



# ASSESSMENT OF MOTORSPORT NOISE EXPOSURE

PRIVATE PLAN CHANGE REQUEST  
GOLDING ROAD

**PREPARED FOR**  
Auckland Trotting Club and Golding Meadow Developments Ltd.

**DATE**  
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Acoustic assessment prepared by Styles Group for Auckland Trotting Club and Golding Meadow Developments Ltd.

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## 1.0 Executive summary

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Styles Group have assessed the level of motorsport noise exposure across a 80.94 Ha site at Golding Road, Pukekohe East (the **Site**) to inform a private plan change request (the **PPC**). The motorsport noise is generated within the Pukekohe Park Precinct (the **PPP**). The PPC zoning pattern will introduce activities sensitive to noise to an area exposed to variable noise levels from motorsport events in the PPP.

The primary focus of this assessment is to ensure that those parts of the PPC site which provide for activities sensitive to noise will be subject to noise levels that are reasonable for residential activity. Where the noise levels in the residential zones are reasonable, the potential for reverse sensitivity conflicts on the operation of the PPP will be avoided or adequately managed. This accords with Objective 1432.2(1) and Policy 1434.3(5) of the Auckland Unitary Plan.

Styles Group have modelled the motorsport noise levels from the PPP across the Site and have assessed the timing, level and frequency of the noise effects to identify whether the noise levels will be compatible with residential amenity. We have assessed the noise effects to determine whether mitigation or planning controls are necessary or appropriate to manage any adverse effects (including reverse sensitivity effects on PPP).

The PPC zoning pattern has been driven by a fundamental need to separate the Residential zones from the PPP to provide a buffer and reduce noise effects on activities sensitive to noise. This has been achieved by proposing that the large area of land closest to the PPP is rezoned Light Industry zone.

We have modelled the motorsport noise effects across the PPC Site and analysed the propagation of noise in the context of local meteorological conditions. Our analysis demonstrates:

- i. Noise effects from the PPP are confined to the day-time period. The general day to day noise levels from the PPP are consistent with the maximum permitted noise levels in the AUP for residential zones exposed to noise from business zones, and noise from special events.
- ii. The PPP standards would authorise up to 80 days per year (all Category A, B and C event days) when motorsport noise levels in the PPC residential zones could exceed 55dB  $L_{Aeq}$ .
- iii. Windrose data demonstrates that meteorological conditions will assist the propagation of motorsport noise towards the PPC site approximately 60% of the time and will impede propagation 40% of the time. This means that the noise levels across the residential zones in the PPC Site would be no greater than 55dB  $L_{Aeq}$  for approximately 60<sup>1</sup> of the 80 days. 30 days will consist of the noise levels from Category C events where the margin above 55dB  $L_{Aeq}$  will be small (up to 2dB). Of the remaining 30 days

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<sup>1</sup> All Category A and B days, and approximately 60% of the 50 permitted Category C days (30).

(Category A and B events), the noise levels from motorsport could be the dominant noise source, with levels up to 67dB  $L_{Aeq}$  at the most exposed sites. For the remaining 305 days of the year the noise levels will be less than 55dB  $L_{Aeq}$ , and by a significant margin for most of those days.

We have recommended the following mitigation measures to manage the noise effects on future noise sensitive activities within the PPC site, and the PPP:

- i. The construction of a 7m high acoustic wall that will run mid-block through the proposed LIZ (north to south). This barrier will provide a noise level reduction even in the absence of a fully built out Light Industry zone.
- ii. That noise sensitive activities established west of the 55dB  $L_{Aeq}$  noise level contour for Category C days are provided with a mechanical fresh air supply and mechanical cooling (air conditioning) to enable occupants to close windows and doors on the noisy days.
- iii. The use of a covenant on titles within the proposed Residential Zones to help set expectations for incoming residents, create awareness of potential noise effects from the PPP, and to ensure all prospective residents are aware of the nature, frequency and duration of noise levels that may be generated across the PPC Site.

Our assessment has demonstrated the PPP noise levels are primarily controlled by existing compliance points closer than any notional boundary that could be established within the PPC Site. The proposed residential zones will not constrain the maximum permitted noise levels which may be generated by the PPP as part of the existing environment.

Reverse sensitivity effects on the PPP will be adequately avoided by ensuring that future land use activities on the Site are compatible with the PPP motorsport noise levels. The noise modelling confirms that future activities sensitive to noise within the PPC Site will experience reasonable levels of noise, taking into account the recommended mitigation measures. We consider that the potential for reverse sensitivity effects on the PPP will be managed appropriately, in accordance with Objective 1432.2(1) and Policy 1434.3(5).

## 2.0 Introduction

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Auckland Trotting Club and Golding Meadow Developments Ltd have engaged Styles Group to assess the exposure of a 80.94 Ha development site at Golding Road, Pukekohe East (the **Site**) to motorsport noise from the Pukekohe Park Precinct (the **PPP**).

This report provides recommendations from an acoustics perspective to inform the master-planning of the Site and private plan change request (the **PPC request**). This advice sets out:

- i. The maximum level of noise that is permitted to be generated within the PPP as authorised by the AUP.
- ii. Noise modelling results that demonstrate the spatial extent of motorsport noise effects across the Site.
- iii. Recommended mitigation measures to manage the level of motorsport noise from the PPP across the Site.

Activities sensitive to noise are defined in Chapter J1 of the AUP as:

“Any dwelling, visitor accommodation, boarding house, marae, papakāinga, integrated residential development, retirement village, supported residential care, care centres, lecture theatres in tertiary education facilities, classrooms in education facilities and healthcare facilities with an overnight stay facility.”

The primary focus of this assessment is to ensure that those parts of the PPC Site which provide for activities sensitive to noise will be subject to noise levels that are no greater than reasonable for residential activity.

Where the noise levels in the residential zones are reasonable, the potential for reverse sensitivity conflicts on the operation of the PPP will be avoided or adequately managed.

This report should be read in conjunction with the PPC Request. A glossary of acoustical terms used within this document is attached as Appendix A.

## 3.0 Context

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Chapter I434 *Pukekohe Park Precinct* of the AUP sets out the planning and noise management standards for the use and development of Pukekohe Park (the **PPP controls**).

The PPP controls recognise and provide for the operation of PPP as a regionally and nationally important venue for motorsports activities and horse racing. The PPP controls enable a range of activities compatible with, or accessory to the primary activities (horse racing and motorsport) including concerts, events and festivals, organised sports and recreation, and community activities. Typical noise sources arising from the operation of PPP include motor racing, practice driver training, vehicle testing, public address system and crowd noise.

Objective 1432.2(1) and Policy 1434.3(5) of the AUP seek to protect Pukekohe Park from reverse sensitivity effects of adjacent development.

In general terms, a reverse sensitivity effect arises from the establishment of new land use activities that results in modifications being necessary to an existing, lawfully established activity to reduce the noise. In this instance, the AUP authorises the PPP to generate noise effects across the adjacent land. Objective 1434.2 recognises that the PPP activities “*will by virtue of their nature, character, scale and intensity, generate adverse effects on surrounding land uses which are not able to be fully internalised*”.

We have undertaken a comprehensive noise modelling exercise to determine the level of actual and potential noise effects across the Site, and to determine whether the land use activities proposed on the Site will be compatible with the permitted noise effects from the PPP.

Reverse sensitivity effects on the PPP will be adequately avoided by ensuring that future land use activities on the Site are compatible with the PPP motorsport noise levels.

## 4.0 The Site and plan change request

The Site (displayed in Figure 1) includes 80.94 Ha of land in Pukekohe East occupying the area between Station Road and Golding Road, and bounded by Yates Road to the south. The Site includes the site currently occupied by the Franklin Trotting Club (**FTC**) and adjacent land.

The FTC facility is currently zoned Special Purpose Zone- Major Recreation Facility (**SPZ**), and the adjacent land is currently zoned Future Urban Zone (**FUZ**).



Figure 1 The PPC Site (outlined in red)

## 4.1 Proposed zoning layout

The proposed PPC zoning layout is displayed in Figure 2.

The PPC request proposes a mixed zoning environment, including business, residential and open space zones. Appendix B provides an analysis of each of the proposed zones, the extent to which they anticipate and provide for ASN, and commentary on the noise effects within and between each zone.

The zoning pattern has been driven by a fundamental need to separate the Residential zones from the PPP to provide a buffer and reduce noise effects on activities sensitive to noise. This has been achieved by proposing that the large area of land closest to the PPP is rezoned as Business – Light Industry Zone (**LIZ**). The LIZ is not generally sensitive to noise.

The maximum permitted noise levels authorised within and between the various zones in the PPC Site will be controlled by the noise management framework contained within Chapter E25 of the AUP. Chapter E25 provides a robust framework to manage the interface noise levels within and between zones to ensure compatibility of land uses activities. A detailed analysis of the noise controls is provided within Appendix B. We are satisfied that the noise effects within the Site will be adequately managed through the zone interface noise standards in Chapter E25.



