

Technical Review – Acoustics (Environmental Noise) Wellington Airport East Side Area (ESA)

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| Title | Noise / Acoustic Review | | |
| | ESA Designation | | |
| Applicant | Wellington International Airport Limited | Version | 3 |
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1 Introduction

Wellington International Airport Limited (**WIAL**) has purchased the southern area of Miramar Golf Course. WIAL seeks to designate land over this southern area of the Miramar Golf Course to the east of the airport for airport purposes within an area which is described as the East Side Area (**ESA**). The purpose of the designation is to accommodate expected long term growth in air traffic, as well as remain consistent with the Wellington International Airport (**WIA**) extensions proposed under the WIA 2040 Master Plan. The proposed designation and related activities bring airport activities closer to noise sensitive locations including houses on Raukawa Street, Bunker Way and Kekerenga Street (the ‘**receiving sites**’). These sites are zoned Outer Residential Zone under the Wellington City Council Operative District Plan. These residential properties which lie to the east of the airport are currently separated by the southern end of the golf course which acts as a buffer zone.

The Notice of Requirement (NoR) for the ESA involves redevelopment of part of the existing Miramar Golf Course site into taxiways, aprons and associated airport activities¹. Marshall Day Acoustics (**MDA**) have been commissioned by WIAL to prepare an Acoustic Assessment Report² (the MDA report) which is included as Appendix G to the overall NoR Application³ for the ESA. In addition to the original MDA report a Further Information Response⁴ (FiR) was also submitted to clarify a number of technical issues raised by Wellington City Council, including noise, with respect to the original MDA assessment and modelling. For clarity the assessment below reproduces a number of graphics from the NoR and MDA reviews.

This review has been prepared by Matthew Borich and Lindsay Hannah.

2 The Purpose of the Designation

The designation is shown as Attachment 1 (the Designated Area) within the NoR. The NoR states within the Designated Area, land may be used for activities for the operation of WIA, limited to the following:

¹ MDA report, p7

² Refer to Marshall Day Acoustics Report entitled ‘Wellington Airport East Side Area Assessment of Noise Effects Rp 003 r04 20181298’ dated February 2020.

³ Refer NoR prepared by Mitchell Daysh entitled NoR for An Airport Purposes Designation East Side Area.

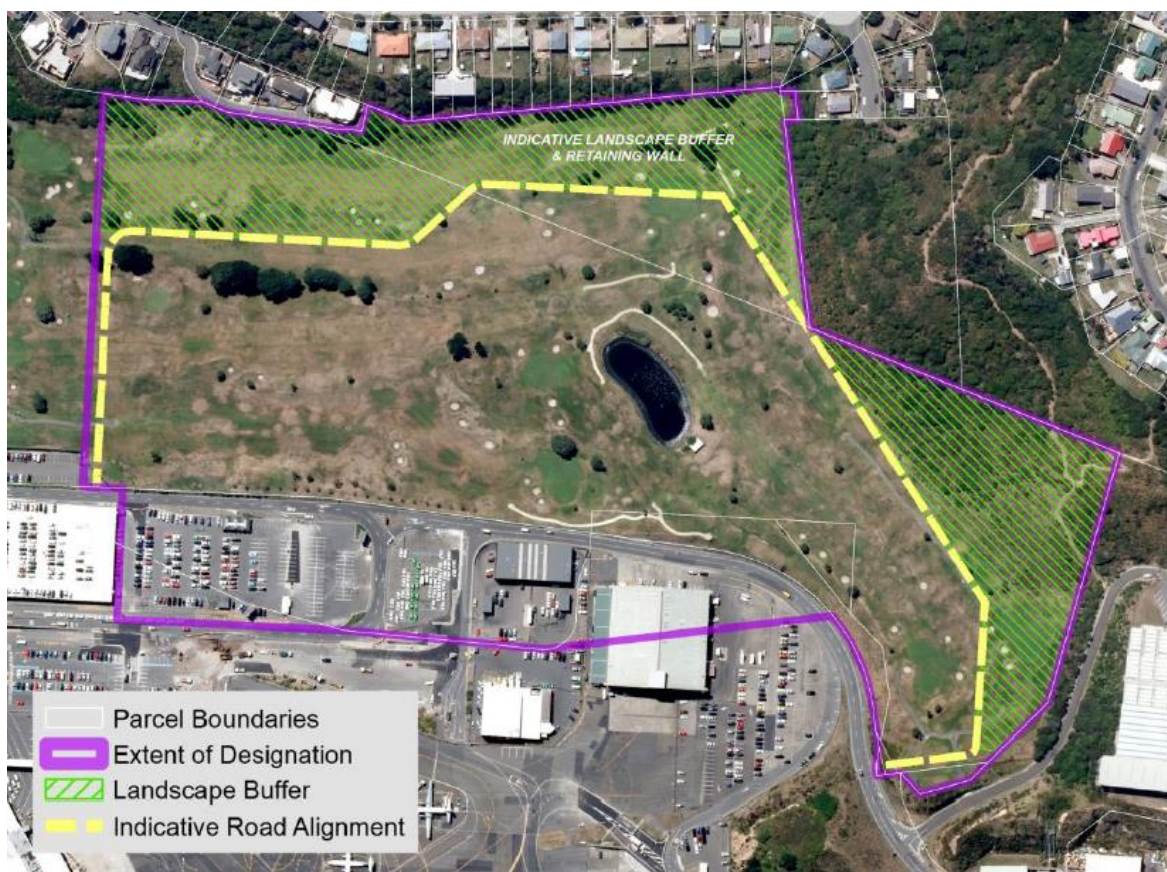
⁴ Refer to Marshall Day Acoustics FiR response dated 17.7.20

- Aircraft operations and associated activities, including all ground-based infrastructure, plant and machinery necessary to assist aircraft operations;
- Taxiways, aprons and other aircraft movement areas;
- Navigation and safety aids, monitoring stations, lighting and telecommunications facilities;
- Car parking, roads, accessways, pedestrian ways, stormwater and wastewater infrastructure,
- utility activities and security fencing;
- All demolition (if required), construction and earthworks activities, including associated structures;
- Landscaping, planting, tracks and trails;
- Ancillary activities, buildings and structures related to the above; and
- Servicing, testing and maintenance activities related to the above

The NoR⁵ states that due to existing growth and development needs have already put significant pressure on WIA constrained 110ha landholding and this has required it to be particularly efficient in its use of space. However, there are limits to this intensification, and the NoR states that it has become clear to WIA that they require additional land to accommodate its activities in both the short and longer term.

3 The Designation Site

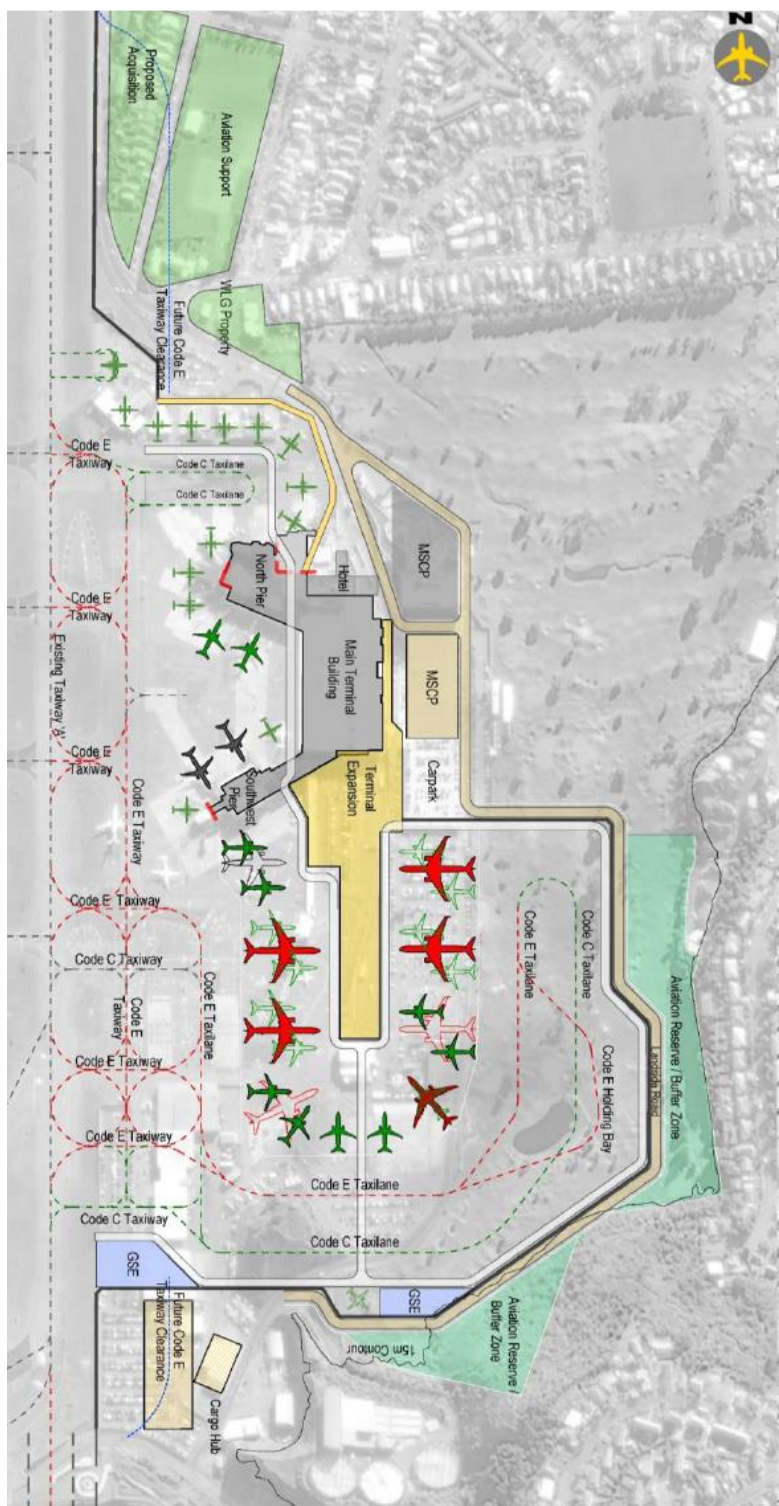
The site is located to the east of WIA and comprises approximately 15.6 hectares of existing WIA land, and Miramar Golf Club land, which as noted above has being acquired by WIAL. The following illustrates the extend of the proposed designation⁶ and the related designation boundary applied for under the NoR.



