. Harness Area PA Coverage Area (9 speakers on edge of track facing southeast, approx. 30m centres)

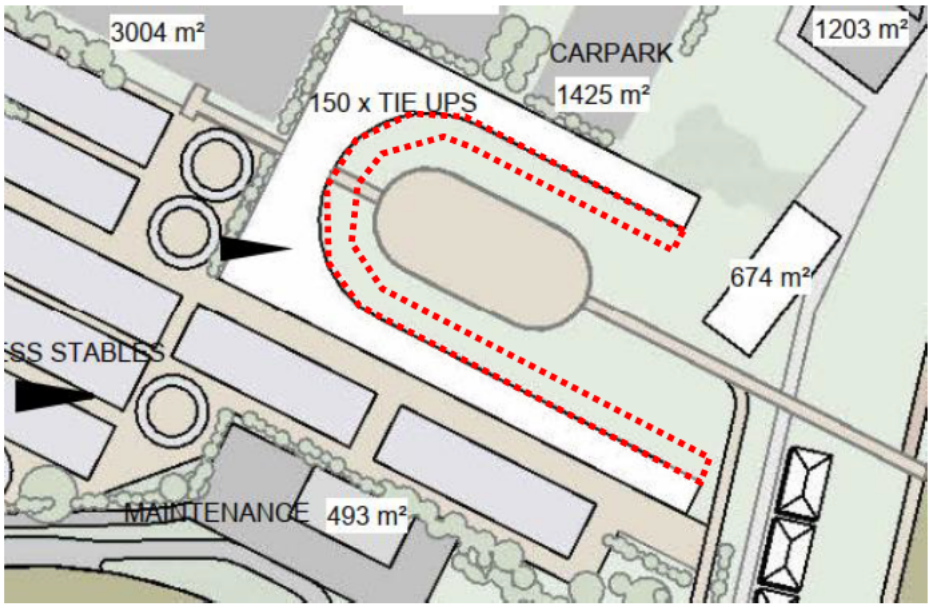


Figure 5. Tie-ups PA Coverage Area (10 speakers on inside building edge facing down, approx. 30m centres)

In accordance with NZS 6802: 2008, the following noise rating corrections are applicable:

- PA system: +5dBA correction for Special Audible Characteristics due to the tonal and impulsive character at all times
- Adjustment for averaging:

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- Daytime period 0700 – 1900: – 5dBA as the PA will operate for less than 30% of the total daytime period for both Main Thoroughbred area and Harness Areas
- Evening period 1900 – 2200: -5dBA as the PA will operate for ~30% of the total evening period for Harness Areas only (approx. 5 x 15min races within a 4-hour period), evening racing for Main Thoroughbred track
- No correction to tiedown area PA as this may operate continuously

The expected dB L_{AFmax} noise levels from the PA have been predicted based on the typical level difference of +25dBA of the dB $L_{Aeq15min}$.

These sources have been input with the measured PA and crowd spectrum, calibrated to the following reference levels with rating corrections applied.

Table 5. PA system calibration setting for 3D noise model – Applicable at centre line of PA coverage line

Area	Daytime Period 0700 – 1900 Rating dB L_{Aeq} / dB L_{AFmax}	Evening Period 1900 – 2200 Rating dB L_{Aeq} / dB L_{AFmax}	Calibration distance
Main Events (Thoroughbred)	75 / 100	N/A	10m
Harness Area		75 / 100	
Tiedown area	60 / 85		

The 3D noise model contours across the site and to surrounding receivers are presented in Appendix B, with the noise ratings presented in Appendix C. The results show that the daytime WDP-OP limit of 50dB L_{Aeq} and evening limit of 45dB L_{Aeq} are achieved at all receiver notional boundaries.

5.2. Special Event Amplified Music – Main Events Building

The main events building (see Figure 1 for location) will be used for Special Events, including predominantly corporate functions or private hire. WTR has stated that events with high levels of amplified music, such as a DJ or band, will be infrequent compared to corporate events with quieter noise levels, or amplified speech only.

These events will occur between the daytime periods of 7am to 7pm, or the evening periods of 7pm until 9:30pm.

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Whilst the majority of Special events will have significantly low levels of amplified music/speech, we have considered the scenario of typical wedding band/DJ amplified noise levels of 90-95dBA, with the main doors open.

The main events building layout is presented below, with the main area being the function/lounge space that may incorporate open doors to the outdoor events area (highlighted in red)

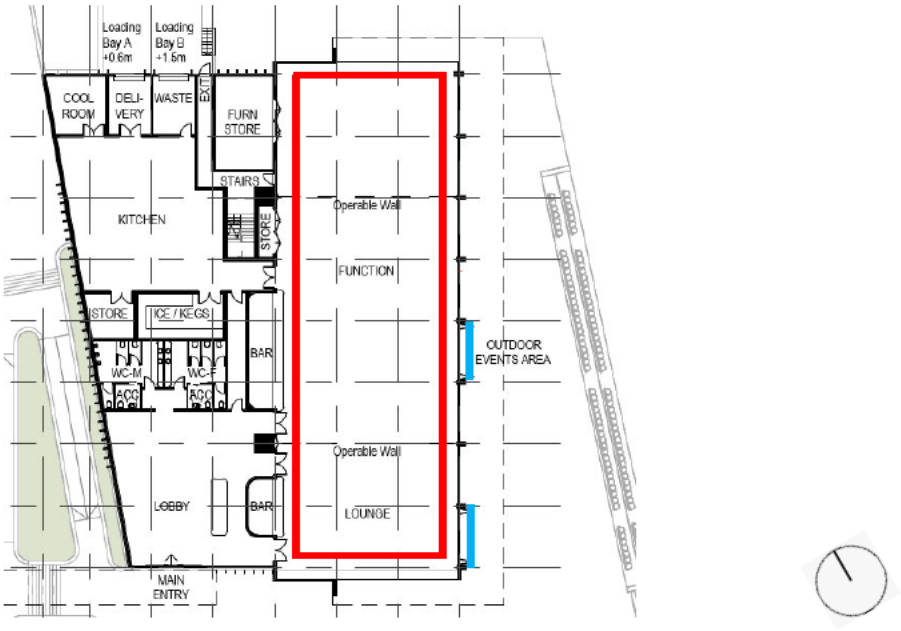


Figure 6. Main Events Building – Area with amplified music/speech (red outline), open doors (blue line)

Finalised construction details of the main events building are not currently available; however, the following minimum construction and corresponding sound reduction performances have been assumed:

- Façade: Fully glazed with ≥12mm single glazing: R_w+C_{tr} 31 dB
- Roof/Ceiling: Profiled metal roof with ~400mm cavity, insulation and lightweight ceiling tile in grid: R_w+C_{tr} 38 dB
- Open doors (no sound reduction)

The 3D noise model has been updated to consider the amplified music/speech breakout of the main events building, the building envelope construction described above, open doors, and an internal reverberant noise level of 90dB L_{Aeq} containing significant bass energy. As a conservative approach, this noise level has been assumed in the whole function/lounge area. In practice, a DJ/Band may only be generating noise up to this level in one area.

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The noise is subject to a +5dBA rating adjustment for Special Audible Characteristics due to the tonal/impulsive content. During the daytime periods, a -5dBA rating reduction is applied for averaging, as these events are not expected to occur for more than 30% of the total period. During the evening period, no rating correction for averaging is applied.

The results of the 3D model are presented in Figure 20 and Figure 21 of Appendix B, with the results at each receiver shown in Appendix C.

All predictions are below the daytime limit of 50dB L_{Aeq} and the nighttime limit of 45dB L_{Aeq} at each existing receiver boundary. These noise limits are also achieved at the boundary of the proposed residential areas to the south of the site.

All other functions not incorporating high levels of amplified music/speech, such as corporate events and gatherings, will have significantly reduced noise levels.

Noise from the parking associated with the Special Events with up to 500 guests is predicted to be significantly lower than that experienced on a race-day, discussed below.

5.3. Vehicle Noise

Noise from vehicles across the development will comprise slow-moving traffic on internal roads and parking manoeuvres for the following areas:

- Thoroughbred car park for race days (including overflow for large events) and Special Events
- Harness car park (and overflow for large events)
- Float and trailer car park and training stables car park
- Commercial area car parks

All of the parking areas above will be used predominantly during the daytime, 0700-1900hrs. The Harness, Thoroughbred and commercial area car parks will be used during the evening periods with reduced volumes. The only parking areas used during night-time periods will be the Harness, float and trailer, and the stables car parking area on the western side of the site for early-morning training.

A 1.8m-high noise barrier is required along the boundary of the following receiver sites to control vehicle noise levels to meet the WDP-OP limits and potential noise effects. These areas are listed and illustrated below:

- 644 Pencarrow Road
- 70 Duncan Road
- 107 Duncan Road
- 110, 112, 20, 104C, 104B, 28A Duncan Road

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Figure 7. 1.8m high noise barrier (red line) to control traffic noise, 644 Pencarrow Road



Figure 8. 1.8m high noise barrier (red line) to control traffic noise, Duncan Road

In the absence of detailed traffic volumes for the various car parks and access roads, noise from vehicles has been modelled as follows:

- Car parks:

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- Area source across whole car park at 1m above ground
- Parking manoeuvres based on a sound power of L_w[1] 69dBA for a single parking manoeuvre over a 1-hour period

- Access roads:
  - Line source to each car park at 1m above ground
  - Sound power of L_w[1] 47dBA per metre for a single movement on the access roads at ~20km/hr over a 1hr period

A summary of the total vehicle movements, including any corrections due to averaging in accordance with NZS 6802: 2008, is presented.

Table 6. Summary of vehicle parking/manoeuvres

	Main Thoroughbred Parking and Access Roads	**Harness Parking and Access Roads**	**Commercial Parking and Access Roads**	**Training and Stables Parking and Access Roads**
Daytime Period	Racing: 50% capacity in 1h period (main and overflow) -5dBA averaging Special Events: 500 movements in 1h period (main only)	50% capacity in 1h period (main and overflow) -5dBA averaging	50% capacity in 1h period -5dBA averaging	50% capacity in 1h period -5dBA averaging
Evening Period	Special Events: 500 movements in 30mins period (main only)	50% capacity 1h period (main and overflow) -3dBA averaging	50% capacity 1h period -3dBA averaging	N/A
Night	N/A	50% capacity in 1h period -0dBA averaging	N/A	50% capacity in 1h period -0dBA averaging

The 3D noise model contours of the vehicles and parking are presented in Appendix B, with the ratings presented in Appendix C.