**Figure 2 The PPC zoning layout**



Figure 3 displays the proximity of the PPC Site to the PPP on the western side of Golding Road

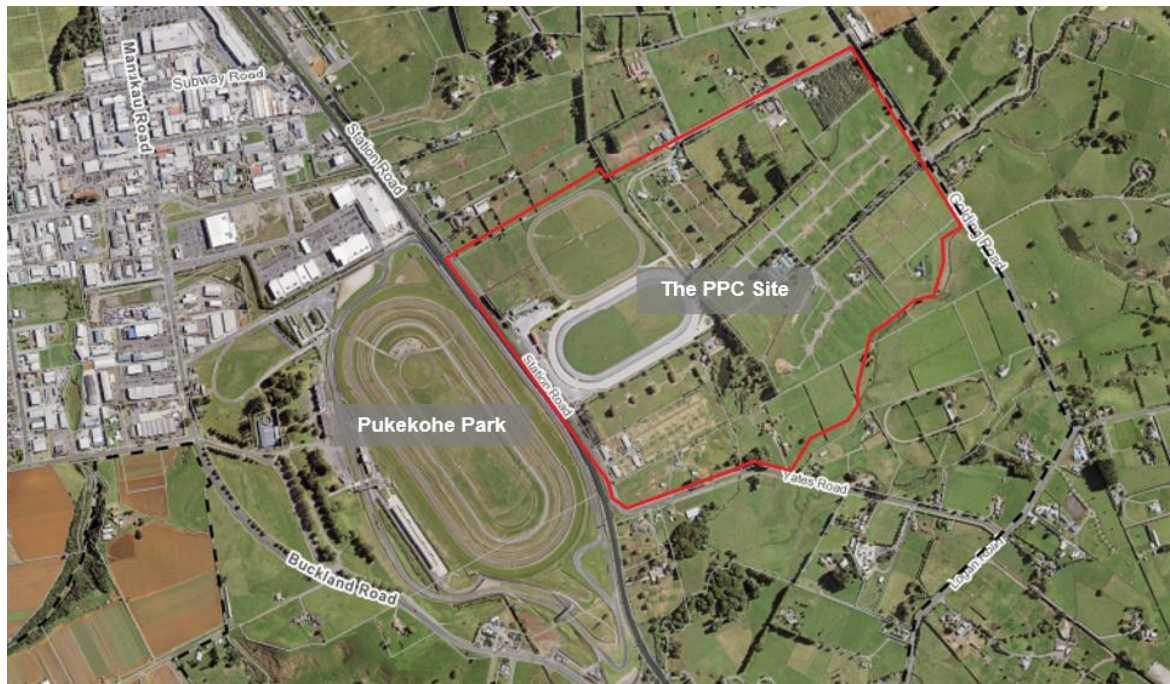


Figure 3 Pukekohe Park Precinct and the PPC Site

## 5.0 AUP Pukekohe Park Precinct noise standards

Noise generated in the PPP is controlled by the standards in I434.6. These override the noise provisions of Chapter E25 and provide standards relating to:

- I434.6.1. *Motorsport activities noise*
- I434.6.2. *Public address system noise*
- I434.6.3. *General noise*

We have reproduced the relevant parts of the Standards we have and provided commentary on the noise effects authorised by the permitted activity standards below.

### 5.1 I434.6.1. Motorsport activities noise

Standard I434.6.1. *Motorsport activities noise* is reproduced below:

I434.6.1. Motorsport activities noise

- (1) There must not be any use of the track by motor vehicles, except for vehicles undertaking track or facility maintenance or repairs, in all of the following circumstances:
  - (a) from 24 December to January 2 inclusive;

- (b) on Good Friday, Easter Sunday and Anzac Day;
  - (c) on Mondays, Tuesdays or more than two Wednesdays of any month except for category E events;
  - (d) Five days before and after a Category A event except that the track can be used for one Category E event within each five day period; and
  - (e) Three days before and after a Category B event except that the track can be used for one Category E event within each three day period.
- (2) The use of the track for any motorsport activity, except for vehicles undertaking track or facility maintenance or repairs, may only take place between:
- (a) Category A & B days between 7am to 7pm;
  - (b) Category B days between 8am to 6pm; and
  - (c) Category C, D and E days between 10am to 5pm.
- (3) The use of the track for any motorsport activity, except for vehicles undertaking track or facility maintenance or repairs, must not exceed all of the following:
- (a) 4 consecutive Category A days;
  - (b) 3 consecutive Category B days; and
  - (c) 3 consecutive days of Category C or D days.
- (4) The noise (rating) level from any motorsport activity or from motor vehicles using the track must not exceed the noise limits in Table I434.6.1.1.
- (5) Vehicles associated with the repair and maintenance of the track and/or facilities are excluded from Standard I434.6.1.

**Table I434.6.1.1: Motorsport noise standards**

Motorsport category	Number of days in any 12 month period	Noise Limit (L <sub>Aeq</sub> )	Timeframe
Category A	Not more than 6	90 dB	12 hours
Category B	Not more than 24	85 dB	12 hours
Category C	Not more than 50	80 dB	7 hours
Category D	Not more than 40	70 dB	7 hours
Category E	Any other day	60 dB	7 hours

- (6) The measurement point for the noise limits in Table I434.6.1.1 is 2m above ground level at the existing 'Bravo' location, 22.5m from the edge of track at coordinates 37°12'54.95"S and 174°54'55.29"E.
- (7) Any motor vehicle using the track must not exceed a noise limit of 95dB L<sub>AFmax</sub> when measured 30 meters at a right angle from the track at points where the vehicle is under maximum power.

- (8) Vehicles using the track on Category E days must have an exhaust system meeting the requirements of Rule 2.7(8) of the Land Transport Rule – Vehicle Equipment Amendment 2007 (Rule 32017/2).
- (9) In the last week of February, May, August and November, the operator of Pukekohe Park Raceway must do both of the following:
  - (a) Publish a calendar identifying all Category A, B, C and D days booked or available at the track for the following 3 months. This must be published in a locally available paper (which is published at least weekly) and must be available on the operator's website; and
  - (b) Provide written notice to the Council of the use of the motor racing track identifying all Category A, B, C and D events held at the track for the previous 3 months.

We have undertaken noise level predictions to understand the spatial propagation of noise levels across the Site from Category A-E days. These results are discussed in Section 6.0 of this assessment.

## 5.2 1434.6.2. Public address system noise

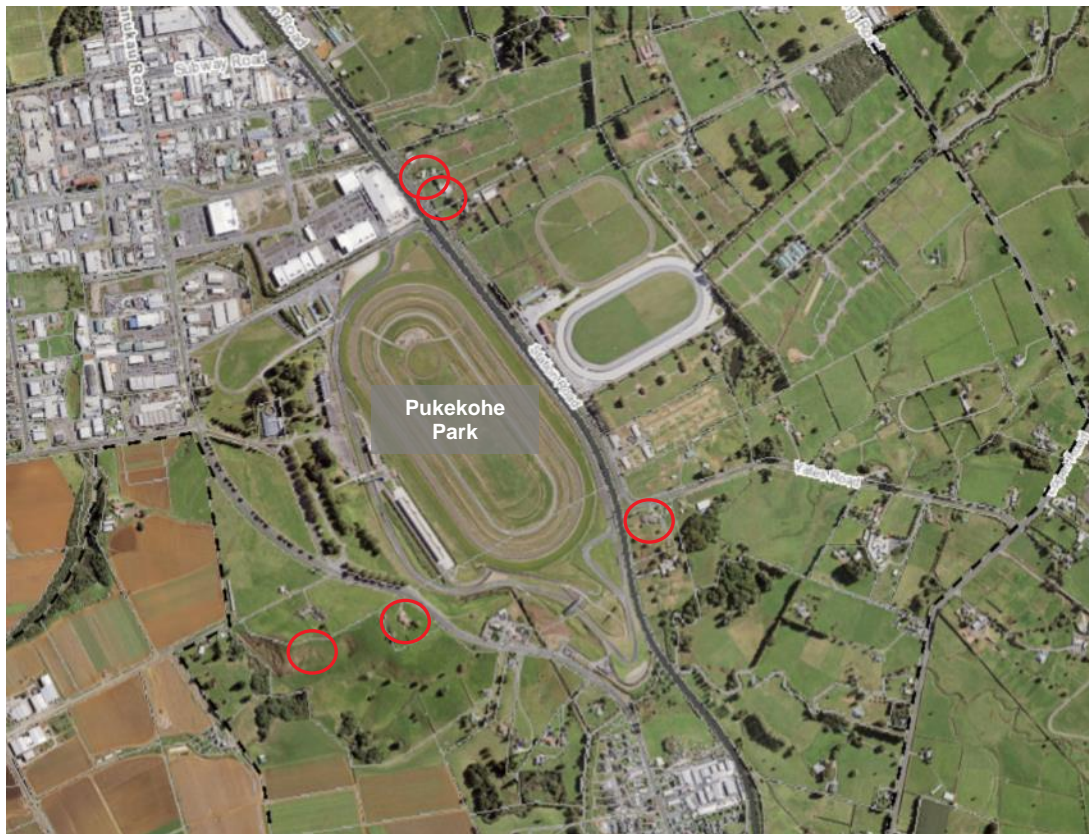
Noise levels arising from the use of a public address system within the PPP are controlled by 1434.6.2. *Public address system noise*. This standard is reproduced below:

- (1) The noise (rating) level from any public address system or any outdoor amplified sound system used for broadcasting voice or music within the site must comply with a noise limit of 50dB  $L_{Aeq}$  when measured at any notional boundary. This excludes Category A, B and C event days when the noise limit must be 65dB  $L_{Aeq(5min)}$  at any notional boundary;
- (2) Any public address system or outdoor amplified sound system must not be used at any of the following times:
  - (a) before 7am or more than one hour before a motorsport activity is programmed to start, whichever is later; and
  - (b) after 7pm or more than one hour after programmed motorsport activity has finished, whichever is the earlier.
- (3) There must be no adjustment for special audible characteristics in relation to noise from the public address system.
- (4) Where  $L_{Aeq(5min)}$  is specified, no 5 minute measurement sample can exceed the stated limit.

The noise limits in 1434.6.2 are required to be measured and assessed at any notional boundary. To determine whether the creation of notional boundaries within the proposed residential zones will give rise to a constraint on the PPP, we have reviewed aerial photos to determine the location of existing notional boundaries surrounding the PPP.

Figure 4 overleaf identifies that the existing environment includes several notional boundaries located in closer proximity to the PPP than the proposed Residential Zones of the PPC. The existing noise compliance points are closer than any notional boundary that may be

established within the PPC Site. Therefore, the establishment of future notional boundaries within the Site will not alter the existing constraints on the PPP's noise emissions under I434.6.



**Figure 4 Existing notional boundaries (noise compliance points) adjacent to the Pukekohe Park Precinct**

### 5.3 I434.6.3. General noise

General noise levels from within the PPP are controlled by I434.6.3. *General noise*. This standard is reproduced below:

The noise (rating) level from any activity as measured at any notional boundary must not exceed the noise limits in Table I434.6.3.1.

**Table I434.6.3.1 General noise standards**

Timeframes	Noise limit
Monday to Saturday 7am – 10pm	55 dB L <sub>Aeq</sub>
Sunday 9am- 6pm	
All other times	45B L <sub>Aeq</sub> 75dB L <sub>AFmax</sub>

- (2) On up to 2 days in any 12 month period, any activity can take place provided that the following standards are met. Standard I434.6.3(2) does not apply to motorsport and horse racing activities:
  - (a) the noise (rating) level does not exceed a limit of 65dB  $L_{Aeq}$  when measured at any notional boundary; and
  - (b) the activity does not exceed 6 hours in duration and does not start before 9am and finishes no later than 10pm.
- (3) Professional fireworks displays and helicopter flights are excluded from this standard.

The general noise standards provide for daytime noise levels of up to 55 dB  $L_{Aeq}$  at any notional boundary. This noise level is consistent with the noise levels authorised at residential zones exposed to noise from business zones (E25.6.19), the active sport and recreation zone (E25.6.17) and many of the AUP precincts (refer to Section 7.4 of this advice).

As noted above, the existing environment includes several notional boundaries located in closer proximity to the PPP than the proposed Residential Zones of the PPC. The existing noise compliance points are closer than any notional boundary that may be established within the PPC Site. Therefore, the establishment of future notional boundaries within the Site will not alter the existing constraints on the PPP's general noise emissions under I434.6.3.

## 5.4 Helicopter noise levels

Noise effects from helicopter landing and take-offs are anticipated and provided for under the PPP controls. Standard I434.6.11 is reproduced below:

### I434.6.11. Helicopter flights

- (1) Landing and departures must take place at least 150m from any neighbouring site.
- (2) The helicopter movements must not exceed the numbers in Table I434.6.11.1 where an arriving flight and a departing flight are counted as two movements.

**Table I434.6.11.1 Helicopter Movements**

Motorsport category	Number of movements
Category A day	Limited to 30 movements per Category A day
Category B day	Limited to 30 movements (in any 12 month period)
Category C day	
Category D day	
Category E day	

The potential noise effects of helicopter landing and take-offs from within the PPP will be greatest on Category A days (up to 6 days in any 12-month period), when up to 30 movements per day are permitted.

## 5.5 Summary of PPP noise levels

The PPP controls enable Pukekohe Park to be utilised for its primary activities while managing the effects on the amenity of surrounding sites. The motorsport noise standards provide for motorsport events while ensuring that the receivers of noise are provided with adequate respite across the year. Importantly, the motorsport noise events are restricted to day-time hours (concluding before 7pm) and do not conflict with typical sleeping hours.

The level and frequency of motorsport noise events are summarised in Table 1

**Table 1 Frequency and level of motorsport noise events**

Motorsport noise source	Number of days in any 12-month period	Noise limit measured at Bravo, 22.5m from the race track (L <sub>Aeq</sub> )	Timeframe
Category A days	Not more than 6	90 dB	12 hours (7am to 7pm)
Category B days	Not more than 24	85 dB	12 hours (7am to 7pm (on Category A & B days) and 8am to 6pm Category B days only).
Category C days	Not more than 50	80 dB	7 hours (10am to 5pm)
Category D days	Not more than 40	70 dB	7 hours (10am to 5pm)
Category E days	Any other day	60 dB	7 hours (10am to 5pm)
Day to day noise	Any day	55 dB L <sub>Aeq</sub> Monday to Saturday 7am-10pm, Sunday 9am-6pm 45 dB L <sub>Aeq</sub> at all other times	

Category A events authorise the highest level of noise emissions across the surrounding land. Category A events are restricted to 6 events in any 12-month period. Noise from Category A days is limited to no more than 12 hours in duration between 7am and 7pm.

Category B events are permitted to occur more frequently (24 times per year), between the hours of 7am and 7pm (on Category A & B days) and 8am to 6pm (Category B days only).

The noise levels from Category C days are 5-10 dB lower than Category A and B days but are also relatively frequent (up to 50 days per year).

The noise levels from Category D and E days are not expected to affect the Residential zones in the PPC area given the low noise limit that applies at the Bravo location. This is demonstrated by the noise modelling we have undertaken.

## 6.0 Motorsport noise modelling

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We have used Brüel & Kjær Predictor computer noise modelling software to determine the spatial propagation of motorsport noise levels from the PPP across the PPC Site. The software enables the accurate prediction of noise levels across large areas of land, at multiple receivers and under a wide range of meteorological and operational conditions. The computer noise model is three-dimensional and takes into account the topography, buildings, ground coverage, physical attributes of the sound sources and receivers and many other factors.

The noise level predictions are based on the International Standards ISO 9613-1/2 *Acoustics – Attenuation of sound during propagation outdoors*. The calculations assume meteorological conditions that slightly enhance propagation in all directions in accordance with NZS 6801:2008. The Brüel & Kjær Predictor software is globally recognised and has been successfully implemented on a large number of projects throughout New Zealand.

This section sets out the information that has been used in the project noise model. This includes the motorsport noise sources, cadastral data, physical mitigation measures, model input parameters and any calculation adjustments applied to the predicted noise levels in accordance with the relevant New Zealand acoustics standards.

### 6.1 Motorsport noise sources

Styles Group has calibrated the noise model using historical motorsport noise measurements obtained from the noise monitoring terminals described below. The data from the Bravo terminal has been used as the primary reference point as this terminal is referenced in the noise limits of Table I434.6.1.1 of the PPP controls.

#### 6.1.1 Noise monitoring terminals

Styles Group were involved in the establishment of the Alpha, Bravo, Charlie and Delta noise monitoring terminals in 2011/2012. We provided advice to the Auckland Council on the appropriate methods and requirements for setting the instruments up, monitoring the noise emissions and the utility of the data for future noise management. We are therefore very familiar with the operational of the terminals, their data outputs, monitoring arrangements and their locations.

All terminals have associated anemometers and the Alpha terminal has additional barometric pressure, rainfall and temperature instrumentation. The weather data is logged along with the measured noise levels, sound files for playback, (for noise source identification) and short and long-term reports for various noise level and meteorological metrics.

