

Figure 5 – Night-time Truck Movements  $L_{Aeq}(15min)$

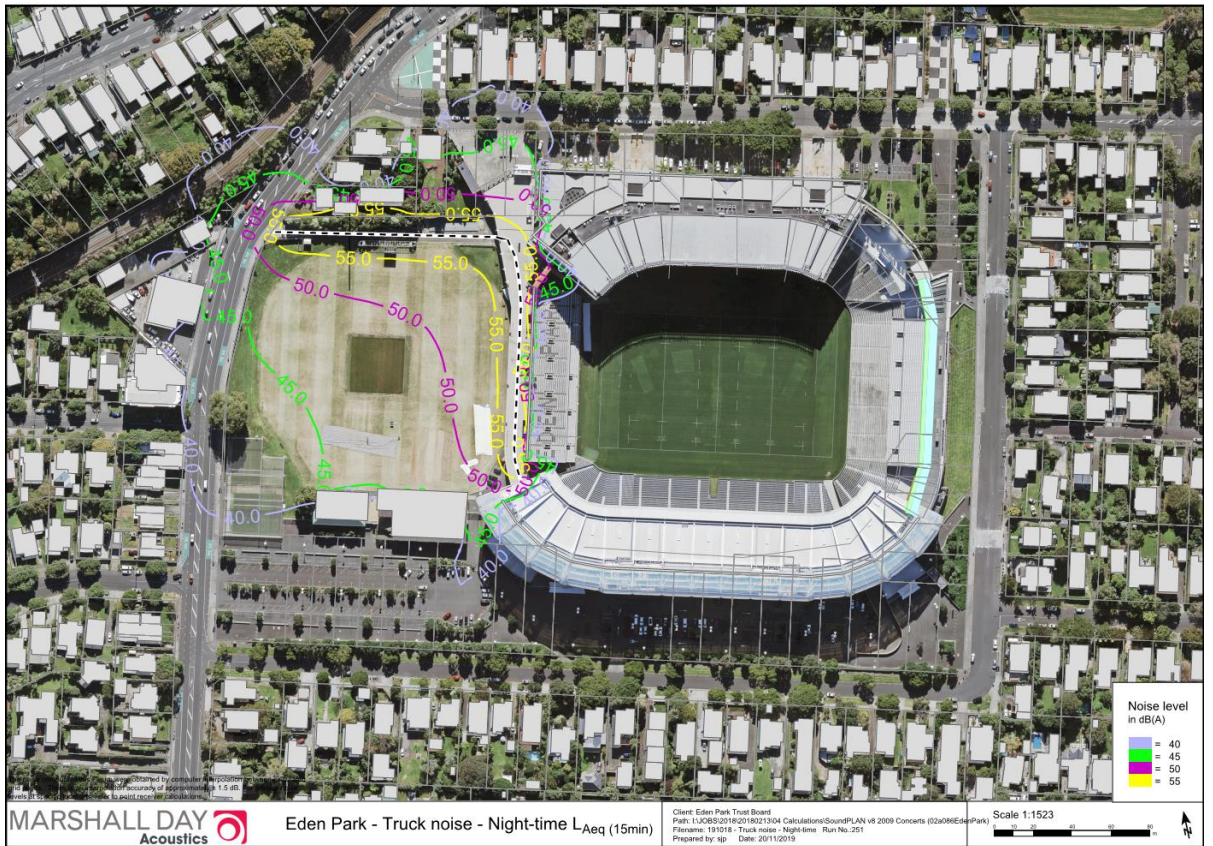
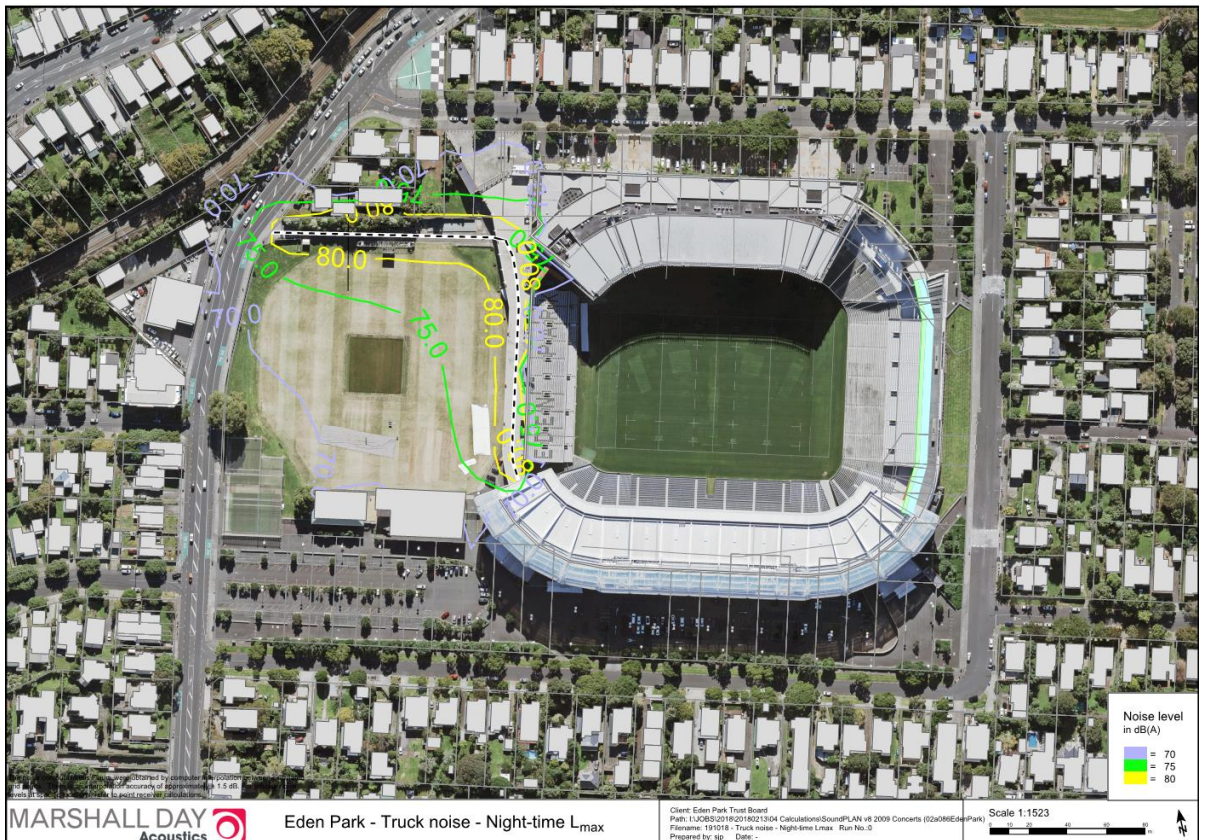