⁵ NoR, p23

⁶ NoR Figure 1,p11

The majority of the land affected by the NOR is currently utilised as part of an 18-hole private golf course. To provide guidance on how the site could be developed and to assist with the effects assessment and development of conditions the NoR sets out a detailed conceptual (draft) master plan of this part of the Airport has been prepared which shows how the operational activities proposed might be laid out on the land concerned, and how this could be integrated with the adjacent terminal area. This Master Plan is shown below⁷ note the location to residential receiver sites:



⁷ NoR Figure 2,p13

The following is an artist's impression of the ESA⁸.



The above diagrams are particularly beneficial in identifying the most exposed properties and visually showing how taxiing aircraft operations, aprons and associated activities will extend into the ESA and how much closer these activities will be to the receiving sites. The proposed designation and related activities bring airport activities much closer to houses on Raukawa Street, Bunker Way and Kekerenga Street, effectively bringing the airport designation adjacent to the Outer Residential Zone boundary interface, with the exemption of the Aviation Reverse Buffer Zone. These properties which lie to the east of the airport are currently separated by the southern end of the golf course. The most affected sites from the airport activities in the ESA are identified in the MDA report; however, noise will be audible beyond these closest sites also. There will be a significant increase in noise levels from some airport activities in the ESA associated with the loss of sound attenuation from buffer distance and screening.

4 Wellington City Council District Plan Noise Rules

Aircraft noise at WIA is divided into a number of unique noise sources. Chapter 11A Airport Area Rules of the Wellington City District Plan set out the aircraft noise rules. Section 7.0 'Existing District Plan Provisions' of the MDA Report sets out in detail the existing Operative Wellington City District Plan noise provisions. The District Plans noise controls for WIA are generally divided into two key areas being:

1. Aircraft operations (engine runup, taxiing, take-off and landing (air noise boundary (ANB))); and
2. Land use noise controls (engine testing, APU/GPU, land-based activities).

The District Plan defines 'Aircraft Operations' as engine run up, taxiing, take-off and landing of aircraft. Importantly take off, landing and taxiing currently take place with the Airport Area. The MDA report states that the only 'Airport Operations' proposed in the ESA are engine run up and taxiing.

⁸Sourced from <https://www.rnz.co.nz/news/national/402008/wellington-council-should-rein-in-airport-expansion-environmental-group-says>

4.1 WIA Aircraft Operations and the Air Noise Boundary (ANB)

NZS 6805:1992 *Airport Noise Management and Land Use Planning* (NZS 6805) is the basis for the management of airport noise effects at airports including WIA. The standard NZS6805 is used as a basis for both managing maximum (long term) noise from airports, while also providing guidance on land use planning controls to deal with effects of aircraft noise on noise sensitive activities establishing within noise affected areas surrounding airports.

The overall purpose of the standard is for the control of airport noise. The standard establishes maximum acceptable levels of aircraft noise exposure around airport and aerodromes for the protection of community health and amenity, whilst recognising the requirement for the airport to operate effectively. The standard is divided into three key areas being: Part 1 - Airport noise management using the air noise boundary concept; Part 2 - Measurement and description of aircraft noise exposure and Part 3 - Investigation for aircraft noise monitoring.

Part 1 is the main focus of this review and sets out airport noise management using the 'Airnoise Boundary (ANB)' concept. The Airnoise Boundary (ANB) is a critical contour as it defines the total measured exposure to noise emitted by aircraft using the airport. According to NZS 6805:1992, the objective of the Airnoise Boundary is ***"avoiding, remedying or mitigating any adverse effects on the environment, including effects on community health and amenity values whilst recognising the need to operate an airport efficiently"***. Controls associated with the Air Noise Boundary are therefore intended to manage the effects of aircraft noise associated with the movement of aircraft to and from the airport while also providing for the safe and efficient operation of the airport.

Noise from aircraft operations at WIA is controlled by setting maximum levels of aircraft sound exposure at an Airnoise Boundary (ANB), given as a 24-hour daily sound exposure averaged over a 'rolling' 90-day average period. This is termed the day-night level (L_{dn}) where the sum of the sound energy from individual events are averaged over 24 hours with night-time noise penalised by adding 10 dB to account for increased sensitivity at night.

This method does not directly control individual aircraft movements but does so indirectly by taking into account the total overall; contribution to the day-night level. The MDA report explains international research has found that the L_{dn} metric correlates well to community annoyance relating to aircraft movements. This control method acts as a management tool where the airport can plan future growth of aircraft operations within the limitations placed by the requirement to comply at the air noise boundary and residents have certainty of noise emissions being adequately controlled. Ninety (90) day L_{dn} levels can be influenced by increases or decreases in the volume of aircraft traffic over the period, an increase or decrease in night flights (which are penalised by 10 dB) or by the introduction of quieter or noisier aircraft. In Wellington the measured L_{dn} has been shown to be strongly influenced by the very high energy short duration take-offs and landings of "jet aircraft". The Operative Wellington City District Plan also specifies a night curfew however in effect this only applies for a 5-hour period (1.00am - 6.00am) and has numerous exemptions. The Wellington City District Plan sets the following rule for control of aircraft operations, described as follows:

Aircraft operations in general

11.1.1.1.1

Aircraft operations shall be managed so that the rolling 90-day average 24-hour night-weighted sound exposure does not exceed a Day/Night Level (L_{dn}) of 65 dBA outside the Airnoise Boundary shown on District Plan Map 35.

Aircraft noise will be measured in accordance with NZS 6805:1992 and calculated as a 90-day rolling average. All terminology shall have the meaning that may be used or defined in the context of NZS: 6805.

The level of noise from aircraft operations, for comparison with L_{dn} 65 dBA, is calculated from the total amount of noise energy produced by each aircraft event (landing or take-off) over a period of 90 days. This method of control does not directly control individual aircraft events, but does so indirectly by taking into account their contribution to the amount of noise generated in a 24-hour period.

Rule 11.1.1.1 limits noise from aircraft operations to 65 dB L_{dn} at the ANB (refer to Map 35 of the District Plan (Appendix C)). **Rule 11.1.1.1** also sets out a host of exclusions from the limits. The MDA review provides a detailed review of the current and future predicted operational noise levels with respect to the ANB, *NZS 6805:19992 Airport Noise Management and Land Use Planning* and Wellington City District Plan. This NoR proposes to impose a condition on WIAL, the requiring authority, to ensure that it manages aircraft operations to achieve compliance with the prescribed noise limit at the ANB identified on the relevant planning map of the District Plan (any adjustments from the NoR will therefore need to comply).

4.2 Land/Ground Based Operations

The District Plan sets out rules from airport noise activities that are not aircraft operations, engine testing or APU's under **Rule 11.1.1.8**

Land Based Activities

11.1.1.1.8

Noise emission levels, from any activity within the Airport area, other than aircraft operations, engine testing and the operation of APUs (as provided for in rule 11.1.1.1.9) when measured at any residential site shall not exceed the following limits:

Monday to Saturday 7am to 10pm 55 dB L_{Aeq} (15 MIN)

At all other times 45 dB L_{Aeq} (15 Min)

All days 10pm to 7am 75 dB L_{Amax}

The noise limits in **Rule 11.1.1.8** are from the upper recommended noise limits specified in the New Zealand environmental noise standard **NZS6802: 2008 Acoustics Environmental Noise** and are consistent with community noise levels published by the World Health Organization (WHO). The upper recommended levels are designed to prevent serious annoyance during the day and sleep disturbance at night for the average person. These limits are generally acceptable for residential areas in high ambient noise environments or adjoining industry or transport infrastructure (such as an airport). Background sound surveys undertaken by Wellington City Council have shown the stringent Sunday daytime limits are not justified and this has been corrected for most other areas in the plan to date.

4.3 Ground Power and Auxiliary Power Operations (GPU's and APU's)

The Wellington City District Plan sets out rules from ground power and auxiliary power units under **Rule 11.1.1.9**

Ground power and auxiliary power units (GPUs/APUs)

11.1.1.1.9

(a) GPUs must comply with the noise limits in rule 11.1.1.1.8.

(b) APUs must comply with the noise limits in rule 11.1.1.1.8, with the exception of:

- *aircraft under tow*
- *the first 90 minutes after the aircraft has stopped on the gate*
- *60 minutes prior to scheduled departure*
- *the use of APUs to provide for engine testing pursuant to rule 11.1.1.1.7.*

Rule 11.1.1.7 also applies, however unscheduled engine testing does not occur at WIA. We understand that engine testing at WIA is only very occasional with unscheduled emergency testing associated with breakdowns. The MDA reports states WIA records show there has been no engine testing between 11.00pm and 6.00am in the last 10 years, which is a significant period. Noise from engine testing is not included in the noise limits on aircraft operations due to the distinct noise profiles of such activities. However, these activities are subject to express control measures. The limits proposed are consistent with the current permitted activity thresholds in the District Plan for the same activities.