The Alpha and Bravo terminals are positioned close to the track to minimise any contribution / contamination of the data by other sources of noise such as birds, trains, traffic and aircraft. The noise of vehicles on the track is generally the dominant sound in these locations. This provides a high degree of confidence that the noise levels they measure are controlled entirely (or almost entirely) by motor racing activities. The proximity to the track also assists in the

accurate derivation of sound power levels of vehicles on the track for noise prediction purposes.

Terminals Charlie and Delta have been positioned outside the PPP and at the approximate notional boundary position of the dwellings at 1722 Bucklands Road (Charlie) and 124 Station Road (Delta). These properties were chosen from a number of candidates based on a number of factors including the landowner's agreement for the installation and their exposure to noise from the Park.

The noise limits applying at the Bravo terminal have been used to calibrate the sound power levels for the predictive model. We have used spectral data measured by the Bravo terminal to inform the sound spectrum of the sources in the noise model. The sound source in the model comprises a line source where the sound power level is specified in  $L_{WA}/m$ , or sound power level per metre. The  $L_{WA}/m$  descriptor is a measure of the sound power of each metre of the track, measured in watts. The  $L_{WA}$  metric should not be confused with or compared to with the  $L_{Aeq}$  or  $L_{Amax}$  noise levels discussed further on in this report. The  $L_{WA}$  level is a function of the source itself and is not distant-dependent as many other metrics are.

The emissions of the different sections of the track vary depending on whether the cars are accelerating, under braking or cornering. Often these phases of driving overlap to some degree. From our measurements and observations, it is clear that racing on some sections of track is louder than others and these characteristics have been included in the model. In particular, the southern end of the back straight has a lower emission where the cars brake hard and then traverse the hairpin corner, and the s-bends at the northern end have a lower overall sound power level per meter than other sections of the track, particularly the front and back straights and the exits of the corners leading into fast sections of the track.

Through a largely iterative process, the emission attributes for the various sections of track in the noise model have been adjusted to best represent the variation in emissions from normal racing. The emissions for all sections of track have then been increased and decreased together based on the measured levels for each type of racing to meet the noise levels measured historically at the Alpha, Bravo, Charlie and Delta noise monitoring terminals.





**Figure 5 Pukekohe Park noise monitoring terminals**

### 6.1.2 Noise barrier

Our initial noise modelling on this project identified that if the LIZ was built out with a high degree of building coverage on each site, the LIZ would comprise an effective acoustic barrier for the Residential zones beyond.

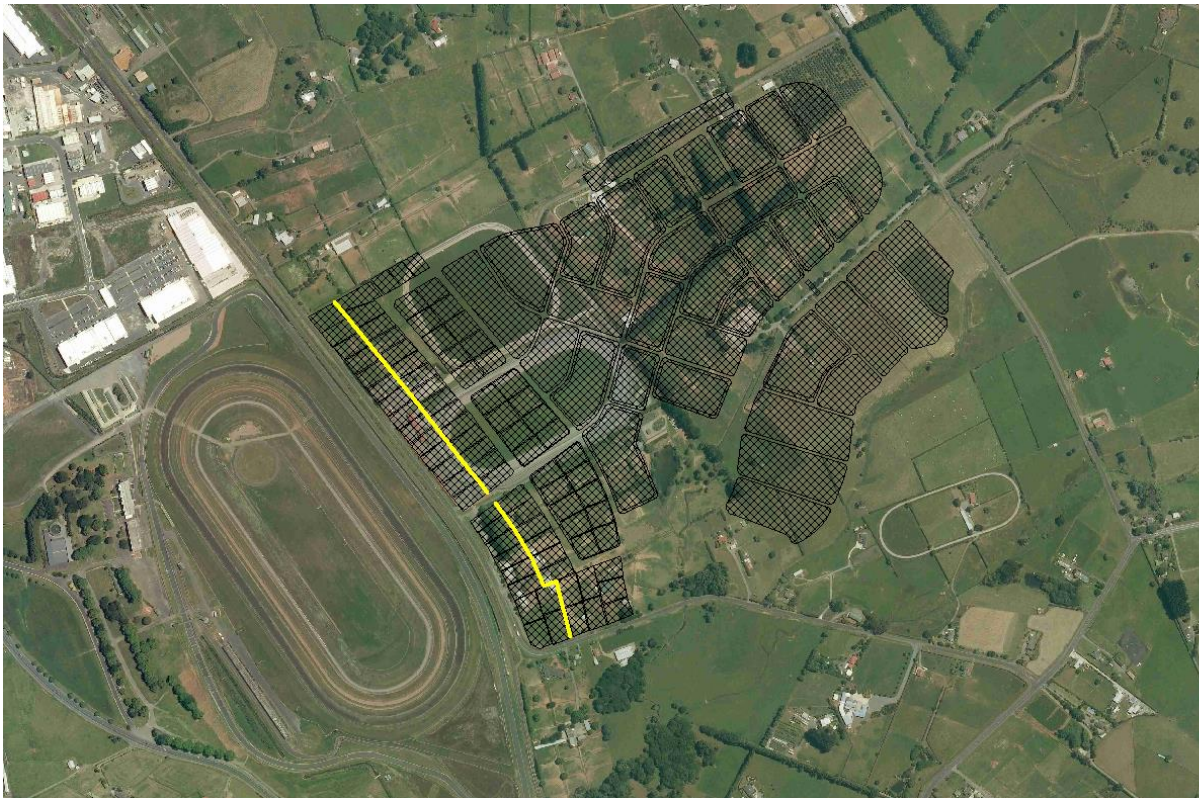
We understand that it is not possible to rely on the build-out of the LIZ for this purpose as some sites may be left relatively open for car parking, yard storage or open manufacturing or other light industry activities that may not involve buildings or structures that would effectively screen motorsport noise. The presence of buildings or structures as acoustic barriers cannot therefore be guaranteed.

We undertook noise modelling of several different acoustic barrier designs to replicate the effect of a built-out LIZ as described above. The most practicable option was deemed to be the 'mid-block' wall. This barrier has been included in the noise modelling to reduce noise levels into the Residential zones in the event the LIZ is not fully built out, or if Residential activity is established before substantial build-out of the LIZ is achieved.

There are two noise barriers incorporated into the noise model, as follows:

- 1) The existing corrugated iron fence along the eastern boundary of the PPP has been included in the noise model at the current heights and extents. The fence has been included with a transmission loss coefficient consistent with standard corrugated iron fencing. This has only a modest effect on the overall noise levels given the relatively low mass of the fence material.
- 2) A noise barrier inside the PPC Site known as the 'mid-block wall'. This barrier is 7m high and runs approximately north to south as shown in Figure 6 below. The gaps in the barrier for roads are assumed to be as narrow as possible, with the barrier extending essentially to the individual site boundaries. The barrier is assumed to be constructed of concrete and / or timber provided the surface density is at least  $10\text{kg/m}^2$ . The barrier must have no gaps along its length or at the base, excluding the gaps included in the noise modelling for road access.

The height and location of the proposed noise barrier has been determined through various iterations of the noise model and through consultation with the Project Team.



**Figure 6 The 'mid block wall'**

### 6.1.3 Noise model parameters

The input parameters for the noise model are set out in Table .

**Table 2: Predictor noise model input parameters**

Parameters/calculation settings	Details
Software	Brüel & Kjær Predictor V2021
Calculation method	ISO 9613.1/2
Meteorological parameters	Single value, C0 = 0
Ground attenuation over land	General method, ground factor: 0.5
Air temperature	293.15 K
Atmospheric pressure	101.33k Pa
Air humidity	60%
Receiver heights (relative)	1.5 m above ground
Building heights (nominal)	4 m
Acoustic barrier (mid-block wall)	7m

The outputs of the noise modelling process are set out in Appendix C and are described in Section 7 below.

## 7.0 Assessment of effects

Styles Group have modelled the motorsport noise effects across the PPC Site and recommended acoustic screening to ensure the noise effects on future activities sensitive to noise will be reasonable.

Our assessment of the motorsport noise effects on activities sensitive to noise within the PPC Site and potential reverse sensitivity effects on PPP is set out below.

### 7.1 Noise exposure across the residential zones

Our noise modelling process has provided the data to enable an understanding of the level of noise exposure to the residential zones arising from motorsport activities undertaken in accordance with the PPP noise standards.

Table 3 below sets out the level of noise exposure in the residential zones for each category of motorsport event.

**Table 3 Frequency and level of motorsport noise in the residential zones of the PPC Site**

Category	Number of days in any 12-month period	Noise limit at Bravo (L <sub>Aeq</sub> )	Timeframe	Noise levels across the residential zones*
A	Not more than 6	90 dB	12 hours (7am to 7pm)	59-67dB L <sub>Aeq(12hr)</sub>
B	Not more than 24	85 dB	12 hours (7am to 7pm (on Category A & B days) and 8am to 6pm Category B days only).	54-62dB L <sub>Aeq(12hr)</sub>
C	Not more than 50	80 dB	7 hours (10am to 5pm)	49-57dB L <sub>Aeq(7hr)</sub>
D	Not more than 40	70 dB	7 hours (10am to 5pm)	39-47dB L <sub>Aeq(7hr)</sub>
E	Any other day	60 dB	7 hours (10am to 5pm)	29-37 dB L <sub>Aeq(7hr)</sub>

\* Assessed over the same timeframes that the motorsport controls specify.