Figure 6 – Night-time Truck Movements  $L_{max}$



The predicted contours (Figures 5 & 6) show that trucks can comply with 40 dB  $L_{Aeq(15min)}$  and 75 dB  $L_{Amax}$  at all properties in the residential zone but exceeds these levels at one or two of the houses in the north west corner of the Eden Park Precinct. While compliance with the Unitary Plan noise limits is not required at these houses, the effects are discussed in section 3.

### ***Disestablishment Noise***

Critical elements of the stage setup (eg. sound and lighting rigs) are normally required to be dismantled immediately after the concert to start the overnight journey to the next venue. Noise from this activity will be well screened from residents by the natural barrier effect of the large stands. Disestablishment noise was inaudible from outside Mt Smart Stadium after the U2 concert however some of the forklifts and other equipment were able to be measured close up.

The method used to dismantle the stage setup and associated equipment, varies from concert to concert. For this reason, MDA has modelled a nominal source at two locations on the field to simulate a nominal activity and determine the 'transfer function' from inside to outside (the difference in level from source  $L_{WA}$  to  $L_{Ap}$  at the residential boundary). Using this technique and the night-time limits of 40 dB  $L_{Aeq}$  and 75 dB  $L_{Amax}$  the sound power levels for activities inside the stadium could be as high as 95 dB  $L_{WAeq}$  and 130 dB  $L_{WAmix}$  and comply.

The measurements of pack down noise at the U2 concert at Mt Smart Stadium confirm these noise levels are achievable.

## **3.0 ASSESSMENT OF EFFECTS**

### **3.1 Music Noise**

As discussed earlier, community response to concert noise varies significantly from individual to individual. However, it is generally agreed by acoustic experts (and adopted by Auckland Council at other stadia) that if concerts are limited in duration, number of events and cut-off time, they are likely to be accepted by the community at considerably higher noise levels than the noise limits applying to day to day activities. This concept is reflected in the noise controls for stadia around New Zealand and other stadia in Auckland. While some stadia have noise limits of 80 to 90 dB at the residential zone boundary, 75 dB  $L_{Aeq}$  is the most commonly used noise limit for concerts in New Zealand and this is proposed for the control of Eden Park concerts.

Noise modelling of three different stage arrangements shows that at the residential zone around Eden Park concert noise can be contained to comply with 75 dB  $L_{Aeq}$  during typical concerts. There is a small group of houses in the north west corner of the Eden Park Precinct (zoned 'Major Recreation Facility') that might experience noise levels 1 or 2dB higher than 75 dB  $L_{Aeq}$ . Firstly, the difference between 75 dB and 77 dB is not discernible. Secondly Eden Park own all of these houses except for 2 units out of the 5 units in the block at 64 Sandringham Rd (the closest to Eden Park). Thirdly, those units are not zoned residential but are within the Precinct.

In general, there is no doubt that some residents around Eden Park will be annoyed by these levels of music noise for the short period that they occur. However, there will also be a large number of people who will be indifferent and some who will enjoy the music. It is considered that the noise effects from the proposed concerts on the residential community are "reasonable" based on the short duration of the noise (3 to 6 hours), the cut-off time of 10:30/11:00pm and the infrequent occurrence (max 6 per year). The modelled noise levels here are less than or similar to, what Auckland Council considers reasonable for residents around other large stadia and for temporary events in general parks.

It is often the case that residents located a significant distance (>1km) from a stadium complain about concert noise, which is typically experienced at less than 55 dB  $L_{Aeq}$  (normal day to day limit). Music at this level would be clearly audible and because these people do not expect to hear the sound at that distance, it is more of a surprise than an unreasonable level of noise. Because they complain does not mean the noise effects are necessarily unreasonable.

## 3.2 Crowd Noise

Another issue to be examined is crowd noise. Crowd noise is explicitly excluded from the noise standards for the Eden Park Precinct and is thus not monitored for compliance but its effects have been predicted and assessed in this report. During sporting events, crowd noise is intermittently at a higher level than the noise limits that the sound system is restricted to at the residential interface. This results in what some residents refer to as 'dirty noise' being experienced at the residential interface (55 dB). In the case of concerts, this is not expected to be the same issue. The music noise during concerts will be greater than, or similar to, the crowd noise, which itself is of a different nature to rugby or cricket crowd noise.

As discussed in section 2.2, concert crowd noise levels are expected to be approximately 65 to 70 dB for short periods of time. These noise levels are not considered to be significant amongst the music noise at 70 to 75 dB. Crowd noise is also intermittent, of short duration and the concerts themselves are infrequent (max 6 per year).

### *Cumulative Effects*

Eden Park is currently allowed 25 'night-time activities' and the question has been asked as to what the cumulative effects will be with 6 concerts added to the programme. It is important to note that these 'night-time activities' take place in what is regarded as the 'noise daytime'. The Eden Park Precinct noise rules change over to the 'night noise limits' at 10:30pm and games have to be finished before then.