5.4. Training Activities

The proposed training area is in the Harness (eastern side) and Stables (western) areas. The training activities are proposed between 4:30am and 11am, during which the lower night-time noise limit of 40dB L_{Aeq} applies, in addition to the daytime limit of 50dB L_{Aeq}.

[1] BayLfU parking noise study – Cars entering/existing car park and parking manoeuvres reference noise levels

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BBA's attendance and noise measurements of typical early-morning training activities showed very quiet noise levels during the training activities themselves. Only galloping horses and some conversation between trainers were expected, which is predicted to be mostly inaudible at all receiver notional boundaries and well below the nighttime noise limit. No additional PAs, loudspeakers, whistles, or alarms that generated any significant noise were used.

On this basis, the main source of noise associated with training activities is due to vehicles, which have been assessed as per section 5.3 of this report. To minimise potential noise effects from early-morning vehicle movements of horse floats, a 1.8m high noise barrier has been proposed on the boundary of the most affected receivers. With the proposed noise barriers, noise from vehicle movements associated with early morning training will comply with the 40dB L_{Aeq} night-time limit.

6. Existing Ambient Noise Levels – SH1

The rural environment is expected to have minimal noise activity, with SH1 to the north as the predominant source of background noise across the site, in addition to passing vehicles on Pencarrow, Hooker, and Duncan Road.

Long-term ambient noise measurements of SH1 around the site were not practicable due to the ongoing roadworks incorporating reduced traffic speeds of 40km and single lanes.

Noise from SH1 has therefore been predicted to all receiver sites using the 3D noise model based on the following NZTA traffic data:

- Road ID: 3943, Cw ID: 10707, App Region: All SH March 2026
- Road Speed: 110 km/hr
- AADT: 17544 (est.) 25/1/2026
- 9.4 % heavy goods vehicles
- Porous asphalt grade 10

The predicted SH1 $L_{Aeq(24hr)}$ traffic noise levels are presented in the results table in Appendix C for comparison against the operational noise predictions. The traffic noise levels at receivers surrounding the site are predicted to range from 39 - 65 dB $L_{Aeq(24hr)}$ depending on proximity to the highway.

The typical differences in noise from the state highway for a whole-day dB $L_{Aeq(24h)}$ highway level and a 1-hour daytime or evening period (when the race track will operate) are shown below:

- Daytime or evening dB $L_{Aeq(1hr)}$: 1-3 dBA higher than the 24 dB $L_{Aeq(24hr)}$

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Based on the above, traffic noise during the day or evening periods when the racecourse is in operation may reach 42-68 dB $L_{Aeq(1hr)}$ at receivers surrounding the site.

7. Residential and Commercial Activities On Site

The proposed WRH development will incorporate a commercial area at the north-west corner of the site, with senior living residential areas at the south-west corner and residential lifestyle blocks at the south-east corner.

These activities are subject to the following acoustic considerations:

Residential

- No reverse sensitivity effects to NZTA are anticipated due to the large separation distances from proposed dwellings to the highway, with predicted SH1 noise levels of ~42dB $L_{Aeq(24hr)}$ or lower as shown in Figure 26 of Appendix B
- No reverse sensitivity effects on the proposed commercial areas on WRH site are expected due to significant separation distances to the nearest dwellings or noise sensitive activities (existing and proposed).
- Potential reverse sensitivity effects on racetrack operations due to proposed dwellings within the WRH site :
    - The noise contours in Figure 18 and Figure 19 of Appendix B show predicted PA noise reaching rating levels of 43dB L_{Aeq} at the Senior Living Areas during the daytime periods, achieving the permitted GRUZ limit of 50 dB L_{Aeq}. During evening periods, rating levels up to 37dB LAeq are predicted, which meets the GRUZ limit of 45dB L_{Aeq}.
    - For the Lifestyle Block area, PA noise levels are lower, with rating levels reaching 37dB L_{Aeq} in the daytime periods and 36dB L_{Aeq} during the evening periods, meeting the GRUZ limits.
    - Instantaneous noise levels of up to ~68 dB L_{AFmax} are expected outdoors in the residential and senior living areas from occasional peaks during the loudest momentary PA announcements, such as the ends of races at the final stretch. This demonstrates that instantaneous noise through the PA system will occasionally be audible in outdoor living areas or faintly audible in internal spaces with windows open for ventilation at the most exposed sites. This is expected only during the home stretch of the races, up to approx. 10 times on a race day. Whilst faintly audible internally, it is not expected to startle or significantly disturb typical residential daytime activities.
    - Parking/vehicle noise will meet the daytime limit of 50dB $L_{Aeq\,at}$ both residential areas, but has the ability to exceed the GRUZ evening limit of 45dB L_{Aeq} by +5dBA and the night-time noise limit of 40dB L_{Aeq} by +10dBA at the edges of

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the Senior Living area. This is only expected during the busiest Harness race days or busy morning training days.

- To mitigate the potential for annoyance from vehicle noise during the evening or night-time periods at the Senior Living area, the dwellings facing the racecourse/access road may be designed with an alternative method of ventilation/cooling to allow windows to remain closed should the occupants require respite from noise. With standard lightweight building construction and windows closed, this provides a ~25 dBA reduction in external traffic noise. This would result in internal noise levels of 25 dBA, below the World Health Organisation recommended guideline of 35 dB L_{Aeq} in bedrooms to avoid sleep disturbance (more sensitive than typical day or evening residential activities)
- With the inclusion of a consent condition to ensure residential buildings are adequately designed to control effects, a "no complaints covenant" is also recommended to protect WRH from reverse sensitivity noise effects.

Commercial Activities

- Noise Emissions
  - No details are currently provided for the expected commercial activities on site. Typical noise-generating activities may include bars/restaurants or a horse auction building.
  - As the site operations will end at 9:30pm followed by exiting traffic up to ~10pm, no noise-generating activities that may cause sleep disturbance will occur, i.e., late-night amplified music from a bar, etc.
  - Commercial activity on the site must be controlled to meet the WDP-OP limits for the General Rural Zone in Rule Noise R8.
  - To ensure potential noise effects from commercial activities are controlled to adjacent commercial sites, the following recommendations are made:
    a. No external amplified music is permitted within the commercial developments
    b. Commercial activities on the site must not exceed the limits specified within Noise-R15 of the WDP-OP for the Commercial Zone at the façade of any other commercial receiver
- Reverse sensitivity to commercial sites within WRH from racecourse noise
  - The predicted PA noise levels are expected to reach similar noise levels as the residential receivers, with up to 50dB L_{Aeq} during the daytime, and 43dB L_{Aeq} during the evening periods. As commercial activities are generally less sensitive than residential, this is not expected to result in reverse sensitivity effects.
- Reverse sensitivity to NZTA

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- Commercial activities are not subject to the reverse sensitivity noise rules unless containing a conference room in accordance with Part 4, APP1, 8 of WDP-OP.

8. Construction Noise and Vibration

The majority of the construction activities for the proposed WRH are expected to be due to the earthwork phases such as removal and replacement of fill to design levels. Other activities include compaction using vibratory rollers, paving works and concrete pouring for the building foundations. As the majority of the buildings related to the racetrack are not more than 1-2 storeys, heavy piling methods are not expected to be required. Similarly, blasting or rock breaking is not expected.

Source noise data for representative construction plant has been selected from NZS 6803: 1999, which makes reference to the British noise standard BS 5228-1: 1997. Where appropriate, noise levels have been selected from the updated BS 5228-1: 2009 version of the standard, or based on previous BBA measurement data.

The distances at which compliance with the 70dB L_{Aeq} / 85dB L_{Amax} is provided for each activity, assuming no noise screening, or a 1.8m high temporary noise barrier that provides at least 10dBA reduction of noise where the barrier blocks the line of sight between the construction activity and receiver facade. Compliance distances assume a +3dB façade reflection in accordance with NZS 6803: 1999.

Table 7. Construction plant / activities, source reference levels and compliance distances

Construction activity	Noise level ref.	Sound Pressure Level at 10m dB L_{Aeq} / L_{Amax}	Compliance Distance, m	
			No Barrier	1.8m Noise Barrier (10dBA reduction)
21t Excavator	BBA database	71 / 86	16	5
28t Dozer	BS 5228: 2009 C1 11	79 / 94	40	13
25t Wheeled loader	BS 5228: 2009 C2 26	79 / 94	40	13
25t Grader (moving ~10km/hr)	BBA database	81 / 96	50	16
Trucks removing / bringing material to site	BS 5228: 2009 C11 6	63 / 78	6	2
12t Vibratory Roller	BS 5228: 2009 C5 21	80 / 95	45	14

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Construction activity	Noise level ref.	Sound Pressure Level at 10m dB L_{Aeq} / L_{Amax}	Compliance Distance, m	
			No Barrier	1.8m Noise Barrier (10dBA reduction)
Concrete truck and pump	BS 5228: 2009 C4 24	75 / 90	25	8
21t Excavator mounted rotary bored piling rig for timber retaining walls	BBA database	71 / 86	16	5

The table above shows that the majority of construction activities can meet the permitted limit of 70dB L_{Aeq} / 85 dB L_{Amax} at distances under 16m when used in conjunction with 1.8m-high noise barriers.

In addition to noise barriers, construction of earth bunds may be considered to provide similar levels of screening for works in close proximity to receiver facades.

As the majority of the construction works will not occur in close proximity to receiver sites for long periods, the compliance distances are expected to be met for most of the construction period. Where works are proposed within these compliance distances, prior notice before works start and the inclusion of noise barriers will reduce potential noise effects.

A construction noise and vibration management plan (CNVMP) is recommended to ensure the compliance distances are achieved, and noise barriers or bunds are installed prior to works commencing. Where the compliance distances cannot be achieved, the CNVMP can detail the mitigation, management and liaison with receivers to minimise potential effects.

8.1. Construction Vibration

With the exception of the vibratory roller, all construction activities are not expected to generate significant levels of vibration. Further, these activities will occur at adequate distances from receiver buildings, complying with the recommended human amenity and building damage limits with a large factor of safety.

An 8t vibratory roller is expected to generate vibration levels of PPV 5mm/s at distances of approximately 5m, achieving the recommended building damage limits specified within Line 2 of DIN 4150 for building damage and the upper human amenity limit for works occurring for no longer than 3 days (with prior notice).

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The inclusion of a CNVMP will be an effective tool to ensure that adequate separation distances are maintained between receivers and the use of the vibratory roller, or that notice is provided to occupants for works in close proximity.

9. Assessment of Effects and Mitigation Methodology

The acoustic assessment has considered the noise emissions from the proposed WRH to existing residential receivers surrounding the site. This showed compliance with the daytime GRUZ limits of 50 L_{Aeq} and the evening limits of 45dB L_{Aeq} for all receivers. These ratings include a +5dBA penalty for Special Audible Characteristics to account for the tonal and impulsive nature of PA noise.