4.4 Construction Noise

The Wellington City District Plan does not currently set out rules for Construction Noise in each chapter, however Chapter 3.0 **‘Definitions’** of the Wellington City District plan sets out the term for **‘Noise Emission Level’**. As part of this definition construction noise is included. Specifically, the definition requires the assessment of construction noise by stating:

...Noise from construction, maintenance and demolition activities, including those associated with the urgent repair of utilities to maintain continuity of service, on any site or on any road shall comply with, and be measured and assessed using, the

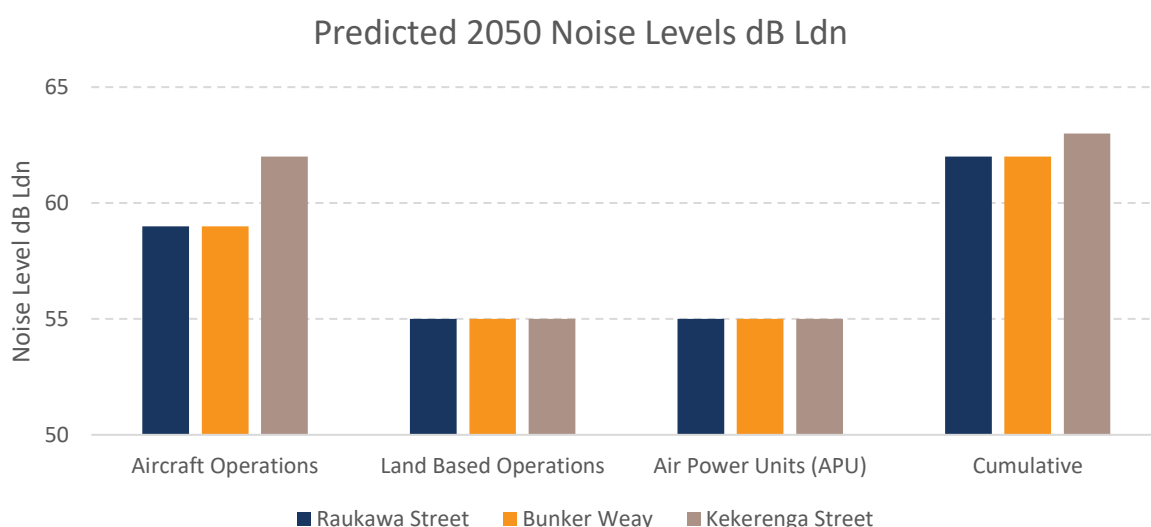
recommendations of NZS6803:1999 Construction Noise except:

- *work on public highways, railways and the Airport;*
- *work on domestic roads where construction work will cause traffic congestion;*
- *in the Central Area where construction work will endanger the safety of pedestrians and the footpath cannot be closed during the day;*
- *in the Central Area where the best practicable option to reduce noise to a reasonable level requires construction work to be undertaken outside normal working hours.*

The MDA report states that construction should be assessed using New Zealand Standard **NZS6803:1999 Acoustics Construction Noise**⁹ The MDA report also states that construction noise has yet to be assessed as the project as not at a stage where the final detailed methodologies have been set. MDA do however recommend a detailed Construction Noise Management Plan be prepared as part of the assessment.

5 Noise Environment at Receiving Sites from Airport Activities

The receiving sites adjacent to WIA are currently exposed to noise emanating from golf course and airport activities. Golf course activities would produce only modest levels of noise from people and related recreational noise. The following graph is a summary of results from Table 4 data of the MDA report for predicted L_{dn} levels for 2050 (with proposed mitigation measures in place).

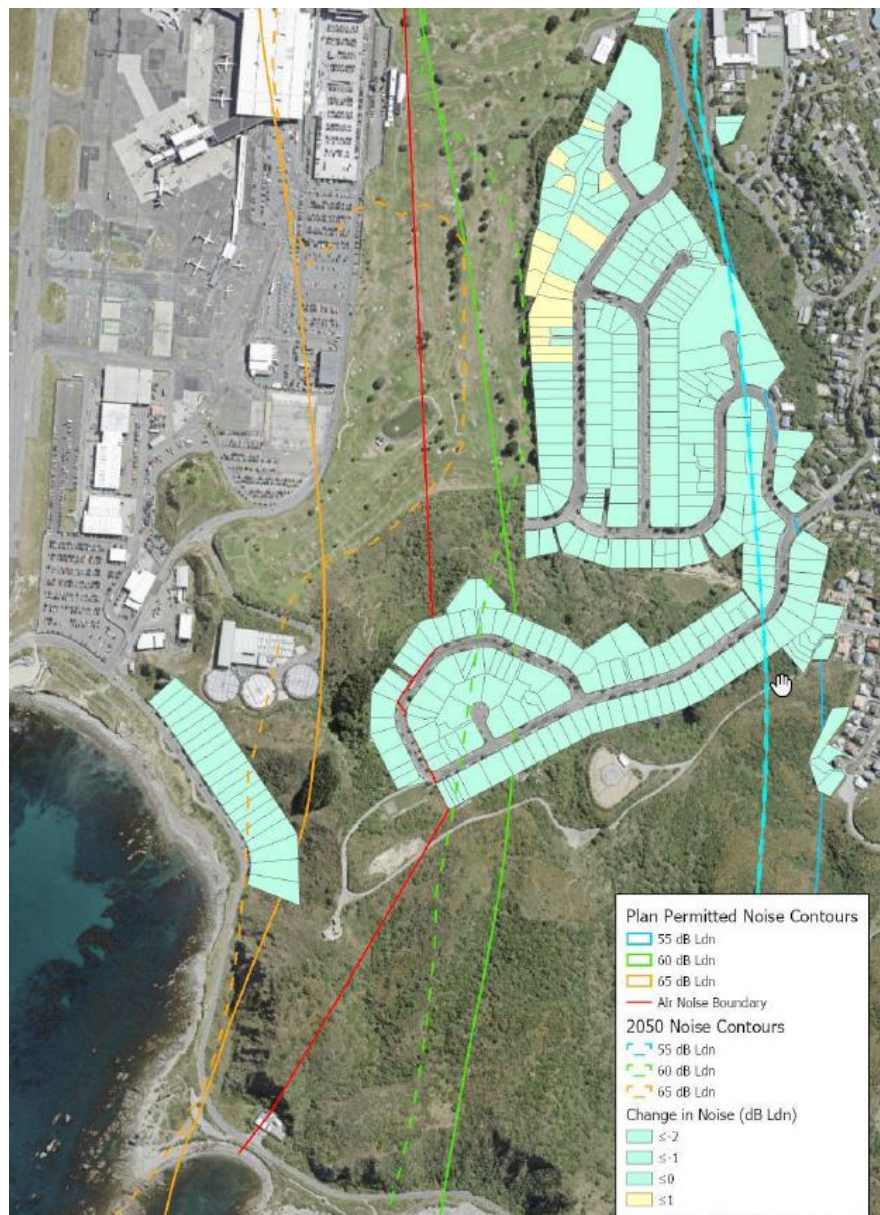


⁹ MDA p16

The above graph is for the total overall noise exposure levels (2050) based on the L_{dn} metric. It is noted that the MDA assessments considers cumulative noise which can only be done by converting all sources to the same noise metric. MDA has therefore used L_{dn} for the cumulative noise assessment. The MDA report has also considered single event levels for individual receiver sites from taxing aircraft, which is a key noise source. The following is a break down off each individual activity proposed at the ESA:

5.1 Aircraft Operations

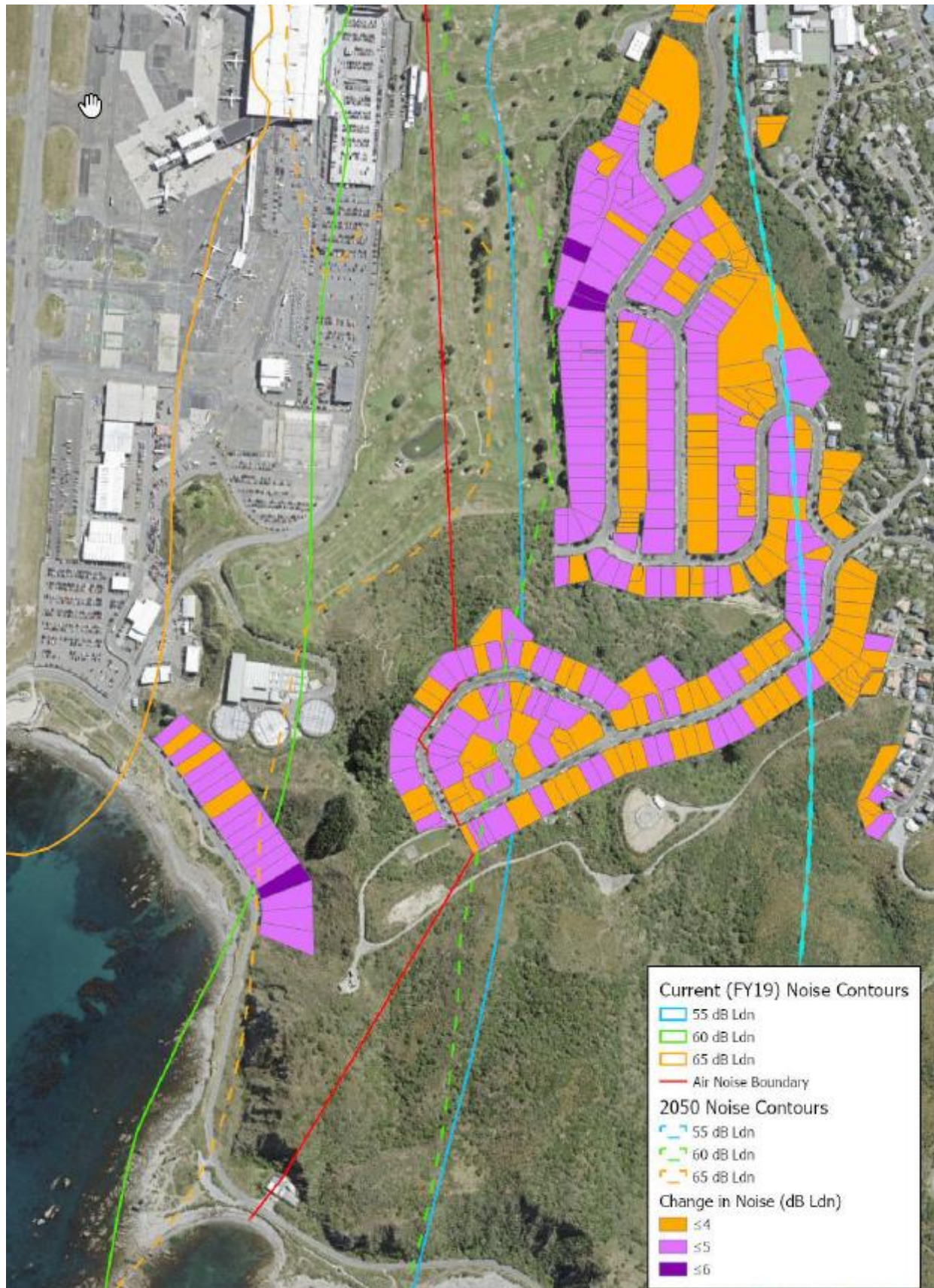
The following is reproduced from Figure C4 'Change in Aircraft Operations Noise 2050 vs Plan Permitted Contours' from the MDA report¹⁰:



The following is reproduced from Figure C5 'Change in Aircraft Operations Noise 2050 vs Current (FY19 Contours' from the MDA report¹¹:

¹⁰ MDA p49

¹¹ MDA p50



The MDA report confirms the dominant noise source dictating the current noise environment is from aircraft operations¹². Current L_{dn} levels at the receiving sites are calculated to range between 53 dB to 57 dB L_{dn} . As expected, the total L_{dn} is estimated to increase over time as airport operations increase (L_{dn} measurements are currently 5 dB below what is permitted by the District Plan at the ANB and therefore may increase by up to 5 dB). The MDA report further states airport operations (taxiing) on the ESA will increase levels by 1 dB at 2050 (1-2 dB initially) which is imperceptible. In specific the MDA report states:¹³

- As the ESA is developed, a progressive, increase in aircraft operations noise will occur and it is predicted that by the year 2050 this will comprise an increase of 1 dB L_{dn} (imperceptible) compared with the levels currently allowed under the current planning provisions.

An assessment of effects based on human perception as listed below when applied to increases to L_{dn} levels does not provide a comprehensive effects assessment and I note MDA made an effects assessment based on single event noise in addition to projected increases in L_{dn} levels¹⁴. Change in apparent loudness are summarised from the MDA report as follows:¹⁵

However, the following general response to an immediate change in noise is typical:

- An increase in noise level of 9 to 10 dB sounds subjectively about 'twice as loud';
- A change in noise of 7 to 8 dB is regarded as 'appreciable';
- A change in noise level of 5 to 6 dB is regarded as 'noticeable';
- A change in noise level of 3 to 4 dB is 'just discernible';
- A change in noise level of 1 to 2 dB is 'not discernible'.

As discussed L_{dn} levels can be influenced by an increase or decrease in aircraft traffic movements over the period, an increase or decrease in night flights (which are penalised by 10 dB) or by the introduction of quieter or noisier aircraft. This makes a straight comparison with change in apparent loudness (human perception) difficult when considering changes to L_{dn} levels. For example, while an increase of 3 dB may be just discernible when comparing two distinct aircraft movements, one aircraft measuring 3 dB higher than the other quieter aircraft, an increase of 3 dBA L_{dn} over the 90-day period is a very different noise effect. For example, a 3 dB L_{dn} increase (or doubling the sound energy) may equate to twice as many aircraft movements of the same type which will be very noticeable to a receiver.

In this instance taxiing operations are proposed to be introduced into the ESA. The 2050 operating scenario is 12 narrow bodied jet aircraft and 12 wide bodied taxiing jet aircraft movements on the ESA per day. The predicted noise exposure levels at the receiving sites are 84 dB L_{AE} for taxiing of narrow-bodied jet aircraft and 95 dB L_{AE} for the wide-bodied taxiing jet aircraft. When considering "individual" single event noise events, sound exposure levels for taxiing of wide-bodied jet aircraft is predicted to be up to 10 dB higher than noise exposure levels of jet take offs on the runway when received at the sites directly adjoining the ESA. The MDA report states taxiing of narrow body aircraft on the new taxiways will subjectively sound at the receiving sites as loud as a jet aircraft take-off on the runway and wide body jet aircraft taxiing in the ESA would sound subjectively twice as loud as a jet- take-off on the runway¹⁶. In **Section 10.1.3** of the MDA report states noise effects are stated as '*disrupting communication outdoors and indoors (windows open) and with window closed quieter activities*'.

¹² MDA report p15

¹³ MDA p36

¹⁴ 10dB + 10dB = 13 dB (not 20 dB). A 3dB increase is double of sound energy while 10 dB increase appears twice as loud.

¹⁵ MDA report p27

¹⁶ MDA ,p25

At 2050 the receiving sites will be exposed to noise emanating from an estimated 110 jet aircraft take-offs per day. The introduction of similar or higher sound exposure levels from 24 taxiing movements in the ESA equates to a percentage change increase in short duration high energy noise events of 21.8%. In summary, approximately a quarter shorter duration high energy noise events per day. This percentage would increase further if the 110 take-offs stated by MDA actually occur over a 24-hour period and are not restricted to daytime hours. In addition, taxiing noise from wide wing jet aircraft will represent the top 9% of sound exposure levels received at the adjoining residential sites to the ESA each day.

Therefore, although there is a minimal increase to L_{dn} levels (which are averaged over a 24 hour period) from taxiing operations in the ESA area which is explained by the limited number of taxiing events compared to jet take-offs, the effects **cannot** be considered imperceptible as the 1 dB change in L_{dn} levels indicates. Mitigation proposed in the MDA report is '*No taxiing under power will be permitted on ESA taxiways at night (10.00pm - 7.00am)*'. This will help prevent adverse effects at night. The effects during the day will be considered in conjunction with the effects of daytime APU operation with the ESA.

5.2 Land Based Activities

During the day and during curfew hours the receiving sites will be exposed to noise emanating from occasional exempted aircraft movements and possibly noise emanating from "distant" APU's or GPU's and other land-based activities. With activities moving closer to the receiving sites the following is predicted by MDA:

1. *Ground support equipment (baggage and cargo handling, refuelling etc) **will not comply** with the Land based night-time limits of 45 dB L_{Aeq} . However, there is a potential **to comply** with the use of quieter Electric GSE;*
2. *Traffic movements on combined GSE and road noise can be managed to comply with the night-time limit;*
3. *GPU's **will comply** if they are the plug-in type where noise emission levels will be negligible; and*
4. *APU's **will not comply** with levels of 62 dBA predicted, and 57 dBA for quieter APU models.*

The MDA report recommends controlling land-based activities (apart from APU's and GPUs) through a Noise Management Plan which will ensure management of activities to ensure compliance with the following noise limits:¹⁷

10.2 Noise Effects from Land Based Activities

We recommend land based activities in the ESA are controlled by the following limits at residential receivers:

| | |
|--------------------|-------------------------|
| 7am to 10pm | 55 dB $L_{Aeq}(15 MIN)$ |
| At all other times | 45 dB $L_{Aeq}(15 MIN)$ |
| | 75 dB L_{AFmax} |

I concur with the MDA report¹⁸ that these limits should apply to the cumulative noise emanating from land-based activities both in the airport area and the ESA to prevent noise creep. As discussed, these limits are consistent with the upper recommended limits in the New Zealand environmental noise standard **NZS6802:2008 Acoustics Environmental Noise**, which are designed to prevent serious annoyance during the day and sleep disturbance at night for the 'average person'.

¹⁷ MDA report p30

¹⁸ MDA report, p32

These limits are generally acceptable for residential areas in high ambient noise environments or adjoining industry or transport infrastructure (such as an airport). I also concur with MDA that more stringent limits on Sundays cannot be acoustically justified within the context of the high background sound levels. This requirement will ensure effects from these land-based activities are reasonable. The proposed requirement for plug in GPUs will ensure effects from the operation of GPUs will be negligible.

Currently the aircraft stands are approx. 400m away¹⁹ from the receiving sites. The closest stands using jet aircraft are currently 480m away and MDA calculates noise emissions from APU's when received at the closest receiving sites will be approximately 58 dB LAeq and 53 dBA LAeq for quieter APU models. The District Plan allows APU's to run 60 minutes prior to take-offs and 90 minutes after landing. On saying that the MDA report states that APU's often operate for only 30 -45 minutes²⁰. Predicted noise levels emanating from APU's on the stands in ESA are 62 dB LAeq and 57 dB LAeq for quieter APU models with operation times up to 30 minutes. When APU units are operating at the same time in the airport area and the ESA, cumulative noise from APU operations may be higher than 62 dB LAeq.