During these 'night-time activities', all noise sources have to comply with 55dB - the daytime noise limit. There are however short duration exceedances of this limit from crowd noise as reported in section 2.2. The totally time the crowd cheering is above the 55dB limit is estimated to be 5 to 10 minutes for a rugby game and 20 to 40 minutes for an ODI. This amounts to only a few hours per year when the noise levels are above the permitted activity standards during the noise daytime. The adverse effects of this small noise exposure are so low that the cumulative effects are low – the concert noise can be assessed on its own – as discussed above.

There is some additional noise from patrons dispersing in the streets after events which might last for approximately an hour. This noise is not controlled as it cannot be controlled by the EPTB and it is anticipated by the plan to be part of an evening event. The proposal for 6 concerts per annum will increase the number of occurrences of this effect from 25 to 31.

### *Programming of Events*

At previous hearings and resident consultation meetings, MDA has heard residents with different opinions on the frequency or programming of events. Some say that they do not want to experience more than 3 events in 1 week (or similar concept). However, there are other residents who say that they would prefer it if the events were close together - over and done with quickly resulting in long periods of no activity (due to the overall restriction to 25 night-time activities and potentially 6 concerts).

MDA are not aware of any literature or research that confirms which of these approaches produces the least noise effects. However, the body of research in environmental noise shows that community response generally aligns with the overall 'noise exposure'. The noise exposure metrics do not differentiate between a) 3 events in one week then nothing for 2 weeks or b) 1 event per week for 3 weeks. In our opinion, there is no benefit to the overall community by specifying a maximum number of events in a short time frame or the reverse of requiring events to be concentrated into a short time frame.

## 3.3 Load In/Pack Down Noise

The final issue to be examined is the level of noise from load in and pack down either side of the concert. The detail of the load in and pack down operation is described in the overall application and the traffic report. In terms of possible noise effects, the two main activities are trucks accessing the

site and disestablishment of the stage and equipment on the night of the concert. These activities have been described in more detail in section 2.3 of this report.

In summary, it is understood that trucks will come to the site from the South/West via the Western Motorway. They would enter the site via the Sandringham Road bus parking bay (well away from Reimers Ave and Walters Rd) and then drive along the south side of the south stand to the tunnel entry at the south west corner. The trucks would then go under the stand via the tunnel for unloading/loading purposes.

Noise from this activity has been predicted in section 2.3 and can comply with the daytime noise limit and is assessed as reasonable in the context of the daytime noise environment around Eden Park.

Between 5 to 25 trucks, depending on the size of the show, could depart the site during the night of the concert. Once loaded, they would travel under the south stand to the Number 2 field and leave the Eden Park site through the gate in the north west corner. Predicted noise levels comply with the daytime noise limits at all residentially zoned properties. The noise levels at the small number of houses inside the north west corner of the Eden Park precinct are higher than these limits by approximately 5 to 15 dB. While the noise limits do not apply to these sites, the potential noise effects for these residents has been assessed.

The main issue for these residents is potential sleep disturbance from individual truck movements. The  $L_{Amax}$  noise level is the most commonly used indicator of sleep disturbance and the AUP sets an  $L_{Amax}$  limit of 75 dB to protect sleep in residential zones around Eden Park. The predicted noise level at the two closest residences in the north west corner is 80 dB  $L_{Amax}$ . This is only 5 dB above the AUP level of protection and will occur only 6 times a year. In addition, the truck noise will be similar in character to the trucks travelling along Sandringham Road which occur already. For these reasons the effects of noise on the north west residents is considered reasonable.

Disestablishment was assessed at the U2 concert at Mt Smart Stadium in November 2019 and found to be inaudible immediately outside the stadium. Calculations of the transfer function from inside Eden Park to the residential zone shows that noise from disestablishment will be well screened by the large stands and can comply with the night-time noise limits.

