Environmental Noise Impact Baseline Assessment & Impact Prediction Pietermaritzburg Airport *Master Plan Phase 1*

September 2016 & January 2017

Prepared For:
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MAPPING
MODELLING
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Synopsis:

This document provides the results and findings of a Baseline Environmental Sound Level Survey conducted during September 2016 for the Environmental Impact Assessment towards the Proposed Expansion of the Pietermaritzburg Airport Master Plan: Phase 1. Estimated growth in passenger demand and probable changes to the aircraft fleet supplied by the INR and Airlink are also assessed towards a 2025 scenario.

Report Issue and Review

Verification	Capacity	Name	Signature	Date
Project Manager	Environmental Noise Specialist & Pr.Sci.Nat.	Andrew Simpson		31 October 2016 11 January 2017

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Background

The Msunduzi Municipality is proposing an expansion of the Pietermaritzburg Airport, in the KwaZulu-Natal Midlands. The project triggers the requirement for an environmental noise specialist study (impact assessment) as part of the overall Environmental Impact Assessment (EIA) process. To quantify and assess the noise environment, IMA Trader 20 cc (IMA) was appointed to conduct a baseline sound level survey as Phase 1 of the noise impact assessment. Additional phases *may* be requested dependent upon the findings of this study.

The aim of this baseline study was to:

- Determine current environmental sound levels in areas surrounding the airport and along the typical commercial aircraft flight paths while the aircraft flies over and in-between flight times.
- Evaluate and compare background ambient sound levels versus aircraft peak noise impacts, using SANS 10103:2008 as a guideline with respect to impacts on various districts (at sensitive receptors).
- Determine whether the aircraft impact on the existing baseline noise environment and at sensitive receptors along the flight path exceed any relevant environmental guidelines.

Following initial presentation of the baseline study, the specialist consultants were asked to consider a projected passenger demand growth scenario up to 2025 (8 years). Based on information extracted from Airport Master Plan Phase 1 as updated by Airlink (being the only commercial operator - not-charter, not-general aviation) regarding the replacement of older aircraft with newer technology to meet this anticipated demand, the associated noise impacts are assessed in context of the baseline measurements.

The projected impact assessment is guided by relative aircraft sound power levels (Effective Perceived Noise Level in Decibels – EPNdB) from the US Federal Aviation Authority (FAA) and does not constitute a formal modelling exercise, which was deemed unnecessary *at this stage* in a joint Review of the Baseline Survey and Technical Workshop between the Institute of Natural Resources (INR), Air Traffic Navigation Services (ATNS), Civil Aviation Authority (CAA), Msunduzi Municipality and Airlink. Minutes recorded at this Technical Workshop are available from the INR.

Key Findings

The key findings from the study are as follows:

- The overall noise environment (L_{Aeq}) is quieter at noon than in the morning or the evening, even including aircraft noise. This shows the influence of road traffic during commuting hours.
- Spatially, the suburbs of Hilton and World's View are quietest, Bisley is the noisiest and Clarendon and Wembley are moderately affected by noise compared with the other suburbs.
- The monitoring points at the north end of the runway are the most impacted. This is typically when the aircraft is at its lowest height above the ground and initiating maximum forward thrust (take-off) or reverse thrust (approach and landing).
- During the survey, it was noted that the 'peak aircraft' noise only persists for an average of 20 - 30 seconds (out of 15-min measurement runs) but varies slightly at each location dependent upon extraneous factors such as wind direction, cloud cover and blanket noise from other sources.
- This study remains valid providing the commercial aircraft operator does not deviate significantly from the two most frequently used aircraft type (ERJ 135 LR and AVRO RJ 85) on the Pietermaritzburg to Johannesburg route. The AVRO ('Quad-jet') is the larger and noisier of the two aircraft, but both aircraft are required for economic reasons. Passenger demand requires that the AVRO is typically used for the first flight out (morning) and the last flight in (evening), with the ERJ being more common in-between.
- In respect of 'compliance' with the SANS land-use district guidelines, the L_{Aeq} result is not closely related to aircraft noise at most sites (as it peaks for only a fraction of the time-weighted average); thus, such terminology should be avoided. Hence, a combination of factors was used to assess the 'aircraft impact' on each receptor location, which showed clearly that Bisley is the most significantly impacted suburb related to aircraft noise. This is directly related to proximity to the north end of the runway, which is most frequently used for take-off and approach owing to the common southeasterly wind field over Pietermaritzburg.
- Whilst aircraft are certainly audible for short periods in other suburbs, elevated L_{Aeq} (above guideline values) are related to a range of sources, from road traffic to

barking dogs. The contribution of aircraft flyover is not regarded as the primary factor causing elevated L_{Aeq}, unless it was specifically observed as such by the noise specialist. Thirty seconds constitutes only 3% of the 15-minute L_{Aeq} monitoring period, which was centered on the flyover time, so the overall influence on longer-term L_{Aeq} parameters remains negligible.

- Given the mixed urban[1] land-use that is impacted by the flights, there are no perfect flight times for the commercial aircraft. All commercial flights will impact one or more of the receptors. Domestic households are more sensitive during morning and evening, whilst schools and crèches are more sensitive during working hours.
- These jet aircraft noise events have already been occurring for five years and no formal complaints have been received to date (ATNS, 2016). The general lack of response until the Scoping Phase of this EIA suggests that the noise events are acceptable to most, who have become acclimatized to typical urban sounds. They are not harmful to health at the levels recorded and should not disturb sleep given that the standard operating hours all fall with SANS daytime classification (6.00am to 10.00pm).
- The passenger demand growth estimates described in the Airport Master Plan: Phase 1 suggest that one or two extra flights will be required per day (refer to Appendix A: INR Summary of 'Passenger Demand and Flight Projections').
- One of these flights has recently been confirmed as that which will depart to Cape Town at 7.00am and arrive from Cape Town at 7.30pm weekdays, with only one outbound and one inbound flight across each weekend (7.00am Sat and 7.30pm Sun). This Cape Town flight will use the smaller and quieter of the two commercial aircraft currently operating from Pietermaritzburg Airport (ERJ 135 LR). Given the low observed noise impact of this aircraft, combined with the take-off and approach times being within the existing peak periods (morning and evening), it is suggested that this impact will be largely indiscernible and should not cause further nuisance.
- The other proposed change would involve accommodation of a 20% growth in the current capacity (across all flights, including the Cape Town flight) by 2025. Intensive discussion with Airlink suggested that the best prediction that can be made at this stage is replacement of the current AVRO RJ 85 with the ERJ 170/190 Series. The latter will facilitate greater passenger carrying capacity, but are also more economical having only two engines versus four.
- After examination of the sound power emissions from the larger of two replacement aircraft (ERJ 190), it is anticipated that noise emissions from this fleet modernization could increase take-off noise (model and load dependent), but will reduce approach and landing noise (all models and loads) close to source and relative to the older, existing aircraft. The differences are small (≤ 5 dB at source), so whether this constitutes any perceived difference at receptors will be largely dependent on extraneous factors (road traffic noise, weather, aircraft operational procedures, etc.). These impacts will continue to occur in the existing peak flight times as dictated by passenger demand.
- Given that future passenger predictions are uncertain, higher confidence can be ascribed to replacement of existing aircraft to absorb passenger demand, since this is motivated by fleet modernization - economic advantages, which bring associated environmental benefits of modern aviation technology.

Impact Assessment & Recommendations

The following is recommended from impact assessment in the context of baseline results, as opposed to aircraft-specific modelling:

- Environmental noise in the Bisley area, close to the north end of the runway is of concern to schools and crèches. This should be tackled through sound attenuation measures on public buildings. These measures could include double-glazing of windows and sound insulation in the ceiling. Such measures have proven effective in the abatement of aircraft noise from best international practice.
- Should the commercial fleet be changed to types of aircraft with significantly higher overall sound level output, the frequency of flights increased, flight times extend beyond the current time bracket or the flight paths change significantly in the future, then the noise impacts must be re-evaluated around the airport precinct

[1] 'Mixed urban' in this context refers to all types of developed land-use that comprise the cityscape, including commercial, industrial and residential, etc.

through further measurement against this baseline.

- On review of findings from the baseline survey, a decision was taken by the Environmental Assessment Practitioner as to whether further investigation through aircraft-specific modelling is required. From the Technical Workshop (INR, 2016), it appears that none of the original triggers for modelling were found. A majority of participants, including representatives from the CAA, ATNS, INR, Airlink and Municipality decided that aircraft-specific noise modelling may cause more confusion than it resolves. This decision was taken considering the small size of the airport, that no extension of the runway is being considered at this stage (which limits its use to relatively similar aircraft) and considering the limited ability of noise modelling to simulate a complex receptor environment (experience gained at King Shaka International Airport). A large portion of the mixed urban noise sources would need to be incorporated for the model to predict realistically, based on the baseline measurements and observations.
- Alternately, a post-expansion comparative survey at significant impact sites may be considered more useful. Since noise created by aircraft is an event (to the ground-based observer) that has already been established spatially, this survey could be limited to sites in close proximity where current impacts from the runway are significant. The basis for this recommendation is that aircraft type and flight plans are not affected significantly by the initial phase of the Airport Expansion Master Plan, whilst flight events are not currently of a harmful magnitude or duration, being very brief compared with other noise sources observed.
- It is planned and gradually being confirmed that all commercial aircraft type will be changed to more modern and quieter[2] aircraft than the current AVRO RJ 85 'Quad-jet'. Reduction of sound energy at source can reduce event-based impacts at all receptors (ICAO, 2007). The contribution of the aircraft flyover at the majority of sites is very small compared with other constant noise sources; road traffic being the most significant contribution to high L_{Aeq} values during this survey, both in the foreground and background. It is only where the flyover actually interferes with speech communication that sound attenuation is required on buildings; i.e. in close proximity at Bisley School and the crèche(s).
- Apart from the (now definite, as at January 2017) introduction of a Cape Town flight using the ERJ 135 LR (described earlier), further flight scheduling cannot be determined accurately at this stage (INR, 2017). However, in order to minimize noise impacts through disturbance, aircraft being introduced should be equivalent to or quieter than the AVRO RJ 85 in all possible flight modes and should be limited to before and after school hours (8.00am to 3.00pm). Noise nuisance should be minimized over Bisley as the primary impact zone, where sensitive receptors such as the school and crèche(s) are situated. Various aviation operational procedures can also facilitate this to some extent (e.g. approach angles), although passenger safety remains the primary concern (ATNS, 2016).

Summary

In summary of this investigation, with given limitations and assumptions, there are no fatal flaws identified from either the baseline or the minor changes in aircraft required by obsolescence and passenger demand. Whilst existing and new flight events are undesirable to sensitive receptors, significant impacts were measured almost exclusively in the Bisley area, immediately adjacent to the north end of the runway. No impacts pose a threat to public health outside of the airport boundary and flyover impacts (nuisance) can be mitigated to some extent in future through adoption of various measures described above using the 'Balanced Approach to Aircraft Noise Management' (ICAO, 2007).

[2] Worst-case (ERJ 190): 4 dB lower on approach (all models); ≤ 5 dB higher on take-off (model and load dependent) - at source; e.g. edge of runway. ERJ 170 is lower in all respects, being a smaller aircraft. Fleet mix yet to be confirmed and subject to variation in operational requirements.

SPECIALIST CONSULTANT

Andrew Simpson is a qualified air quality scientist with a Master of Science (M.Sc. Applied Climatology) obtained from the University of Natal. He has been registered as a Professional Natural Scientist (Pr.Sci.Nat.) since 1997, having worked on numerous air quality and environmental noise projects throughout Southern Africa. He has provided consulting support to a wide range of private sector clients in various sectors of the economy, including petrochemical, metallurgical, mining, agricultural, solid waste and para-statal infrastructure clients such as Transnet and ACSA. In addition, he has provided specialist support to a range of National, Provincial, District and Local government bodies, including the national Department of Environmental Affairs, the KwaZulu-Natal Department of Environmental Affairs, eThekwini Metro and the City of Cape Town. He is the principal author of the Air Specialist Report and book chapter for the KwaZulu-Natal State of the Environment Report (2004). Most recently, he was a contributing author of Code of Practice for Air Dispersion Modelling in South Africa, as promulgated in terms of NEMAQA under GNR 533 of 2014.

ACKNOWLEDGEMENTS

The author would like to acknowledge environmental noise survey fieldwork conducted through September 2016 by Hilton Ryder and Linda Shrives. Without their dedication to measure during long shifts (often in excess of 14 hours per day, including weekends) and variable weather, the first and only baseline survey of noise associated with Pietermaritzburg Airport would not have been possible. Linda also assisted in drafting the Draft Baseline Assessment, which proved pivotal to the subsequent Technical Workshop discussions.

Much of the initial baseline review, essential research on passenger predictions, aircraft fleet and scheduling of changes was assisted by Sian Oosthuizen and Dave Cox of the INR. Our interactive workshop sessions, emails and telecoms were valuable in contextualizing environmental noise impacts towards the best possible recommendations for future management of the Airport facility. One example of this research is included, unchanged as Appendix A of this report.

DISCLAIMER

The author is independent, having no vested interest in the project outcome, nor the client, other than remuneration for professional fees in respect of services rendered as considered under all applicable legislation, including that outlined in Section 7 of the National Environmental Management: Air Quality Act (Act No. 39 of 2004).

Whilst every possible effort has been made by the authors to acquire, evaluate, interpret and workshop information pertaining to current and potential noise impacts from this airport and associated commercial aircraft fleet, project timeframes were limited and future projections cannot be confirmed to the ideal level of detail. These, however, are common limitations in any specialist study towards and Environmental Impact Assessment attempting to predict the future, but exacerbated in this project by uncertainty over the current economic climate, which to a large extent influences future decisions taken by commercial airlines. The information thus presented is the best available at time of writing (11 January 2017), as researched or provided to the authors by various stakeholders. This study aims to offer an unbiased perspective towards informed decision-making by the authority, based on best available knowledge at time or writing, regardless of subsequent dissemination or review.

Should complaints arise owing to significant changes not indicated by the applicants; nor anticipated or foreseen by the consultant in this initial baseline survey and impact assessment, then further investigation may be required. Any reasonable requests must be accommodated by both the Airport Facility (Municipality) and the Commercial Operator (Airlink). Likewise, the introduction of other operators at the Airport is not considered by the authors and must be assessed separately, although reference to this baseline study is recommended to assess impacts cumulatively. Public liability remains vested with the EIA applicant.

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For IMA Trader 20 cc
11 January 2017

GLOSSARY

A-weighting The human ear is not equally sensitive to sound of all frequencies, i.e. it is less sensitive to low-pitched than high-pitched sounds. In order to compensate when making sound measurements, the measured value is passed through a filter that simulates the human hearing characteristic. Internationally this is an accepted procedure when working with measurements that relate to human responses to sound/noise.

Ambient sound level Ambient noise will be defined as the totally encompassing sound in a given situation at a given time, and is usually composed of sound from many sources, both near and far.

Annoyance General negative reaction of the community or person to a condition creating displeasure or interference with specific activities**.**

dB or dB(A) The human ear is a sensitive instrument that can detect fluctuations in air pressure over a wide range of amplitudes. This limits the usefulness of sound quantities in absolute terms. For this reason a sound measurement is expressed as ten times the logarithm of the ratio of the sound measurement to a reference value, 20 micro (millionth) Pa. This process converts a scale of constant increases to a scale of constant ratios and considerably simplifies the handling of sound measurement quantities. The attached 'A' indicates that the sound measurement has been A-weighted; i.e. the closest statistical equivalent to human perception of sound pressure levels.

dBZ Historically sound levels were read off a hand held meter and the noise levels were noted in dB, after the development of different weighting curves sound levels were noted as Z-weighting or dBZ to reduce the confusion with different type of weighting applied noise levels.

Octave bands Octave bands refer to the frequency groups that make a sound. The sound is generally divided in to 10 groups (octave bands) ranging from 32 hertz (Hz) to 8,000 Hz. The lower frequency ranges of a sound have a vibrating character where the higher frequency of sound has the character of high pitched sound. In viewing the total octave bands scale from 32 Hz to 8000 Hz the character of the sound can be described.

Noise Noise is generally defined as unwanted sound.

Sound Sound is small fluctuations in air pressure, measured in Newtons per square meter (N/m^2) or Pascals (Pa) that are transmitted as vibrational energy via a medium (air) from the source to the receiver. The human ear is a pressure transducer, which converts these small fluctuations in air pressure into electrical signals, which the brain then interprets as sound.

Sound or noise level A sound or noise level is a sound measurement that is expressed in decibels (dB or dB(A)).

Sound pressure Sound pressure is the force of sound exerted on a surface area perpendicular to the direction of the sound and is measured in N/m^2 or Pa. The human ear perceives sound pressure as loudness and can also be expressed as the number of air pressure fluctuations that a noise source creates.

Sound pressure level The sound pressure level is a relative quantity as it is a ratio between the actual sound pressure and a fixed reference pressure. The reference pressure is usually the threshold of hearing, namely 20 micropascals (μPa).

Sound power Sound power is the rate of sound energy transferred from a noise source per unit of time in Joules per second (J/s) or Watts (W).

Sound power level The sound power level is a relative quantity as it relates the sound power of a source to the threshold of human hearing (10^{-12} W). Sound power levels are expressed in dB (A), as they are referenced to sound detected by the human ear (A-weighted).

LIST OF ACRONYMS AND ABBREVIATIONS

AIA	Acoustic Impact Assessment
dB	Decibel
dB(A)	A-weighted sound measurement
dBZ	Z-weighted sound measurement
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
Hz	Hertz
INR	Institute of Natural Resources NPC
IMA	IMA Trader 20 cc
KSIA	King Shaka International Airport
L_{Aeq}	Equivalent continuous sound pressure level
L_{Amax}	Maximum sound pressure level of a noise event, normally measured on an A-weighted decibel scale
L_{Amin}	Minimum sound pressure level of a noise event, normally measured on an A-weighted decibel scale
L_{A10}	Noise level that exceeded for 10 percent of the sample, normally measured on an A-weighted decibel scale
L_{A90}	Noise level that exceeded for 90 percent of the sample, normally measured on an A-weighted decibel scale
$L_{R,dn}$	Equivalent continuous day/night rating level
$L_{Req,d}$	Equivalent continuous rating level for day-time
$L_{Req,n}$	Equivalent continuous rating level for night-time
$L_{Req,T}$	Typical noise rating levels
L_{WA}	Sound power level
NEMA	National Environmental Management Act
NEMAQA	National Environmental Management: Air Quality Act
SABS	South African Bureau of Standards
SANS	South African National Standards
SPL	Sound Pressure Level
TWA	Time-weighted average
WHO	World Health Organization

1 INTRODUCTION

The Msunduzi Municipality is proposing an expansion of the Pietermaritzburg Airport, KwaZulu-Natal. The expansion, known as Phase 1 of the Airport Master Plan, includes the development of vacant land on the airport site, and the upgrade of aviation infrastructure to meet the increasing growth in passenger and cargo volumes and general aviation. The project triggers the requirement for a baseline noise survey as part of the Environmental Impact Assessment (EIA) process.

To quantify the baseline noise environment, the Institute of Natural Resources NPC (INR) appointed IMA Trader 20 cc (IMA) to undertake a baseline sound level survey and assess measurements combined with personal observations and interviews. IMA was appointed at the beginning of September 2016 to undertake the monitoring survey and compile the draft report by the first week in October 2016. During this period, every available day was used to take sound level measurements in a strategic spatial approach, formulated using GIS. However, the weather limited certain day-time monitoring to half days, whilst some days were excluded entirely for monitoring owing to rain or excessively windy conditions. Weather during the month of September is characterised by a repetitive sequence of cooler frontal conditions (mid-latitude lows) interspersed with local Berg wind conditions; these mesoscale climatic events not being conducive to noise monitoring so most measurements were taken in the intra-frontal periods. The project was thus completed in mid-October using measurements conducted under relatively calm and dry conditions.

The aim of the study was to:

- Determine current environmental sound levels in areas surrounding the airport and along the typical commercial aircraft flight paths, while the aircraft fly over and in-between during non-flight times.
- Evaluate and compare baseline and ‘aircraft peak’ ambient sound levels against guidelines in SANS 10103:2008 with special focus towards impacts on sensitive receptors.
- Discern whether the aircraft impact on the existing noise climate and sensitive receptors along the flight path constitutes a significant nuisance factor (e.g. interferes with speech communication), then rank and symbolise these findings.

The study comprised of daytime acoustic monitoring to assess the current noise climate in key areas along the flight path (within 15km of the airport), tabulating and mapping of the noise baseline along with the ‘aircraft peak’ noise. This report provides a baseline assessment for comparison should aircraft type, frequency of flights, flight times or the flight routes change in the future. The consultant was asked to consider the likely impact of two additional flights, but only using the same flight paths, during existing operating hours and with quieter aircraft, which have since been specified in detail.