The predominant source of noise and potential for noise effects from the WRH site is due to the PA system and crowd during racing events, expected to operate from 1230 – 17:30 for Thoroughbred events and 1730 – 2130 for Harness Events, Mondays to Saturdays. The levels discussed below apply to the most exposed residential sites, to the north-west of the WRH site. Other residential receivers are located at greater separation distances and experience approximately 5-10dBA lower levels of noise.

Thoroughbred Raceday Events and Trials

During the daytime periods, PA and crowd noise rating levels up to 50dB L_{Aeq} are expected at the most exposed sites, with maximum instantaneous noise levels of up to 75 dB L_{AFmax} for the final stretch when the PA is at its loudest, or typically up to 65-70 dB L_{AFmax} for standard announcements. These occasional events are expected to be audible above the background noise levels for outdoor living areas and for internal areas with windows open. Whilst these noise levels are occasionally audible, they are sufficiently low not to cause significant disturbance to typical daytime residential activities. While there is no daytime L_{Amax} limit, these instantaneous levels are marginally above the GRUZ night-time limit of 65 dB L_{AFmax}, which is designed to provide protection against sleep disturbance (more sensitive than daytime amenity).

Harness Events

During the evening periods with only the Harness PA system operating, maximum rating levels of 42dB L_{Aeq} are predicted at the edge of the WRH site, achieving the GRUZ limit of 45dB L_{Aeq}. Maximum instantaneous noise levels of 67dB L_{AFmax} are predicted for the loudest PA announcement during the homestretch, expected to be audible in external areas and faintly audible internally with windows open for brief moments.

Control of PA Noise

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To ensure these levels are controlled, it is recommended that a Noise Management Plan be implemented, which details the monitoring and calibration of the PA system to meet the permitted limits at all receiver sites. With the PA system limited to a level of 75dB $L_{Aeq(1min)}$, operational times, and the number of events per year restricted, the overall effects on the existing residential activities surrounding the site are not expected to exceed a reasonable level.

Vehicle Noise On site

Noise from vehicle movements and parking on site is expected to result in a minor increase to the existing noise environment and is only expected to be noticeable on the busiest race days. With the inclusion of 1.8m noise barriers along the boundary of the closest receiver sites, potential noise effects from early-morning training activities will be controlled.

Special Events – Main Events Building

Special Events within the main events building are expected to mostly comprise corporate functions or gatherings generating minimal noise activity for the vast majority of uses. If occasional events are proposed involving amplified music, such as a wedding or party with doors open, this is predicted to reach rating levels no higher than 30 dB L_{Aeq} during the daytime period or 36dB L_{Aeq} during the evening period, at the most affected receiver.

This is a considerably low level of noise, expected to be mostly inaudible or faintly audible during lulls in the existing noise environment. As these events will not operate past 9:30pm, the potential for sleep disturbance during typical night time periods is vastly mitigated, noting that it is common practice in NZ to consider effects on sleeping only after 10pm. These levels of amplified music noise is expected to have no impact on the residential acoustic amenity of existing receivers.

To ensure these levels and effects are controlled, Special Events should have a limited internal level of amplified noise up to an internal reverberant level of 95dB $L_{Aeq(30sec)}$ and not occur past 9:30pm.

The above control measures should be implemented as consent conditions and in a Noise Management Plan for Special Events.

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Potential Reverse Sensitivity Effects within WRH site

Vehicle noise to the Senior living residential area is not expected to exceed that of a typical arterial road on race days. Vehicles/floats arriving for early-morning training events, however, do have the potential to cause a noticeable increase in noise if windows are open. It is therefore recommended to ensure bedrooms of the closest lots facing the access road incorporate a HVAC system to allow windows to remain closed, reducing vehicle noise to an acceptable level.

No significant reverse sensitivity effects from PA noise are expected from the proposed commercial or residential activities on the site. Where commercial activities on site are required to meet the GRUZ limits at existing residential receivers and the new WRH site residential areas, no noise effects are expected. A restriction prohibiting external amplified music is recommended for commercial activities on the site to control potential effects, in addition to the recommended noise limits for adjacent commercial sites.

Construction Noise & Vibration

Due to the large amount of earthworks required for the site, some annoyance from ongoing construction noise is expected, even while the permitted limits. These can be significantly reduced and managed by implementing noise barriers where required for works in close proximity and a CNVMP.

10. Recommendations

The following are recommended as conditions of consent to ensure noise levels and effects are managed (separate to the rules already provided within WDP-OP):

General Racing Operations:

1. The following restrictions apply to Raceday / Trials Events with amplified speech/music PA use:
    - Thoroughbred Racing Trial Events:
        a. Limited to up to 40 racing events per year, and
        b. Limited to up to 20 trial events per year
        c. Restricted to the hours of 1230 – 17:30, Monday to Saturday only
    - Harness Racing Events:
        a. Limited to up to 50 events per year
        b. Restricted to the hours of 17:30 to 21:30, Monday to Saturday only

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PA System and Amplified music/Speech

2. Amplified music/speech via the PA system is only permitted for Thoroughbred or Harness Raceday events in the designated audience coverage areas.
3. The PA system must not exceed a maximum level of 75dB $L_{Aeq(1min)}$ when measured at a height of 1.5m above ground, at a horizontal distance of 10m from a central loudspeaker coverage line for both Thoroughbred and Harness audience areas.
4. An Operational Noise Management Plan must be prepared by a suitably qualified/experienced acoustic consultant, including:
    - Staff and contact details responsible for the management of noise
    - Staff training procedures
    - Complaints logging and corrective measures procedure
    - Methods to reduce PA coverage for areas not in use (i.e. for smaller events with reduced spectators)
    - Record of PA equipment details and calibration history carried out every two years
    - PA sound system calibration/monitoring details including:
        i. Calibration of the PA system amplification maximum settings, or the calibration of an on-wall noise monitor (SoundEar III or similar) for both Thoroughbred and Harness audience areas.
        ii. The calibration must be carried out using a Type 1 integrating sound level meter to demonstrate how the limiting levels in condition 3 are achieved.
        iii. The calibration measurements must be taken on a typical race event, accounting for the peak usage at the end of a race.

Noise barriers

5. 1.8m high noise barriers must be installed and maintained on the site boundaries as indicated in Figure 7 and Figure 8 of the BBA acoustic report dated (add date here). To be acoustically effective, the noise barriers must have no holes or gaps, with a minimum surface mass of 8kg/m^2 such as 20mm lapped timber palings (or equivalent).

Special Events (Main Event Building)

6. Special Events in the Main Events Building, including functions that are not related to race-day events, are restricted to the hours of 7am to 9:30pm
7. Internal amplified music for Special Events must not exceed an internal reverberant noise level of 95dB $L_{Aeq(30sec)}$. This must be monitored using an on-wall monitor such as the SoundEar III or similar, calibrated by a suitably experienced acoustic consultant. Details of the calibration and monitoring must be included within the Noise Management as detailed within Condition 4.

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Commercial Activities

8. No external amplified music or speech is permitted for any commercial activity on the site
9. Noise from the commercial activities must not exceed the limits specified within the WDP-OP as follows:
    - Residential Receivers: Noise Rule R8, measured at the notional boundary
    - Commercial Receivers: Noise Rule R15, measured at the façade

Residential Activities

10. A Consent Notice, or No Complaints Covenant for all residential lots on the site regarding WRH noise PA system, crowd, horse training activities. This Notice/Consent is only valid on the basis that noise does not exceed the permitted limits specified within WDP-OP Noise Rule R8. (legal advice on the implications of this covenant is recommended).
11. All residential lots in the Senior Living Area that share a site boundary with the WRH must incorporate an alternative method of ventilation and cooling for any bedroom with a façade that has direct line of sight to the Harness car park access road. The HVAC system must be designed to meet the following ventilation and temperature requirements: (to be confirmed by a mechanical engineer, i.e. Building Code G4)

Construction Noise and Vibration

12. A suitably qualified/experienced acoustic consultant must provide a construction noise and vibration management plan (CNVMP) for the site. The CNVMP must:
    - Be prepared prior to commencing works on site
    - Detail the contact details of the site manager in the event of a complaint
    - Detail the compliance distances for each construction activity against the limits specified within WDP-OP Rule R4 at each receiver with and without 1.8m high construction noise barriers
    - The noise mitigation methods and staff training procedures
    - Outline the process for community liaison and procedures for the handling of any complaints.
    - Be implemented and maintained throughout the duration of the project.

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11. Conclusion

An acoustic assessment has been provided for the proposed Waikato Thoroughbred Racetrack as part of the Substantive application for the Fast Track Resource Consent application. This includes an assessment of PA/crowd noise, vehicle movements, training operations, and construction works, as well as a reverse-sensitivity assessment of residential and commercial activities on the site.

Noise surveys of the Te Rapa Racecourse and Cambridge training facilities have been undertaken to evaluate suitable PA levels and crowd noise, as well as the typical noise characteristics of race events.

3D noise modelling of the Thoroughbred and Harness Track PA levels has been carried out to predict noise ratings at the closest receiver sites, as well as at the new residential areas within the project site. With the proposed limiting and calibration of the PA system, noise ratings can achieve the WDP-OP daytime and evening noise limits for all receivers in the GRUZ zone. Similarly, these limits will not be exceeded at the proposed residential areas on the project site.

PA noise is expected to be faintly audible over the existing background noise for the brief periods when a race ends (the final stretch) for the most affected residential receivers on Pencarrow Road. The overall noise effects, however, are not expected to exceed a reasonable level due to the brief periods during a race day (up to 10 times), limited race times per day, and a limited number of events per year.

Vehicle and car parking noise has also been predicted considering typical peak movements across the whole site. With the inclusion of 1.8m-high noise barriers for the most affected existing receivers, compliance with the permitted limits can be achieved and potential effects controlled. Similarly, HVAC systems in bedrooms in the Senior Living Area facing the access roads will reduce the potential effects of early-morning vehicle noise. Training activities during the early morning (night-time) periods are not expected to generate any appreciable noise other than from vehicle movements.

Special Events comprising mostly corporate functions are not expected to generate any appreciable noise; however, private hire such as for weddings may incorporate amplified music such as a DJ/band. Even when assuming open doors, predicted noise levels during the day and evening are not expected to exceed a reasonable level.

Commercial noise limits and a restriction on external amplified music are recommended for the proposed commercial areas on the project site to ensure reverse sensitivity or noise emissions are controlled.