### **3.4 Community Liaison**

Community response to noise is significantly more positive when people know the nature of the noise event and details of when the noise will start and finish and the nature of the activities such as 'bump in/out activity'. It is recommended that EPT notify the wider Eden Park community of the details of the event well before the day. EPT have excellent community liaison procedures in place already which would allow this to happen. It is also recommended that more specific engagement takes place with the small number of residents in the north west corner of the Eden Park Precinct.

## **4.0 PROPOSED NOISE CONDITIONS**

In the event that consent is granted, the following noise conditions are proposed to control noise effects. The conditions are based on the Mount Smart Stadium concert rules from the AUP and the Eden Park Precinct rules and are collated in Mr Vinall's planning report.

1. The noise (rating) level from any activity as measured within the boundary of any residentially zoned site not owned by the Eden Park Trust, must not exceed 75 dB  $L_{Aeq}$ .
2. Noise limits must be measured in accordance with NZS 6801:2008 Acoustics – Measurement of Environmental Sound and assessed in accordance with NZS 6802:2008 Acoustics – Environmental Noise. An adjustment must not be applied to amplified music or amplified voice sounds containing special audible characteristics (with respect to section 6.3 of NZS6802:2008).

3. Concerts shall start no earlier than 10:00am for daytime concerts and no earlier than 6:30pm for night-time concerts on week days. Concerts shall finish no later than 10:30pm Sunday to Thursday and 11:00pm Friday to Sunday and be limited to a total duration of 6 hours. There shall be no concerts on Sunday except when the Sunday precedes a public holiday.
4. Testing and balancing of all sound systems including vocal checks by performers must cumulatively not exceed 3 hours and must not commence before 10am on any day.
5. There shall be no more than 6 concerts in any 12 month period and no more than 4 concerts within any 2 week period. Any event lasting longer than 6 hours must be counted as 2 concerts. The duration of an event must be determined by the cumulative length of time that the standard noise limits are exceeded.
6. Crowd noise is to be excluded from any assessment of compliance with these limits.
7. Professional fireworks displays and helicopter flights are excluded from these standards. Pyrotechnics are controlled separately in the precinct rules.
8. Heavy vehicles associated with the concert shall not use Walters Road or Reimers Avenue.

## APPENDIX A GLOSSARY OF TERMINOLOGY

<b>dB</b>	<u>Decibel</u> The unit of sound level.  Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \mu\text{Pa}$ i.e. $\text{dB} = 20 \times \log(P/P_r)$
<b>dBA</b>	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
<b><math>L_{\text{Aeq}}(t)</math></b>	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.  The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
<b><math>L_{\text{Amax}}</math></b>	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
<b><math>L_{\text{dn}}</math></b>	The day night noise level which is calculated from the 24-hour $L_{\text{Aeq}}$ with a 10 dB penalty applied to the night-time (2200-0700 hours) $L_{\text{Aeq}}$ .
<b>SEL or <math>L_{\text{AE}}</math></b>	<u>Sound Exposure Level</u> The sound level of one second duration which has the same amount of energy as the actual noise event measured.  Usually used to measure the sound energy of a particular event, such as a train pass-by or an aircraft flyover
<b>NZS 6801:2008</b>	New Zealand Standard NZS 6801:2008 " <i>Acoustics – Measurement of environmental sound</i> "
<b>NZS 6802:2008</b>	New Zealand Standard NZS 6802:2008 " <i>Acoustics – Environmental Noise</i> "
<b>NZS 6807:1994</b>	New Zealand Standard NZS 6807:1994 " <i>Noise Management and Land Use Planning for Helicopter Landing Areas</i> "