The MDA report propose the following mitigation. That APU's must comply with the land-based activity noise limits except for:

- *Aircraft under tow (7.00am -10.00pm);*
- *20 minutes after block on stand (7.00am -10.00pm);*
- *10 minutes prior to block off time on stand (7.00am -10.00pm); and*
- *This in effect prohibits the operation of APU's in the ESA between 10.00pm and 7.00am and (as the MDA report states, limits operational hours to what is absolutely necessary).*

5.3 Assessment of Effects from Noise Emanating from Taxiing and APU Operations

From the information provided in the MDA report, the APU operations will be for significant periods in the ESA. Predicted noise emissions from APU operations of 62 dB LAeq received at the residential sites adjoining the ESA will exceed the recommended upper daytime limits of 55 dB LAeq(15min) specified in the New Zealand standard, **NZS 6802:2008 Acoustics Environmental Noise**. These levels are more consistent with the noise limits set in the Wellington City District Plan for sites in mixed use industrial areas and the Central Area (set at 60 dB LAeq at all times day and night).

Clause C8.6.2 of NZS 6802:2008 Acoustics Environmental Noise explains the upper limit of 55 dB LAeq is recommended as 'few people are seriously annoyed' from activities with levels below 55 dB LAeq. The exceedance by 7 dBA for standard APU models will sound appreciably louder than the upper limit specified in the standard and based on this serious annoyance can be expected from some of the residents in the receiving sites. It is noted noise emanating from APU's operating in the airport area only exceed the upper limit by 3 dBA hence an exceedance here is just perceptible.

Taxiing noise in the ESA is likely to immediately precede or occur immediately after APU operations. Although of short duration taxiing noise will be very noticeable to the occupiers of the adjacent receiving sites. Noise from taxiing of wide-bodied jet aircraft will sound twice as loud to these residents when compared to any current airport noise events they are currently exposed to. The noise exposure levels are predicted to be 10 dB higher than noise received at these sites from current jet aircraft take-offs. Currently such noise exposure levels from airport operations would only occur from noise emanating from jet take-offs when received at some sites within the Airnoise boundary. All sites within the Airnoise Boundary are currently being offered sound insulation to mitigate unacceptable levels of noise and these noise exposure levels will therefore have a lower effect at these sites.

¹⁹ MDA report p19

²⁰ MDA report p20

The day time amenity effects from the proposed operation of APU's combined with the effects from the proposed taxiing within the ESA are considered to be at a high level and additional mitigation beyond that recommended in the MDA report is recommended to ensure internal amenity effects are reasonable, namely I recommend as a minimum:

- *No more than 12 movements of wide body jet aircraft on taxiways within the ESA are permitted per day; and*
- *Property owners of sites in Raukawa Street and Bunker Street directly adjoining the boundary of the East Side area as identified on Figure 2, ESA Receivers of the Marshall Day Acoustics report Appendix G, shall be offered 6 months prior to commencement of the operation of the ESA a mechanical ventilation package at no charge to the owner where all habitable rooms within their dwelling house are provided with a positive supplementary source of fresh air ducted from the outside. The supplementary source of fresh air is to achieve a minimum of 7.5 litres per second per person.*

6 Proposed Noise Management (Noise Control Methods)

The MDA review sets out a host of recommended noise management methods under **Section 11.0** of the Acoustic Report²¹.

11.0 RECOMMENDED NOISE CONTROLS

It is recommended that the designation conditions generally reflect the limits imposed by the existing District Plan Airport Area noise rules but with seven changes to enable the Masterplan and manage the noise effects:

1. Undertake construction noise assessment and prepare construction noise management plan;
2. Allow an exceedance of the ANB within the ESA to allow for localised taxiing noise;
3. Align the daytime noise limits for land based airport activities on Sunday with those for Monday to Saturday;
4. Tighten the allowance for APUs within the ESA to be exempt from noise limits;
5. Exclude taxiing under power within the ESA between 10pm and 7am;
6. Require continuous monitoring of airport noise at the interface between the ESA and the residential zone;
7. Exclude engine testing from the ESA.

7 Summary

The project will initially involve construction works which are temporary in nature. A specific construction assessment and noise management plan will need to be prepared when the final construction methodology is known. Construction noise can be adequately managed by the provision of a noise management plan in general accordance with the New Zealand construction standards, **NZS6803:1999 Acoustics Construction Noise**. Community consultation will also be a key part to the day to day management of construction noise of this nature and scale.

Following construction, the ongoing day to day noise effects at receiver sites will include the proposed new taxiways, aircraft stands, roading and auxiliary activities. As the ESA develops there will be an increase in aircraft operations noise at receiver sites.

The dominant noise source dictating the current noise environment at the receiving sites is noise emanating from jet take-offs and to a lesser extent, landings on the airport runways. With the designation of the ESA this remains

²¹ MDA report, p34

unchanged when considering L_{dn} levels as the new aircraft operations within the ESA are predicted to increase L_{dn} levels by only an indiscernible level of 1 dB. On saying that this equates to approximately a quarter more short duration high energy noise events per day and taxing noise from wide wing jet aircraft will represent the top 9% of sound exposure levels received at the adjoining residential sites to the ESA each day. Overall Aircraft Operations will result in an increase of 5-6 dB L_{dn} by 2050.

When considering individual noise single events, sound exposure levels (SEL/ L_{AE}) predicted at the receiving sites for taxiing of wide-bodied jet aircraft is predicted to be up to 10 dB higher (subjectively twice as loud) than noise exposure levels of jet aircraft take offs. In the MDA report noise effects are stated as *'disrupting communication outdoors and indoors (windows open) and with window closed quieter activities'*. The exceedance by up to 7 dBA by APU models operating during the day will sound appreciably louder than the recommended upper limit, 55 dB $L_{Aeq(15min)}$ specified in the New Zealand standard, **NZS 6802:2008 Acoustics Environmental Noise** and serious annoyance can be expected from some of the residents in the receiving sites. In my view the change in noise environment from taxiing and APU operation within the ESA will be very noticeable to the occupiers of the receiving sites and unless suitable mitigation is in place, there is the potential to cause significant adverse noise effects to both health and amenity.

A condition limiting the number of such taxiing movements and the offer to install mechanical ventilation to the existing most affected homes, so occupiers have a choice whether to open windows is recommended as an additional mitigation measure for internal amenity.

Noises emanating from Land based activities are reasonable as they will be managed to meet the upper recommended levels in the environmental noise standard **NZS 6802:2008 Acoustics Environmental Noise** which protects against sleep disturbance and undue levels of community annoyance.

In summary, I have considered the proposed noise levels in the existing environment and within the special WIA context where existing residential houses are exposed to high levels of aircraft noise and located within the current ANB.

In my view noise emanating from all activities can be managed to a reasonable level except for sound exposure levels of taxiing of wide-bodied jet aircraft, and the operations of APU's during the day where further mitigation is needed as recommended to prevent potentially significant adverse effects. Importantly the mitigation solutions address internal amenity not external amenity.

8 Recommended Conditions

8.1 Aircraft Operations

1. No taxiing under power will be permitted on ESA taxiways at night (10.00pm -7.00am).
2. No more than 12 movements of wide body jet aircraft on taxiways within the ESA are permitted per day.
3. All residents of sites in Raukawa Street and Bunker Street directly adjoining the boundary of the East Side Area above. These ESA receivers of the Marshall Day Acoustics report Appendix G shall be offered 6 months prior to operation of the ESA a mechanical ventilation package where all habitable rooms are provided with a positive supplementary source of fresh air ducted from the outside. The supplementary source of fresh air is to achieve a minimum of 7.5 litres per second/per person.
4. Noise from aircraft operations shall not exceed 65 dB L_{dn} at the new proposed compliance line in the designation as shown in the Marshall Day report provided within the NoR.

8.4 General

9. No engine testing is permitted in the ESA.
10. Only plug in GPUs shall be used in the ESA.
11. Continuous noise monitoring shall be undertaken representative of noise immission received at the closest residential sites to the ESA. Results shall be made available at the Airnoise Management Committee to be tabled at meetings.

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22nd December 2020

Glossary of Terms and Definitions

Decibel (denoted dB) is a relative unit of measurement used in acoustic science. The dB is a logarithmic ratio between the measured level and a reference (threshold) level of 0 dB (for sound pressure).

dBA is the A-weighting sound level. A weighting refers to the *A weighted curve or A filter and A network* under frequency weightings. The A-weighting attempts to correlate sound level meter (objective) measurements with the subjective human response. Human hearing (our ears) are frequency selective, being most sensitive between 500 Hz and 6,000 Hz, compared with the full range of the dBA scale ranging from 20Hz up to 20,000 Hz.

L_{Aeq} is the A-weighted equivalent continuous sound level. T denotes the time period over which the fluctuating sound levels are averaged.

L_{AE} is A-weighted sound exposure level also known as **SEL**. The Sound Exposure Level is the constant sound level that has the same amount of energy in one second as the original noise event.

L_{AFmax} is the A-weighted *maximum sound level* measured with a fast time-constant

L_{dn} is the day-night noise level, configured from the L_{Aeq} (equivalent noise level) over a 24-hour period with a night time operations penalty of 10 dBA for noise events during the hours of 22:00-07:00 (10.00pm to 7.00am).