These noise levels are consistent with motorsport events that would reach the absolute maximum permitted noise levels for all days of racing permitted by the PPP standards.

#### 7.1.1 Practical limitations and meteorological effects

We understand that most race days are quieter and shorter than what is permitted, and often by a considerable margin. Although we acknowledge that the potential noise effects must take into account the maximum theoretical level that is permitted, we understand that for practical reasons, the maximum permitted level of noise effects is unlikely to be reached on many motorsport days, and especially for the Category B and C days. The limitations include rain, less than a full field of race cars, breaks in racing across the day and warm up and practice sessions generating less noise than the racing itself.

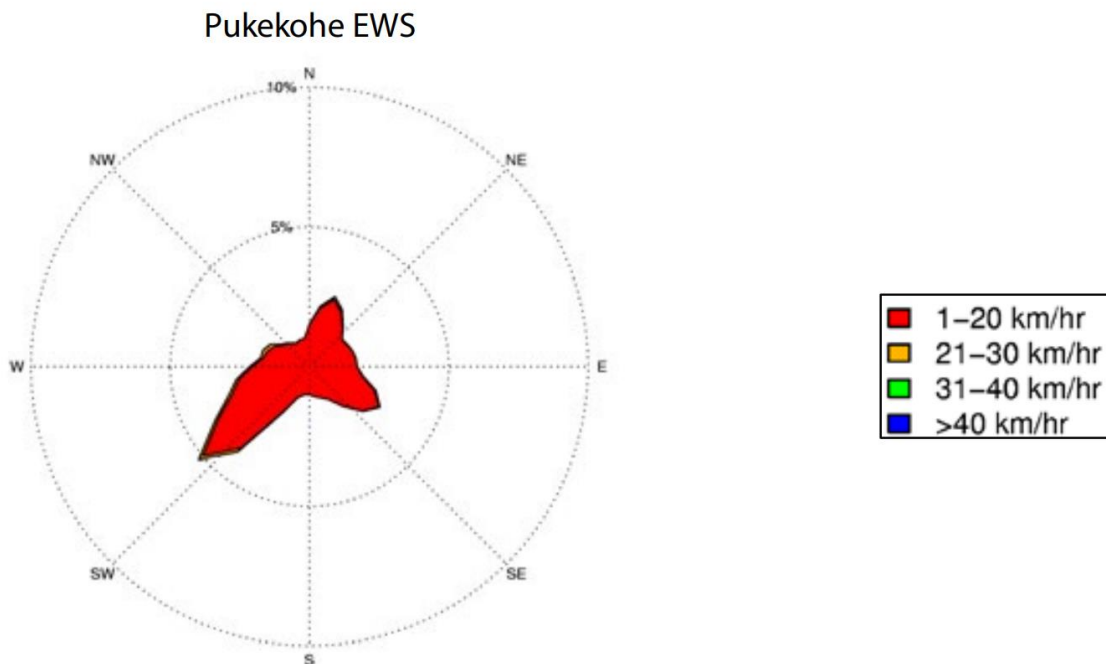
The computer noise modelling process assumes that the meteorological conditions enhance the propagation of noise in all directions away from the PPP including towards the PPC Site. It is likely that there will be a considerable number of motorsport days where the meteorological conditions may impede propagation towards the PPC Site. Meteorological conditions that impede the propagation of noise towards the PPC would be present when winds blow generally from the east, (NNE to SSE). Based on our experience in Auckland, winds generally from the east are relatively common in Auckland during the summer months. Figure 7 shows the windrose from the Pukekohe EWS from NIWA data<sup>2</sup>. This demonstrates that wind from northeast to southeast occurs for a considerable period of the year.

Given that motorsport is most-commonly undertaken during the summer months also, the likelihood of meteorological conditions reducing the motorsport noise levels into the PPC Site are considerable. These conditions would be likely to reduce noise levels across the PPC Site

<sup>2</sup> <https://niwa.co.nz/static/Auckland%20ClimateWEB.pdf>

by 5-10dB  $L_{Aeq}$  at the western extent of the residential zones, and potentially up to 15-20dB at the eastern extent of the residential zones.

Overall, we expect that the noise levels across the residential zones in the PPC Site would on-average be approximately 5dB lower than those set out in Table 3 when the meteorological effects are taken into account.



**Figure 7 NIWA annual windrose data for Pukekohe EWS**

## 7.2 Summary of noise effects in the residential zones of the PPC Site

In general terms, we consider that activities sensitive to noise in residential zones (that are not subject to acoustic insulation standards) should not be exposed to noise levels exceeding 55dB  $L_{Aeq}$  during the day and 45dB  $L_{Aeq}$  at night. This is on the basis that the noise exposure at these levels is generally consistent every day throughout the year.

Where the level of noise exposure from a primary noise source is variable in level, frequency or duration across the year, some flexibility or adjustment to this standard approach is appropriate.

The PPP standards would authorise up to 80 days per year (all Category A, B and C event days) when motorsport noise levels in the PPC residential zones could exceed 55dB  $L_{Aeq}$ .

The windrose above demonstrates that wind from the north-east to south-east would impede the propagation of noise towards the PPC site approximately 40% of the time. It is likely that the motorsport noise levels across the residential zones in the PPC Site would be lower than the permitted standards for many days of the year when taking into account the likely effect of

meteorological conditions that impede propagation towards the PPC Site. The breakdown of these days by Category and level is set out in Table 4.

**Table 4 Frequency and level of motorsport noise taking into account meteorological effects**

Category	Number of days in any 12-month period when noise levels would exceed 55dB L <sub>Aeq</sub> in residential zones	Maximum noise level at most exposed residential sites in the PPC area*
A	Not more than 6	Up to 62-67dB L <sub>Aeq(12hr)</sub>
B	Not more than 24	Up to 57-62dB L <sub>Aeq(12hr)</sub>
C	Approximately 30*	Up to 55-57dB L <sub>Aeq(7hr)</sub>
D	None	
E	None	

\* Taking into account meteorological effects

Taking into account the likely effect of meteorological conditions that will impede propagation towards the PPC Site during a considerable number<sup>3</sup> of event days, the cumulative number of event days where noise levels would be likely to exceed 55dB L<sub>Aeq</sub> is approximately 60 per year.

30 days will consist of the noise levels from Category C events where the margin above 55dB L<sub>Aeq</sub> will be small (up to 2dB). This increase in level will be very small and generally unnoticeable compared to 55dB L<sub>Aeq</sub>.

The most exposed dwellings in the residential zones may experience noise levels from approximately 57dB to 67dB L<sub>Aeq</sub> on the remaining 30 Category A and B event days. The motorsport noise level on these days is likely to be the dominant noise source in the residential zones, especially at the western extent of those zones.

### 7.2.1 Appropriateness of the LIZ as a buffer

Activities sensitive to noise within the LIZ are not permitted, with the exception of tertiary education facilities (where they are accessory to an industrial activity on the same site) and workers accommodation.

We consider that the LIZ is an appropriate zone to create a buffer from the PPP provided that the activities sensitive to noise provided for in this zone are adequately insulated from the potential noise effects of other activities in the LIZ zone according to the standards in E25. This will ensure that the majority of noise from the PPP would be mitigated. Any remaining effects would be relatively minor.

<sup>3</sup> All Category A and B days, and approximately 60% of the 50 permitted Category C days (30)

## 7.2.2 “General noise” effects across the PPC site

I434.6.3. *General noise* requires that the day-to-day noise emissions from PPP (not otherwise provided for under I434.6.1 *Motorsport activities noise*) must comply with a noise limit of 55 dB  $L_{Aeq}$  (daytime) and 45 dB  $L_{Aeq}$  (night-time) when measured and assessed at any notional boundary.

Residential noise levels of 55 dB  $L_{Aeq}$  (daytime) and 45 dB  $L_{Aeq}$  (night-time) are consistent with the maximum permitted noise levels anticipated and provided for at the interface between Business and Residential Zones under the AUP (E25.6.19). This includes the noise levels which will be authorised within the PPC between the interface of the proposed LIZ and MHUZ.

The noise sources in the PPP that would be subject to these noise limits are currently constrained by the proximity of the existing notional boundaries as shown in Figure 4. If the noise emissions from the PPP are compliant at these notional boundaries, the noise levels in the PPC will be significantly lower by a margin of at least -10dB, and possibly as much as -20dB.

For these reasons, we have not identified any concerns relating to the PPP “general noise” levels across the proposed residential zones of the PPC.