**APPENDIX B SUMMARY OF NZ STADIA NOISE CONTROLS (EX AUCKLAND)**

Venue	Maximum No of Events per annum	Total Duration per annum (hours)	Cut-off Time (hours)	Noise Limit dBA L <sub>10</sub> (Residential Zone)
Arena Manawatu, Palmerston Nth	30	435 (permitted between 8.00 am – 10.30pm)	2230	75
Waikato	5	20 hrs	11:00 pm	80
Napier	5	63 hrs	10:30/12:00pm/1:00 am	90
Wellington Stadium	6	84 hrs	11:00 pm	75
New Plymouth Rugby Park	52	260 hrs	10:00 pm	60
Rodney District	N/A	13 hrs	9:00 am /6:00 pm 6:00 pm /1:00 pm	80 75
Okara Stadium Whangarei	5	25 hrs	10:30 pm 11:00 pm	85 (3 No.) 75
Rotorua	5	55 hrs	3 @ 11:00 pm 2 @ 10:45 pm	3 @ 90 2 @ 85
Hamilton MF Zone	5	3 + 4 hrs	11:00 pm	75
The Hub Hawera	6	Total 6 Single 3	7.00 am 10.00 pm	80

## APPENDIX C AUP SPECIAL EVENT NOISE CONTROLS

Facility	Event	Events per year	Duration (Hours) <sup>1</sup>	Cut-off time	Noise Limit (dB LAeq)
Western Springs Stadium	High Noise	6	6	10:00/11:00pm	82
	Medium Noise	4	6	10:00pm	70
	Low Noise	4	6	10:00pm	55
Mt Smart Stadium	High Noise	6	6 + 3	10:30pm	75
	Medium Noise	30	6 + 3	10:30pm	65
	Low Noise	50	6 + 3	10:30pm	55
North Harbour Stadium	High Noise	6	4 + 3	11:30pm	82
	Medium Noise	10	4 + 3	11:00pm	82
	Other	-	-	10:30pm	55
Ellerslie Racecourse, ASB Showgrounds &	High Noise	5	6	10:30pm	75
Bruce Pullman Park, ECOLight Stadium	Medium Noise	15	6	10:30pm	65
Temporary Activity; Auckland wide	High Noise	3	6 + 2	11:00pm	80
	Medium Noise	12	6 + 2	11:00pm	70

<sup>1</sup> Where two numbers are shown (x+y) the first (x) is the maximum duration of the concert and 'y' is the maximum duration of sound check/rehearsal



## APPENDIX D EDEN PARK PRECINCT - NOISE RULES

### I310.6.1. Noise

- (1) The noise (rating) level from any activity as measured within the boundary of any site in a residential zoned property (not owned by the Eden Park Trust) must not be greater than the noise limits in Table I310.6.1.1 Noise standards.

**Table I310.6.1.1: Noise standards**

Time, day, duration and frequency	Noise limit
All days between 8:00am and 10:30pm	55dB $L_{A10}$ (13hr) 60dB $L_{A10}$ (10min) 85dB $L_{Amax}$
At all other times	40dB $L_{A10}$ and 75dB $L_{Amax}$

- (2) Noise limits must be measured in accordance with NZS 6801:2008 Acoustics – Measurement of Environmental Sound and assessed in accordance with NZS 6802:2008 Acoustics – Environmental Noise.
- (3) For noise events an adjustment must not be applied to amplified music or amplified voice sounds containing special audible characteristics (with respect to section 6.3 of NZS6802:2008) but other sources of sound may have an adjustment applied if necessary in accordance with the same section.
- (4) The prescribed time frames for the purpose of assessment according to NZS6802:2008 must be the timeframe for which any particular noise limit applies.
- (5) Crowd noise is to be excluded from any assessment of compliance with these limits.
- (6) Where  $L_{Aeq}$  (10min) is specified, no 10 minute measurement sample can exceed the stated limit.
- (7) A computer based measurement system (including electronic limiter) attached to the sound system output must be used as the preferred method of measurement for sound system noise except for any 75 dB noise events.
- (8) Professional fireworks displays and helicopter flights are excluded from this standard.

APPENDIX E NOISE MODELLING – CONCERT SOUND (3 STAGE CONFIGURATIONS)