Wellington International Airport Limited (**WIAL**)

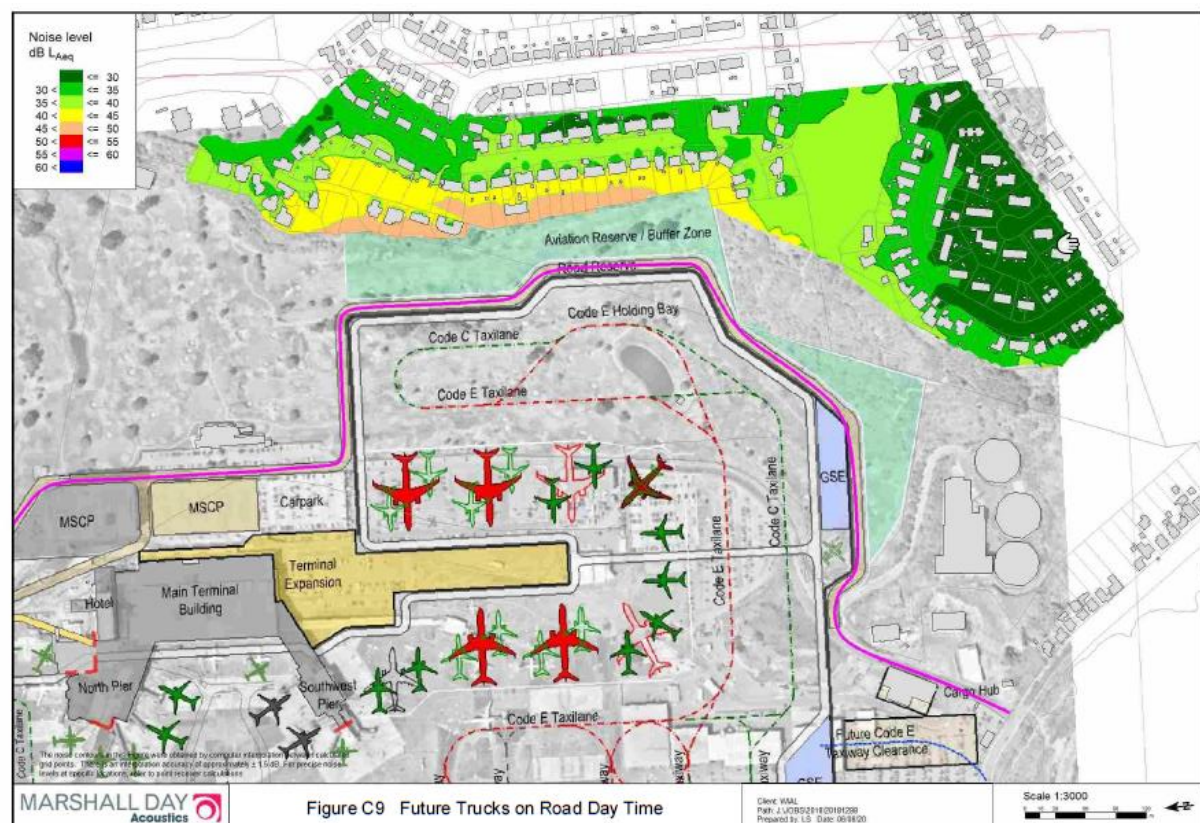
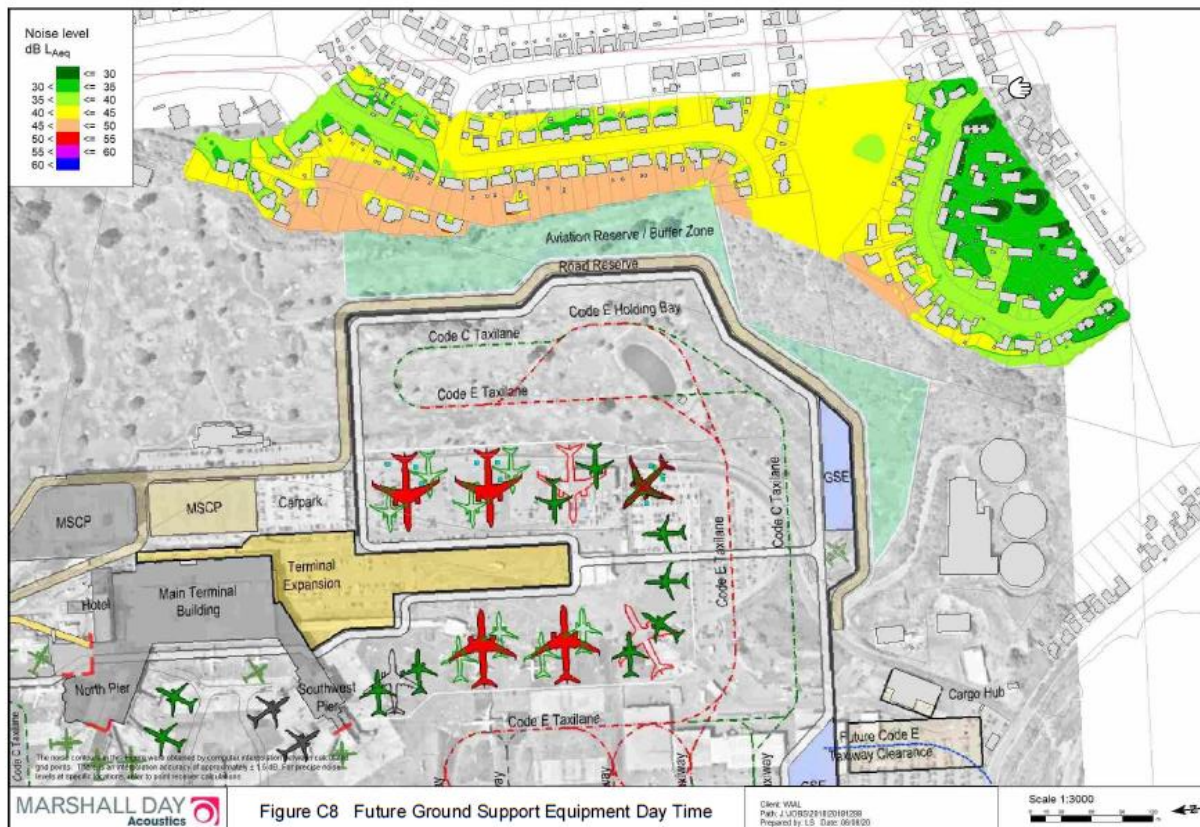
East Side Area (**ESA**)

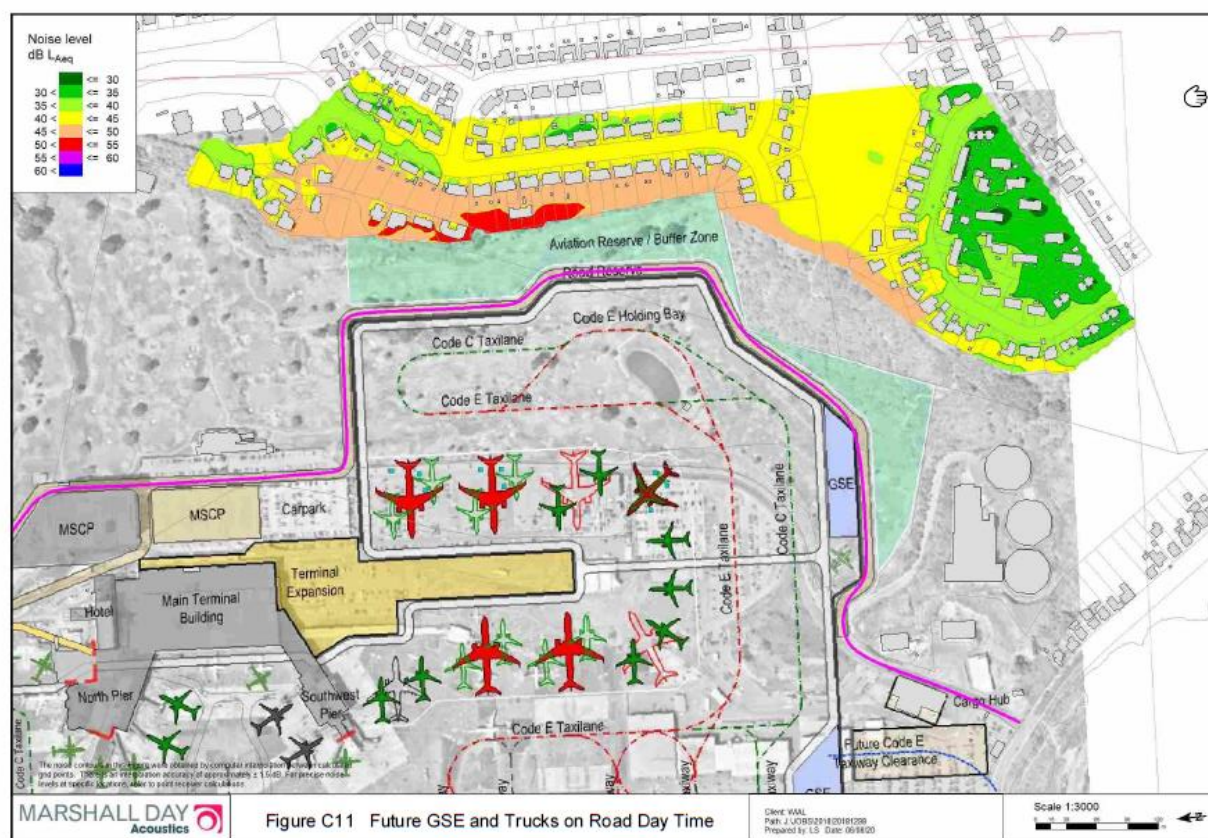
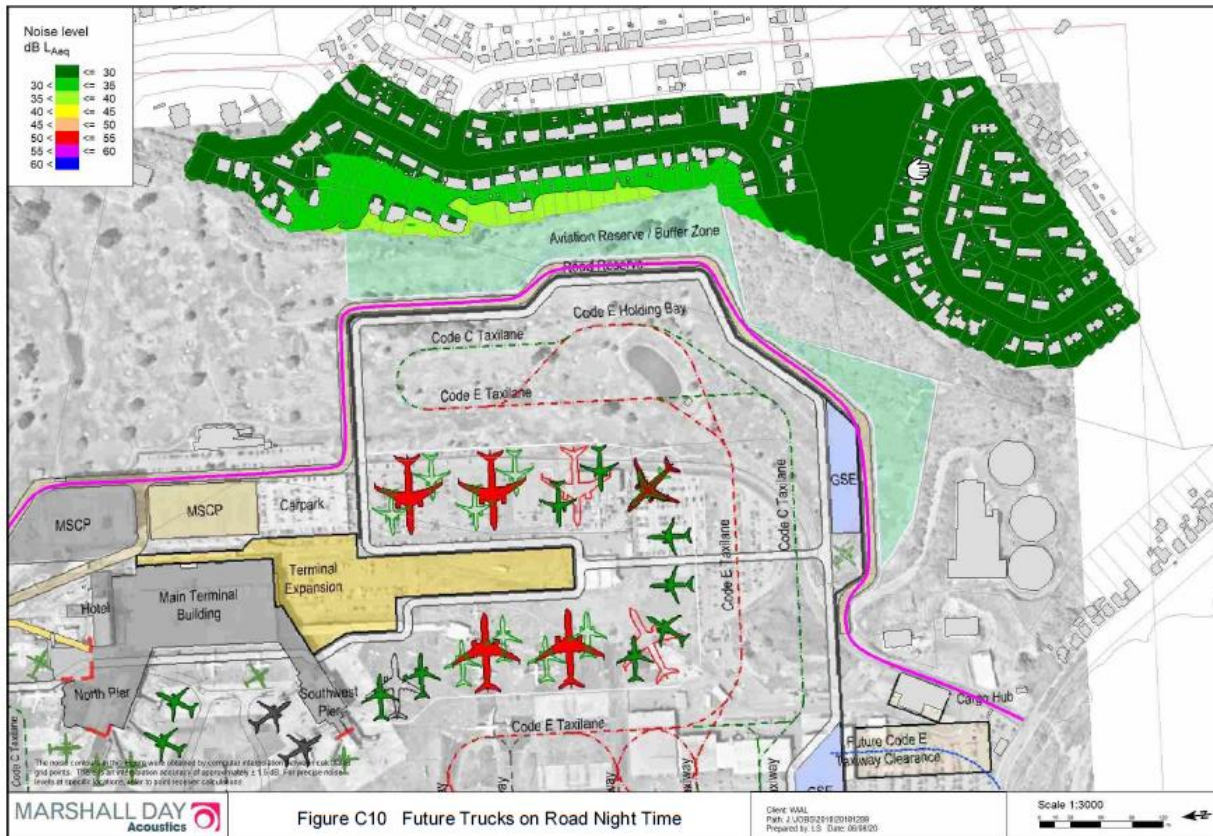
Wellington International Airport (**WIA**)