2 LIMITATIONS AND UNCERTAINTIES (BASELINE)

This document reports on the findings of the environmental sound level survey and specialist study undertaken during September 2016 only, so is not a complete annual study that can accurately account for seasonal variance. Propagation of sound energy is affected by seasonal weather patterns. The key factors are air density (related to temperature) and winds. Winter conditions are typically most conducive to sound propagation through the boundary layer, since the air is cooler and therefore denser. It is also calm and stratified, allowing effective sound transmission in straight line (line of sight). In summer, apart from the air being warmer and less dense, there is also more convective movement in the boundary layer which reduces sound transmission in a straight line.

With respect to the survey reported in this assessment, the first two weeks of September 2016 were effectively similar to winter conditions and allowed for regular daily measurements. However, the weather patterns changed markedly around mid-month to intermittent Berg winds and rain, with calm days prior to the onset of these mesoscale systems. Whilst this made it more difficult to find suitable days for measurement, only days that complied with conditions suggested SANS 10103:2004 (p.23) were used for surveys; i.e. all measurements reported in this assessment were taken during conditions when:

1. Wind speed did not exceeding 5 m/s; and
2. Under effectively dry surface conditions.

Furthermore, the weather conditions during all measurements were recorded and evaluated in context as best possible. Seasonal monitoring should be considered if numerous complaints are reported during a particular season for which data reported in this assessment cannot be considered representative. This is a common practical limitation of environmental noise surveys, but does not invalidate the findings, provided that they are considered in appropriate context.

3 BACKGROUND INFORMATION

3.1 Locality and Land-use

The Pietermaritzburg Airport is located at 29°38'44.47" S and 30°23'45.06" E off Oribi Road in the Suburb of Oribi, Pietermaritzburg, KwaZulu-Natal. The airport is approximately 4.5km south of the Pietermaritzburg central business district. The site is bounded by suburban, industrial, small-scale agricultural holdings and the Bisley Valley Nature Reserve.

3.2 Pietermaritzburg Airport

Pietermaritzburg Airport air traffic control tower operates during day-time hours, typically between 06h30 and 20h00 for commercial aircraft. On rare occasions the last flight may be delayed but never arrived after 21h00. The Fire and Rescue operate from 06h00 to 21h00 (INR, 2016).These operating hours restrict the time when commercial aircraft can use the airport.

Private (general aviation) aircraft typically frequent the airport during daylight hours. However, they are free to use the airport at any time of day (no time constraints) (INR, 2016).General aviation aircraft do not have a specific flight path; they use visual navigation based on clear airspace, which is the norm at any airport. General aviation aircraft are also not restricted by the glide slope as are the commercial aircraft (INR, 2016). The assumption that noise output of the light aircraft is significantly lower than that of the commercial aircraft was verified by individual observations during the survey to some extent (this has also been verified with the ATNS). Although the focus of this study was primarily on commercial aircraft, several general aviation flights were observed and measured at ground-level, confirming that they do not generate as much impact as commercial (especially jet-engine) aircraft.

The length of the airport runway restricts the type of aircraft that can land or take off at this facility. Currently, the airport has the following aircraft types which frequent the airspace:

- Fixed winged aircraft (wide variety ranging from small (light) to medium aircraft)
- Helicopters
- Private jets
- ERJ 135 LR Jets[3]
- AVRO RJ 85 Quad-jet[2]

[3] Operated by Airlink

Airlink is currently the only commercial airline which operates from the Pietermaritzburg airport. All commercial flights commute only between Johannesburg (JNB) and Pietermaritzburg (PZB) at time of writing. The current flight times and names are displayed in Table 1.

Table 1: Flight schedule between Pietermaritzburg and Johannesburg

PZB TO JNB		JNB TO PZB	
MON – FRI			
SA8730	06h45	SA8747	07h00
SA8732	08h30	SA8735	12h15
SA8736	14h00	SA8743	15h30
SA8744	17h00	SA8741	17h00
SA8742	18h25	SA8739	18h15
SATURDAYS ONLY			
SA8732	08h30	SA8735	12h15
SA8736	14h00		
SUNDAYS ONLY			
SA8736	14h00	SA8735	12h15
SA8744	17h00	SA8743	15h30
		SA8741	17h00

The current commercial flight paths were selected according to safety and efficiency to the aircraft users. The paths need to take in to account obstacles as well as terrain in the area. The flight path can vary (slightly) on a daily basis or as frequent as an hourly basis depending on wind and temperature. Figure 1 shows a map of all available flight paths overlaid on the topo-cadastral map sheet (image 2930CB) on which terrain contours clearly indicate the valley topography of the Msunduzi River valley in which Pietermaritzburg is established. Use of the Pietermaritzburg Airport was historically constrained in poor weather conditions, often leading to flights being diverted to the old Durban International Airport. In response, Airlink invested in a new navigation beacon on World's View five years ago, which facilitates tighter approach and departure angles that work with instrument navigation in poor weather conditions to ensure that safe take-off and landing is possible. This has decreased inconvenience for passengers and lead to a growth in demand for flights from Pietermaritzburg.

The commercial aircraft descend at an angle of 3 degrees from the 40km peg for safe landing (INR, 2016). Large aircraft cannot turn easily; therefore the flight paths are fixed on a straight line for landing over the Msunduzi Municipal area and are unlikely to change in the near future. The majority (95%) of commercial flights land and take off from the north side of the runway (over Bisley) – this was significant to the noise measured at the south versus north ends of the runway in this study. Only during five percent (5%) of the year do the commercial aircraft land and take-off from the south side of the runway (over Mkondeni and Ukulinga Farm). This is dependent on wind and climatic conditions. Using the south side of the runway as the primary flight path is not an option because the most common wind direction is south easterly.

It was unclear outset of the survey whether there was any intention to change the schedule of commercial flights. There are no plans to extend the runway, which is short by modern commercial aviation standards and therefore limits the type of aircraft that can be used. It is now suggested that there will be two more flights per day in the Phase One Master Plan, but using *quieter* aircraft. Instantaneous (or event-based) noise will therefore be reduced, whilst the short–term disturbance factor may increase slightly. However, the nuisance potential is limited to the Bisley area, immediately adjacent to the north end of the runway, since quieter aircraft will be less discernible at more distant suburbs as the sound decay with aircraft altitude and distance from the airport is notably rapid (beyond the immediate take-off zone). This is discussed in more detail later along with interpretation of the existing baseline noise environment.

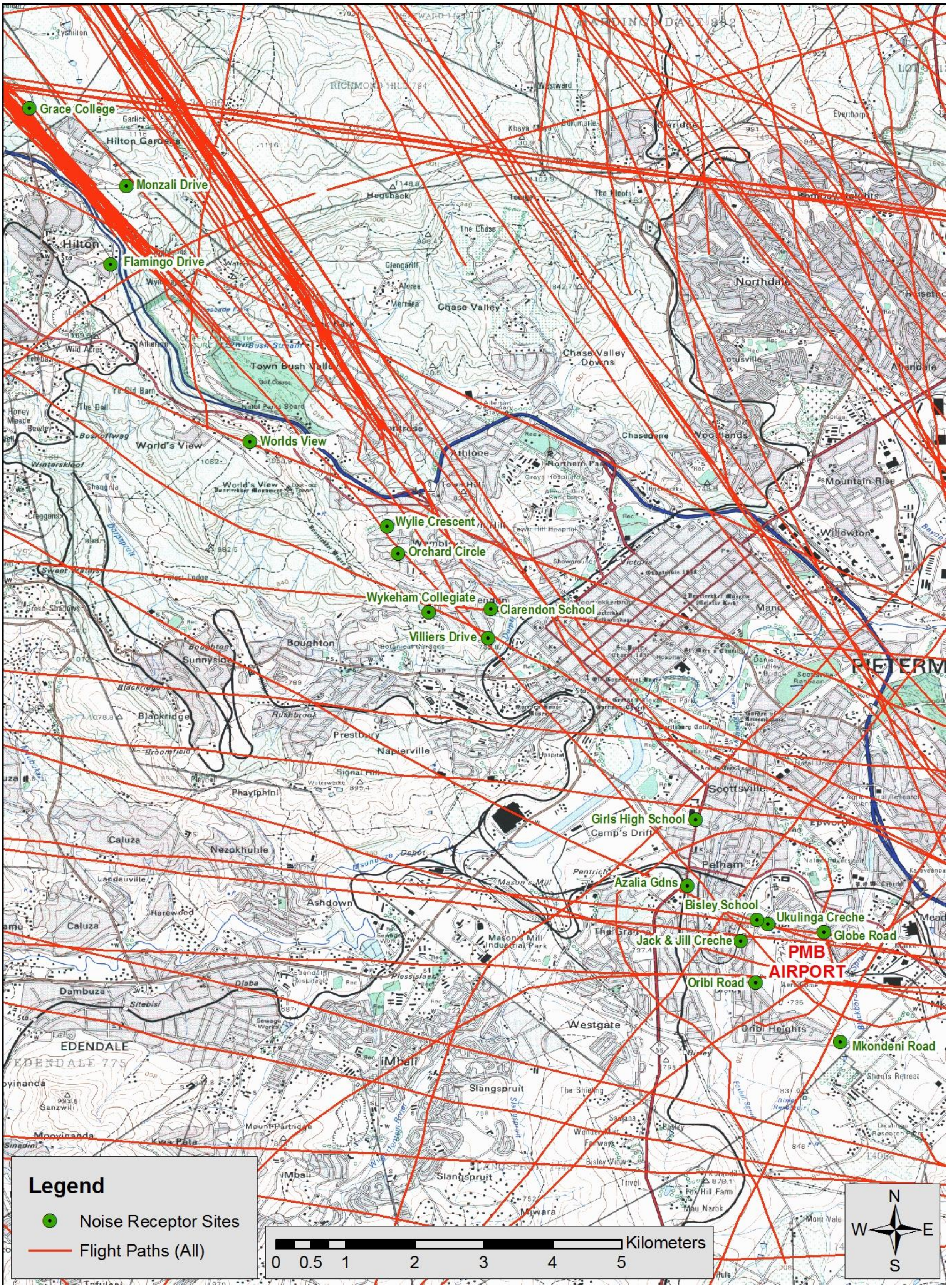

Figure 1: All flight paths over Pietermaritzburg (ATNS, 2016) overlaid on topo-cadastral backdrop image, showing selected noise receptor sites. Only flight paths running from SE to NW relate to PZB; others running E to W relate to DUR-JHB flights at higher altitude.

4 NOISE FUNDAMENTALS

4.1 Background

Sound is defined as any pressure variation (in air, water or other medium) that the human ear can detect. Noise is defined as "unwanted sound", which can lead to health impacts and can negatively affect people's quality of life. Hearing impairment is typically defined as a decrease in the threshold of hearing. Severe hearing deficits may be accompanied by tinnitus (ringing in the ears). Noise-induced hearing impairment occurs predominantly in the higher frequency range of 3,000 to 6,000 Hertz (Hz), with the largest effect at 4,000 Hz. With increasing L_{Aeq}, 8-hour and increasing exposure time, noise-induced hearing impairment occurs even at frequencies as low as 2,000 Hz. However, hearing impairment is not expected to occur at L_{Aeq} 8-hour levels of 75 dB(A) or below, even after prolonged occupational noise exposure.

Speech intelligibility is adversely affected by noise. Most of the acoustical energy of speech is in the frequency range of 100 to 6,000 Hz, with the most important cue-bearing energy being between 300 and 3,000 Hz. Speech interference is basically a masking process in which simultaneous interfering noise renders speech incapable of being understood. Environmental noise may also mask other acoustical signals that are important for daily life such as doorbells, telephone signals, alarm clocks, music, fire alarms and other warning signals.

Sleep disturbance is another major effect of environmental noise. It may cause primary effects during sleep and secondary effects that can be assessed the day after night-time noise exposure. Uninterrupted sleep is a prerequisite for good physiological and mental functioning and the primary effects of sleep disturbance are: (a) difficulty in falling asleep; and (b) awakening and alteration of sleep stages or depth. The difference between the sound levels of a noise event and background sound levels, rather than the absolute noise level, may determine the reaction probability.

The annoyance due to a given noise source is subjective from person to person, and is also dependent upon many non-acoustic factors such as the prominence of the source, its importance to the listener's economy (wellbeing), and his or her personal opinion of the source. The result of increased exposure to noise on individuals can have negative effects, both physiological (influence on communication, productivity and even impaired hearing) and psychological effects (stress, frustration and disturbed sleep). As such, noise impacts need to be understood to mean one or a combination of negative physical, physiological or psychological responses experienced by individuals, whether consciously or unconsciously, caused by exposure to noise.

More technically, noise impacts are defined as the capacity of noise to induce annoyance depending upon its physical characteristics including the sound pressure level, spectral characteristics and variations of these properties with time. During day-time, individuals may be annoyed at L_{Aeq} levels below 55 dB, while very few individuals are moderately annoyed at L_{Aeq} levels below 50 dB. Sound levels during the evening and night should be 5 to 10 dB lower than during the day (World Health Organisation, 1999).

Table 2: Typical noise ranges in dB(A) expressed as typical / subjective human interpretation (third column).

Sound Pressure Level (SPL – dBA)	Typical Source	Subjective Evaluation
130	threshold of pain	intolerable
120 **110**	heavy rock concert grinding on steel	extremely noisy
100 **90**	loud car horn at 3m construction site with pneumatic hammering	very noisy
80 **70**	kerbside of busy street loud radio or television	loud
60 **50**	department store general office	moderate to quiet
40 **30**	inside private office inside bedroom	quiet to very quiet
20	unoccupied recording studio	almost silent

4.2 Noise Propagation

Sound is a pressure wave that decreases over distance from the source. Depending on the nature of the noise source, sound propagates at different rates. The three most common categories of noise are point sources (specified single point of noise generation) line sources (multiple linear noise generating points, such as a road) and area sources (specified single area of noise generation). The most important factors affecting noise propagation are:

- The type of source (point, line or area);
- Obstacles such as barriers and buildings;
- Distance from source;
- Atmospheric absorption;
- Ground absorption; and,
- Reflections.

Research has shown that doubling the distance from a noise source results in a proportional decline in noise level. Sound propagation in air can be compared to ripples on a pond. The ripples spread out uniformly in all directions, decreasing in amplitude as they move further from the source. An acoustically hard site exists where sound travels away from the source over a generally flat, hard surface such as water, concrete, or hard-packed soil. These are examples of reflective ground, where the ground cover provides little or no attenuation. The standard attenuation rate for hard site conditions is 6 dB(A) per doubling of distance for point sources. Thus, if a person stands at a position one meter from the source and then moves one meter further away from the source, the sound pressure level will drop by 6 dB(A); moving to 4 meters, the drop will be a further 6 dB(A), and so on. When ground cover or normal unpacked earth (i.e. a soft site) exists between the source and receiver, the ground becomes absorptive to sound energy. Absorptive ground results in an additional noise reduction of 1.5 dB(A) per doubling of distance. Added to the standard reduction rate for acoustically soft conditions, point source noise attenuates at a rate of 7.5 dB(A) per doubling of distance.

This methodology is only applicable when there are no reflecting or screening objects in the sound path. When an obstacle is in the sound path, part of the sound may be reflected and part absorbed and the remainder may be transmitted through the object. How much sound is reflected, absorbed and/or transmitted depends on many factors, including the properties of the object. When locations are not in the line of sight of the noise source, there may be up to 10 dB(A) attenuation for broadband noise, with a further 10 dB(A) attenuation when inside the average residence and the windows are open.

4.3 Characteristics of Noise (Frequency Character)

The human ear simultaneously receives sound (normal un-weighted sound or Z-weighting dB(Z)) at many frequencies (octave bands) at different amplitudes. The ear then adjusts its sensitivity based on the amplitude of the sound observed. This focuses the sound and makes it audible by adjusting the amplitude of the low, middle and high frequencies. To measure how a person experiences sound, an electronic weighting adjusted to the Z-weighted sound was developed, including three different weighting curves, namely:

- A-weighting - this measurement is often noted as dB(A) and this weighting curve attempts to make the noise level meter respond *closely to the characteristics of a human ear*. It attenuates the frequencies at low frequencies. Various national and international standards relate to measurements recorded in the A-weighting of sound pressure levels;
- B-weighting - is similar to A-weighting but with less attenuation. The B-weighting is very seldom, if ever, used. The B-weighting follows the C-weighted trend;
- C-weighting - is intended to represent how the ear perceives sound at high decibel levels. C-weighted measurements are reported as dB(C); and
- Z-weighting - this refers to linear, unweight noise levels (instantaneous readings are displayed on the sound level meter as such), prior to any weighting.

The weighting is employed by arithmetically adding a table of values (Table 3), listed by octave bands, to the measured linear sound pressure levels for each specific octave band. The resulting octave band measurements are logarithmically added to provide a single weighted value describing the sound, based on the applied weighting curve (Figure 1). Thus, if the A-weighted curve was applied to the sound, the noise level is noted as dB(A).

Table 3: Frequency weighting table for the different weighting curves

Frequency (Hz)	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
A-weighting	-39.4	-26.2	-16.1	-8.6	-3.2	0	1.2	1	1.1
B-weighting	-17.1	-9.3	-4.2	-1.3	-0.3	0	-0.1	-0.7	-2.9
C-weighting	-3	-0.8	-0.2	0	0	0	-0.2	-0.8	-3
Z-weighting	0	0	0	0	0	0	0	0	0

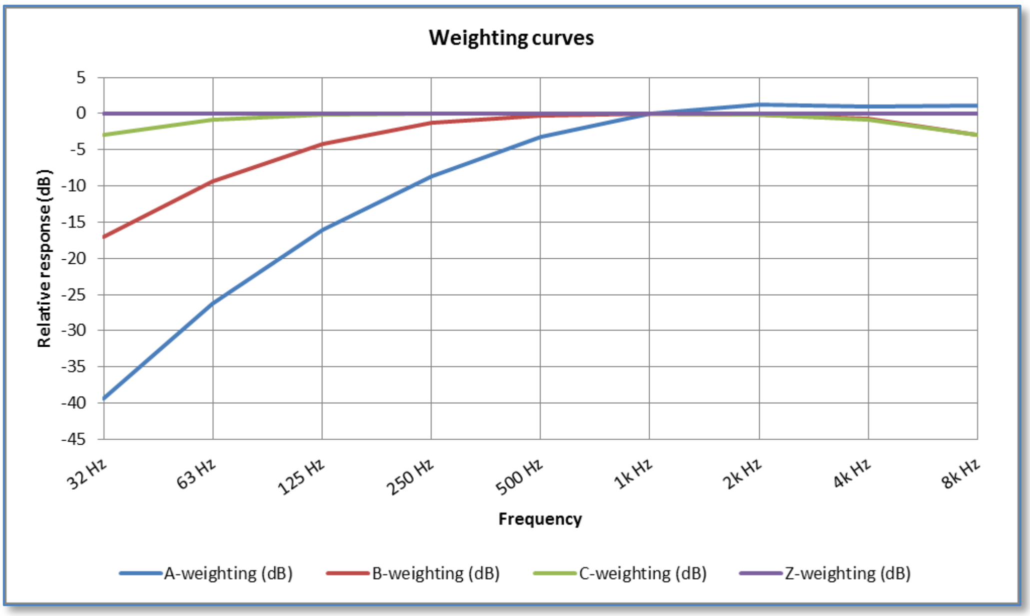

Figure 2: Different weighting curves.

5 ENVIRONMENTAL NOISE LEGISLATION AND GUIDELINES

In South Africa, environmental noise control has been in place for three decades, beginning in the 1980s with codes of practice issued by the then South African Bureau of Standards (SABS) to address noise pollution in various sectors of the country. Under the previous generation of environmental legislation, specifically the Environmental Conservation Act (Act No. 73 of 1989) (ECA), provisions were made to control noise in different districts from a national level. In later years, the ECA was replaced by the National Environmental Management Act (Act No. 107 of 1998) (NEMA), from where the new National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEMAQA) originated. In NEMAQA, the noise control provisions are mentioned in Section 34, as follows:

> "(1) The minister may prescribe essential national standards –
>
> > (a) for the control of noise, either in general or by specific machinery or activities or in specified places or areas; or
> >
> > (b) for determining –
> >
> > > (i) a definition of noise; and
> > >
> > > (ii) the maximum levels of noise.
>
> (2) When controlling noise the provincial and local spheres of government are bound by any prescribed national standards."

Under NEMAQA, the noise control regulations were to be updated and are applied to all provinces in South Africa. The noise control regulations give all the responsibilities of enforcement to the local or provincial authority (dependent upon the capacity of the local authority), where location specific by-laws can be created and applied to the areas of jurisdiction with approval of provincial government. Furthermore, NEMAQA prescribes that the Minister must publish maximum allowable noise levels for different districts and national noise standards. These have *not yet been accomplished in all provinces*. As a result, all monitoring and assessments are done in accordance with the South African National Standards (SANS) 10103:2004 (updated 2008), 10328:2008 and 10102:2003 as described below. SANS10117:2004 (updated 2008) prescribes a code of practice for *'Calculation and prediction of aircraft noise around airports for land use purposes'*, but as the title suggests, is *only applicable to the immediate vicinity of an airport*.