We note that for up to two days in any 12-month period, Standard I434.6.3. *General noise* enables the noise limits to be exceeded, up to 65 dB  $L_{Aeq}$  for up to six hours between the hours of 9:00am and 10:00pm. These noise levels must not be exceeded at any notional boundary.

Figure 4 sets out the existing notional boundaries located in closer proximity to the PPP than any notional boundary that may be established as a result of the PPC. The existing notional boundaries will continue to control the noise emissions from the PPP. For this reason, the establishment of future notional boundaries inside the Site will not constrain the current noise generating potential of the PPP. The noise levels inside the PPC will be considerably lower than the noise levels at the existing notional boundaries.

## 7.3 Internal noise amenity

The motorsport noise effects will only be experienced during the daytime period. Sleep disturbance effects are not expected to arise.

Notwithstanding, we recommend that the houses that are likely to be exposed to noise levels greater than 55dB  $L_{Aeq}$  on Category C days are designed and constructed to ensure that residents can enjoy a high level of amenity indoors. This will be most helpful on the louder of the Category C days, as well as Category A and B days.

Most modern houses will achieve a noise level reduction (**NR**) from outside to inside of at least 25dB, provided that windows and doors are closed. Many dwellings will achieve an NR greater than 25dB, and in some cases up to 30dB without any specific acoustic treatment.

If an NR of 25dB is assumed, the indoor noise levels will be no greater than:

- 1) 42dB  $L_{Aeq}$  on the loudest Category A days (6 per annum)

2) 37dB  $L_{Aeq}$  on the loudest Category B days (24 per annum)

3) 32dB  $L_{Aeq}$  on the loudest Category C days (30 per annum<sup>5</sup>)

These noise levels are compatible with residential activity during the day, especially given the limit frequency per year on which they may be experienced. A NR of 25dB will provide a significant level of respite if sought by residents.

Our view is that the only control necessary to deliver this outcome is a rule requiring that all activities sensitive to noise located west of the 55dB  $L_{Aeq}$  noise level contour for Category C days must be provided with a mechanical fresh air supply and mechanical cooling (air conditioning) system. This will ensure that occupants are able to close windows and doors on noisy days and remain cool and supplied with sufficient fresh air. We note that the mechanical ventilation and cooling provisions in E25.6.10(3) would be fit for purpose. It is our experience that these could be applied to future sites by way of precinct controls or by a consent notice on the title.

#### 7.4 Noise effects in the Auckland context

We have reviewed the motorsport noise effects in the context of event noise levels authorised by the AUP across similar residential environments. These include:

- i. Noise levels authorised by the Chapter E40 Temporary Activity standards.
- ii. Noise levels authorised from activities and events in other Major Recreation Zone (MRZ) precincts.

These provisions are summarised in the table below.

Standard / Precinct	Day time noise levels authorised at any activity sensitive to noise
Standard E40.6.4.- Temporary activities in public places (outside the City Centre and Metropolitan Centres)	Up to 15 noise events (in public places) for up to six consecutive days in any 12 month period (provided that no more than two noise events occur in any seven-day period).  The standard authorises noise levels of 70dB $L_{Aeq}$ and 80dBA $L_{A01}$ , with noise levels of up to 80dB $L_{Aeq}$ and 90dBA $L_{A01}$ for three noise events, for a maximum of three hours.
Standard I413.6.1 Noise, Franklin A&P Showgrounds Precinct	Noise levels of up to 55 dB $L_{Aeq}$ on any day

<sup>5</sup> Taking into account meteorological conditions that will assist the propagation of motorsport noise towards the PPC site on 60% of Category C days.



Standard / Precinct	Day time noise levels authorised at any activity sensitive to noise
Standard I313.6.1 Noise, Ellerslie Racecourse Precinct	<p>Noise levels of up to 55 dB <math>L_{Aeq}</math> on any day, with provision for special noise events (between 8:00am and 10:30pm) in any 12 month period:</p> <ul style="list-style-type: none"> <li>• 5 special noise events generating noise levels of up to 75 dB <math>L_{Aeq}</math>.</li> <li>• 15 special noise events generating noise levels of up to 65 dB <math>L_{Aeq}</math>.</li> </ul>
Standard I301.6.1. Noise, ASB Showgrounds Precinct	<p>Noise levels of up to 55 dB <math>L_{Aeq}</math> on any day, with provision for special noise events (between 8:00am and 10:30pm) in any 12 month period:</p> <ul style="list-style-type: none"> <li>• 5 special noise events generating noise levels of up to 75 dB <math>L_{Aeq}</math>.</li> <li>• 15 special noise events generating noise levels of up to 65 dB <math>L_{Aeq}</math>.</li> </ul>
Standard I321.6.1. Noise, Mount Smart Stadium Precinct.	<p>Noise levels of up to 55 dB <math>L_{Aeq}</math> on any day, with provision for special noise events (between 8:00am and 10:30pm) in any 12 month period:</p> <ul style="list-style-type: none"> <li>• 6 special noise events generating noise levels of up to 75 dB <math>L_{Aeq}</math>.</li> <li>• 30 special noise events generating noise levels of up to 65 dB <math>L_{Aeq}</math>.</li> </ul>
Standard I427.6. Noise, Pacific Events Centre Precinct	<p>Noise levels of up to 55 dB <math>L_{Aeq}</math> on any day, with provision for special noise events (between 8:00am and 11:00pm) in any 12 month period:</p> <ul style="list-style-type: none"> <li>• 6 special noise events generating noise levels of up to 75 dB <math>L_{Aeq}</math>.</li> <li>• 18 special noise events generating noise levels of up to 65 dB <math>L_{Aeq}</math>.</li> </ul>

The analysis above demonstrates that the AUP anticipates that residential zones can be exposed to noise from temporary events and MRZ Precincts well above levels of 55dB  $L_{Aeq}$ , on the basis that the frequency of such exposure is limited.

The limitation on the frequency of exposure is generally a function of the noise level. In simple terms, the higher the noise level, the lower the frequency of exposure should be. If the margin above the standard noise limits for the zone is relatively minor, then the frequency of exposure to such noise levels can be greater.

We consider that the motorsport noise effects on residential zones in the PPC Site can be compared to the other AUP standards generally as follows:

- 1) The residential zones in the PPC Site will be exposed to motorsport noise levels exceeding 55dB  $L_{Aeq}$  on up to approximately 60 days per year taking into account meteorological conditions. For approximately 30 of those days, the margin above 55dB  $L_{Aeq}$  will be small (up to 2dB). Of the remaining 30 days, the noise levels from motorsport could be the dominant noise source, with levels up to 67dB  $L_{Aeq}$  at the most exposed sites. For the remaining 305 days of the year the noise levels will be less than 55dB  $L_{Aeq}$ , and by a significant margin for most of those days.
- 2) Residential receivers near to other MRZ precincts and sites where Temporary Activities could occur could reasonable be exposed to a smaller number of days per year when noise levels exceed 55dB  $L_{Aeq}$ , but the noise level could also be considerably greater. Noise levels up to 75dB  $L_{Aeq}$  can be generated by activities in the MRZ precincts, and up to 80dB  $L_{Aeq}$  for a small number of days for other Temporary Activities. This could be on up to 15 days in the case of Temporary Events, and up to 20 days for receivers adjacent to other MRZ precincts.

In our view, the level of noise exposure for the PPC residential zones are a reasonable balance between the level of noise exposure and the frequency of exposure. The effects are further mitigated by the acoustic insulation measures we have recommended.

## 7.5 Reverse sensitivity effects on PPP

Objective 1432.2(1) and Policy 1434.3(5) of the AUP seek to protect the PPP from reverse sensitivity effects of adjacent development. This assessment has been undertaken to identify whether the noise environment on the PPC Site will be compatible with activities sensitive to noise, and to determine any mitigation measures to ensure the noise environment will be reasonable. If the receivers are exposed to noise levels that are no greater than reasonable, we consider that the potential for reverse sensitivity effects on PPP will be managed appropriately.

As set out above, the noise modelling we have undertaken confirms that future activities sensitive to noise within the PPC Site will not be exposed to unreasonable levels of noise.

Notwithstanding, we consider that it would be helpful if the incoming residents are made aware of the potential level and frequency of noise that is permitted to be generated within the PPP. In our experience, use of a no-complaints covenants to help manage reverse sensitivity effects on a noise generator are a relatively common method of achieving this. It is our experience that covenants are an effective mechanism to inform future residents that the relevant properties may be exposed to a particular level of noise for a specified number of days per year. It is our experience that this mechanism is valuable for helping to set the expectations of incoming residents.

In our view, a mechanism to help set expectations for incoming residents should be used to create awareness of potential noise effects from the PPP. This will help to ensure that all prospective residents are informed of the nature, frequency and duration of noise levels that may be generated across the PPC Site.