Marshall Day Acoustics (**MDA**)

Notice of Requirement (**NoR**)

Wellington City Council (**Council / WCC**)





Appendix C: Summary of Operative Wellington City Council District Plan Noise Rules Chapter 11 Rules

Chapter 11^A Airport Area Rules

Chapter 11^B Golf Course Recreational Prescient Rules

11.1.1.1 Noise

Aircraft operations in general

11.1.1.1.1

Aircraft operations shall be managed so that the rolling 90-day average 24-hour night-weighted sound exposure does not exceed a Day/Night Level (L_{dn}) of 65 dBA outside the Airnoise Boundary shown on District Plan Map 35.

Aircraft noise will be measured in accordance with NZS 6805:1992 and calculated as a 90-day rolling average. All terminology shall have the meaning that may be used or defined in the context of NZS: 6805.

The level of noise from aircraft operations, for comparison with L_{dn} 65 dBA, is calculated from the total amount of noise energy produced by each aircraft event (landing or take-off) over a period of 90 days. This method of control does not directly control individual aircraft events, but does so indirectly by considering their contribution to the amount of noise generated in a 24-hour period.

11.1.1.1.2

The following aircraft operations are **excluded** from the calculation of the rolling 90 day average in [rule 11.1.1.1.1](#):

- aircraft landing in an emergency
- the operation of emergency flights required to rescue persons from life-threatening situations or to transport patients, human vital organs or medical personnel in a medical emergency

the operation of unscheduled flights required to meet the needs of a national civil defence emergency declared under the Civil Defence Act 1983

- military aircraft movements which shall be managed in compliance with rule [11.1.1.1.3](#).

[11.1.1.1.3](#) The following conditions shall apply to New Zealand Defence Force Military aircraft:

- (a) New Zealand military transport aircraft operations shall be managed so that the following 90 day average 24 hour night-weighted sound exposure does not exceed a Day/Night Level (L_{dn}) of 55 dBA outside the Airnoise Boundary shown on District Plan Map 35.

Aircraft noise will be measured in accordance with NZS6805:1992 and calculated as a 90 day rolling average.

All terminology shall have the meaning that may be used or defined in the context of NZS6805. The level of noise from aircraft operations, for comparison with L_{dn} 55 dBA, is calculated from the total amount of noise energy produced by each aircraft event (landing or take-off) over a period of 90 days. This method of control does not directly control individual aircraft events, but does so indirectly by taking into account their contribution to the amount of noise generated a 24 hour period.

- (b) Movements of New Zealand military combat aircraft shall be limited to 80 per year.

(c) For the purpose of this rule:

- military transport aircraft means any fixed wing transport or logistics aircraft including Andover, Boeing 727, Hercules, Orion and Airtrainer (and their replacements)

- military combat aircraft means any fixed wing strike or training aircraft including Macchi and Skyhawk (and their replacements)
- movements of New Zealand military combat aircraft equate to:
landing = 1 movement
takeoff = 1 movement
touch and go = 2 movements
low level pass = 2 movements.
- **11.1.1.1.4** No non-noise certified jet aircraft or chapter 2 jet aircraft shall be operated, except:
 - in the event of unscheduled non-serviceability when substitute aircraft meeting chapter 2 may be used for the period of the non-serviceability; or
 - in the event of Wellington Airport being used as an alternate airport; or
 - in the event of emergencies; or
- military aircraft which shall be subject to rule **11.1.1.1.2**.

Chapter 2 jet aircraft are those which are certified with noise levels defined in the International Civil Aviation Organisation Convention Annex 16. Non noise certified jet aircraft are those which have no certification within the context of the International Civil Aviation Organisation Convention Annex 16 – Environmental Protection, Volume 1 (Aircraft Noise) Chapters 2 (second edition 1988) or United States Federal Aviation Regulations Part 36, Stage 2.

Night flying operations

11.1.1.1.5 Domestic operations must not occur during the hours from

- midnight to 6am.

International operations must not occur during the hours:

- midnight to 6 am for departures
- 1 am to 6 am for arrivals

For the purposes of this Rule 'operations' means the start of a take off roll or touch down on landing.

11.1.1.1.6 The following are exceptions to rule **11.1.1.1.5**:

- (a) disrupted flights where operations are permitted for an additional 30 minutes
- (b) in statutory holiday periods when operations are permitted for an additional 60 minutes
- (c) aircraft using the Airport as a planned alternative to landing at a scheduled airport, but which shall not take off until otherwise permitted under rule **11.1.1.1.5**
- (d) aircraft landing in an emergency
- (e) the operation of emergency flights required to rescue persons from life-threatening situation or to transport patients, human vital organs or medical personnel in a medical emergency
- (f) [the operation of unscheduled flights required to meet the needs of any state of emergency declared under the Civil Defence Emergency Management Act 2002 or any international civil defence emergency.]^{PC76}
- (g) aircraft carrying heads of state and/or senior dignitaries acting in their official capacity
- (h) no more than 4 aircraft movements per night with noise levels not exceeding 65 dB LAF_{max} (1 sec) at or beyond the airnoise boundary.

For the purpose of (b), statutory holiday period means:

- (i) the period from 25 December to 2 January, inclusive. Where 25 December falls on either a Sunday or a Monday, the period includes the entire of the previous weekend. Where New Year's day falls on a weekend, the period includes the two subsequent working days. Where 2 January falls on a Friday the period includes the following weekend
- (ii) the Saturday, Sunday and Monday of Wellington Anniversary weekend, Queens Birthday weekend and Labour weekend

- (iii) Good Friday to Easter Monday inclusive
- (iv) Waitangi Day
- (v) ANZAC Day
- (vi) where Waitangi Day or ANZAC Day falls on a Friday or a Monday, the adjacent weekend is included in the statutory holiday period
- (vii) the hours from midnight to 6:00am immediately following the expiry of each statutory holiday period defined in (i) to (vi) above.

The purpose of (h) is to allow certain quiet aircraft to operate at Wellington Airport during the curfew. The 65 $L_{max(1sec)}$ dBA noise limit has been based on noise levels from aircraft that have been found to be acceptable for operating at night at Wellington. The level does not purport to be the upper limit necessary to avoid sleep disturbance.

Engine testing

11.1.1.1.7 (a) Aircraft propulsion engines may be run for the purpose of engine testing:

- during the hours of 0600 to 2000
 - to carry out essential unscheduled maintenance between 2000hrs and 2300hrs
 - to operate an aircraft within flying hours but provided the engine run is no longer than required for normal procedures, which for the purpose of this rule shall provide solely for short duration engine runs by way of flight preparation while the aircraft is positioned on the apron.
- (b) No person shall start or run any aircraft propulsion engine for the purposes of engine testing on the hardstand area south and west of the Air New Zealand hanger at any time. This area is depicted by the shaded portion of Map 35.