5.1 South African National Standards (SANS)

SANS 10117:2008 - *'Calculation and prediction of aircraft noise around airports for land use purposes'* indicates the following limits on various land-uses:

i. Residential areas. The total noisiness index should not exceed 65 dB(A) for residential areas.
ii. Residential areas having acoustically insulated buildings. The total noisiness index should not exceed 75 dB(A) for residential areas where the buildings are so designed that a reduction of at least 20 decibels is expected in aeroplane noise (measured in dB(A)) between the outside and inside of the buildings, and where the buildings are so ventilated that the windows and doors can be properly insulated.
iii. Industrial areas. The total noisiness index should not exceed 85 dB(A) for industrial areas.
iv. Forbidden areas. In areas where the total noisiness index exceeds 85 dB(A), no land development for the purpose of residential, commercial or industrial usage should be allowed.

However, this is based largely on a modelling approach from aircraft sources in isolation and only in close proximity to the airport (not below flights paths over an extensive urban area), so does not include complexities introduced by the urban baseline environment. Such an approach may be contemplated in Phase 2 (Integrated Noise Model, or its successor) of this study, should the baseline findings deem it necessary to make further investigation of the near-source environment.

Thus, SANS 10328:2008–'*Methods for environmental noise impact assessments'* presently informs acoustic specialist studies towards environmental impact assessment in South Africa. This code of practice is applied in combination with SANS 10103:2008 –*'The measurement and rating of environmental noise with respect to annoyance and to speech communication'* that offer Typical Rating Levels ($L_{Req,T}$) for noise as presented in Table 4. These values should be viewed as *guidelines* of typical noise levels in the various land use zones. For the purpose of this assessment, noise levels will be assessed against the typical rating levels for noise in 'districts' (Table 4).

Table 4: Typical rating levels for noise in districts (adapted from SANS 10103:2008)

Type of District	Classification	Equivalent Continuous Rating level for Noise ($L_{Req,T}$) (dBA)		
		Outdoors		
		Day – Night ($L_{R,dn}$)	Daytime ($L_{req,d}$)	Night-time ($L_{req,n}$)
a) Rural	A	45	45	35
b) Suburban (with little road traffic)	B	50	50	40
c) Urban	C	55	55	45
d) Urban (with one or more of the following: workshops, business premises and main roads)	D	60	60	50
e) Central Business Districts	E	65	65	55
f) Industrial District	F	70	70	60

'Daytime' is defined as 06h00 to 22h00 and 'Night-time' is defined as 22h00 to 06h00. 'Day-night' is used when a full 24-hour average is taken. As stipulated by the SANS 10103:2008, noise can create an annoyance to a community or to a group of persons if the increase in average noise levels exceeds the rating level of the residual noise by quantified amounts. These noise rating levels together with estimated group responses have been presented in Table 5.

Table 5: Categories of community/group response (adapted from SANS 10103:2008)

Excess ($\Delta L_{Req,T}$)[a] dBA	Estimated Community/Group response	
	Category	Description
0 – 10	Little (Low)	Sporadic Complaints
5 – 15	Medium	Widespread Complaints
10 – 20	Strong (High)	Threats of community/group action
>15	Very Strong (High)	Vigorous community/group action

NOTE: Overlapping ranges for the excess values are given because a spread in the community reaction might be anticipated.

[a] $\Delta L_{Req,T}$ should be calculated from the appropriate of the following:

1) $L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the residual noise (determined in the absence of the specific noise under investigation);

2) $L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level of the ambient noise given in Table 1 of the code;

3) $L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from Table 2 of the code; or

4) $L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in the area because of the proposed development under investigation.

The SANS guidelines are used to identify priority areas that require the attention of the regulatory authorities. It is important to note that all such guidelines are not intended for use in prosecution, but merely serve as a *guide for action by the relevant local authority*. The guidelines are thus not directly enforceable by law, since noise regulations have not yet been promulgated under NEMA or NEMAQA in most parts of the country (including KwaZulu-Natal). Certain Metros and a few Provinces (Gauteng and Western Cape) have promulgated specific regulations after NEMAQA, but only limited (pre-NEMAQA) Municipal Bylaws remain available in Msunduzi Municipality at this stage. These by-laws are based on the old '7 decibel rule', where a noise is deemed a 'nuisance' when the noise levels are increased by more than 7dB(A) over the 'residual' noise. The problem with assessment and enforcement on this basis lies largely in the definition of 'residual' noise, which is not simple to differentiate from 'ambient' noise where a wide range of sources contribute.

The case of road traffic is a classic example, as some will argue that such noise is part of the baseline environment (since it almost continuous in nature from arterial routes; e.g. the N3 through Pietermaritzburg), whereas others may contest that this itself is a 'nuisance' since it raises 'ambient' noise levels by more than 7 dB(A) over what they would have been in the absence of the highway. Once the highway becomes accepted as part of the background, then it can no longer be argued to constitute a nuisance, even though it may raise ambient sound levels along its entire route above the suburban district guideline. Hence, the subjectivity in noise impact assessments remains largely unresolved (adapted from Van Der Merwe, 2008).

6 SOUND LEVEL MEASUREMENT METHODOLOGY

6.1 SANS Methods

The SANS 10117:2004 code of practice is purely an impact prediction model for aircraft in close proximity to the airport, which does not take into account significant extraneous noise factors (that exist across the Msunduzi Municipality), with road traffic being a major contributor. Such influences often have a greater impact on the noise experienced by a community and can even obscure aircraft noise completely beyond the airstrip itself. The community surrounding the Pietermaritzburg Airport and under the typical flight path is exposed to a combination of noise and the nuisance must be contemplated cumulatively. The SANS 10117:2004 guidelines are best applied to a greenfields (undeveloped) airport site, whereas the Pietermaritzburg Airport has been in operation for many years and is surrounded by other noise sources in a mixed urban area.

Noise nuisance surrounding the Pietermaritzburg Airport is therefore best assessed in a cumulative, community-based manner (SANS 10328:2008, p.24). The monitoring locations and area of perceived impact (land-use) are governed by the SANS 10103:2008 guidelines and not those applicable to a stand-alone airport; therefore SANS 10103:2008 methodology was considered most appropriate to this baseline sound level study.

The SANS 10103:2008 rating levels for noise in 'districts' were used as guidelines of typical noise levels that are likely to be experienced in the various land use zones. The noise environment was assessed through detailed sound level measurements, which included statistics for background and foreground noise levels. IMA have found from previous specialist studies, such as the King Shaka International Airport (KSIA) noise impact specialist studies, that better understanding of the actual noise nuisance experience by the public is obtained from this approach. Modelling aircraft noise alone, even at the relative greenfields site (where KSIA now operates) proved highly contentious and numerous surveys were ultimately required to assess the perceived aircraft nuisance holistically, using methods similar to SANS 10103:2004 (updated 2008). However, should pure aircraft modelling as detailed in SANS 10117:2004 be required in the immediate vicinity of the airport, this can be undertaken as Phase 2 of the noise impact assessment. A profile of the baseline environment under flight paths crossing Pietermaritzburg, including and observing aircraft impacts during the survey was agreed to be more important as Phase 1, and may preclude the need for any modelling. *It is important to note that no change in runway length or flight paths are anticipated, although the type of aircraft may become quieter and two additional flights are being introduced, but only during existing operating hours at this stage of the Airport Master Plan.*

The sound level assessment quantified sound pressure levels at selected monitoring sites located below the flight path across Pietermaritzburg (no further than 15km from the airport). Sound level measurements (dB(A)) were determined using an SABS calibrated Type 1 Integrating Sound Level Meter (SLM) operated by a competent person in accordance with relevant national standards, including SANS 10103:2008 – *The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication* and best international practice from experience of surveys meeting current European Union directives for environmental noise. European Union directives introduce percentile measurements; specifically L_{A10} and L_{A90} (see below). The instrument used for the sound measurement was a CEL-621C SLM manufactured by Casella-CEL (UK). The instrument holds valid SANAS Laboratory Calibration (October 2015) and was also field calibrated by the noise specialist prior to initiating measurements on various days throughout September 2016. The sound level parameters that were recorded and their application in interpretation in this study are:

- **L_{Aeq}**-The equivalent continuous sound level, normally measured on an A-weighted decibel scale. By law, the guidelines that are administered are the L_{Aeq} levels since this closely replicates the sensitivity of human hearing. The L_{Aeq} is an average of the recorded sound levels over the entire recording interval. *As the decibel scale is logarithmic, relatively high intensity, albeit short-duration sound episodes will have a significant impact on the L_{Aeq}.*
- **L_{Amax}** - The maximum sound pressure level of a noise event, normally measured on a weighted decibel scale. L_{Amax} is the loudest sound interval recorded, and gives an idea of the loudest instantaneous peak that occurs.
- **L_{Amin}**- This is the lowest instantaneous sound pressure level in decibels with a specified frequency weighting and time weighting. The L_{Amin} shows the lowest levels recorded throughout the survey or the quietest moment over the survey at each site.
- **L_{A90}** - This parameter indicates the sound levels the receiving environment is exposed to 90% of the time. This can be equated to the continuous sound levels present during the survey (those that occur for 90% of the run) as it excludes the loudest events. Colloquially referred to as the ‘background sound’.
- **L_{A10}** - This parameter indicates the sound levels that the receiving environment will be exposed to 10% of the time and describes only the loudest sounds measured. As the dB scale is logarithmic, the influence of the louder sounds is therefore far more imposing. This illustrates the effect of impact noise or noisy events during the run period.

6.2 Monitoring Sites

No specific zone levels have been defined for the Msunduzi Municipality and hence the typical rating levels for noise in districts as provided in Table 4 (summary from SANS 10103:2008) were used to benchmark results. It is important to note that only the L_{Aeq} can be compared *directly* with these guidelines, although other parameters were also compared with the district guidelines to assist in *interpretation of results*. The applicable districts for this survey were determined based on the relevant land-use as a guideline.

Seventeen[4] monitoring sites were strategically selected from the identified receptors, where measurements were taken whilst aircraft were landing or taking-off, and with no aircraft operation to offer comparison (typical baseline). Monitoring sites were selected according to the following criteria:

Aircraft-related

- Proximity to the airport runway;
- Proximity to the typical flight path;
- Altitude of aircraft over terrain; and
- Take-off versus landing versus altitude (flight trajectory and thrust requirement).

Receptor-related

- Physical characteristics at receptor site (terrain, baseline noise environment);
- Land-use classification (similar to town planning scheme);
- Receptor sensitivity (residential, schools and high population areas etc.); and
- Engagement with Interested and Affected Parties (I&APs) (undertaken during the Scoping Phase of the EIA).

Measurements were taken over working days of the week and some weekends (weather-permitting). Monitoring times were determined according to the flight schedule (Table 1). Where possible, all ten (10) flights (five landing, five taking-off) were recorded over a 15-minute measurement period at each monitoring location to monitor the impact during an entire day-time period. A background (no flight) reading was also taken as a baseline before or after the flight had passed. Notes were taken to differentiate the noise contribution between flights and extraneous noise (e.g. from road traffic, barking dogs, people talking, wind in trees, etc.). This was required as the measured peak (L_{Amax}) at many sites *did not correspond with aircraft flyover*, so the skilled operator was required to note the 'aircraft peak impact' specifically during the SLM run which was focused on each aircraft event, but was not limited to this source.

As mentioned previously, SANS 10103:2008 defines the daytime period to be between 06h00 and 22h00 and the night-time period to be between 22h00 and 06h00 as reference time intervals, during which samples are taken as applicable. All sites were monitored during daytime hours (since all flights occur during the daytime reference interval); therefore, only the daytime guidelines were required for comparison.

6.3 Impact of Weather

Wind speeds greater than 5m/s can impact on the sound level meter and meaningful measurements cannot be obtained, even with use of the SLM windshield. The sound level meter can compensate (muffle) winds, but only up to maximum of 5 m/s, when wind noise typically becomes a major component of the recorded statistics. Propagation of sound energy varies greatly with the presence of wind, which can either 'blow away' sound energy or can 'carry it' towards a receptor in a manner that skews results. Surveys should therefore ideally be taken in relatively calm conditions (< 5 m/s) *unless the effect of wind is the focus of the study*. Similarly, measurements cannot be undertaken during wet weather conditions as rainfall not only obscures results, but can also damage the sensitive microphone.

During this study, the weather limited certain day-time monitoring to half days. Strong winds in the mornings and rainstorms in the evenings were experienced during some days of September 2016. Other days had to be ruled-out for monitoring altogether owing to rain or excessively high wind conditions (Berg winds). The month of September with the onset of spring is characterised by the repetitive passage of cool frontal systems interspersed with Berg wind weather conditions; neither of which are ideal for sound level monitoring.

[4] The number of monitoring sites was restricted by inclement weather (see Section 5.3) and time constraints imposed by the client.

Nonetheless, due to time constraints from the client, the appointment to undertake the noise monitoring exercise was restricted to the month of September 2016. All calm, dry days (largely through the first two weeks of September 2016) were used to complete the survey as best practically possible. Weather conditions during the latter part of the month were less favourable, requiring survey days to be selected carefully, to remain accordance with SANS 10328:2008.

7 SURVEY RESULTS AND DISCUSSION

The sound levels (L_{Aeq} and 'instant peak aircraft') recorded during each of the measurement events are presented in Table 6 and Table 7 (detailed table which also includes L_{Aeq}, L_{Amax} and LA_{10} in Appendix A). Given that there are no formalized (legally-enforceable) standards for noise, the colour-coding of green, amber and red offer a visual, ranked interpretation based on a combination of how the L_{Aeq}, L_{A90} and observed 'instant peak aircraft' sound levels compare with the relevant (or most appropriate) land-use guideline values offered in SANS 10103:2008. This highly conservative classification is as follows:

1. Green – measured value less than SANS land-use guideline;
2. Amber – measured value more than, but less than 5 dB above SANS land-use guideline; and
3. Red – measured value more than, and greater than 5 dB above SANS land-use guideline.

Whilst the significance of green and red codes are obvious, the reason for incorporating an amber (intermediate) class is because the L_{Aeq} and the L_{A90} represent composite statistical values that are easily influenced by a wide range of noise sources; i.e. could be elevated owing to a particularly busy road traffic noise or the wind on some days. As such, caution must be exercised in any assumption that 'non-compliance' of the L_{Aeq} (especially, as the L_{A90} is a better representation of constant sound levels during the 15-min measurement run) constitutes aircraft impact. There is no doubt that the 'aircraft peak' raises the L_{Aeq} in many instances, *but it is often not the key source* which created the transgression of land-use guidelines in a time-weighted average (TWA), since all noise measured (as opposed to modelled) is cumulative. Road traffic was the most common observed cause where L_{Aeq} was measured above the district guideline, although even barking dogs and wind through trees in a quiet suburban district can transgress district guidelines during a 15-minute measurement.

Subjective operator assessment on review of the 'hard data' was incorporated to generate an overall colour-coding with 'low/medium/high' rank of aircraft impact at each site, based on a comparison of the three colour-coded parameters; i.e. L_{Aeq} vs L_{A90} vs instant peak aircraft. The L_{A10} and L_{Amax} are not used in the evaluation of results initially, since they may not represent the actual aircraft impact at all, but are often related to other noise sources – variable road traffic (noisy vehicles) being the most common cause of noise nuisance observed during the survey.

SANS land-use classification is also colour-coded for ease of reference, whilst the pale blue rows in the SLM data section indicates that more measurements may be required at these sites; i.e. measurements were compromised by changing weather patterns that did not allow for conclusive numerical results (but suggest a *possible* noise nuisance). It was challenging to complete the survey in the short space of time provided because of the onset of spring weather conditions. However, all reasonable efforts were made to cover key impact areas and ensure that measurements were representative with input from the SLM operators – all of whom are skilled in noise observation. The baseline measurement rows (distinguished by a diagonal hatch pattern) have also been included to make the actual flight (aircraft impact) measurements more prominent.

Table 6: Recorded sound levels L_{Aeq} vs Instant Peak due to Aircraft (dB(A)) Sites 1-8

	1		2		3		4		5		6		7		8	
Date	03 September 2016		04 September 2016		05 September 2016		06 September 2016		07 September 2016		08 September 2016		09 September 2016		11 September 2016	
Day	Saturday		Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Sunday	
Suburb	Oribi		Oribi		Hilton		Bisley		Bisley		Bisley		Bisley		Hilton	
Address	Globe Road		Oribi Road		Grace College School		Ukulinga School/Crèche		Lindas Jack and Jill Crèche		Bisley School		Azalia Gardens Retirement Village		Flamingo Drive	
GPS Co-ordinate	29.64228 S 30.40175 E		29.64881 S 30.39283 E		29.53499 S 30.29838 E		29.64116 S 30.39442 E		29.64337 S 30.39088 E		29.64066 S 30.39303 E		29.636235 S 30.38399 E		29.55533 S 30.30889 E	
Elevation (m)	709		725		1143		711		696		702		685		1103	
LandUse Zone	Suburban (little road traffic)		Urban (with road traffic)		Urban (with road traffic)		Urban (with road traffic)		Urban (with road traffic)		Urban (with road traffic)		Urban (with main roads)		Suburban (little road traffic)	
Relevant SANS Guideline	50		55		55		55		55		55		60		50	
Aircraft Impact	LOW		LOW		LOW		HIGH		MEDIUM		HIGH		MEDIUM		LOW	
Parameter	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft
06:45	-	-	-	-	55.7	57.1	64.9	79.0	61.4	69.0	68.6	82.0	65.3	74.0	-	-
Background	-	-	-	-	54.7	-	50.2	-	59.6	-	53.8	-	63.6	-	-	-
08:00	-	-	-	-	56.5	56.0	54.7	56.0	58.9	56.0	59.8	63.0	61.0	60.0	-	-
Background	-	-	-	-	52.7	-	44.5	-	55.3	-	57.0		-	-	-	-
08:45	50.4	61.1	-	-	51.6	52.0	64.1	80.0	64.1	76.0	66.9	80.0	58.4	76.0	-	-
Background	49.6	-	47.9	-	44.0	-	44.6	-	55.2	-	-	-	59.7	-	46.0	-
13:15	51.7	*	53.4	47.0	46.7	52.9	55.7	57.0	54.6	54.0	62.3	62.0	61.9	56.0	*	-
Background	47.5	-	53.6	-	45.0	-	52.4	-	55.4	-	56.6		62.5	-	-	-
13:50	49.7	54.0	56.2	53.0	46.5	53.6	60.8	72.0	53.9	56.0	67.6	67.0	61.4	???	47.5	53.2
16:30	-	-	50.8	47.3	49.2	55.8	57.3	59.0	59.1	58.2	66.7	57.0	Rain		*	-
Background	-	-	49.0	-	47.8	-	-	-	51.6	-	61.4	-			-	-
17:00	-	-	53.4	61.0	46.2	54.0	64.6	72.0	58.0	64.0	63.7	75.0	Rain		44.0	55.0
Background	-	-	48.1	-	48.1		51.2		59.2	-	61.6				64.9	-
18:00	-	-	45.1	51.0	49.3	56.3	56.0	62.0	41.5	57.0	61.2	57.0	Rain		50.2	57.0
18:25	-	-	-	-	46.7	58.3	62.0	68.0	57.5	65.0	64.7	74.0	Rain		-	-
Background	-	-	-	-	46.0	-	51.8	-	52.7	-	58.4	-			54.7	-
19:15	-	-	-	-	47.5	54.0	55.7	56.0	55.4	57.0	58.3	60.0	Rain		-	-

Please Note the following:

- For ease of interpretation and visual analysis, some background monitoring surveys have been omitted
- * Aircraft landed/took-off in other direction, thus no disturbance
- # Flight cancelled due to delays in JHB
- Sub-urban (little road traffic); Urban with road traffic; Urban with main road (SANS land-use code shading)
- Low Impact; Medium Impact; High Impact (impact code shading)

Table 7: Recorded sound levels L_{Aeq} vs Instant Peak due to Aircraft (dB(A)) Sites 9-17