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Construction noise and vibration levels are predicted to achieve the limits specified within the WDP-OP with adequate separation distances and/or construction noise barriers. With the implementation of a Construction Noise and Vibration Management Plan. With the recommended mitigation measures and further refinement at later design stages, the proposed development is capable of achieving acceptable noise outcomes for both existing and future receivers.

Recommendations have been provided for conditions of consent to ensure noise levels and effects are adequately controlled.

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Appendix A: Site and Surrounding Area

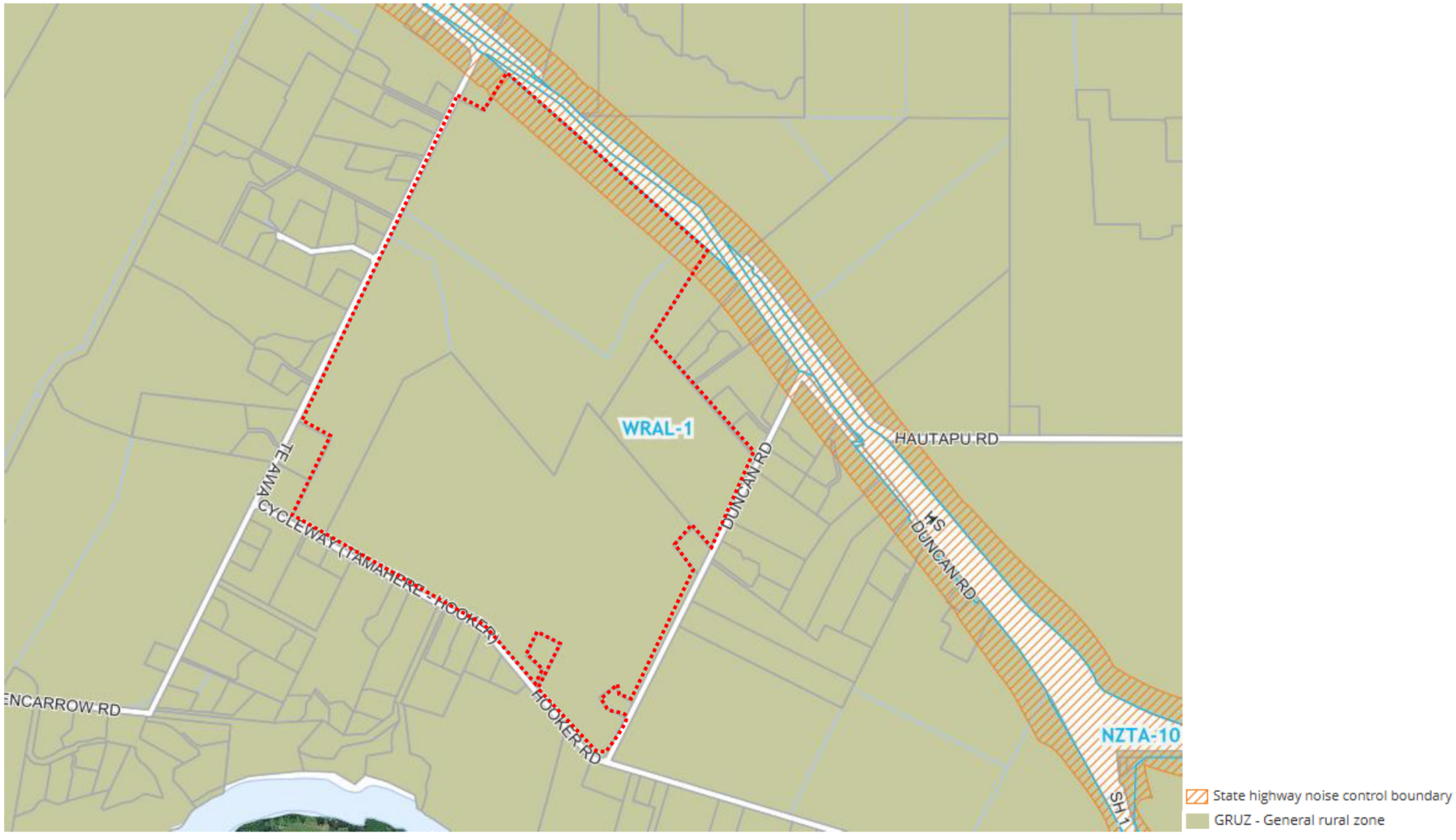


Figure 9. Site location (dotted red outline) and WDP-OP Zoning,

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Figure 10. Site location (dotted red outline) and surrounding area (overview

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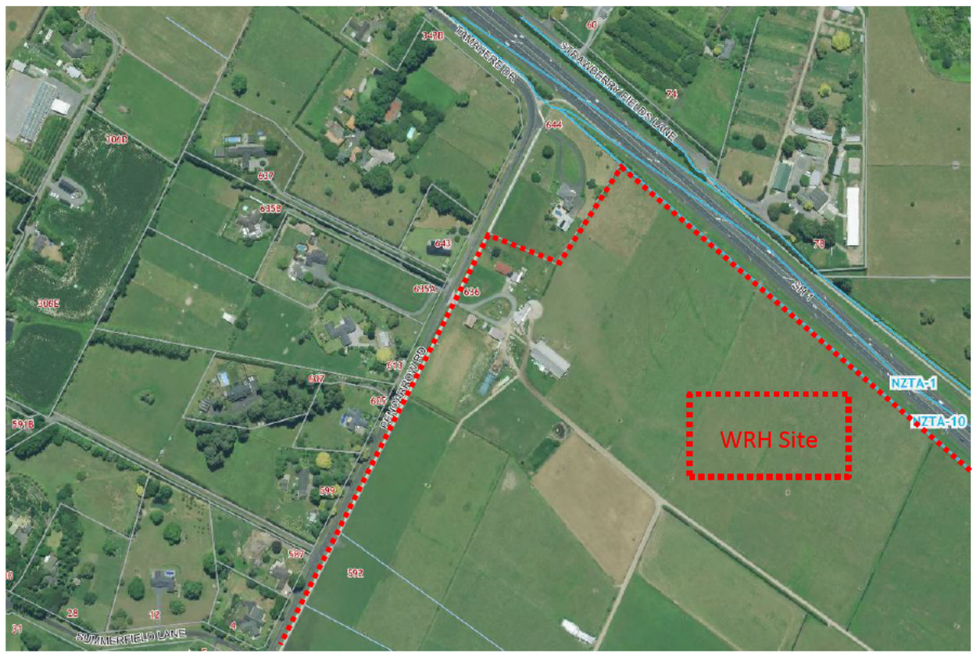


Figure 11. Site (dotted red line) and surrounding receivers 1 of 7)



Figure 12. Site (dotted red line) and surrounding receivers 2 of 7)

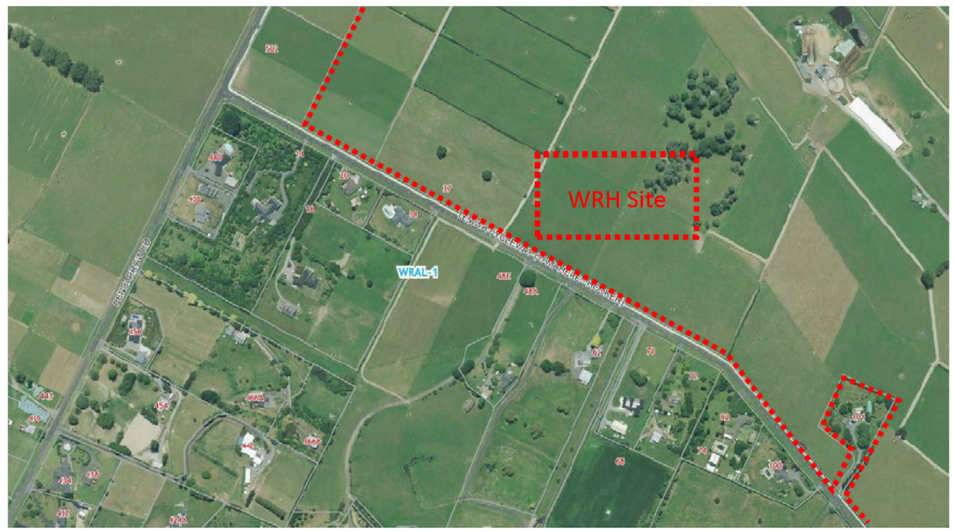


Figure 13. Site (dotted red line) and surrounding receivers 3 of 7)



Figure 14. Site (dotted red line) and surrounding receivers 4 of 7)

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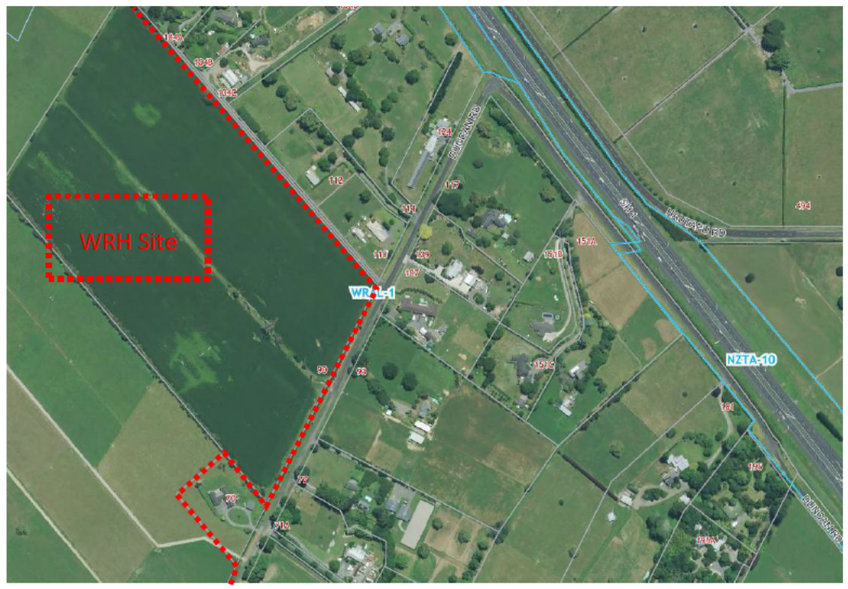


Figure 15. Site (dotted red line) and surrounding receivers 5 of 7)



Figure 16. Site (dotted red line) and surrounding receivers 6 of 7)