## 8.0 Conclusion

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Auckland Trotting Club and Golding Meadow Developments Ltd propose to re-zone approximately 81 hectares of land adjacent to the PPP. The zoning pattern will introduce activities sensitive to noise to an area exposed to variable noise levels from motorsport events in the PPP during the daytime.

Styles Group have assessed the motorsport noise levels across the Site to determine the timing, level and frequency of the noise effects and to identify whether the noise levels will be compatible with residential amenity on the Site. We have assessed the noise levels to determine whether mitigation or planning controls are necessary or appropriate to manage any adverse effects (including reverse sensitivity effects on PPP).

Objective 1432.2(1) and Policy 1434.3(5) of the AUP seek to protect the PPP from reverse sensitivity effects of adjacent development. The zoning pattern has been driven by a fundamental need to separate the Residential zones from the PPP to provide a buffer and reduce noise effects on activities sensitive to noise. This has been achieved by proposing that the large area of land closest to the PPP is rezoned LIZ.

We have modelled the motorsport noise effects across the PPC Site and analysed the propagation of noise in the context of local meteorological conditions. Our assessment demonstrates:

- iv. Noise effects from the PPP are confined to the day-time period. The general day to day noise levels from the PPP are consistent with the maximum permitted noise levels in the AUP for residential zones exposed to noise from business zones, and noise from special events.
- v. The PPP standards would authorise up to 80 days per year (all Category A, B and C event days) when motorsport noise levels in the PPC residential zones could exceed 55dB  $L_{Aeq}$ .
- vi. Windrose data demonstrates that meteorological conditions will assist the propagation of motorsport noise towards the PPC site approximately 60% of the time and will impede propagation 40% of the time. This means that the noise levels across the residential zones in the PPC Site would be no greater than 55dB  $L_{Aeq}$  for approximately 60<sup>6</sup> of the 80 days. 30 days will consist of the noise levels from Category C events where the margin above 55dB  $L_{Aeq}$  will be small (up to 2dB). Of the remaining 30 days (Category A and B events), the noise levels from motorsport could be the dominant noise source, with levels up to 67dB  $L_{Aeq}$  at the most exposed sites. For the remaining 305 days of the year the noise levels will be less than 55dB  $L_{Aeq}$ , and by a significant margin for most of those days.

We have recommended the following mitigation measures:

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<sup>6</sup> All Category A and B days, and approximately 60% of the 50 permitted Category C days (30).

- i. The construction of a 7m high acoustic wall that will run 'mid-block' through the proposed LIZ (north to south). This barrier will reduce noise levels in the event that the LIZ is not fully built out.
- ii. That noise sensitive activities established west of the 55dB  $L_{Aeq}$  noise level contour for Category C days are provided with a mechanical fresh air supply and mechanical cooling (air conditioning)<sup>7</sup> to enable occupants to close windows and doors on the noisy days.
- iii. The use of a covenant on titles within the proposed Residential Zones to help set expectations for incoming residents, create awareness of potential noise effects from the PPP, and to ensure all prospective residents are informed of the nature, frequency and duration of noise levels that may be generated across the PPC Site.

Our assessment has demonstrated that the PPP noise levels are primarily controlled by existing compliance points closer than any notional boundary that could be established within the PPC Site. The proposed residential zones will not constrain the maximum permitted noise levels which may be generated by the PPP.

The noise modelling confirms that future activities sensitive to noise within the PPC Site will experience reasonable levels of noise.

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<sup>7</sup> We consider that the mechanical ventilation and cooling controls in E25.6.10(3) are appropriate and could be applied to the residential sites by way of consent notice or precinct controls.

## Appendix A Glossary of terms

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Noise	A sound which serves little or no purpose for the exposed persons and is commonly described as ‘unwanted sound’. The definition of noise includes vibration under the Resource Management Act.
dB (decibel)	The basic measurement unit of sound. The logarithmic unit used to describe the ratio between the measured sound pressure level and a reference level of 20 micropascals (0 dB).
A-weighting	A frequency filter applied to the full audio range (20 Hz to 20 kHz) to approximate the response of the human ear at lower sound pressure levels.
$L_{Aeq(t)}$ (dB)	The A-weighted equivalent sound pressure level with the same energy content as the measured varying acoustic signal over a sample period (t). The preferred metric for sound levels that vary over time because it takes into account the total sound energy over the time period of interest.
$L_{AFmax}$ (dB)	The maximum A-weighted sound pressure level recorded during the measurement period using a fast time-weighting response.
Noise rating level	A derived noise level used for comparison with a noise limit.
Notional boundary	A line 20 metres from any side of a residential unit or other building used for a noise sensitive activity, or the legal boundary where this is closer to such a building.
NZS 6801:2008	N.Z. Standard NZS 6801:2008 Acoustics – Measurement of environmental sound.
NZS 6802:2008	N.Z. Standard NZS 6802:2008 Acoustics – Environmental noise.
The Act	The Resource Management Act 1991.
s16	Section 16 of the Act states that “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”.

## Appendix B Sensitivity analysis

Zone	AUP permitted land uses and extent to which the zone is sensitive to noise	Maximum permitted noise levels authorised within and between zones (Chapter E25)
<b>Business-Light Industry Zone (LIZ)</b>	<p>The LIZ provides an environment for light industrial activities to function effectively. The zone activity table authorises industrial activities and small-scale commercial activities.</p> <p>In terms of ASN, dwellings are not provided for<sup>8</sup> and tertiary education facilities are only permitted where they are accessory to an industrial activity on the same site.</p>	<p>E25.6.5 prescribes a noise limit of 65dB <math>L_{Aeq}</math> at all times for noise levels generated and received between sites in the Light Industry Zone.</p> <p>The proposed zoning layout will result in a LIZ-MHUZ interface. Future LIZ occupants will be required to comply with the noise limits of E25.6.19 <i>Business Zones interface</i>. This standard requires LIZ operators to achieve compliance with 55 dB <math>L_{Aeq}</math> during the daytime and 45 dB <math>L_{Aeq}</math>, 75dB <math>L_{AFmax}</math> (and low frequency controls of 60 dB <math>L_{eq}</math> at 63Hz and 55dB <math>L_{eq}</math> at 125Hz) at all other times. These noise limits apply when measured and assessed at the boundary of any residential site</p>
<b>Business Neighbourhood Centre Zone (NCZ)</b>	<p>The NCZ applies to small shopping precincts in residential neighbourhoods, to meet the frequent retail and commercial needs of residents/ passer bys. The zone activity table permits small scale commercial activities.</p> <p>In terms of ASN, dwellings, visitor accommodation and boarding are permitted in the NCZ.</p>	<p>Noise levels between sites in the NCZ are controlled under E25.6.7. This standard prescribes a noise limit of 60 dB <math>L_{Aeq}</math> (daytime) and 50 dB <math>L_{Aeq}</math> , 75dB <math>L_{AFmax}</math> (and low frequency controls of 60 dB <math>L_{eq}</math> at 63Hz and 55dB <math>L_{eq}</math> at 125Hz) at all other times.</p> <p>As the NCZ is surrounded by the MHUZ, future NCZ activities will be required to comply with the noise limits of E25.6.19 <i>Business Zones interface</i>. This standard requires compliance with 55 dB <math>L_{Aeq}</math> during the daytime and 45 dB <math>L_{Aeq}</math>, 75dB <math>L_{AFmax}</math> (and low frequency controls of 60 dB <math>L_{eq}</math> at 63Hz and 55dB <math>L_{eq}</math> at 125Hz) at all other times. These noise limits apply when measured and assessed at the boundary of any residential site.</p>
<b>Residential Mixed Housing</b>	<p>The MHUZ is a high-density residential zone.</p>	<p>Noise levels between sites in residential zones are controlled by E25.6.2. This standard prescribes a daytime noise limit of 50 dB <math>L_{Aeq}</math>, 40dB <math>L_{Aeq}</math> / 75 dB <math>L_{AFmax}</math> at all other times.</p>

<sup>8</sup> With the exception of workers accommodation (one per site).