	9		10		11		12		13		14		15		16		17	
Date	12 September 2016		14 September 2016		15 September 2016		16 September 2016		16 September 2016		19 September 2016		20 September 2016		21 September 2016		29 September 2016	
Day	Monday		Wednesday		Thursday		Friday		Friday		Monday		Tuesday		Wednesday		Thursday	
Suburb	Wembley		Clarendon		Clarendon		Clarendon		Mkondeni		Hilton		Hilton		Pelham		Wembley	
Address	5 Orchard Circle		The Wykeham Collegiate School		Villiers Drive		Clarendon School, Roberts Road		Murray Road, Mkondeni		CnrMonzali Drive and William Younger		Worlds View		Girls High School, Alexander Road		9 Wylie Crescent	
GPS Co-ordinate	29.59300 S 30.34628 E		29.60060 S 30.35033 E		29.60401 S 30.35807 E		29.60016 S 30.35835 E		29.65656 S 30.40388 E		29.54507 S 30.31098		29.57837 S 30.32706 E		29.37574 S 30.38502 E		29.58939 S 30.34492 E	
Elevation (m)	816		817		740		706		753		1114		1078		668		828	
LandUse Zone	Suburban (little road traffic)		Urban (with road traffic)		Suburban (little road traffic)		Urban (with road traffic)		Urban (with main roads)		Suburban (little road traffic)		Suburban (little road traffic)		Urban (with main roads)		Suburban (little road traffic)	
Relevant SANS Guideline	50		55		50		55		60		50		50		60		50	
Aircraft Impact	MEDIUM		LOW		MEDIUM		MEDIUM		MEDIUM		LOW		LOW		LOW		MEDIUM	
Parameter	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft	LAeq	Instant Peak Aircraft
06:45	Wind	-	-	-	58.5	62.0	68.2	69.0	-	-	55.3	58.0	47.0	51.0	67.3	68.0	54.9	65.0
Background	-	-	-	-	59.1	-	66.6	-	-	-	54.5	-	46.6	-	66.7	-	54.0	
08:00	Wind	-	57.6	56.0	56.2	60.0	64.5	60.0	-	-	51.4	*	48.5	60.0	65.5	*	52.1	61.5
Background	-	-	55.4	-	58.4		62.9		-	-	50.5	-	46.0	-	65.8	-	47.5	
08:45	Wind	-	54.7	*	49.8	*	61.0	70.0	-	-	48.9	*	42.6	43.0	64.9	57.0	50.9	61.7
Background	50.1	-	53.5	-	-	-	-	-	-	-	-	-	-	-	64.1	-	58.7	
13:15	60.8	56.0	55.9	58.0	50.4	*	63.4	*			43.1	*	43.3	51.0	65.1	56.0	44.1	60.0
Background	-	-	53.5	-	48.4	-	63.2	-	-	-	47.3	-	40.8	-	-	-		
13:50	52.4	43.0	55.5	*	51.7	57.0	63.7	63.0	-	-	49.3	55.0	39.6	*	64.0	56.0	55.2	62.2
16:30	57.3	54.0	57.2	62.0	55.0	59.0	-	-	62.3	50.0	52.9	60.0	48.7	54.0	-	-		#
Background	64.6	-	56.6	-	54.8	-	-	-	62.5	-	45.8	-	47.2	-	-	-		
17:00	51.2	57.5	57.3	*	56.4	*	-	-	70.0	84.0	46.7	*	50.8	*	-	-		#
Background	56.0	-	-	-	57.7	-	-	-	-	-	46.8	-	57.1	-	-	-	46.1	
18:00	*	-	-	-	57.4	57.0	-	-	-	-	47.0	53.0	-	-	-	-	55.0	60.3
18:25	*	-	-	-	57.5	68.0	-	-	-	-	-	-	-	-	-	-	55.5	67.0
Background	62.0	-	-	-	55.1	-	-	-	-	-	40.7	-	-	-	-	-	56.1	
19:15	51.8	61.1	-	-	55.8	60.0	-	-	-	-	-	-	-	-	-	-	55.5	63.0

Please Note the following:

- For ease of interpretation and visual analysis, some background monitoring surveys have been omitted
- * Aircraft landed/took-off in other direction, thus no disturbance
- # Flight cancelled due to delays in JHB
- **Sub-urban (little road traffic)**; **Urban with road traffic**; **Urban with main road** (SANS land-use code shading)
- **Low Impact**; **Medium Impact**; **High Impact** (impact code shading)

The hard data correlate well with on-site observations. For example, Bisley Primary School and Ukulinga Crèche were the only two sites that showed a ‘High’ aircraft impact classification, which is confirmed by interviews conducted at the schools. It is important to note that there are several other noise sources at most monitoring sites, such that the background noise sources can be greater than the instant peak from the aircraft. The full set of colour-coded results along with the field observations should be examined carefully to understand why the aircraft impact has been ranked as above, since all statistics and observations were discussed by the survey team to develop this ranking. A net ranking of ‘High’, ‘Medium’ or ‘Low’ relates to the comparison between various statistics and the SANS land-use code, verified and moderated to some extent on a subjective (observed) evaluation, which must also be considered as supporting evidence in the assessment of any claimed ‘nuisance’.

The average morning, noon and evening sound level measurements (L_{Aeq}) are presented spatially in Figures 3, 4 and 5 respectively using coloured symbols to indicate the comparative sound level range at each site. These are plotted as absolute values to offer a spatial pattern, and are not related to compliance or otherwise with varying SANS district standards, except for the final ‘Aircraft Noise’ plot (Figure 6), which takes all factors into account (as described above).

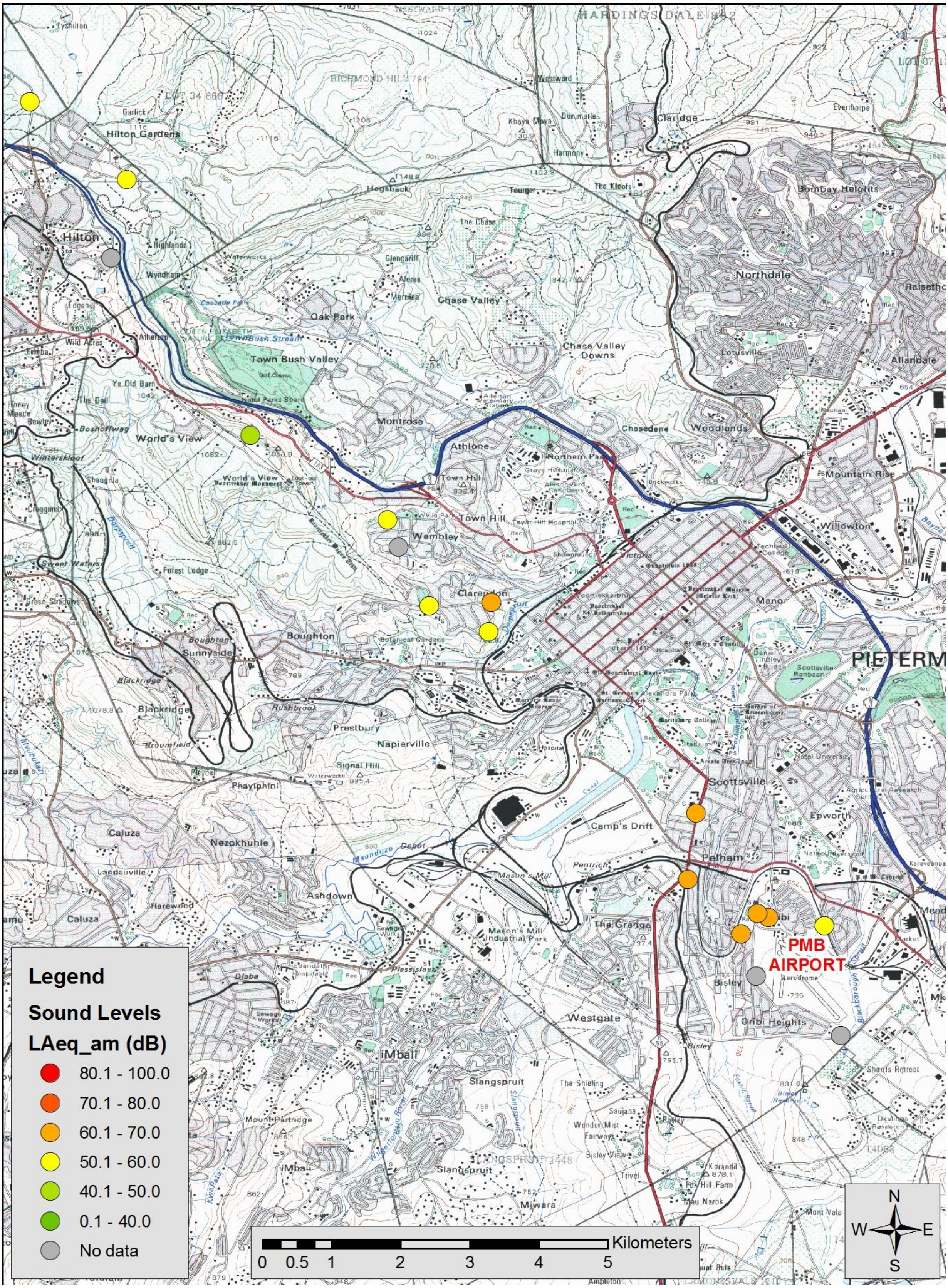

Figure 3: Spatial representation of ambient sound levels (LAeq) at select monitoring locations during morning hours (06h00-09h15).

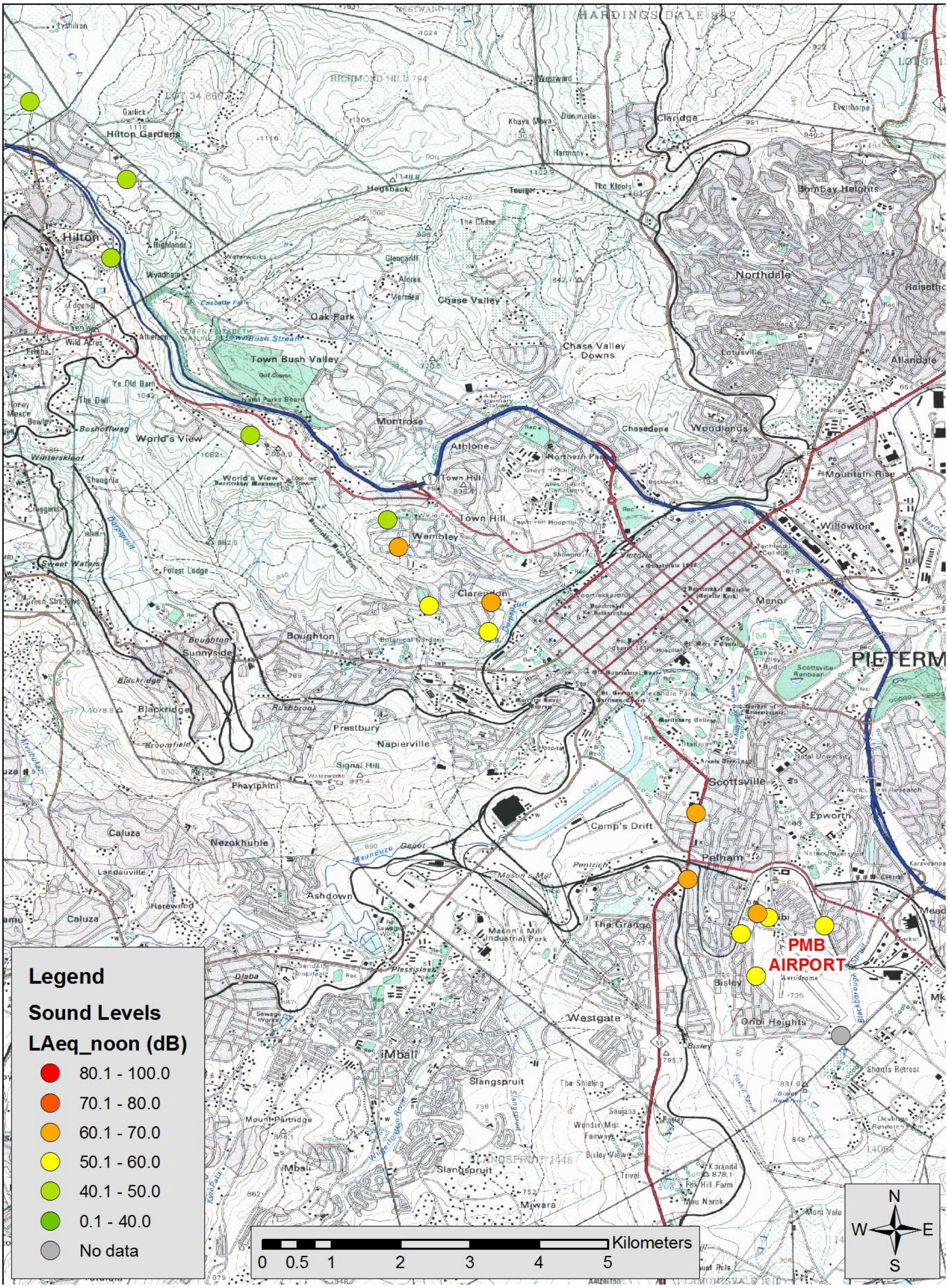

Figure 4: Spatial representation of ambient sound levels (LAeq) at select monitoring locations during noon (early afternoon) hours (12h45-14h00).

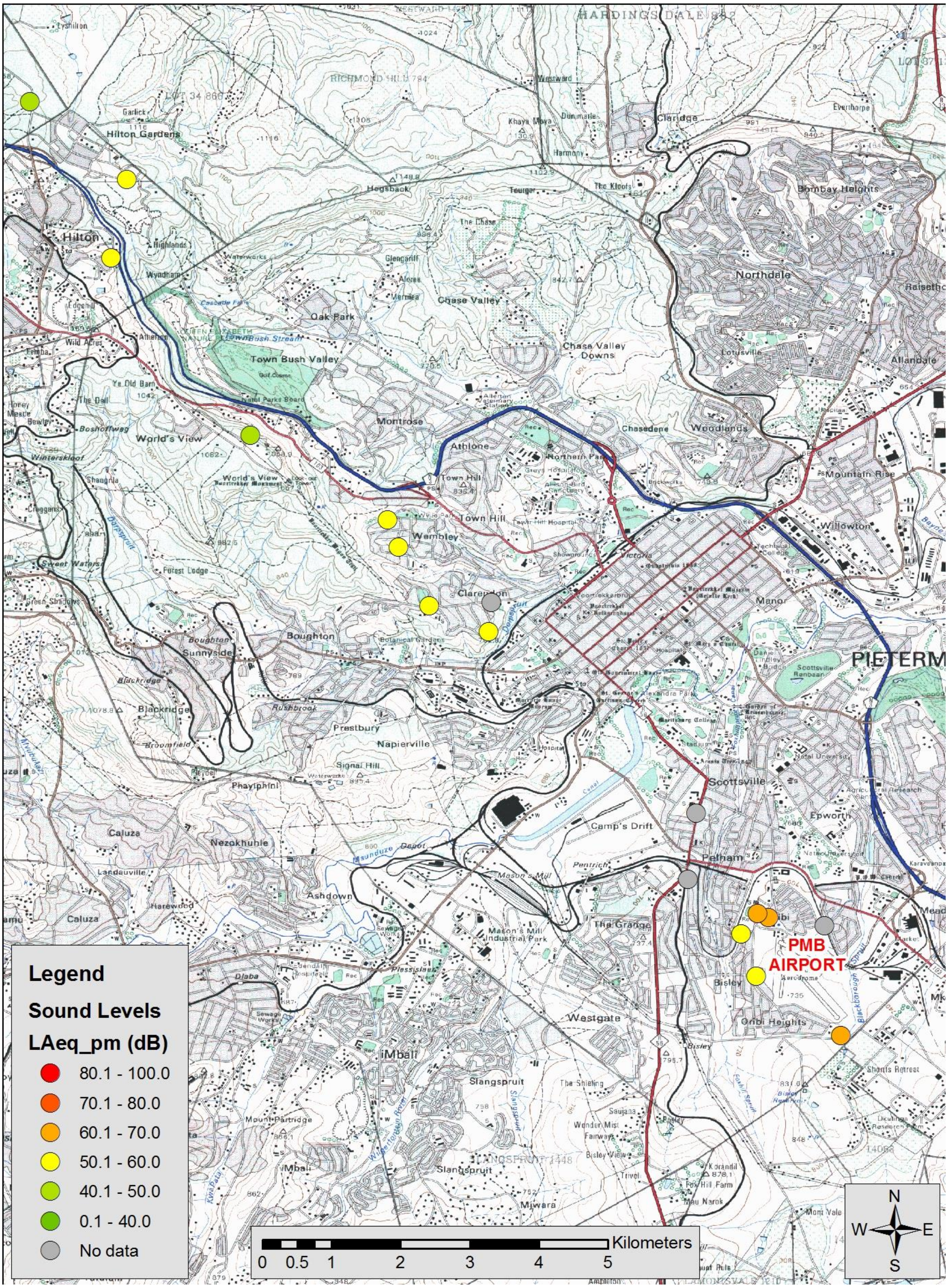

Figure 5: Spatial representation of ambient sound levels (LAeq) at select monitoring locations during evening hours (16h00-21h00).

L_{Aeq} was used for interpretation in the Tables as considered by the SANS method. There are several other noise sources at each monitoring point. Often the non-aircraft noise sources are greater than the instant peak from the aircraft. It is pertinent that L_{Amax} was *always* greater than the observed 'instant peak aircraft' noise, whilst even L_{A10} was higher than the 'instant peak aircraft' noise on approximately 40% of all flyovers (indicating that the aircraft noise did not contribute significantly to the highest 10% of the measured noise environment, even though the flyover did occur during the run).

Low sound level (range of 1 - 50 dB) measurements and zones have been indicated by green dots. Medium sound level (range of 50 – 70 dB) measurements and zones have been indicated by yellow and light orange dots while high sound level measurements and zones have been indicated by dark orange and red dots (range of 70-100 dB).

The L_{Aeq} at all monitoring sites for all monitoring periods (morning, noon and evening) remained below 70 dB. Morning and evening periods tend to be noisier in suburban and urban areas. The overall environment (L_{Aeq}) is quieter at noon than in the morning or evening, even including aircraft noise. This shows the influence of road traffic during commuting hours. Typically traffic peaks during 07h00 - 08h30 and 16h00-17h30. Spatially, the suburbs of Hilton and World's View are generally quietest, Bisley clearly noisiest, whilst Clarendon and Wembley are moderately noisy when compared with the other suburbs.

It was found that neither L_{Amax} nor L_{A10} measure the aircraft peak accurately given the very short noise influence from the aircraft (typically 20 – 30 seconds only). Therefore, personal observation of the aircraft peak on the sound level meter (L_{AF}) was carefully documented at each site on field logs by the operator. Such methodology can be considered more useful than the longer-term (even L_{A10} equates to 90 seconds, versus approximately 30 seconds of audible aircraft noise, which also varies during that period) statistics produced by the sound level meter as actual observed data at the time of maximum influence is noted. This being said, the comparison of aircraft peak impact (observed) and L_{A90} (measured) alone offers a useful 'rule of thumb' for this aircraft impact assessment; possibly more so than any L_{Aeq} figures in isolation.

The highest (maximum reading available, if more than one reading was available at each site for each time period / set of flights) morning, noon and evening aircraft peak has been presented spatially in Figures 6, 7 and 8 respectively using coloured symbols to indicate the comparative sound level range at each site. Low sound level (range of 1 - 50 dB) measurements and zones have been indicated by green dots, medium sound level (range of 50 – 70 dB) measurements and zones have been indicated by yellow and light orange dots whilst high sound level measurements and zones have been indicated by dark orange and red dots (range of 70 – 100 dB).

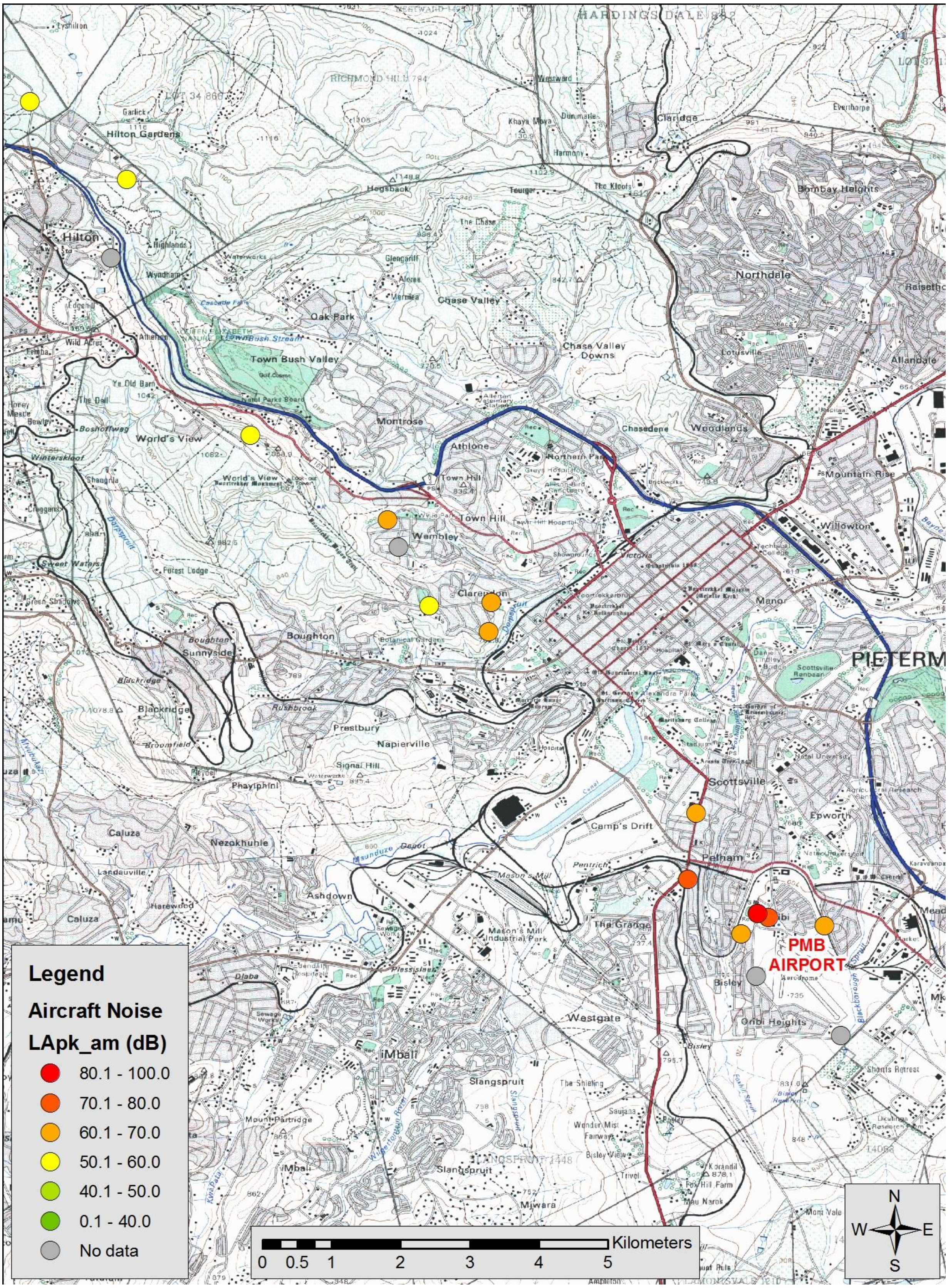

Figure 6: Spatial representation of aircraft instant peak noise levels at select monitoring locations during morning hours (06h00-09h15).