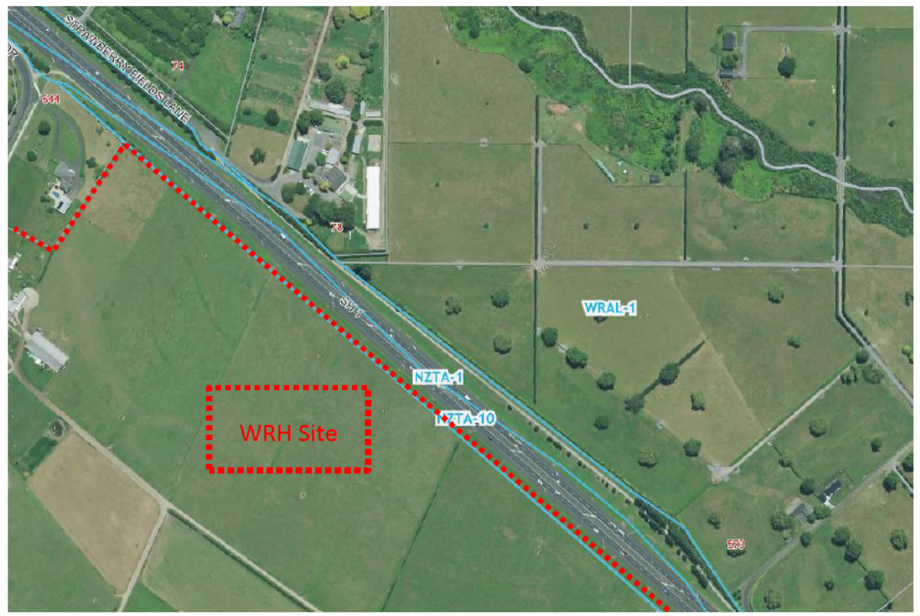


Figure 17. Site (dotted red line) and surrounding receivers 7of 7)

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Appendix B: 3D Noise Model Predictions

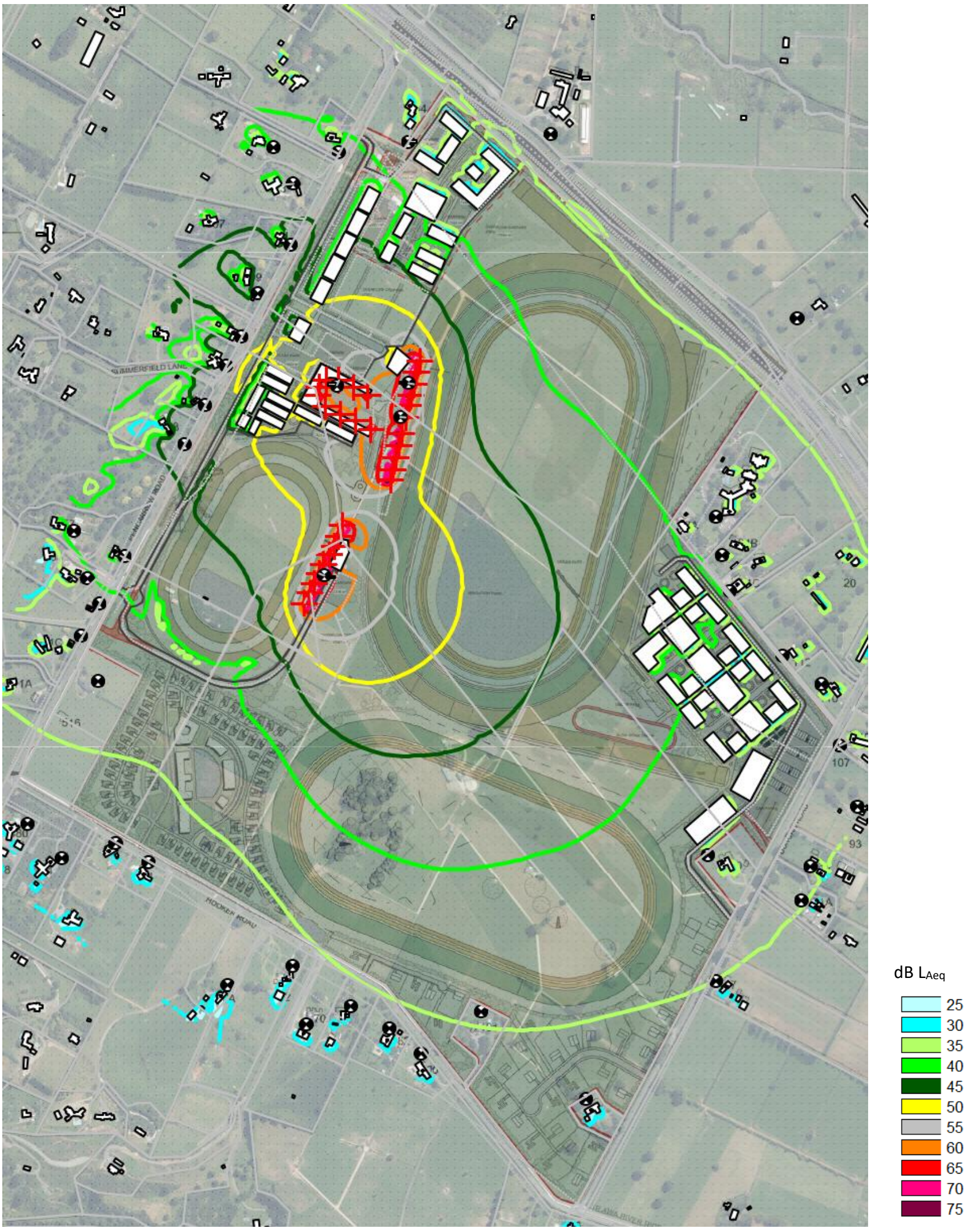


Figure 18. PA / Crowd 3D noise model prediction, Daytime period 0700 – 1900, dB L_{Aeq}

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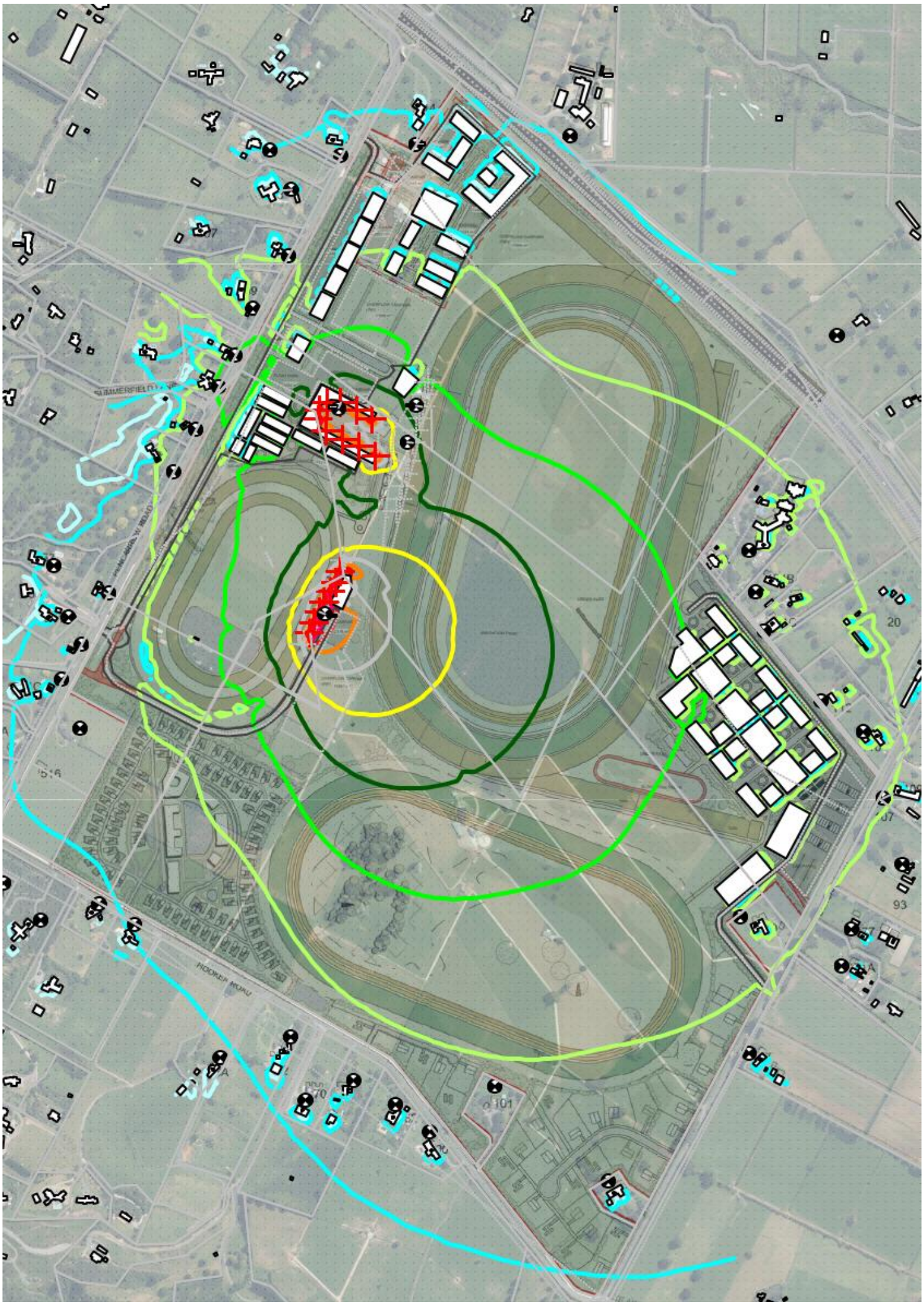


Figure 19. PA / Crowd 3D noise model prediction, Evening Period 1900 - 2200, dB L_{Aeq}