(c) Restrictions on engine testing from 2300hrs to 0600hrs do not apply if engine testing can be carried out in compliance with all of the following:

- (i) measured noise levels do not exceed 60 dB $L_{AEQ(15 min)}$ at or within the boundary of any residentially zoned site
- (ii) measured noise levels do not exceed 75 dB L_{AFmax} at or within the boundary of any residentially zoned site
- (iii) noise levels shall be measured in accordance with NZS6801: 2008 Acoustics – Measurement of Environmental Sound.
- (iv) the total number of engine test events to which rule **11.1.1.1.6(c)** applies shall not exceed 18 in any consecutive 12 month period
- (v) the total duration of engine test events to which rule **11.1.1.1.6(c)** applies shall be no more than 20 minutes.

Land based activities

11.1.1.1.8

Noise emission levels, from any activity within the Airport area, other than aircraft operations, engine testing and the operation of APUs (as provided for in rule **11.1.1.1.9**) when measured at any residential site shall not exceed the following limits:

Monday to Saturday 7am to 10pm 55 dB $L_{AEQ(15 MIN)}$

At all other times 45 dB $L_{AEQ(15 MIN)}$

All days 10pm to 7am 75 dB L_{AFmax}

Ground power and auxiliary power units (GPUs/APUs)

11.1.1.1.9

- (a) GPUs must comply with the noise limits in rule **11.1.1.1.8**.
- (b) APUs must comply with the noise limits in rule **11.1.1.1.8**, with the exception of:
 - aircraft under tow
 - the first 90 minutes after the aircraft has stopped on the gate
 - 60 minutes prior to scheduled departure
 - the use of APUs to provide for engine testing pursuant to rule **11.1.1.1.7**.

11.1.1.2 Screening of Activities and Storage

Sites with yards which abut a Residential or Open Space Area must be screened from view by a fence not less than 1.8m high

11.3 Discretionary Activities (Restricted)

11.3.1.7

noise, except for 11.1.1.1.1, 11.1.1.1.2, 11.1.1.1.3 and 11.1.1.1.7

The conditions in **rule 11.1.1** may be waived totally, except that:

- rule **11.1.1.1.8** noise emission levels shall not be exceeded by more than 5 decibels
- rule **11.1.1.6**, maximum lighting levels, must not be exceeded by more than 20 percent

11.3.1.17 Noise

11.3.1.17.1 The degree to which noise emissions can be reduced through mitigation or management measures, changes in the location, or methods of operation of the activity.

11.3.1.17.2 Whether the proposal will have any adverse effects on the health and safety of people.

11.3.1.17.3 The effects of the type, intensity and duration of the noise emitted from any activity.

It is appropriate for noise sensitive activities locating within the Airport area to be protected from intrusive noise effects.

11B GOLF COURSE RECREATION AREA RULES

11.5.1.1 Noise

11.5.1.1.1 Noise emission levels when measured at or within the boundary of any site, other than the site from which the noise is generated, shall not exceed the following:

Monday to Saturday 7am to 10pm 45 dB $L_{AEQ(15 MIN)}$

At all other times 40 dB $L_{AEQ(15 MIN)}$

All days 10pm to 7am 65 dB L_{AFmax}

11.5.1.1.2 Any activity occurring within the Golf Course recreation area when measured from any land or premises outside the precinct shall comply with the noise limits stated in Appendix 1.

11.6 Discretionary Activities (Restricted)

11.6.1.1 Noise

noise emission levels under **Rule 11.5.1.1**, shall not be exceeded by more than 5 decibels

11.6.1.10 Noise

The extent to which noise emissions will be intrusive. Council will seek to ensure that the best practicable option is used to mitigate noise and that adverse effects are minor.

Appendix 1. Noise

Activities must comply with the following noise limits.

Residential (Outer)

Noise emission levels when measured on any residential site in the Outer Residential Area must not exceed:

Monday to Saturday 7am to 7pm 50dB ($L_{AEQ(15 MIN)}$)

Monday to Saturday 7pm to 10pm 45dB ($L_{AEQ(15 MIN)}$)

At all other times 40dB ($L_{AEQ(15 MIN)}$)

All days 10pm to 7am 65dB (L_{AFmax})

Where it is impractical to measure outside a dwelling, then measurements shall be made inside (with windows closed). Where indoor measurements are made the noise limits stated above shall be reduced by 15dB.

3.10 Definitions

AIRCRAFT OPERATIONS: means the engine runup, taxi-ing, take-off or landing at an airport of an aircraft, and "operate" has a corresponding meaning

NIGHT CURFEW EXEMPTION CERTIFICATE: means a certificate issued by the Wellington City Council to the effect that the single event noise level of the stated aircraft type (and configuration) has been measured at Wellington International Airport and has been able to adequately demonstrate that it creates no more than 75 dB L_{AFmax} (1 sec Leq time-weighting) at or beyond the airnoise boundary during a minimum of 10 landings and/or departures. A list of night curfew exempt aircraft shall be compiled and copies of the approved list will be maintained by WIAL with copies held at Wellington City Council offices for public inspection.

[PRIMARY FUNCTION OF THE AIRPORT AREA: means the transport of people and cargo by aircraft and any ancillary activity or service that provides essential support to that function. This includes, but is not limited to, aircraft operations, airport operational activities (such as runways, traffic control structures and terminal buildings), cargo warehouses and other storage facilities, airport travellers' accommodation and services, vehicle parking and servicing, aircraft catering and servicing, retail and commercial services that support airport activities (provided that such retail and commercial services are located within the Terminal Area), internal roading, access and service ways.]

NOISE EMISSION LEVEL: means the noise level measured and assessed in accordance with NZS 6801: 2008 "Acoustics - Measurement of Environmental Sound" and NZS 6802: 2008 "Acoustics - Environmental Noise", where this Plan or conditions of consent refer to the LAeq(15min) descriptor and in accordance with NZS 6801: 1991 "Measurement of Sound" and NZS 6802: 1991 "Assessment of Environmental Sound" where this Plan or conditions of consent refer to the L(10) descriptor, except as expressly provided for in this Plan.

In addition:

- The assessment of cumulative effect of activities (with the exception of road traffic noise) shall be determined. Measurement of noise shall be made in such a way that as far as reasonably practical, the contribution of individual activities creating the noise shall be identified.
- The following activities and specific noise sources are not appropriately controlled using assessment by either NZS 6802: 2008 "Acoustics – Environmental Noise" or NZS6802:1991 "Assessment of Environmental Sound" and noise rules in this Plan, unless the rule states to the contrary:
 - vehicles driven on a road (within the meaning of s.2(1) of the Transport Act 1962) or vehicular movements on any sites which are in keeping with normal residential activity
 - **the operation of aircraft including helicopters, at Wellington International Airport and airborne aircraft elsewhere throughout the District.**
- High energy impulsive sounds such as gunfire, blasting and warning devices are not adequately controlled using assessment by either NZS 6802: 2008 "Acoustics - Environmental Noise" or NZS6802:1991 "Assessment of Environmental Sound" and noise rules in this Plan, unless the rule states to the contrary.
Noise from high energy impulsive sounds are not adequately controlled using the current New
- Where in noise rules in this Plan, the noise emission limit applies "at or within the boundary of any site, other than the site from which the noise is generated" then neither shall the noise standard apply at or within the boundaries of any other site included in the parcel of land that incorporates the site from which the noise is generated, provided that:
 - all sites in the parcel of land are held under the same ownership or under the same management

- to be considered part of the parcel of land each site shall remain contiguous with at least one other site in the parcel that is under the same ownership.

Existing uses that are established before the Plan became notified may emit noise that exceeds the noise emission standards in the District Plan. The Resource Management Act provides for these activities to continue as long as the uses are the same or similar in character, intensity, and scale to those which existed before the rule became operative or the proposed plan was notified.

Any change to the activity that causes a worsening of the effects will require a resource consent.

This does not remove the duty placed on every occupier and every person carrying out an activity to adopt the best practicable option to ensure that the emission of noise does not exceed a reasonable level *Zealand Standards. Activities that emit noise with such characteristics are generally likely to cause greater annoyance than assessment using Rules within this Plan would indicate. The impact of such activities would be assessed by reference to Section 16(1) of the Resource Management Act.*

- Noise from construction, maintenance and demolition activities, including those associated with the urgent repair of utilities to maintain continuity of service, on any site or on any road shall comply with, and be measured and assessed using, the recommendations of NZS6803:1999 Construction Noise except:
 - work on public highways, railways and the Airport;
 - work on domestic roads where construction work will cause traffic congestion;
 - in the Central Area where construction work will endanger the safety of pedestrians and the footpath cannot be closed during the day;
 - in the Central Area where the best practicable option to reduce noise to a reasonable level requires construction work to be undertaken outside normal working hours.
- Nothing in the noise rules shall be used to prevent emergency work from taking place. Such work would arise from the need to protect life or limb or minimise or prevent loss or serious damage to property or minimise or prevent environmental damage.

[NOISE SENSITIVE ACTIVITY: means

- any residential activity
- any hotel, motel or other premises where residential accommodation for five or more travellers is offered at a daily tariff or other specified time
- early childhood centres]

And, within the airnoise boundary depicted on Map 35, also includes

- Any school or other learning facility; and
- Any hospital, rest home, hospice, respite facility or other activity with the primary purpose of care for the infirm.

[NON-AIRPORT ACTIVITY: means an activity within the Airport and Golf Course Recreation Precinct which is not related to the primary function of the Airport area.