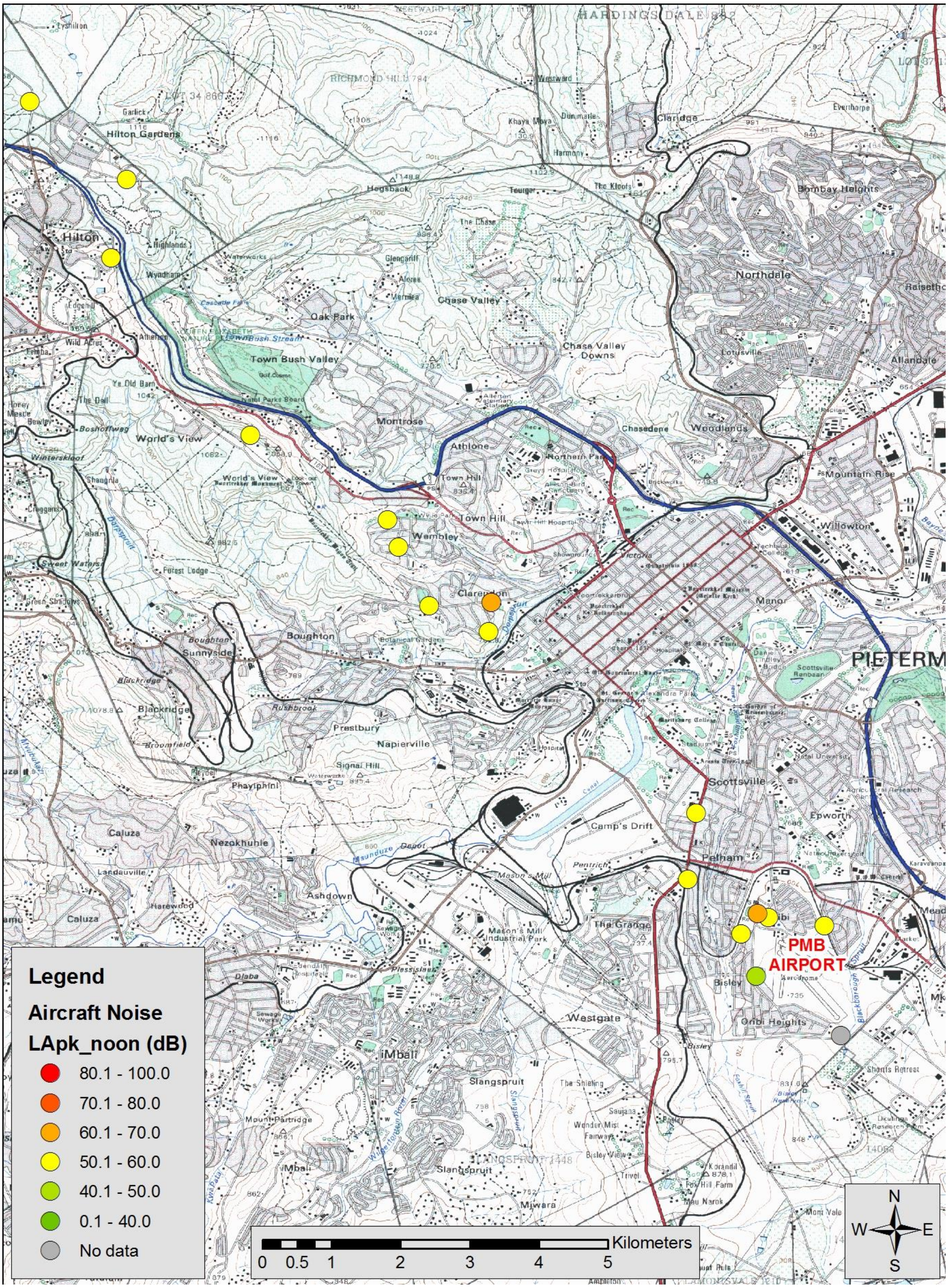

Figure 7: Spatial representation of aircraft instant peak noise levels at select monitoring locations during noon (early afternoon) hours (12h45-14h00).

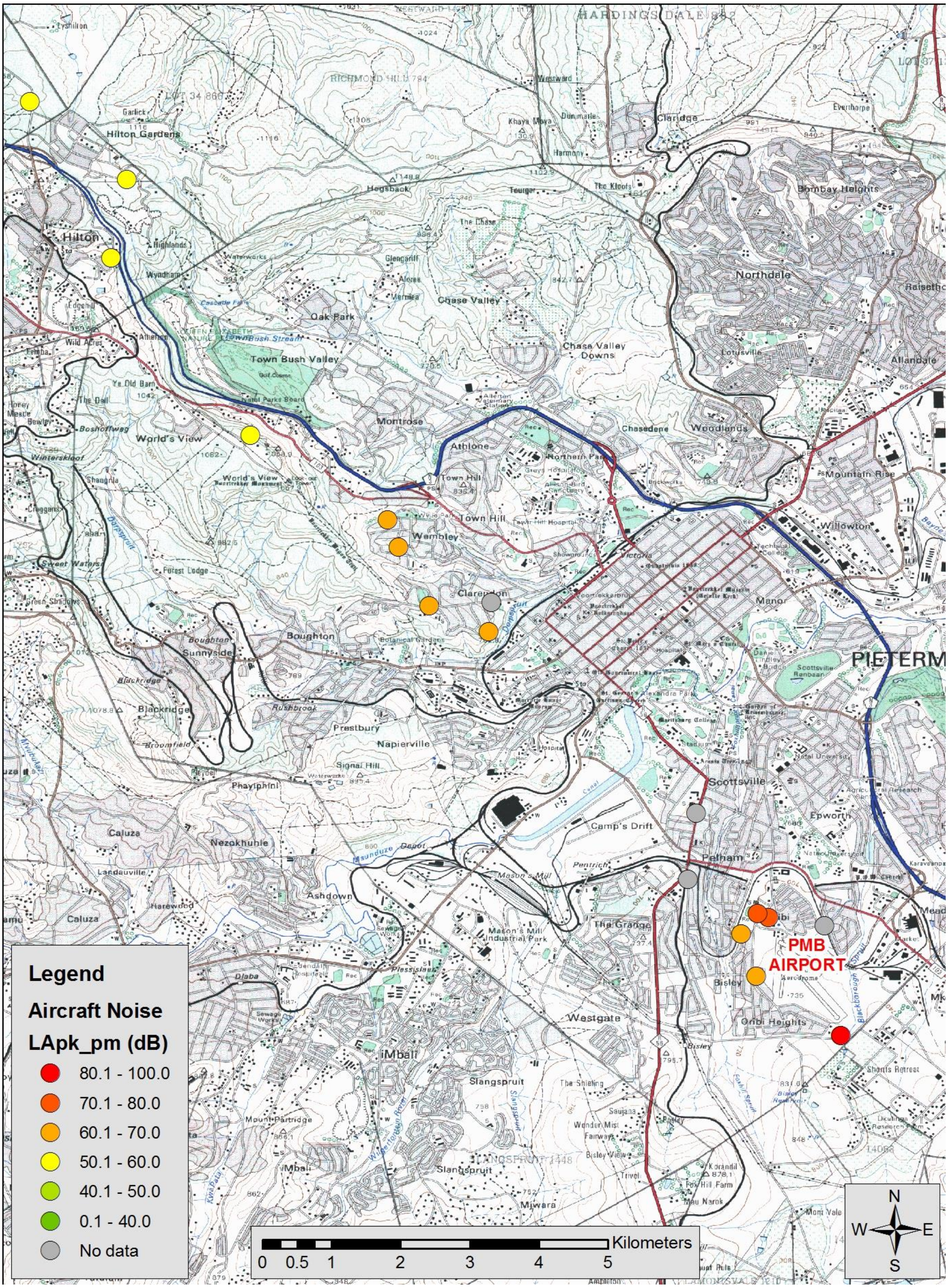

Figure 8: Spatial representation of aircraft instant peak noise levels at select monitoring locations during evening hours (16h15-21h00).

The instant peak from the aircraft at all monitoring sites for all monitoring periods (morning, noon and evening) remained below 70 dB with the *notable exception of the Bisley area*. The monitoring points at the north and south ends of the runway are evidently (and logically) the most severely impacted. This is typically when the aircraft is at its lowest height above the ground and initiating maximum forward thrust (take-off) or reverse thrust (landing). Interestingly, the monitoring points east and west of the runway did not produce high impact readings as aircraft taxiing noise does not seem to greatly affect the acoustic environment. Furthermore, buildings between the airport and the nearest receptor tend to absorb (attenuate) noise from the aircraft while on the ground as described in Section 3.2. More buildings in and around the airport as envisaged in Phase 1 of the Airport Expansion Master Plan may therefore assist in attenuating local noise impacts further.

Morning and evening periods tend to be noisier in suburban and urban areas. The overall environment (L_{Aeq}) is quieter at noon than in the morning or evening, even including aircraft noise. This shows the dominance of road traffic during commuting hours. Typically, traffic peaks during 07h00 - 08h30 and 16h00-17h30. Spatially, Hilton and World’s View remain the quietest suburbs, Bisley remains noisiest suburb (also because of constant heavy road traffic combining with intermittent aircraft noise), whilst Clarendon and Wembley are still moderately noisy in comparison with the other suburbs. Clarendon has the noisier baseline environment of the latter two suburbs, since there is relatively heavy traffic on Roberts Road, whereas parts of Wembley have a quieter baseline environment so aircraft noise impact is *relatively* significant.

As mentioned, it was noted from early in the survey how limited is the duration of aircraft noise events, which only persist for a matter of 20 to 30 seconds (out of 15-min) and can vary, even at the same location, dependent upon extraneous factors such as wind direction, cloud cover and blanket noise from other sources. Sometimes, at locations further away from the Pietermaritzburg Airport, the aircraft is visible aloft but *barely audible* as it goes overhead. This is possible when strong vertical wind shear takes the elevated aircraft noise in another direction rather than it propagating uniformly downwards in the theoretical cone shape. This phenomena is also more common when the aircraft is early in its landing descent, with elevation still high and no major engine thrust being required (almost gliding); in contrast to take-off, when full thrust is always required throughout the ascent over Pietermaritzburg (therefore mostly audible).

The overall predicted sound level impact (net evaluation) has been presented spatially in Figure 8 using coloured symbols to indicate the comparative noise nuisance at each site. The method of evaluation of the data to produce the overall impact output map took into account all of the following criteria:

- L_{Aeq}, L_{Amin}, L_{A90}, L_{A10}, L_{Amax}
- Personally observed ‘instant peak aircraft noise’
- Field observations and log sheet information
- Interviews with local residents/school staff where relevant

The operator was cognizant of where they were standing on a selected site, recorded personal observations and conducted informal interviews (where possible) with the residents or school staff to establish the noisiest area and time of greatest impact from the aircraft. Therefore, both objective (analytical) and subjective (personal) information were used to obtain the final output with a weighting of approximately 70% (analytical) to 30% (personal) respectively. This methodology was also found to be the most accepted way forward for the KSIA Noise Impact Assessment – several surveys were conducted from 2007 to 2012 by independent specialists and are ongoing at two fixed sites by ACSA, who have invested in more advanced sound level monitoring instrumentation to meet ICAO requirements for an international airport. In contrast, Pietermaritzburg is a small local airport, but the approach taken in Phase 1 of this assessment has also focused on community impacts using experience gained from KSIA, where desktop-modelled outputs were not readily accepted by the Interested and Affected Parties.

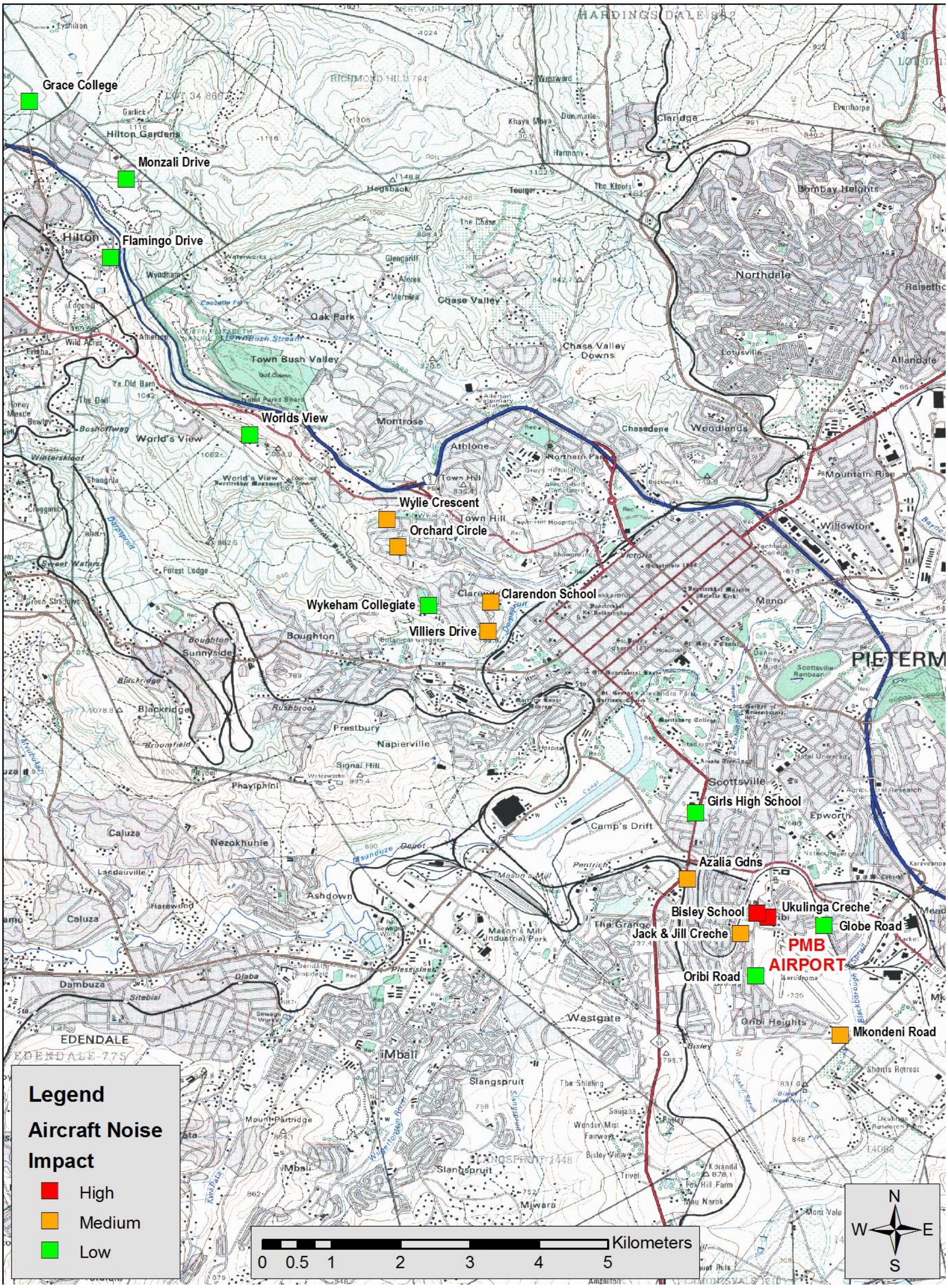

Figure 9: Spatial representation of integrated aircraft noise impact assessment (net evaluation, as described above and colour-coded in Table 6 and Appendix 1) at monitoring locations.

Bisley (close to the north-end of the runway), and to a lesser extent Clarendon and Wembley (directly under the departure and approach flight paths) show up clearly as the primary and secondary noise impact sites respectively. Bisley is thus graded ‘High’ in terms of aircraft noise impact, as the aircraft generate a significant amount of noise at take-off and landing. Whilst the maximum duration of exposure to this is 20- 30 seconds, it does affect speech communication close to the runway. In contrast, whilst the aircraft noise is discernable at Clarendon (between road traffic) and at Wembley (being an otherwise quiet suburb), the flyover does not interfere with outside speech communication at normal distances (from one person to another).

When comparing the L_{Aeq} maps (Figures 3, 4 and 5) depicting noise zones of the ‘holistic/baseline noise environment’ against the derived ‘aircraft impact noise environment’ zones (Figure 8), the maps appear quite different owing to the cumulative interference of road traffic noise at many of the survey sites. This is somewhat mitigated by use of the appropriate SANS land-use guideline values as the benchmark, which allows more noise in urban areas and especially along main roads. Zoning of the baseline environment is also why no monitoring was conducted in the central business district (CBD), as although the aircraft fly over the western portion of the CBD regularly, the complex baseline environment obscures aircraft noise such that it becomes largely indiscernible.

It was initially hoped to produce a spatial interpolation output (noise contours) of the impact from aircraft, this ultimately became unscientific to produce isopleths from the linear distribution of monitoring points created by the survey focus on most commonly used flightpaths (largely linear; refer Fig.1 p.13). Such output would be produced more typically through the use of an aircraft-specific noise propagation model as described in SANS 10117:2008, but only for the “immediate vicinity” of the airport as the urban *noise environment becomes too complex beyond a few kilometres* (SANS 10328:2008, p.24 8.3.1.3 Air traffic NOTE 2). It has been found in previous studies that the noise environment and potential nuisance experienced by communities on the ground do not correlate well with a mathematical model in such a complex urban environment. The accuracy of a model would improve for a greenfields site on a relatively homogenous landscape (i.e. similar land uses, land cover and less complex terrain across the modelling domain).

8 DATA INTERPRETATION

With a continuous process (noise source), acoustic specialists will often use the L_{A90} or the L_{Amin} to be more representative of the impact than the L_{Aeq}; the latter being easily distorted by even a short-duration interference such as a passing vehicle, aircraft flyover or even a barking dog. However, examination of the spread of these statistics within each run gives an idea of the nature of the noise being experienced:

- If the markers representing each measurement run are widely spaced across the dB(A) scale, it tends to indicate a quieter baseline environment with intermittent loud noises (‘impulse sound’ or ‘events’).
- The condition of the baseline environment is also described by the position of the L_{Aeq} relative to the SANS district guideline.
- If the markers are clustered at the bottom end of the dB(A) scale, the environment is generally quiet with little impact of intermittent loud noises.
- If the markers are clustered near the top end of the dB(A) scale, the steady state noise levels are high.

The following graphs (Figures 10 and 11) illustrate the variation in intensity of the sound pressure levels for each of the sound level parameters recorded at two important, but distinctly contrasting monitoring locations (both schools).

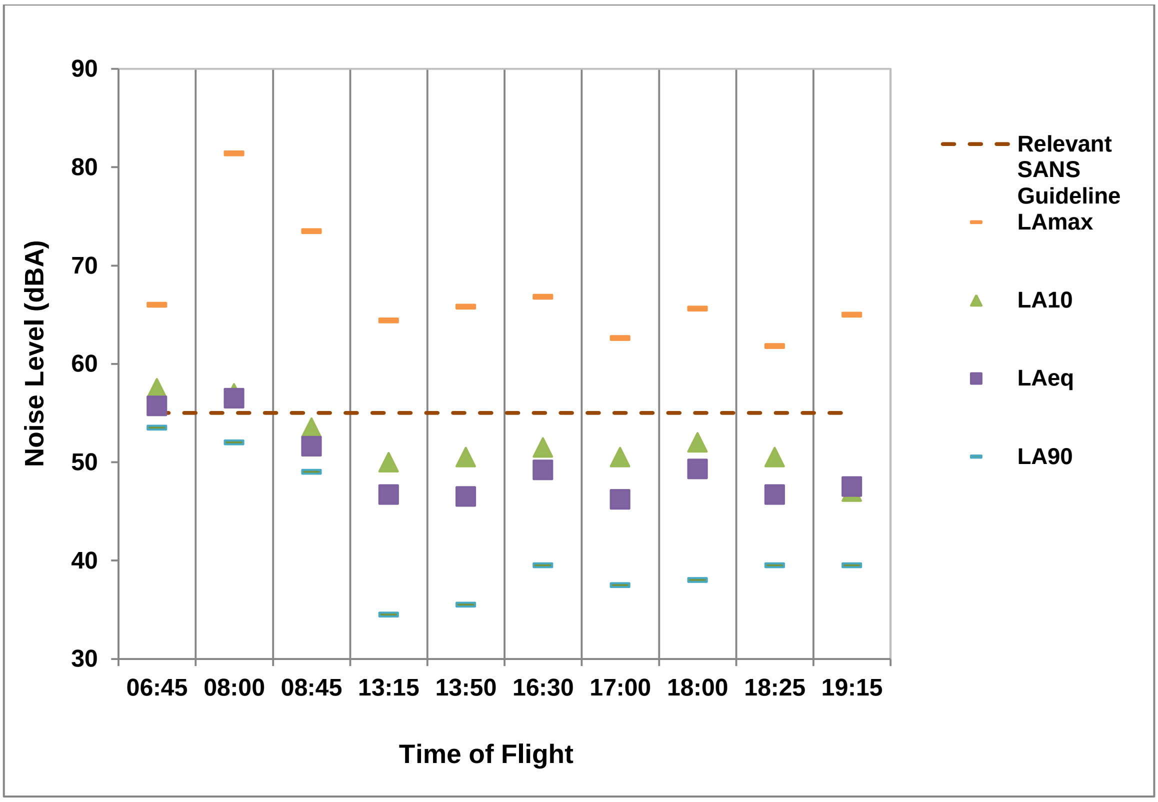

Figure 10: Graphical representation of the sound levels recorded during each of the scheduled commercial flights at Grace College School.