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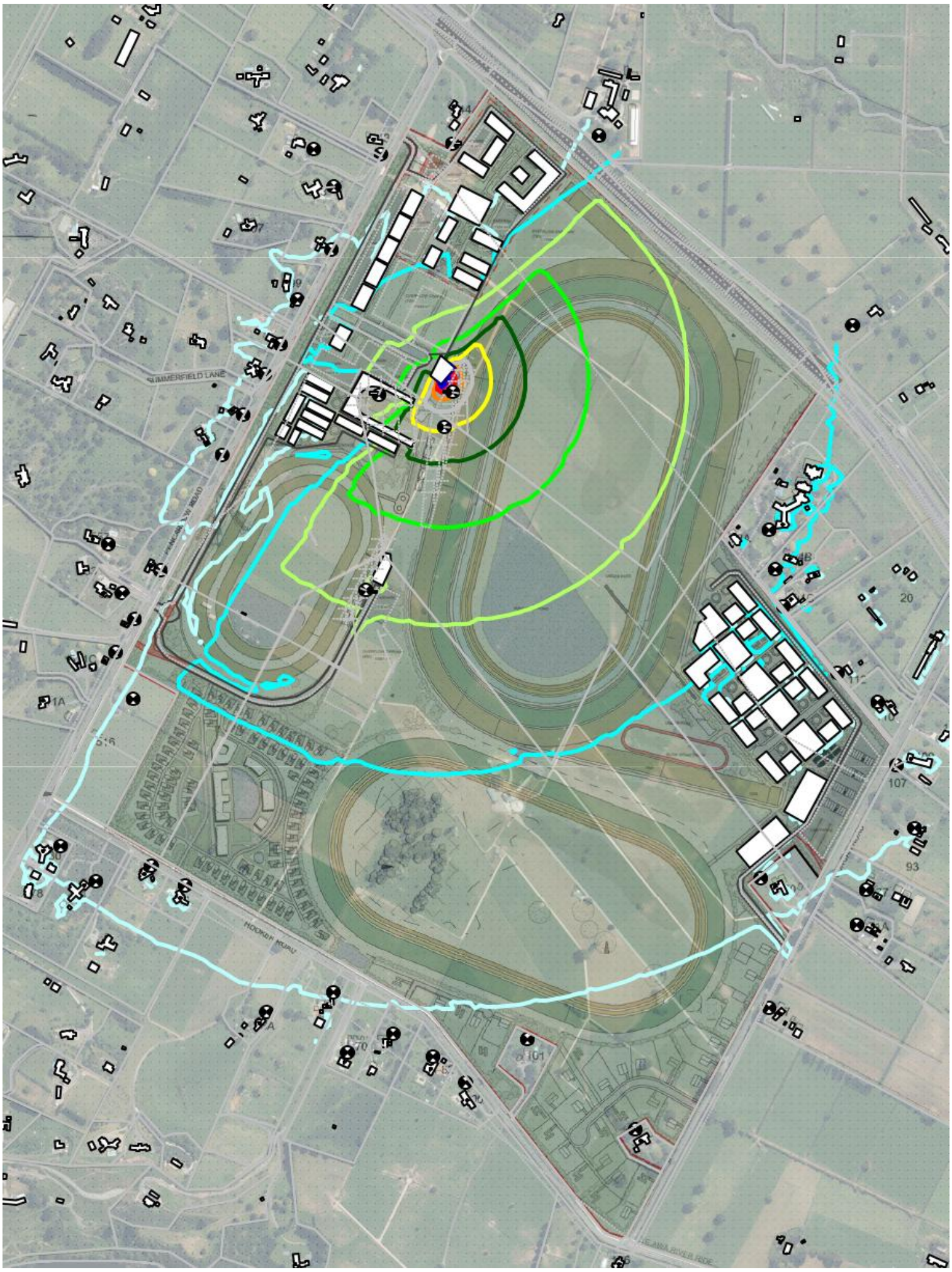


Figure 20. Special Event – Amplified Music/speech, Daytime Period 0700-1900, dB L_{Aeq}

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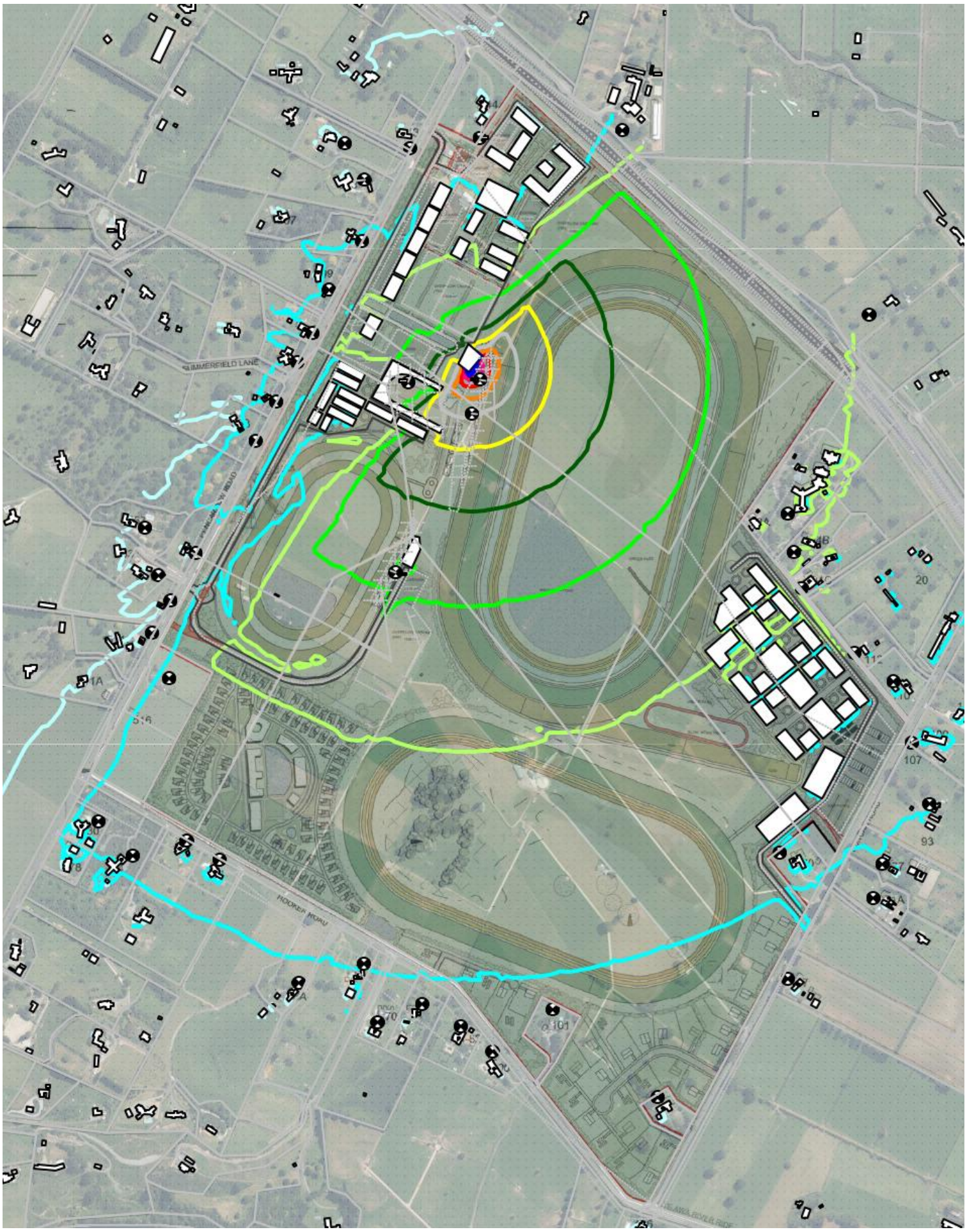


Figure 21. Special Event – Amplified Music/speech, Evening Period 01900-2200, dB L_{Aeq}

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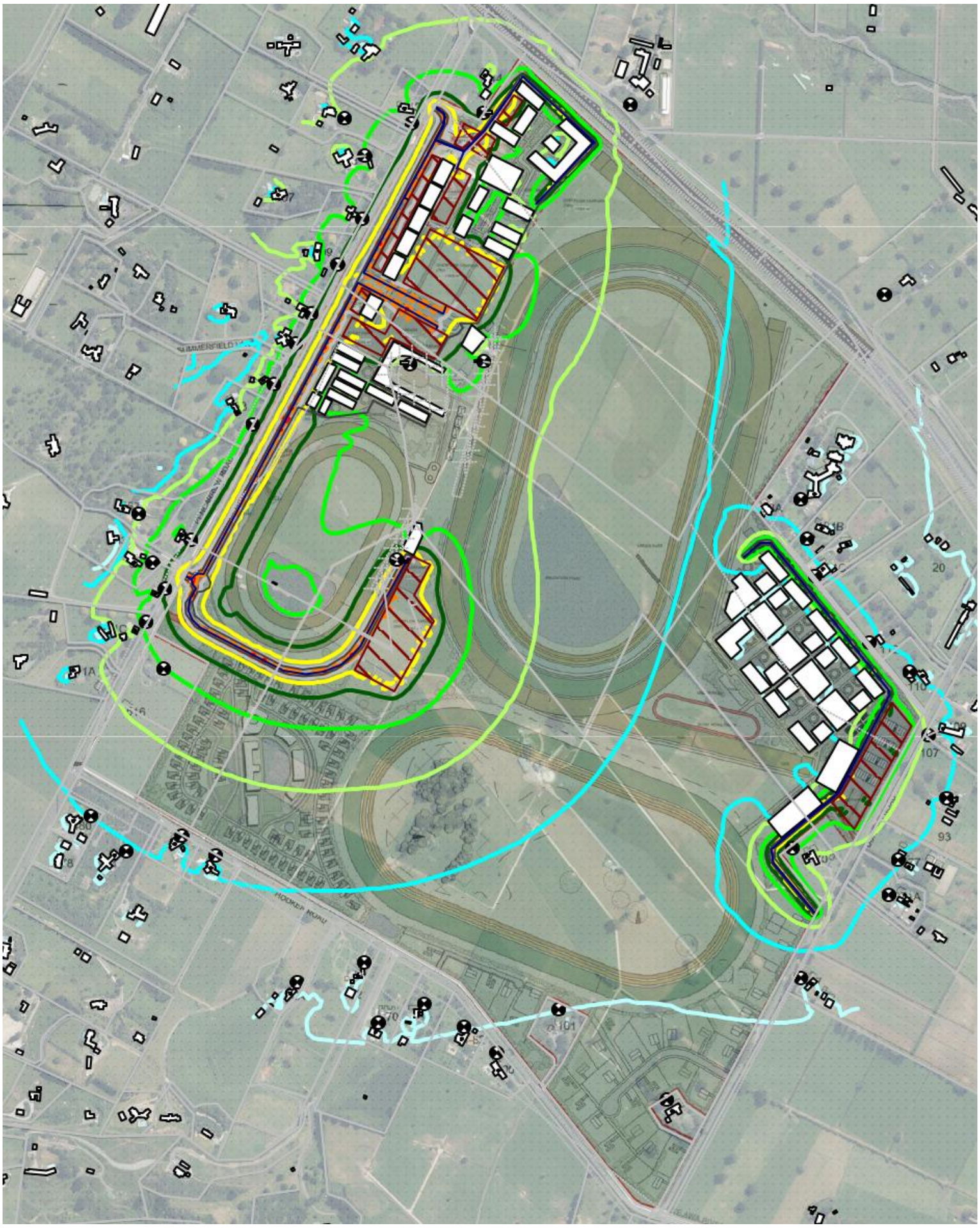


Figure 22. Raceday and Commercial Parking / Vehicle 3D noise model prediction, Daytime period 0700 – 1900, dB L_{Aeq}