Zone	AUP permitted land uses and extent to which the zone is sensitive to noise	Maximum permitted noise levels authorised within and between zones (Chapter E25)										
<b>Urban Zone (MHUZ)</b>	The zone activity table anticipates and provides for residential activity and supported residential care / visitor accommodation and care centres for up to 10 people.	These noise limits seek to ensure the amenity values of residential zones are protected from unreasonable noise, particularly in the night time period.										
<b>Open Space- Sport and Active Recreation Zone (OS-SAR)</b>	The OS-SAR Zone provides for indoor and outdoor organised sports, activity recreation and community facilities. The activity table also anticipates and provides for commercial activities ancillary to sport and active recreation facilities (such as providing food and beverage to support recreational use).	<p>Recreational noise levels within the OSSAR and received in the residential zones are controlled under E25.6.17. This standard is reproduced below.</p> <p><b>Table E25.6.17.1 Noise levels at the open Space – Sport and Active Recreation Zone interface</b></p> <table border="1"> <thead> <tr> <th data-bbox="1043 756 1099 777">Time</th> <th data-bbox="1576 756 1700 777">Noise level</th> </tr> </thead> <tbody> <tr> <td data-bbox="965 823 1178 876">Monday to Saturday 7am – 10pm</td> <td data-bbox="1238 791 2040 908">55 dB L<sub>Aeq</sub> Except that for a cumulative period of: (i) 3 hours per day between 7am and 9.30pm Monday to Friday; and (ii) 6 hours between 7am and 10pm on Saturdays. the noise level must not exceed 60dB L<sub>Aeq</sub></td> </tr> <tr> <td data-bbox="958 916 1184 1032">Sundays and Public Holidays 9am- 6pm outside the daylight saving period</td> <td data-bbox="1263 916 2011 1000">55dB L<sub>Aeq</sub> Except that for a cumulative period of 3 hours between 10am and 3pm Sundays the noise level must not exceed 60dB L<sub>Aeq</sub></td> </tr> <tr> <td data-bbox="965 1040 1178 1157">Sundays and Public Holidays 8am- 7pm during the daylight saving period</td> <td data-bbox="1263 1040 2011 1125">55dB L<sub>Aeq</sub> Except that for a cumulative period of 3 hours between 10am and 3pm Sundays the noise level must not exceed 60dB L<sub>Aeq</sub></td> </tr> <tr> <td data-bbox="994 1211 1149 1232">All other times</td> <td data-bbox="1536 1163 1738 1279">40dB L<sub>Aeq</sub> 55dB L<sub>eq</sub> at 63 Hz 50dB L<sub>eq</sub> at 125 Hz 75dB L<sub>AFmax</sub></td> </tr> </tbody> </table>	Time	Noise level	Monday to Saturday 7am – 10pm	55 dB L <sub>Aeq</sub> Except that for a cumulative period of: (i) 3 hours per day between 7am and 9.30pm Monday to Friday; and (ii) 6 hours between 7am and 10pm on Saturdays. the noise level must not exceed 60dB L <sub>Aeq</sub>	Sundays and Public Holidays 9am- 6pm outside the daylight saving period	55dB L <sub>Aeq</sub> Except that for a cumulative period of 3 hours between 10am and 3pm Sundays the noise level must not exceed 60dB L <sub>Aeq</sub>	Sundays and Public Holidays 8am- 7pm during the daylight saving period	55dB L <sub>Aeq</sub> Except that for a cumulative period of 3 hours between 10am and 3pm Sundays the noise level must not exceed 60dB L <sub>Aeq</sub>	All other times	40dB L <sub>Aeq</sub> 55dB L <sub>eq</sub> at 63 Hz 50dB L <sub>eq</sub> at 125 Hz 75dB L <sub>AFmax</sub>
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# Appendix C Motorsport noise level contours

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# Motorsport noise level contours- Category A

Noise level contours - Motorsport category A

Styles Group Vibration & Acoustics Consultants



588000

1770000

1771000

1772000

# Motorsport noise level contours- Category B

Noise level contours - Motorsport category B

Styles Group Vibration & Acoustics Consultants

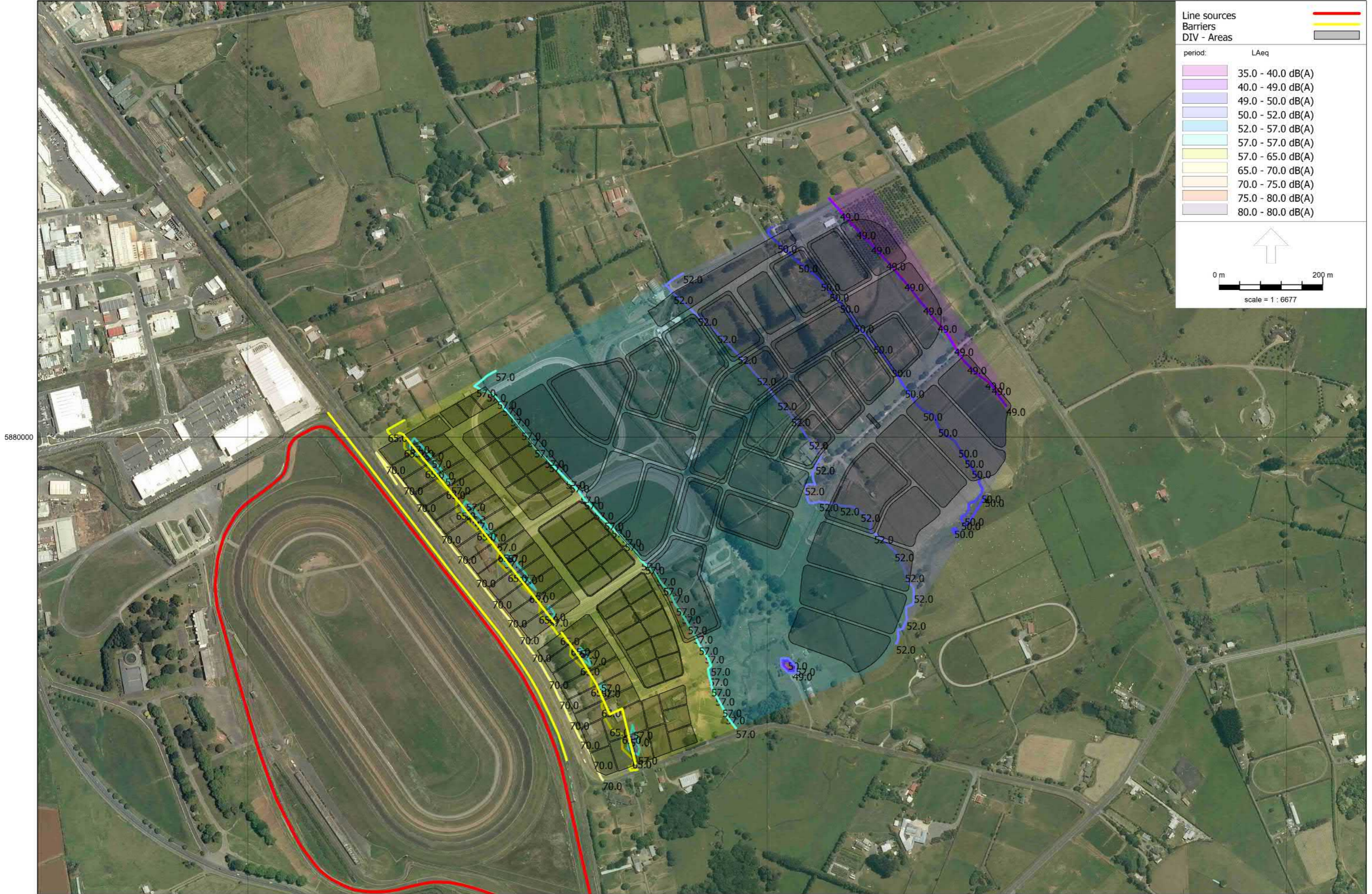


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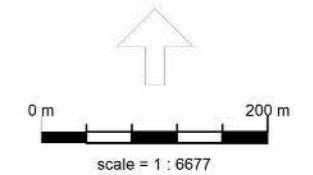
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Line sources	Barriers	DIV - Areas

period:	LAeq
	35.0 - 40.0 dB(A)
	40.0 - 49.0 dB(A)
	49.0 - 50.0 dB(A)
	50.0 - 52.0 dB(A)
	52.0 - 57.0 dB(A)
	57.0 - 57.0 dB(A)
	57.0 - 65.0 dB(A)
	65.0 - 70.0 dB(A)
	70.0 - 75.0 dB(A)
	75.0 - 80.0 dB(A)
	80.0 - 80.0 dB(A)



# Motorsport noise level contours- Category D

Noise level contours - Motorsport category D

Styles Group Vibration & Acoustics Consultants



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# Motorsport noise level contours- Category E

Noise level contours - Motorsport category E

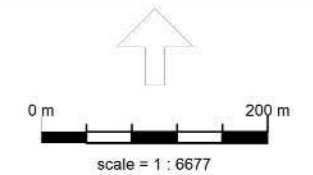
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Line sources	Barriers	DIV - Areas

period:	L <sub>Aeq</sub>
	29.0 - 37.0 dB(A)
	37.0 - 45.0 dB(A)
	45.0 - 50.0 dB(A)
	50.0 - 55.0 dB(A)
	55.0 - 57.0 dB(A)
	57.0 - 60.0 dB(A)
	60.0 - 65.0 dB(A)
	65.0 - 70.0 dB(A)
	70.0 - 75.0 dB(A)
	75.0 - 80.0 dB(A)
	80.0 - 80.0 dB(A)



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