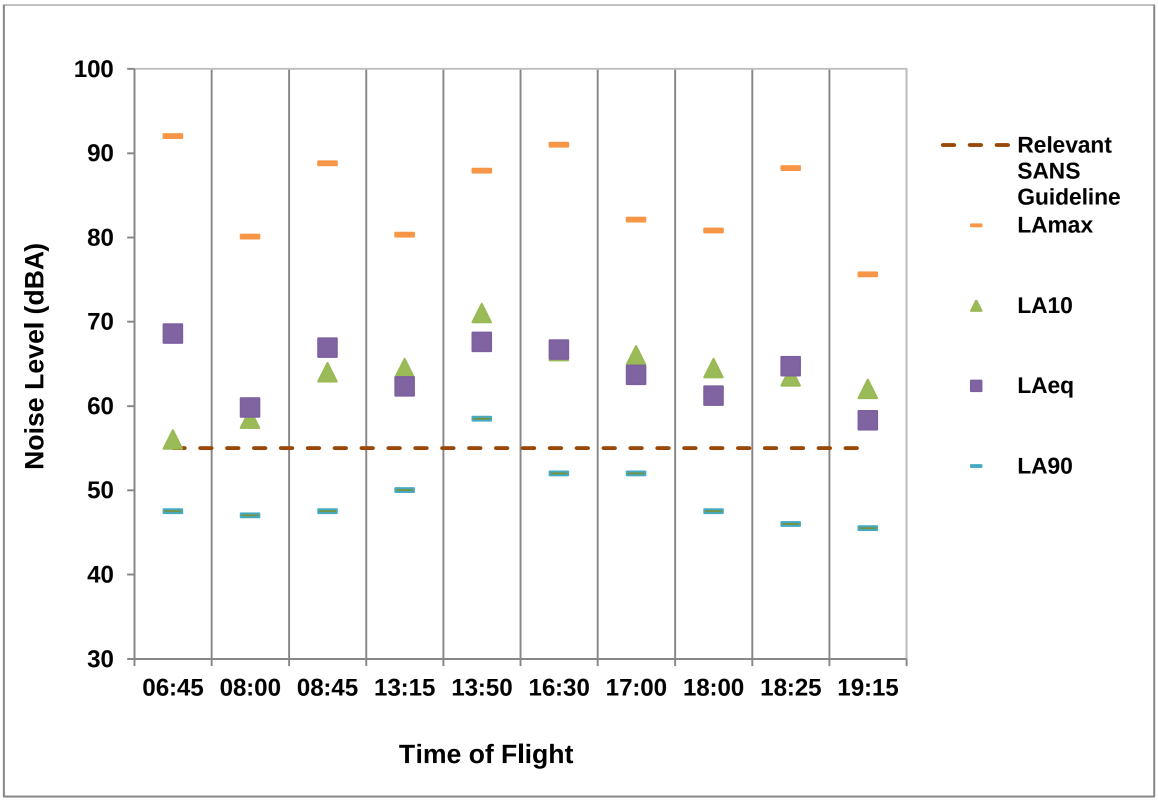

Figure 11: Graphical representation of the sound levels recorded during each of the scheduled commercial flights at Bisley School.

Based on the information presented in Figure 10 and 11, the following is relevant for the commercial flight monitoring periods:

- Given that the markers representing each measurement run for both Grace College and Bisley Schools are widely spaced across the dB(A) scale, it indicates a relatively quieter background environment with intermittent loud noises, characteristic of a school environment when classes are in session.
- However, whilst both plots show a wide range of sound levels (wide spread of markers), the L_{Aeq} and spread of statistics for Grace College lie almost entirely below the relevant SANS guideline whereas the spread of statistics for Bisley School sit almost entirely above the SANS guideline.
- The steady state ambient sound levels (L_{Aeq}) at the Grace College monitoring site were mostly below the SANS urban day-time guideline of 55 dB(A) with the exception of the two early morning recordings. The noisiest time of day is typically during the morning traffic commute between 06h00 and 08h15.
- The steady state ambient sound levels (L_{Aeq}) at the Bisley School monitoring site were all above the SANS urban day-time guideline of 55 dB(A).
- Whilst strictly speaking, only the L_{Aeq} should be compared directly with the SANS district guideline, it is conspicuous and makes clear case of noise nuisance that all statistics except for L_{A90} are above the recommended threshold at Bisley School. This describes a generally noisier environment than at Grace College, to which the aircraft noise adds further (peak values during events).
- Given that noise is considered to interfere with speech communication and create annoyance (distraction), this is not conducive to the learning environment at Bisley School. This concurs with personal opinions offered by the School Principal and teachers interviewed.

9 CONCLUSION: BASELINE SURVEY

Based on the above sound level results and interpretation the following conclusions are relevant:

- Commercial aircraft operations do contribute to elevated sound levels at certain areas along the airport flight path. Bisley School, Ukulinga Crèche and the residential properties in close proximity the schools on the northern boundary of the airport are impacted significantly. Flight take-off, approach and landing movements impact the school and crèches to create a disturbance; i.e. aircraft noise momentarily interferes with speech and communication at these sites. These events only peak for a short duration (20 - 30 seconds) as taxiing and other airport apron movements are relatively quiet and not clearly discernable above road traffic noise.
- The highest impacts tend to be limited to the immediate take-off and landing runway area. The short runway is not favorable for noise impacts. With a short runway, aircraft need to use larger amounts of thrust to take-off (especially with the steep ascent then required to transcend the basin topography of PMB) and approach/land (reverse thrust) which make for noisier emissions on any aircraft than might possible with more typical commercial aircraft on a longer runway. With landing in particular, on a longer runway, aircraft can often use brakes and wing flaps alone to stop, with minimal reverse thrust. However, with the short Pietermaritzburg Airport runway, commercial aircraft always require a certain amount reverse thrust for safe landing purposes. Passenger safety remains the highest priority and is non-negotiable (by law), above environmental nuisance.
- The suburbs of Clarendon and Wembley are also impacted moderately owing to their topographic altitude versus height above this terrain of the aircraft when flying over. Flights landing were measured to impact these suburbs more than take-off scenarios as the approach trajectory for Pietermaritzburg Airport is notoriously difficult. This trajectory, relatively close to terrain height over the north-western suburbs is necessitated by the topography that forces aircraft to navigate carefully around Hilton and World's View to make safe landing on a relatively short airstrip. The flight path was only established five years ago with assistance from a new navigation beacon on World's View that

facilitates tight approach angles even during poor weather (largely instrument controlled). Previous to this, flights were often diverted to Durban International Airport (now KSIA) during poor visibility. Thus, the new technology has effectively enabled a higher frequency of flights in and out of Pietermaritzburg, possibly adding to perceived aircraft noise.

- The noise produced by the commercial aircraft can be compared to a drone-type noise nuisance that arrives and dissipates surprisingly quickly. Nevertheless, at sites in Bisley close to the take-off and approach/landing zone (airstrip), the impact of this short-lived noise *can be significant for sensitive receptors*. However, since “a universally accepted criterion for ‘significant effect’ does not exist, the [specialists and] interested and affected parties and authorities should agree on suitable criterion, based on the information available to the specific case” (SANS 10328:2008, p.20 7.3.6.4 Assessment NOTE).
- The taxiing of aircraft on the runway does not appear to greatly affect sound levels in the areas immediately surrounding the airport or beyond. The aircraft is under minimal thrust during apron operations and this sound is easily overwhelmed by road traffic in the area.
- This study remains valid as long as the commercial aircraft operator (Airlink) does not deviate significantly from the two most frequently used aircraft type (ERJ 135 LR Jets and the AVRO RJ 85) on the Pietermaritzburg to Johannesburg route. The AVRO is the larger and noisier of the two aircraft, being a wide-body ‘Quad-jet’, whereas the ERJ is a narrow-body twin engine aircraft, commonly referred to as a ‘Business Jet’. Both aircraft types are required to serve this route as passenger demand varies significantly through the day, with the early and late flights being most popular for business people; thereby requiring the larger AVRO aircraft. During the course this study, Airlink have confirmed that they intend to introduce some larger, more modern aircraft to replace the AVRO during peak passenger demand (morning and evening flights). These aircraft are designed and manufactured by Embraer who supply the current ERJ 135 LR; the claimed energy (fuel) consumed and sound generated *per passenger* on the more modern aircraft is lower than the current combination. This phased substitution is examined in more detail in the Impact Assessment (Section 10 – below).
- Some residents along the flight path have become accustomed to the noise. However, there will always be some individuals or particular environments (schools) where the aircraft noise is considered to be a significant nuisance. This range of opinion and receptor sensitivity is common in noise impact assessments, with no pure statistical analysis doing justice to a subjective (human) interpretation.
- To put the matter into a human nuisance context, it was calculated that approximately 15,500 residents live in close proximity to (under) the flight path (Msunduzi Municipal wards 24, 36 and 26) and yet ATNS have never received a formal complaint (INR, 2016). During the EIA Scoping Phase, two written comments were received and Bisley School raised the issue, being clearly affected. Interestingly, Girls High School, which is also within the potentially affected Ward 24 did not register this issue (INR, 2016). *These Scoping Phase (nuisance) findings therefore correlate well with the Specialist Report (technical) grading.*
- Whilst the above findings are all important and will be expanded upon towards the final EIA ratings in Section 10 (below), it should also be considered that the Airport brings considerable benefit to the economy of Pietermaritzburg and the KwaZulu-Natal Midlands. This has become even more significant to business travelers since the King Shaka International Airport is further away from Pietermaritzburg (115 km) than the old Durban International Airport, whilst traffic congestion on the N3 and N2 has worsened (personal observation). Assessments of sustainable development should always include the balance of environmental, economic and social factors and recognize that the progression of aviation technology must increase safety and reduce environmental impacts to meet international best practice.

10 NOISE IMPACT ASSESSMENT: AIRPORT EXPANSION MASTER PLAN PHASE 1

This section is based largely on the consultant's baseline survey, discussions and relevant (noise impact) interpretation of documents provided by the Institute of Natural Resources from November 2016 to January 2017, as included but not limited to the body text of this report and contents of Appendix A. The 'Passenger Demand and Flight Projections' were collated and supplied to IMA Trader 20 cc (IMA) after final consultation between the Environmental Assessment Practitioner(s) and the Pietermaritzburg Airport Facility Management (Msunduzi Municipality), Air Traffic Navigation Services (ATNS) and the PMB Airlink Branch Manager (Smith, 2017).

10.1 Concepts

The following is recommended from impact assessment in the context of baseline results towards projected scenarios, as opposed to aircraft-specific noise modelling:

- A baseline noise environment with special reference to the impact of aircraft noise has been established for the first time in Pietermaritzburg. However, should the aircraft type be changed to those with a significantly greater sound output, the frequency of flights increase, flight times be extended beyond the current (06h00 to 22h00) schedule or the flight paths change in the future, then the noise impacts must be re-evaluated. Increased passenger demand can evidently be accommodated through first filling available flights (using current aircraft), and then extended further by replacing the AVRO (83 passengers) with a higher capacity but quieter[5] ERJ series aircraft, which includes the ERJ 170 (75 passengers) and the ERJ 190 (110 passengers).
- It is being proposed that Airlink *may introduce up to two more flights on weekdays within the current schedule*, but *using an aircraft fleet mix with lower sound output than the current models*. This will have the effect of reducing the impact per event (by the percentage reduction in sound output) on most aircraft movements, but increasing the frequency of events by 20% (which equates to 60 seconds per day). It is considered that since the nuisance value is largely determined by the sound level of each event (above ambient, which triggers or does not trigger a nuisance), more than the number of events (which do not appear to trigger nuisance, providing they remain within the current time schedule), then this impact will be of *minor significance at most receptors* and could possibly improve the overall situation once the AVRO is replaced by quieter aircraft (ERJ series) for Airlink flights using Pietermaritzburg Airport.
- Whilst no new aircraft offers a perfect solution with the limited airstrip at Pietermaritzburg Airport, it is important to consider that the AVRO RJ 85 will have to be phased-out and superseded by newer models over the next 2 to 5 years, since it is an old aircraft (over 20 years by design) that is no longer manufactured. The aircraft are thus reaching their maximum service life in respect of safety (maintenance, technology and replacement parts) and economic viability (fuel / energy consumed per passenger / kilometer).
- A noise monitoring survey should be completed after the initial phase of the airport expansion is complete (by 2025, but preferably in the next 5 years) to discern any changes to the noise environment surrounding the airport development. This should be focused more on sensitive receptors in the immediate proximity of the airstrip where impacts are most significant, although sufficient background measurements should be taken in the outlying suburbs such as Clarendon and Wembley to rule out significant changes in aircraft impact.

[5] Whilst the ERJ 190 can be noisier than the AVRO in take-off (model dependent, at source), all models are quieter in approach. The ERJ 170 is logically quieter than either the AVRO or the ERJ 190 in all aircraft movements (Foster, 2016 as reported by INR, 2016/7). Exact future fleet mix between AVRO (outgoing), ERJ 170 and ERJ190 (incoming) not yet known or confirmed by Airlink (Smith, 2017 as reported by INR, 2017).

- Given the mixed land-use that is impacted by the flights, *there are no favourable flight times for the commercial aircraft*. All commercial flights will impact one or more land uses at a certain time of day. Some residents may be concerned about early morning and late afternoon / evening flights, whilst schools and crèches near the airstrip will be affected by flights during working hours. This is a typical compromise of the complex urban environment in which the airport is based; exacerbated slightly by the short runway, basin topography and consequent approach and departure angles thereby imposed for commercial aviation.
- The relevant authority should consider *sound-proofing at the nearest sensitive receptors*, namely Bisley School and Ukulinga Crèche. Double-glazing on windows in the worst affected rooms of the school would be a priority to reduce noise interference in the classroom environment. Insulating the roof and/or ceiling is further effective method for sound attenuation with respect to overhead noise (i.e. aircraft). The EAP will need to confirm who the responsible authority for such attenuation measures is – it may be the Municipality or Department of Education. If it is the Municipality, then attenuation must be included in Precinct Plan and then in the IDP. At this stage, such measures are only proposed for Bisley School, but residents in close proximity to the airstrip take-off and landing zones (within approximately 500 meters, but needs to be verified) may also claim 'nuisance'. This must be considered by the Municipality and Airlink in final deliberation on the EIA, which *may require further (higher density, gridded) measurements in the immediate vicinity of the airport.*
- Although the noise influence is typically from aircraft when overhead, planting of quick-growing dense shrubs/trees along the Bisley School and Ukulinga Crèche fence line, and/or around the fence line of the Airport may assist to reduce the horizontal component of noise propagation towards sensitive receptors. Evergreen shrubs/trees capable of growing to at least two meters and maintaining dense foliage density close to ground are required, rather than seasonal trees or shrubs which die back close to ground level in the dry season. Such vegetation barriers typically prove as effective as expensive artificial noise attention barriers from international experience, and also remain aesthetically attractive.
- On review of the findings from this report, a decision will need to be taken by the Environmental Officer (authority) as to whether further investigation (e.g. aircraft-specific modelling, as per SANS 10117:2008) is required during the course of the Expansion Master Plan. However, it appears that none of the original triggers for modelling have been found so far. The original criteria for additional modelling were:
    - If flight path changed as this would result in more people being affected.
        - *This will not be the case because of the various factors that constrain the flight path e.g. topography, prevailing winds. This is confirmed in a study conducted by ATNS.*
    - If new flights were scheduled beyond current operating hours (06h00 to 22h00) this may cause noise nuisance.
        - *The new flights would be within the existing operating hours.*
    - Any change to aircraft with higher sound output could result in a nuisance.
        - *The commercial operator plans to introduce newer aircraft which can have lower sound output across the replacement fleet for most aircraft movements.*
- Aircraft-specific noise modelling may not be worth the extra effort and even cause confusion considering its limited ability to simulate a complex receptor environment (i.e. a large portion of the urban noise sources would need to be incorporated for the model to predict realistically). However, the implementation of attenuation measures in close proximity to the Airport may require further investigation (modelling or grid-based sampling) to *define areas and apportion costs precisely*.
- Given that there are a total of ten flights per day (Mon - Fri), and a further eight flights across the entire weekend, the total duration of noise events is a very small fraction (approximately 5 minutes out of 24 hours). This number of flights is not predicted to increase substantially, even with projected passenger numbers to 2025, since:

  - Existing flights, using the AVRO RJ 85 and ERJ 135 LR are not at full capacity (i.e. there are currently more seats available); and
  - Capacity can be increased through the introduction of ERJ 170 LR and ERJ 190 AR aircraft, which have more seats, but lower[6] sound output levels that the AVRO and roughly equivalent to the ERJ 135 LR.
  - A large portion of the growing passenger demand is for the Cape Town flight, which will include one take-off and one approach per weekday and one take-off on a Saturday and one approach on a Sunday. This flight will use the ERJ 135 LR aircraft currently used on the off-peak Johannesburg flights, which has the lowest sound outputs and least receptor impact of all aircraft considered in this study, often being indiscernable above road traffic noise in suburbs beyond Bisley.
- Detailed noise specifications for the AVRO RJ 85, ERJ 135 LR and ERJ 190 IGW/LR are provided in Table 5 of Appendix A. The noise emissions from the ERJ 170 LR were not available, but are claimed (by Airlink) and logically (smaller aircraft) lower than either the AVRO RJ 85 or the ERJ 190 models (Foster, 2016).
- Current and projected passenger demand and flight projects are depicted in Figure 1, Tables 1 to 4 of the INR (2017) document in Appendix A. A further theoretical calculation, which is best understood after careful consideration of projections in Appendix A suggests that:
  - If the Cape Town flight is the highest passenger demand growth at present (being a new and desired second destination vs Jhb, as the only current destination), then ± 23,000 of the anticipated ± 38,000 could be absorbed by that flight alone, using the ERJ 135 LR as confirmed.
  - This leaves ± 15,000 passengers that need to be accommodated on other flights (largely to Jhb) once the current passenger capacity is exceeded.
  - Given that the ERJ 190 accommodates 27 more passengers per flight than the AVRO RJ 85, then 550 flights per annum using the new ERJ vs the AVRO can satisfy that demand.
  - Since there are already 42 (of 58) flights per week using the AVRO, that growth in passenger demand can be met once 25% of the fleet is replaced.

Whilst some of the above is theoretical, and based on projections which may vary in reality, any future prediction includes an element of uncertainty by definition. These concepts and comparisons are useful to demonstrate that the changes required by passenger demand in the Airport Expansion Master Plan Phase 1 are not that great in context of what is already happening (the *status quo*), as described by the baseline survey. The suburb-specific impact assessment tables that follow attempt to quantify the impact of the *status quo* and proposed expansion more specifically, based on the survey readings, observations and interviews (practical experience) combined with aircraft logistic and test data (theoretical and project specification).

[6] Model dependent and relative to which existing aircraft is being replaced. These details could not be confirmed at time of writing and all always subject to change owing to operational circumstances that cannot be predicted accurately. However, the overall trends are favourable in terms of noise outputs for most new aircraft in most manoeuvres, given advancing aviation technology, guided by international standards.

10.2 Impact Tables

Three scenarios are considered in the following impact assessment tables, based on *assumptions and limitations* that are central to this study; i.e.:

1. **Proposed Expansion:** describes the Airport Expansion Master Plan Phase 1 project / growth, which focuses largely on the *modernization of the aircraft fleet* from a noise perspective, with introduction of two possible new aircraft models to replace older existing models and *increase passenger capacity*. It also covers the introduction of the Cape Town Flight using the ERJ 135 (confirmed as at January 2017) and the possible introduction of another Jhb-bound flight (not confirmed iro aircraft model, although scheduling is likely to remain during peak demand – morning and evening).
2. **With Mitigation:** describes the above, using all possible and *practical mitigation strategies* as guided by the ICAO 'Balanced Approach to Aircraft Noise Management'. This has four key elements, as follows:
    a. Reduction at source;
    b. Land-use planning and management;
    c. Noise abatement operational procedures; and
    d. Operating restrictions.