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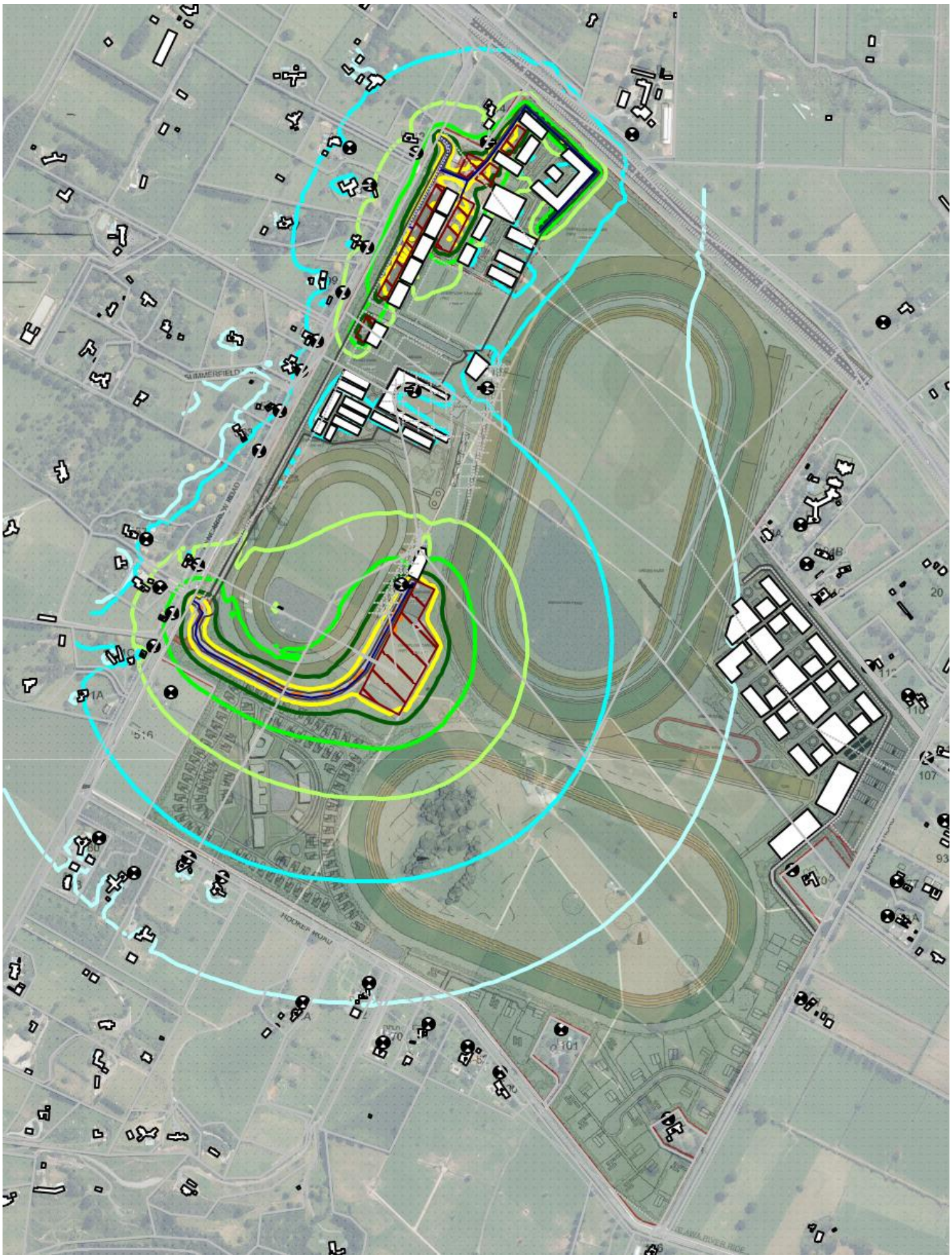


Figure 23. Raceday and Commercial Parking / Vehicle 3D noise model prediction, Evening Period 1900 - 2200, dB L_{Aeq}

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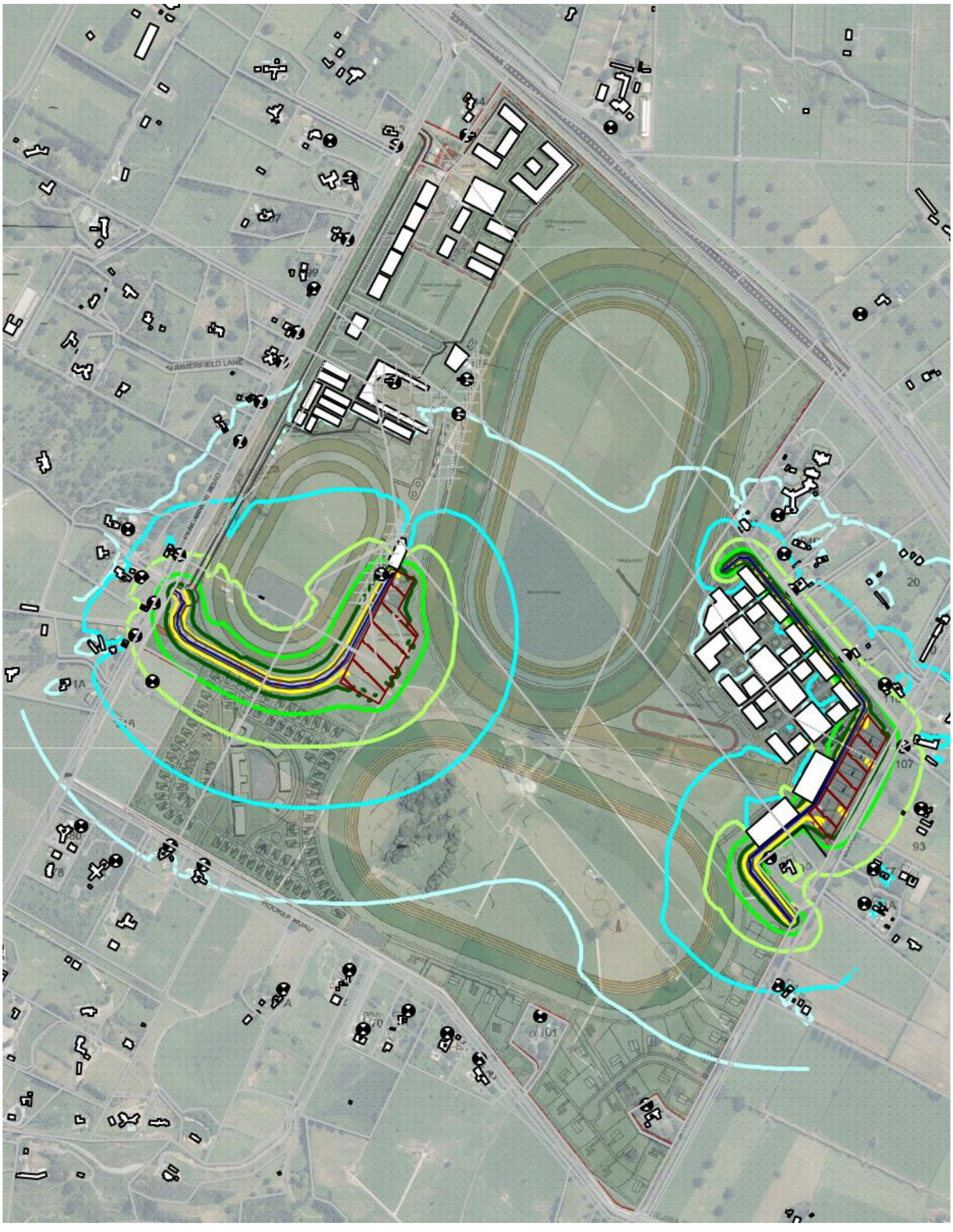


Figure 24. Training Parking / Vehicle 3D noise model prediction, Nighttime Period 2200-0700, dB L_{Aeq}

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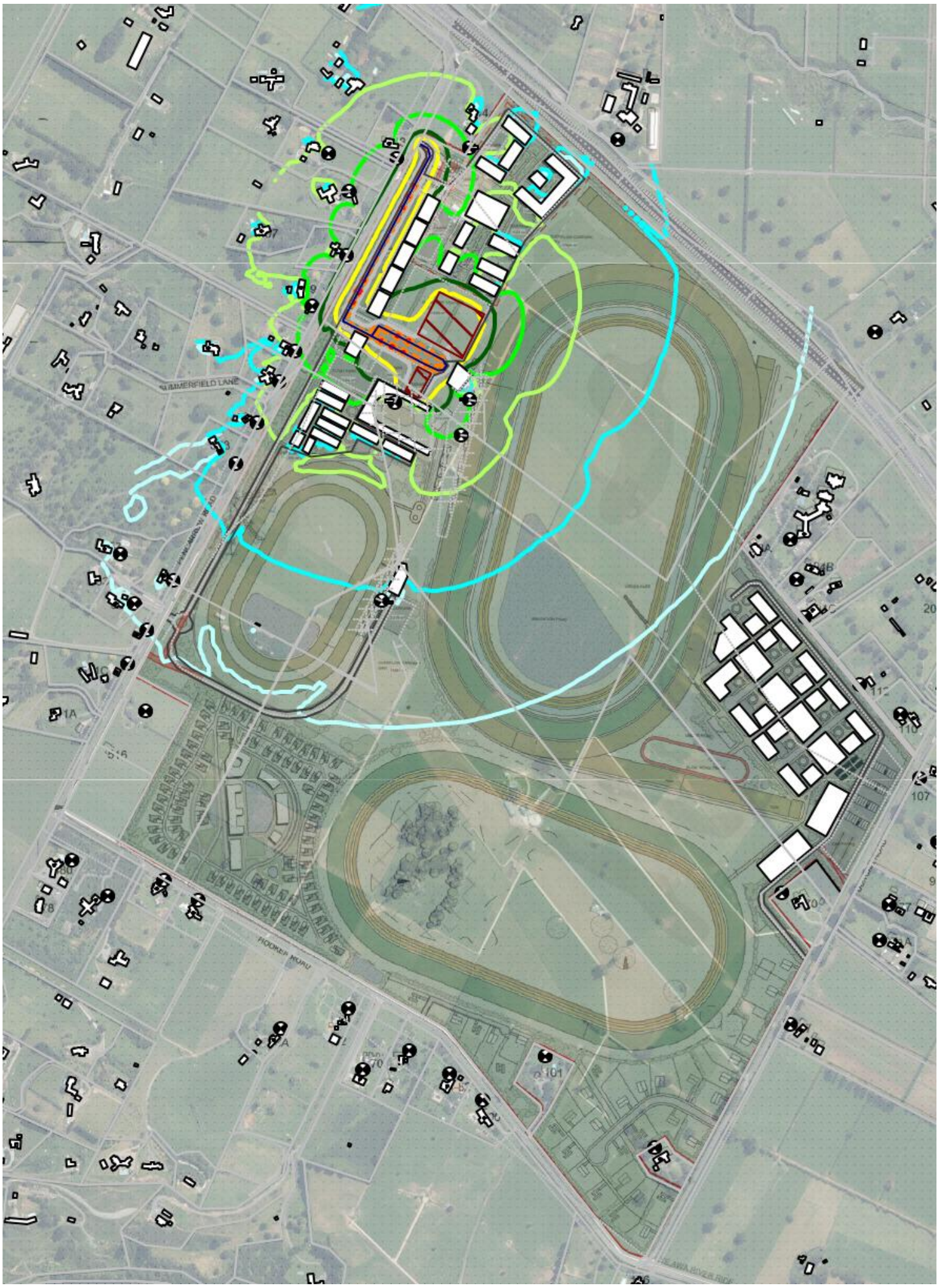