    These were presented by the Civil Aviation Authority and discussed with relevance to Pietermaritzburg at the Technical Workshop (November 2017) and highlighted in **bold** in the tables below. In addition to the summary presentation, the minutes and a summary document collated by the INR (INR, 2016), the full document is available to read online (www.icao.int) should the reader desire more detailed insight than presented here.
3. **No-Go Option:** effectively describes continuance of the *status quo* iro aircraft type and scheduling. However, it is important to note that whilst this option must be considered for EIA purposes, it is *impractical to maintain the airport precinct and aircraft fleet unchanged in perpetuity*. As mentioned earlier, the AVRO is already out of production and safety regulations will ultimately dictate that these units must be superseded by a more modern aircraft (one which is currently in production), regardless of actual growth in passenger demand. The latter will influence *which* models supersede the AVRO, although this is also constrained by the physical characteristics of the airfield (runway, infrastructure, etc.) and its geographical location (topographical setting and socio-economic pressures).

Whilst 17 sites were measured across most parts of the flight schedule in the baseline survey, a spatial zoning and temporal pattern becomes apparent from the GIS maps presented as Figures 3 to 9 (p. 24 to 32), which should be considered alongside the impact tables presented below. To avoid duplicity, suburbs (sites) are grouped as follows for impact assessment:

1. **Zone 1:** Hilton and World's View (four sites – distant: 10 km and more NW of runway);
2. **Zone 2:** Clarendon and Wembley (five sites – intermediate: between 6 and 9 km NW of runway);
3. **Zone 3:** Pelham and Scottsville Extension (two sites – nearby: between 2 and 3 km NW of runway);
4. **Zone 4:** Bisley (three sites – close proximity: within 1 km NW of runway);
5. **Zone 5:** Mkondeni and Oribi (three sites – close proximity: within 1 km NE, SE and SW of runway).

Summary of Impact Significance: Aircraft Noise on Environmental Noise in Zone 1 (Hilton and World's View)

	Impact Type	Impact Status	Impact Magnitude			Impact Likelihood	Significance Magnitude	Significance Likelihood	Significance Impact	Degree of Confidence	Comment
			Extent	Duration	Intensity						
Proposed Expansion	Direct	Negative	Local	Long-term	Low	Likely	Low	Likely	Minor	Medium	Aircraft at high altitude; noise impacts discernable but low. More flight events = higher probability
With Mitigation	Direct	Negative	Local	Long-term	Low	Likely	Low	Likely	Minor	Low	As above and flight paths or approach unlikely to change w/ mitigation
No-Go Option	Direct	Negative	Local	Long-term	Low	Definite	Low	Definite	Minor	High	Environmental noise impact remains as per baseline – low impact in these areas

Summary of Impact Significance: Aircraft Noise on Environmental Noise in Zone 2 (Clarendon and Wembley)

	Impact Type	Impact Status	Impact Magnitude			Impact Likelihood	Significance Magnitude	Significance Likelihood	Significance Impact	Degree of Confidence	Comment
			Extent	Duration	Intensity						
Proposed Expansion	Direct	Negative	Local	Long-term	Medium	Likely	Medium	Likely	Moderate	Medium	Aircraft discernable during approach in these suburbs; *impact dependent upon road traffic and flight path.* More flight events = higher probability
With Mitigation	Direct	Negative	Local	Long-term	Medium	Likely	Low	Likely	Minor	Low	ERJ quieter during *approach* than AVRO; *take-off* already completed; **reduction at source & operational procedures**
No-Go Option	Direct	Negative	Local	Long-term	Medium	Definite	Medium	Definite	Moderate	High	AVRO has moderate noise impact over these suburbs, exacerbated by landing gear in this zone

Summary of Impact Significance: Aircraft Noise on Environmental Noise in Zone 3 (Pelham and Scottsville Extension)

	Impact Type	Impact Status	Impact Magnitude			Impact Likelihood	Significance Magnitude	Significance Likelihood	Significance Impact	Degree of Confidence	Comment
			Extent	Duration	Intensity						
Proposed Expansion	Direct	Negative	Local	Long-term	Low	Likely	Low	Likely	Minor	Medium	Background noise is dominant in these suburbs; one or two new events / minor changes in aircraft unlikely to be detected
With mitigation	Direct	Negative	Local	Long-term	Low	Likely	Low	Likely	Minor	Low	New aircraft fleet and scheduling not yet confirmed in detail; noise impacts remain minor
No-Go Option	Direct	Negative	Local	Long-term	Low	Definite	Low	Definite	Minor	High	Background noise is dominant in these suburbs; aircraft present but often obscured by road traffic

Summary of Impact Significance: Aircraft Noise on Environmental Noise in Zone 4 (Bisley)

	Impact Type	Impact Status	Impact Magnitude			Impact Likelihood	Significance Magnitude	Significance Likelihood	Significance Impact	Degree of Confidence	Comment
			Extent	Duration	Intensity						
Proposed Expansion	Direct	Negative	Local	Long-term	High	Likely	High	Likely	Major	Medium	Measured aircraft noise impact interferes with speech communication; more events = more impact
With Mitigation	Direct	Negative	Local	Long-term	Moderate	Likely	Medium	Likely	Moderate	Low	ERJ quieter *approach* than AVRO; largest models have noisier *take-off*; minimization through: **fleet mix, sound attenuation (insulation) & op. proc.**
No-Go Option	Direct	Negative	Local	Long-term	High	Definite	High	Definite	Major	High	Measured aircraft noise impact interferes with speech communication

Summary of Impact Significance: Aircraft Noise on Environmental Noise in Zone 5 (Mkondeni and Oribi)

	Impact Type	Impact Status	Impact Magnitude			Impact Likelihood	Significance Magnitude	Significance Likelihood	Significance Impact	Degree of Confidence	Comment
			Extent	Duration	Intensity						
Proposed Expansion	Direct	Negative	Local	Long-term	Moderate	Likely	Medium	Likely	Moderate	Medium	Background noise often dominant in Mkondeni; aircraft noise rarely propagates E-W towards Oribi; new events / minor changes in aircraft *can* impact S end of runway
With mitigation	Direct	Negative	Local	Long-term	Low	Likely	Low	Likely	Minor	Low	ERJ quieter *approach* than AVRO; largest models have noisier *take-off*; minimization through: **fleet mix, noise abatement (barriers) & op. proc.**
No-Go Option	Direct	Negative	Local	Long-term	Moderate	Definite	Medium	Definite	Moderate	High	Background noise often dominant in Mkondeni; aircraft noise rarely propagates E-W towards Oribi; aircraft movements *can* impact S end of runway

In **summary** of this investigation, with stated *degrees of confidence*, there are no fatal flaws identified from either the baseline or the minor changes in aircraft required by obsolescence and passenger demand. Whilst new flight events are undesirable to sensitive receptors, significant impacts were measured almost exclusively in the Bisley area, immediately adjacent to the north end of the runway. Flyover impacts can be mitigated to some extent through adoption of various measures described above using the 'Balanced Approach to Aircraft Noise Management' (ICAO, 2007). The INR has prepared a detailed appraisal of each possible element and its applicability (or not) to this project, which is included in the collated socio-economic impact assessment report, based on discussion with the specialist consultant during a further workshop. However, in rank order, it is evident that 'Reduction at source' is most effective, followed by 'Noise abatement and operational procedures'. 'Land-use planning and management' will take a long time to change existing urban land-use patterns in the absence of major economic incentives, whilst 'Operating restrictions' are already as tight as possible (limited from 6.00am to 10.00pm). The Airport must be managed to provide a net socio-economic benefit at the minimum practical environmental cost.

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Appendix A: Airport Expansion Master Plan: Passenger Demand and Flight Projections

Summary Report compiled by Institute of Natural Resources (10 January 2017)

PHASE 1 – Passenger Demand and Flight Projections

Phase 1 of the airport's Master Plan defined infrastructure needs required to cater for flights and passengers (combined arriving and departing) to a volume of 250 000 passengers per annum (Airport Master Plan, 2014) (Figure 3). At the time, the prediction was that this capacity would be attained in approximately 2025.

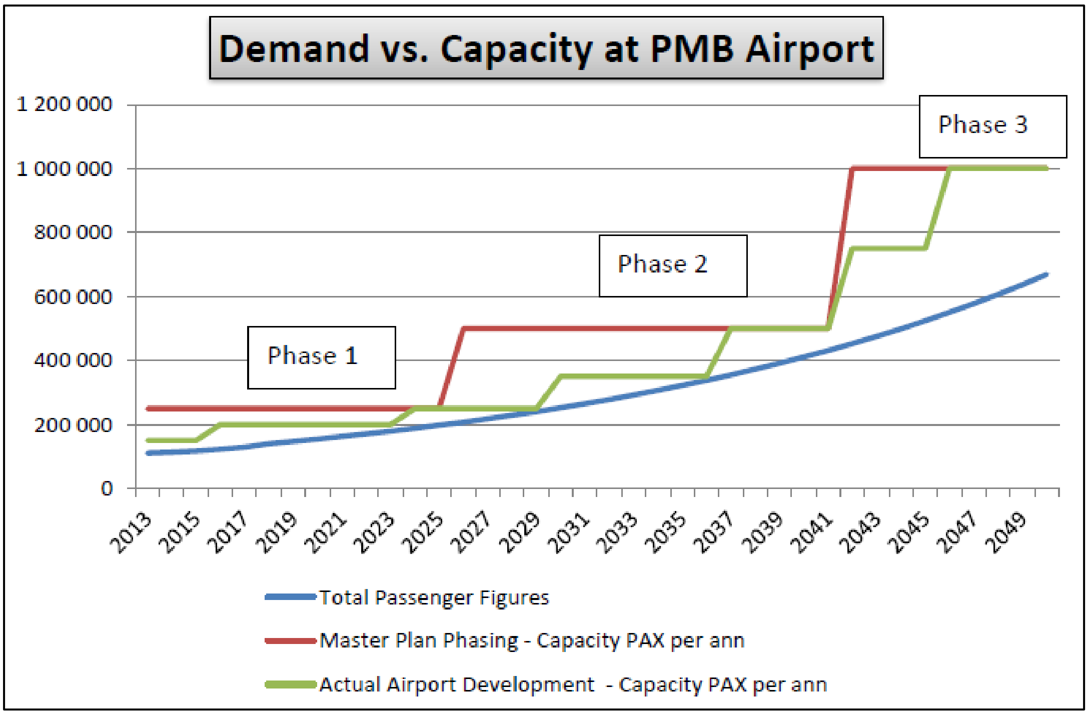

Figure 3: Passenger demand verses capacity at PMB airport (Source: Airport Master Plan, 2014)

A review of the current airport passenger capacity in relation to the Phase 1 threshold 250 000 (PAX[7]), is used to estimate the potential number of additional scheduled flights that would need to be added to meet the demand. The current scheduled passenger capacity (based on the scheduled flights and aircraft capacity in 2017) is 212 056 as presented in Table 8.

Table 8: Current (2017) scheduled passenger capacity and aircraft used

Flight Departure Time[8] and Capacity										Total capacity/day	Total capacity/annum
PMB to JHB weekday flights					JHB to PMB weekday flights						
06:45	*08:45*	*13:50*	*17:00*	*18:00*	*7:00*	*12:15*	*15:30*	*17:00*	*18:15*	*Per weekday*	*Weekdays*
83[9]	83	37[10]	83	83	37	37	83	83	83	692	179 920
PMB to JHB Saturday flights					JHB to PMB Saturday flights						
08:45		*13:50*			*12:15*					*Per Saturday*	*Saturdays*

[7] Pax: Passengers
[8] All times are listed as the flights departure time, from Pietermaritzburg Airport or O R Tambo International
[9] Based on the aircraft capacity of the AVRO RJ85 (approximately 83 passengers)
[10] Based on the aircraft capacity of the ERJ 135-LR (approximately 37 passengers)

83	83	83			249	12 948
PMB to JHB Sunday flights		JHB to PMB Sunday flights				
14:00	*17:00*	*12:15*	*15:30*	*17:00*	*Per Sunday*	*Sundays*
83	83	37	83	83	369	19 188
TOTAL ANNUAL SCHEDULED PASSENGER CAPACITY (2017)						212 056

In 2016, **123 063 passengers** were recorded for scheduled flights (based on Indiza Airport Management's records of the 2016 flight and passenger movements for the Pietermaritzburg Airport), indicating that there is currently excess passenger capacity of 88 993. The current PAX is therefore approximately 58% of the current capacity. According to Airlink, the only commercial airline presently operating at the Pietermaritzburg Airport, once the PAX reaches 65% of the capacity, the commercial airline seeks means of expanding their passenger capacity. This is achieved either through increased aircraft capacity or flight frequency (Smith, pers. comm., 2017[11]).

Based on the existing capacity (212 056) as calculated in Table 8, an additional 37 944 passengers/annum capacity is required to meet the Phase 1 demand of 250 000 passengers/annum. This amounts to approximately an additional **20% or one-fifth** of the current capacity, needed to meet the Phase 1 demand. Table 9 below summarizes these calculations.

Table 9: Current capacity vs needed capacity

	Passengers/Annum
Current capacity available (2017)	212 056
Current pax (2016)	123 063
Current excess capacity	88 993
Capacity required to reach 250 000 passenger/annum estimate	**37 944**

As there are currently 58 flights operating to and from Pietermaritzburg Airport per week (on average), an additional 20% capacity would translate to an additional 11 or 12 flights per week. This amounts to an additional 1 or 2 scheduled flights required to be added per day to reach the 250 000 demand estimation (Table 10).

Table 10: Estimate additional flights required to meet 2025 demand

Estimation of number of additional flights needed	
Current number of flights/week (both directions)	58 flights/week
Need approximately (one fifth of current capacity)	11 - 12 additional flights/week
Required to meet 250 000 passenger/annum demand	**1 - 2 additional flights/day***

**These additions would likely be during weekdays, weekend additions would typically be less based on the current flights/day trend.*

Airlink has recently announced the introduction of a scheduled flight between Cape Town International Airport and Pietermaritzburg Airport. The flight additions include a daily flight to and from Cape Town International Airport on weekdays, and a single flight on Saturday and Sundays. The ERJ 135-LR aircraft will be used to service this route, however this may be altered in the future based on the demand trends. Table 11 indicates that this new flight accounts for approximately two-thirds of the additional capacity required to meet the Phase 1 demand.

Table 11: Passenger capacity generated due to Cape Town flight addition

	PMB Departure/Arrival Time	Total capacity/day	Total capacity/annum
PMB-CPT weekday flight	07:00 (departure)	37	9620
CPT-PMB weekday flight	19:30 (arrival)	37	9620
PMB-CPT Saturday flight	07:00 (departure)	37	1924

[11] Personal Communication by INR with Christine Smith (Airlink Branch Manager), 10 January 2017

	PMB Departure/Arrival Time	Total capacity/day	Total capacity/annum
CPT-PMB Sunday flight	19:30 (arrival)	37	1924
		TOTAL PASSENGER/ANNUM	**23 088**

Airlink indicated that they plan to replace old technology (Avro RJ 85) with the Embraer EJet E170LR and E190AR type aircraft (Smith, pers. comm.). This change is planned take place within a two year time frame. This is significant in terms of passenger capacity as these aircraft have capacity of approximately 75 and 110 respectively, which in combination is significantly greater than the ERJ 135-LR and Avro RJ 85 aircraft's capacity of 37 and 83 respectively. Therefore, the existing scheduled flights will have a greater capacity to meet the demand when the existing aircraft are replaced, thus potentially decreasing the need for additional scheduled flights.

Airlink anticipated introducing the Embraer EJet E190AR type aircraft within the next 12 months in effort to phase out the Avro RJ 85 aircraft (Smith, pers. comm.). It is anticipated that the ERJ 135-LR aircraft will continue to be used for off-peak scheduled flights, while the new aircraft will replace the Avro RJ 85 on the peak flights.

The U.S. Department of Transportation - Federal Aviation Administration's (FAA) *Aircraft Noise Data for United States Certificated Turbojet Powered Airplanes* is used to determine the noise output variation between the current and new aircraft operating out of the Pietermaritzburg Airport. Table 12 below provides detail of the aircraft noise output. In the case of the E190AR type aircraft, there are various types of the same model aircraft, varied due to their engine model. Based on communication with Airlink, it is unknown which specific aircraft will service the route, and therefore the worst case scenario (greatest noise output aircraft type, highlighted in red) should be used in the assessment.

Table 12: Aircraft Noise Data for United States Certificated Turbojet Powered Airplanes (Source: FAA)[12]

Manufacturer	Model	MTOW	MLW	Engine Model	THRUST			FLAPS		Noise Level (EPNdB)			Stage
		1000#	1000#		No.	1000#	BPR	TO	AP	TO	SL	AP	
BAE SYSTEMS (AVRO)	146-RJ 85	89.50	77.50	LF 507-1F	4	7.00	5.10	18	33	81.9	88.7	96.9	3
EMBRAER	EMB-135LR	44.09	40.78	AE3007A1/3	2	7.20	4.77	9	45	77.9	84.4	92.3	3
EMBRAER	ERJ-190-100 IGW	114.20	97.00	CF34-10E5	2	18.82	5.00	1	6	86.9	91.9	92.8	3
EMBRAER		114.20	97.00	CF34-10E5A1	2	18.82	5.00	1	6	86.1	93.1	92.8	3
EMBRAER		114.20	97.00	CF34-10E6	2	18.82	5.00	1	6	86.1	91.9	92.8	3
EMBRAER		114.20	97.00	CF34-10E6A1	2	18.82	5.00	1	6	86.1	96.1	92.8	3
EMBRAER	ERJ-190-100 LR	110.89	94.80	CF34-10E5	2	18.82	5.00	1	6	86.1	91.9	92.7	3
EMBRAER		110.89	94.80	CF34-10E5A1	2	18.82	5.00	1	6	85.1	93.1	92.7	3
EMBRAER		110.89	94.80	CF34-10E6	2	18.82	5.00	1	6	86.0	92.0	92.7	3
EMBRAER		110.89	94.80	CF34-10E6A1	2	18.82	5.00	1	6	85.1	93.1	92.7	3
EMBRAER	ERJ-190-100 STD	105.36	94.80	CF34-10E5	2	18.82	5.00	1	6	84.7	92.1	92.7	3
EMBRAER		105.36	94.80	CF34-10E5A1	2	18.82	5.00	1	6	83.7	93.3	92.7	3
EMBRAER		105.36	94.80	CF34-10E6	2	18.82	5.00	1	6	84.7	92.1	92.7	3
EMBRAER		105.36	94.80	CF34-10E6A1	2	18.82	5.00	1	6	83.7	93.3	92.7	3

**There is no detail on the* EJet E170LR, *however Airlink indicated that it is safe to assume that it offers lower noise emission than the E190AR (Foster, pers. comm., 2016*[13]*)*

[12] Acronyms in the table: **MTOW** - Maximum Certificated Takeoff Weight; **MLW** - Maximum Certificated Landing Weight; **#** - Pounds; **BPR** - Bypass Ratio; **TO** – Takeoff; **AP** – Approach; **SL** - Sideline

[13] Personal Communication by INR with Rodger Foster (Airlink Chief Executive Officer, Managing Director), 1 November 2016

Appendix B: Sound Level Results: Tabular Summary

Date	**03 September 2016**						**04 September 2016**						**05 September 2016**					
Day	**Saturday**						**Sunday**						**Monday**					
Suburb	**Oribi**						**Oribi**						**Hilton**					
Address	**Globe Road**						**Oribi Road**						**Grace College School**					
GPS Co-ordinate	**29.64228 S 30.40175 E**						**29.64881 S 30.39283 E**						**29.53499 S 30.29838 E**					
Elevation (m)	**709**						**725**						**1143**					
LandUse Zone	**Suburban (little road traffic)**						**Urban (with road traffic)**						**Urban (with road traffic)**					
Relevant SANS Guideline	**50**						**55**						**55**					
Weather Delay	***None***						***None***						***None***					
Aircraft Impact	**LOW**						**LOW**						**LOW**					
Parameter	**LAeq**	**Compliant with Guideline**	**LAmax**	**LA10**	**LA90**	**Instant Peak Aircraft**	**LAeq**	**Compliant with Guideline**	**LAmax**	**LA10**	**LA90**	**Instant Peak Aircraft**	**LAeq**	**Compliant with Guideline**	**LAmax**	**LA10**	**LA90**	**Instant Peak Aircraft**
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:45	-	-	-	-	-	-	-	-	-	-	-	-	55.7	No	66.0	57.5	53.5	57.1
Background	-	-	-	-	-	-	-	-	-	-	-	-	55.5	No	61.2	57.0	53.5	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	54.7	Yes	62.1	57.0	52.0	-
08:00	-	-	-	-	-	-	-	-	-	-	-	-	56.5	No	81.4	57.0	52.0	56.0
Background	-	-	-	-	-	-	-	-	-	-	-	-	52.7	Yes	66.3	54.5	50.0	-
08:45	50.4	No	71.1	51.5	43.0	61.1	-	-	-	-	-	-	51.6	Yes	73.5	53.5	49.0	52.0
Background	49.6	Yes	70.8	51.5	42.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	47.9	Yes	59.2	51.0	42.0	-	44.0	Yes	56.9	48.5	36.5	-
13:15	51.7	No	69.7	53.0	42.5	*	53.4	Yes	72.5	56.0	44.0	47.0	46.7	Yes	64.4	50.0	34.5	52.9
Background	44.9	Yes	59.5	47.5	41.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Background	47.5	Yes	63.5	50.5	41.5	-	53.6	Yes	72.7	57.0	44.5	-	45.0	Yes	66.1	49.5	33.5	-
13:50	49.7	Yes	67.8	52.0	42.5	54.0	56.2	No	70.9	60.0	47.0	53.0	46.5	Yes	65.8	50.5	35.5	53.6
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16:30	-	-	-	-	-	-	50.8	Yes	63.9	54.5	41.5	47.3	49.2	Yes	66.8	51.5	39.5	55.8