Figure 25. Special Events Parking / Vehicle Daytime 0700-1900 and Evening 1900-2200 periods, dB L_{Aeq}

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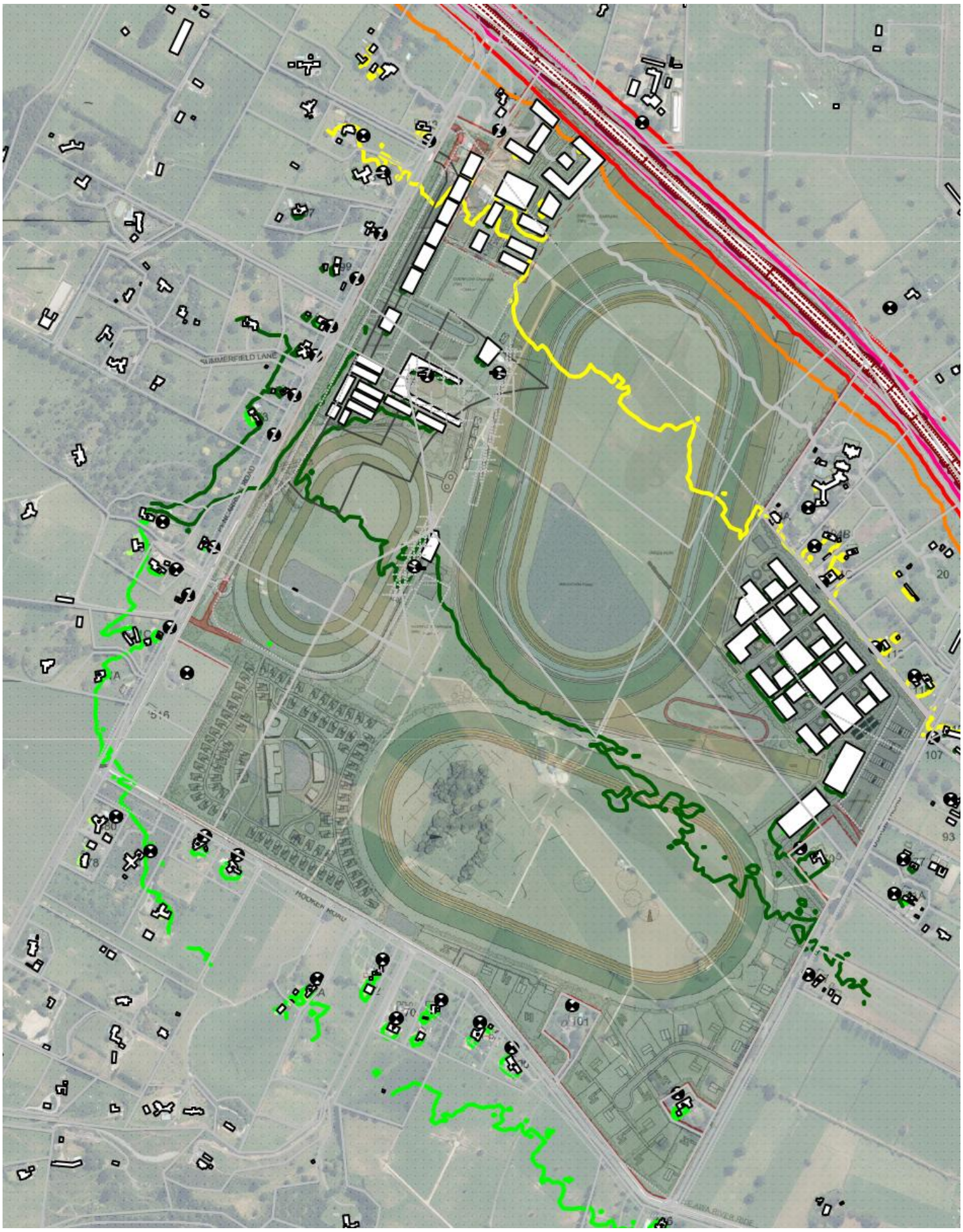


Figure 26. Predicted SH1 Traffic Noise, dB $L_{Aeq(24hr)}$

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Appendix C: Operational Noise Predictions

Table 8. Predicted Operational Noise Level Results and SH1 ambient levels

Receiver	Daytime 0700 – 1900 dB L_{Aeq}						Evening 1900 – 2200 dB L_{Aeq}						Night time 2200 - 0700	Predicted Existing SH1 Noise dB $L_{Aeq(24hr)}$
	Raceday PA / crowd	Raceday Vehicles / Parking	Total: Raceday	Special Event Amplified Music	Special Event Parking	Special Event Total	Raceday PA / crowd	Raceday Vehicles / Parking	Total: Raceday	Special Event Amplified Music	Special Event Parking	Special Event Total	Training Area Parking	
644 Pencarrow Road	38	45	45	23	40	40	31	42	42	28	40	40	17	55
643 Pencarrow Road	41	44	46	23	44	44	31	39	40	28	44	44	17	51
635B Pencarrow Road	42	38	43	22	37	37	30	32	34	27	37	37	17	51
635A Pencarrow Road	40	40	43	25	39	39	32	34	36	27	39	39	18	50
605 Pencarrow Road	46	45	49	26	45	45	35	38	39	30	45	45	20	49
599 Pencarrow Road	48	45	50	28	42	42	38	35	40	31	42	42	21	49
587 Pencarrow Road	49	44	50	28	39	39	40	32	41	33	39	40	23	48
4 Summerfield Lane	49	44	50	27	37	37	40	30	41	33	37	38	24	48
5 Summerfield Lane	48	43	49	27	34	35	38	30	38	32	34	36	25	47
563 Pencarrow Road	46	42	48	21	32	32	36	31	37	32	32	35	27	46
535 Pencarrow Road	41	45	46	24	27	29	34	37	39	26	27	30	35	42

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Receiver	Daytime 0700 – 1900 dB L_{Aeq}						Evening 1900 – 2200 dB L_{Aeq}						Night time 2200 - 0700	Predicted Existing SH1 Noise dB $L_{Aeq(24hr)}$
	Raceday PA / crowd	Raceday Vehicles / Parking	Total: Raceday	Special Event Amplified Music	Special Event Parking	Special Event Total	Raceday PA / crowd	Raceday Vehicles / Parking	Total: Raceday	Special Event Amplified Music	Special Event Parking	Special Event Total	Training Area Parking	
557 Pencarrow Road	40	34	41	23	26	28	31	30	33	29	26	31	27	45
531 Pencarrow Road	40	42	44	21	25	26	32	37	38	28	25	30	35	43
525 Pencarrow Road	39	45	46	23	25	27	33	41	42	26	25	29	40	42
511C Pencarrow Road	38	41	43	26	24	28	32	38	39	28	24	29	36	41
526 Pencarrow Road	37	40	42	25	23	27	33	37	38	31	23	32	35	42
480 Pencarrow Road	32	30	34	26	19	27	28	27	31	31	19	31	24	40
14 Hooker Road	31	30	34	26	19	27	28	27	30	30	19	30	24	40
20 Hooker Road	33	31	35	25	20	26	30	29	32	31	20	31	26	41
34 Hooker Road	33	31	35	25	19	26	30	29	33	31	19	31	26	41
48A Hooker Road	31	27	33	24	17	25	30	25	31	30	17	30	22	42
62 Hooker Road	34	27	35	25	18	26	32	26	33	30	18	30	23	42
70 Hooker Road	33	26	33	24	17	25	31	24	32	29	17	29	21	41
72 Hooker Road	34	26	35	24	17	25	33	24	33	30	17	30	22	42
82 Hooker Road	34	25	35	23	16	24	33	23	33	29	16	29	22	42
100 Hooker Road	34	24	34	24	16	25	32	22	33	29	16	29	21	41

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Receiver	Daytime 0700 – 1900 dB L_{Aeq}						Evening 1900 – 2200 dB L_{Aeq}						Night time 2200 - 0700	Predicted Existing SH1 Noise
	Raceday PA / crowd	Raceday Vehicles / Parking	Total: Raceday	Special Event Amplified Music	Special Event Parking	Special Event Total	Raceday PA / crowd	Raceday Vehicles / Parking	Total: Raceday	Special Event Amplified Music	Special Event Parking	Special Event Total	Training Area Parking	dB $L_{Aeq(24hr)}$
104C Duncan Road	35	25	36	24	16	25	34	23	34	29	16	29	23	42
101 Hooker Road	33	23	34	27	14	27	32	19	32	28	14	28	22	43
18 Duncan Road	35	27	36	25	15	25	34	20	34	29	15	29	31	44
47 Duncan Road	38	41	43	25	18	26	37	22	37	32	18	32	40	45
70 Duncan Road	35	29	36	26	16	26	34	19	34	29	16	29	32	46
71A Duncan Road	35	30	37	27	16	27	34	19	34	30	16	30	34	46
77 Duncan Road	35	30	36	28	17	28	34	19	34	30	17	30	34	49
93 Duncan Road	36	34	38	30	18	30	35	20	35	31	18	31	39	50
107 Duncan Road	37	31	38	30	19	30	36	20	36	32	19	32	35	51
110 Duncan Road	38	34	40	31	20	31	37	22	37	33	20	33	38	50
112 Duncan Road	39	33	40	27	22	28	38	23	38	35	22	35	38	49
104A Duncan Road	39	29	39	22	23	26	38	23	38	35	23	35	31	50
104B+C Duncan Road	39	28	39	26	24	28	37	23	37	36	24	36	28	52
537 Hautapu Road	33	26	34	24	23	27	31	20	31	35	23	35	18	59
78 Hautapu Road	34	34	37	30	31	34	30	29	32	32	31	35	16	65

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