Background	-	-	-	-	-	-	48.1	Yes	60.8	51.5	42.0	-	47.8	Yes	61.5	51.5	39.5	-
Background	-	-	-	-	-	-	49.0	Yes	64.3	52.0	41.5	-	-	-	-	-	-	-
17:00	-	-	-	-	-	-	53.4	Yes	73.6	55.5	43.0	61.0	46.2	Yes	62.6	50.5	37.5	54.0
Background	-	-	-	-	-	-	-	-	-	-	-	-	48.1	Yes	62.5	52.0	39.0	
Background	-	-	-	-	-	-	48.1	Yes	67.0	49.5	38.0	-	-	-	-	-	-	-
18:00	-	-	-	-	-	-	45.1	Yes	57.5	48.5	39.0	51.0	49.3	Yes	65.6	52.0	38.0	56.3
Background	-	-	-	-	-	-	-	-	-	-	-	-	45.6	Yes	59.7	49.0	38.5	-
18:25	-	-	-	-	-	-	-	-	-	-	-	-	46.7	Yes	61.8	50.5	39.5	58.3
Background	-	-	-	-	-	-	-	-	-	-	-	-	46.0	Yes	63.8	49.5	39.5	-
19:15	-	-	-	-	-	-	-	-	-	-	-	-	47.5	Yes	65.0	47.0	39.5	54.0
Background	-	-	-	-	-	-	-	-	-	-	-	-	44.0	Yes	56.9	46.5	40.0	-

Date	06 September 2016						07 September 2016						08 September 2016					
Day	Tuesday						Wednesday						Thursday					
Suburb	Bisley						Bisley						Bisley					
Address	Ukulinga School/Creche						Lindas Jack and Jill Creche						Bisley School					
GPS Co-ordinate	29.64116 S 30.39442 E						29.64337 S 30.39088 E						29.64066 S 30.39303 E					
Elevation (m)	711						696						702					
LandUse Zone	Urban (with road traffic)						Urban (with road traffic)						Urban (with road traffic)					
Relevant SANS Guideline	55						55						55					
Weather Delay	*None*						*None*						*None*					
Aircraft Impact	HIGH						MEDIUM						HIGH					
Parameter	LAeq	Compliant with Guideline	LAmax	LA10	LA90	Instant Peak Aircraft	LAeq	Compliant with Guideline	LAmax	LA10	LA90	Instant Peak Aircraft	LAeq	Compliant with Guideline	LAmax	LA10	LA90	Instant Peak Aircraft
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:45	64.9	No	88.8	53.0	47.0	79.0	61.4	No	84.7	59.5	47.0	69.0	68.6	No	92.0	56.0	47.5	82.0
Background	50.2	Yes	60.7	52.5	47.5	-	59.6	No	79.0	61.5	46.5	-	53.8	Yes	72.4	56.5	49.0	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00	54.7	Yes	73.5	55.0	41.0	56.0	58.9	No	90.8	57.5	44.0	56.0	59.8	No	80.1	58.5	47.0	63.0
Background	44.5	Yes	64.8	46.5	40.5	-	55.3	No	77.5	56.0	42.5	-	57.0	No	78.0	59.5	48.5	
08:45	64.1	No	87.5	51.0	40.0	80.0	64.1	No	88.9	52.0	41.0	76.0	66.9	No	88.8	64.0	47.5	80.0
Background	44.6	Yes	57.2	47.5	40.0	-	55.2	No	82.1	57.0	40.0	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13:15	55.7	No	82.7	53.5	42.5	57.0	54.6	Yes	75.1	50.0	37.5	54.0	62.3	No	80.3	64.5	50.0	62.0
Background	50.1	Yes	77.2	51.5	43.5	-	55.4	No	81.5	50.5	38.5	-	56.6	No	77.6	57.5	48.5	
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13:50	60.8	No	87.0	52.5	42.0	72.0	53.9	Yes	73.3	53.5	41.0	56.0	67.6	No	87.9	71.0	58.5	67.0
Background	52.4	Yes	72.2	52.0	42.5		-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16:30	57.3	No	79.5	58.0	49.0	59.0	59.1	No	79.0	59.5	43.5	58.2	66.7	No	91.0	66.5	52.0	57.0
Background	-	-	-	-	-	-	51.6	Yes	69.5	53.0	45.0	-	60.6	No	83.3	62.0	53.0	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	61.4	No	78.7	63.5	52.0	-
17:00	64.6	No	85.6	60.0	46.5	72.0	58.0	No	75.5	59.5	44.0	64.0	63.7	No	82.1	66.0	52.0	75.0
Background	51.2	Yes	66.0	55.0	44.5		59.2	No	81.4	62.5	43.0	-	61.6	No	77.5	65.0	50.0	
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

18:00	56.0	No	76.1	56.0	45.0	62.0	41.5	Yes	75.7	54.5	41.5	57.0	61.2	No	80.8	64.5	47.5	57.0
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18:25	62.0	No	83.0	59.0	46.5	68.0	57.5	No	77.1	59.5	40.5	65.0	64.7	No	88.2	63.5	46.0	74.0
Background	51.8	Yes	70.4	54.0	43.5	-	52.7	Yes	73.8	50.0	38.5	-	58.4	No	74.6	62.0	45.5	-
19:15	55.7	No	76.7	55.5	41.0	56.0	55.4	No	76.5	51.5	39.5	57.0	58.3	No	75.6	62.0	45.5	60.0
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Date	09 September 2016						10 September 2016	11 September 2016					
Day	Friday						Saturday	Sunday					
Suburb	Bisley						Rain	Hilton					
Address	Azalia Gardens Retirement Village							Flamingo Drive					
GPS Co-ordinate	29.636235 S 30.38399 E							29.55533 S 30.30889 E					
Elevation (m)	685							1103					
LandUse Zone	Urban (with main roads)							Suburban (little road traffic)					
Relevant SANS Guideline	60							50					
Weather Delay	*Evening rain*						*Rain*	*None*					
Aircraft Impact	MEDIUM							LOW					
Parameter	LAeq	Compliant with Guideline	LAmax	LA10	LA90	Instant Peak Aircraft		LAeq	Compliant with Guideline	LAmax	LA10	LA90	Instant Peak Aircraft
Background	-	-	-	-	-	-		-	-	-	-	-	-
06:45	65.3	No	84.6	66.5	53.0	74.0		-	-	-	-	-	-
Background	63.6	No	79.8	67.0	54.0	-		-	-	-	-	-	-
Background	59.3	Yes	72.3	63.5	48.0	-		-	-	-	-	-	-
08:00	61.0	No	90.1	64.5	47.5	60.0		-	-	-	-	-	-
Background	-	-	-	-	-	-		-	-	-	-	-	-
08:45	58.4	Yes	80.2	61.5	46.5	76.0		-	-	-	-	-	-
Background	59.7	Yes	81.1	62.5	47.5	-		-	-	-	-	-	-
Background	-	-	-	-	-	-		46.0	Yes	63.8	49.5	39.5	
13:15	61.9	No	81.8	66.0	48.0	56.0		*			-	-	-
Background	62.5	No	77.8	67.0	49.5	-		-	-	-	-	-	-
Background	-	-	-	-	-	-		-	-	-	-	-	-
13:50	61.4	No	86.0	65.0	49.5	*		47.5	Yes	65.0	47.0	39.5	53.2
Background	-	-	-	-	-	-		-	-	-	-	-	-
Background	-	-	-	-	-	-		-	-	-	-	-	-
16:30	Rain							*		-	-	-	-
Background								-	-	-	-	-	-
Background								-	-	-	-	-	-
17:00	Rain							44.0	Yes	56.9	46.5	40.0	55.0
Background								64.9	No	88.8	53.0	47.0	-

Background								-	-	-	-	-	-
18:00	Rain							50.2	No	60.7	52.5	47.5	57.0
Background								54.7	No	73.5	55.0	41.0	-
18:25	Rain							-	-	-	-	-	-
Background								-	-	-	-	-	-
19:15	Rain							-	-	-	-	-	-
Background								-	-	-	-	-	-

Date	**12 September 2016**						**13 September 2016**	**14 September 2016**					
Day	**Monday**						**Tuesday**	**Wednesday**					
Suburb	**Wembley**						**Rain & wind**	**Clarendon**					
Address	**5 Orchard Circle**							**The Wykeham Collegiate School**					
GPS Co-ordinate	**29.59300 S 30.34628 E**							**29.60060 S 30.35033 E**					
Elevation (m)	**816**							**817**					
LandUse Zone	**Suburban (little road traffic)**							**Urban (with road traffic)**					
Relevant SANS Guideline	**50**							**55**					
Weather Delay	***Windy morning***						***Rain & wind***	***None***					
Aircraft Impact	**MEDIUM**							**LOW**					
Parameter	**LAeq**	**Compliant with Guideline**	**LAmax**	**LA10**	**LA90**	**Instant Peak Aircraft**		**LAeq**	**Compliant with Guideline**	**LAmax**	**LA10**	**LA90**	**Instant Peak Aircraft**
Background	-	-	-	-	-	-		-	-	-	-	-	-
06:45	Wind	-	-	-	-	-		-	-	-	-	-	-
Background	-	-	-	-	-	-		-	-	-	-	-	-
Background	-	-	-	-	-	-		-	-	-	-	-	-
08:00	Wind	-	-	-	-	-		57.6	No	69.2	60.0	51.5	56.0
Background	-	-	-	-	-	-		55.4	No	71.7	58.5	47.5	-
08:45	Wind	-	-	-	-	-		54.7	Yes	72.1	58.0	47.5	*
Background	-	-	-	-	-	-		53.5	Yes	65.9	57.5	47.0	-
Background	50.1	No	77.2	51.5	43.5	-		-	-	-	-	-	-
13:15	60.8	No	87.0	52.5	42.0	56.0		55.9	No	70.1	58.5	47.0	58.0
Background	-	-	-	-	-	-		53.5	Yes	68.5	56.0	47.5	-
Background	-	-	-	-	-	-		-	-	-	-	-	-
13:50	52.4	No	72.2	52.0	42.5	43.0		55.5	No	75.6	57.0	46.5	*
Background	-	-	-	-	-	-		-	-	-	-	-	-
Background	-	-	-	-	-	-		-	-	-	-	-	-
16:30	57.3	No	79.5	58.0	49.0	54.0		57.2	No	81.2	58.5	51.0	62.0
Background	64.6	No	85.6	60.0	46.5	-		56.6	No	70.5	59.0	52.0	-
Background	-	-	-	-	-	-							
17:00	51.2	No	66.0	55.0	44.5	57.5		57.3	No	70.3	59.5	52.0	*
Background	56.0	No	76.1	56.0	45.0	-		-	-	-	-	-	-

Background	-	-	-	-	-	-		-	-	-	-	-	-
18:00	*					-		-	-	-	-	-	-
Background	-	-	-	-	-	-		-	-	-	-	-	-
18:25	*			-	-	-		-	-	-	-	-	-
Background	62.0	No	83.0	59.0	46.5	-		-	-	-	-	-	-
19:15	51.8	No	70.4	54.0	43.5	61.1		-	-	-	-	-	-
Background	-	-	-	-	-	-		-	-	-	-	-	-

Date	**15 September 2016**						**16 September 2016**						**16 September 2016**					
Day	**Thursday**						**Friday**						**Friday**					
Suburb	**Clarendon**						**Clarendon**						**Mkondeni**					
Address	**Villiers Drive**						**Clarendon School, Roberts Road**						**Murray Road, Mkondeni**					
GPS Co-ordinate	**29.60401 S 30.35807 E**						**29.60016 S 30.35835 E**						**29.65656 S 30.40388 E**					
Elevation (m)	**740**						**706**						**753**					
LandUse Zone	**Suburban (little road traffic)**						**Urban (with road traffic)**						**Urban (with main roads)**					
Relevant SANS Guideline	**50**						**55**						**60**					
Weather Delay	***None***						***Pre-frontal wind & late rain***						***Pre-frontal wind & late rain***					
Aircraft Impact	**MEDIUM**						**MEDIUM**						**MEDIUM**					
Parameter	**LAeq**	**Compliant with Guideline**	**LAmax**	**LA10**	**LA90**	**Instant Peak Aircraft**	**LAeq**	**Compliant with Guideline**	**LAmax**	**LA10**	**LA90**	**Instant Peak Aircraft**	**LAeq**	**Compliant with Guideline**	**LAmax**	**LA10**	**LA90**	**Instant Peak Aircraft**
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06:45	58.5	No	75.6	62.0	51.0	62.0	68.2	No	84.8	71.5	57.5	69.0	-	-	-	-	-	-
Background	59.1	No	76.5	62.5	51.5	-	66.6	No	82.2	69.5	60.0	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
08:00	56.2	No	77.8	56.5	50.0	60.0	64.5	No	77.6	68.5	51.0	60.0	-	-	-	-	-	-
Background	58.4	No	83.9	57.0	48.5		62.9	No	81.2	67.0	49.5		-	-	-	-	-	-
08:45	49.8	Yes	60.4	51.0	48.5	*	61.0	No	75.9	66.0	45.5	70.0	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13:15	50.4	No	73.1	49.0	44.5	*	63.4	No	80.1	67.5	52.0	*						
Background	48.4	Yes	69.1	50.0	44.0	-	63.2	No	76.9	67.5	51.5	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13:50	51.7	No	69.5	53.5	44.5	57.0	63.7	No	77.0	67.0	52.5	63.0	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16:30	55.0	No	70.5	57.5	48.5	59.0	-	-	-	-	-	-	62.3	No	72.0	65.5	55.0	50.0
Background	54.8	No	77.0	56.5	48.5	-	-	-	-	-	-	-	62.5	No	80.7	65.0	54.5	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17:00	56.4	No	78.8	57.0	48.0	*	-	-	-	-	-	-	70.0	No	92.6	66.0	54.0	84.0
Background	57.7	No	83.4	56.0	48.0	-	-	-	-	-	-	-	-	-	-	-	-	-

Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18:00	57.4	No	79.9	55.5	48.0	57.0	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18:25	57.5	No	75.9	57.5	50.5	68.0	-	-	-	-	-	-	-	-	-	-	-	-
Background	55.1	No	67.8	55.5	54.0	-	-	-	-	-	-	-	-	-	-	-	-	-
19:15	55.8	No	72.0	56.5	50.0	60.0	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Date	17 September 2016	18 September 2016	19 September 2016					
Day	Saturday	Sunday	Monday					
Suburb	Rain	Rain	Hilton					
Address			Corner of Monzali Drive and William Yonger, Hilton Gardens					
GPS Co-ordinate			29.54507 S 30.31098					
Elevation (m)			1114					
LandUse Zone			Suburban (little road traffic)					
Relevant SANS Guideline			50					
Weather Delay	*Rain*	*Rain*	*None*					
Aircraft Impact			LOW					
Parameter			LAeq	Compliant with Guideline	LAmax	LA10	LA90	Instant Peak Aircraft
Background			-	-	-	-	-	-
06:45			55.3	No	69.2	56.5	51.5	58.0
Background			54.5	No	71.9	55.5	50.0	-
Background			-	-	-	-	-	-
08:00			51.4	No	68.5	51.5	46.0	*
Background			50.5	No	71.3	50.0	42.5	-
08:45			48.9	Yes	68.3	49.0	41.5	*
Background			-	-	-	-	-	-
Background			-	-	-	-	-	-
13:15			43.1	Yes	66.3	43.0	35.5	*
Background			42.7	Yes	66.8	43.5	34.5	-
Background			-	-	-	-	-	-
13:50			49.3	Yes	70.8	50.5	36.0	55.0
Background			47.3	Yes	66.7	47.0	39.0	-
Background			45.8	Yes	63.1	46.5	38.5	-
16:30			52.9	No	74.6	49.0	39.5	60.0
Background			-	-	-	-	-	-
Background			-	-	-	-	-	-
17:00			46.7	Yes	69.2	47.5	39.5	*

Background			-	-	-	-	-	-
Background			46.8	Yes	71.4	46.0	39.0	-
18:00			47.0	Yes	67.7	41.5	35.5	53.0
Background			40.7	Yes	59.9	43.0	34.5	-
18:25			-	-	-	-	-	-
Background			-	-	-	-	-	-
19:15			-	-	-	-	-	-
Background			-	-	-	-	-	-

Date	20 September 2016						21 September 2016					
Day	Tuesday						Wednesday					
Suburb	Hilton						Pelham					
Address	Worlds View						Girls High School, Alexander Road					
GPS Co-ordinate	29.57837 S 30.32706 E						29.37574 S 30.38502 E					
Elevation (m)	1078						668					
LandUse Zone	Suburban (little road traffic)						Urban (with main roads)					
Relevant SANS Guideline	50						60					
Weather Delay	*None*						*None*					
Aircraft Impact	LOW						LOW					
Parameter	LAeq	Compliant with Guideline	LAmax	LA10	LA90	Instant Peak Aircraft	LAeq	Compliant with Guideline	LAmax	LA10	LA90	Instant Peak Aircraft
Background	-	-	-	-	-	-	-	-	-	-	-	-
06:45	47.0	Yes	60.7	48.5	44.5	51.0	67.3	No	78.7	70.0	61.5	68.0
Background	46.6	Yes	60.9	48.0	44.5	-	66.7	No	80.0	69.5	60.0	-
Background	-	-	-	-	-	-	-	-	-	-	-	-
08:00	48.5	Yes	71.0	49.0	43.5	60.0	65.5	No	76.5	69.0	57.0	*
Background	46.0	Yes	71.6	46.0	42.5	-	65.8	No	77.8	69.5	56.0	-
08:45	42.6	Yes	56.0	44.0	40.5	43.0	64.9	No	75.1	68.5	53.5	57.0
Background	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	64.1	No	79.2	67.5	52.5	-
13:15	43.3	Yes	67.3	42.0	37.0	51.0	65.1	No	82.8	68.0	55.0	56.0
Background	40.8	Yes	56.3	42.0	38.5	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-
13:50	39.6	Yes	58.0	41.0	37.5	*	64.0	No	74.7	67.5	56.0	56.0
Background	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-
16:30	48.7	Yes	65.1	48.5	44.5	54.0	-	-	-	-	-	-
Background	47.2	Yes	60.7	48.5	45.5	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-
17:00	50.8	No	73.3	53.0	45.5	*	-	-	-	-	-	-
Background	57.1	No	89.5	49.0	45.0	-	-	-	-	-	-	-

Background	-	-	-	-	-	-	-	-	-	-	-	-
18:00	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-
18:25	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-
19:15	-	-	-	-	-	-	-	-	-	-	-	-
Background	-	-	-	-	-	-	-	-	-	-	-	-

Date	22 September 2016	23 September 2016	24 September 2016	25 September 2016	26 September 2016	27 September 2016	28 September 2016	29 September 2016					
Day	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday					
Suburb	Wind	Wind	Rain morning	Rain	Wind	Wind afternoon	Rain	Wembley					
Address								9 Wylie Crescent, Wembley					
GPS Co-ordinate								29.58939 S 30.34492 E					
Elevation (m)								828					
LandUse Zone								Suburban (little road traffic)					
Relevant SANS Guideline								50					
Weather Delay	*Wind*	*Wind*	*Rain morning*	*Rain*	*Wind*	*Wind afternoon*	*Rain*						
Aircraft Impact								MEDIUM					
Parameter								LAeq	Compliant with Guideline	LAmax	LA10	LA90	Instant Peak Aircraft
Background													
06:45								54.9	No	71.9	56.0	52.0	65.0
Background								54.0	No	63.1	56.0	51.5	
Background													
08:00								52.1	No	72.9	47.5	39.0	61.5
Background								47.5	Yes	61.3	50.5	38.5	
08:45								50.9	No	68.6	51.5	43.0	61.7
Background													
Background								58.7	No	79.3	51.5	41.5	
13:15								44.1	Yes	62.2	45.5	40.5	60.0
Background													
Background													
13:50								55.2	No	82.3	51.0	39.0	62.2
Background													
Background													
16:30													#

Background													
Background													
17:00													#
Background													
Background								46.1	Yes	62.7	48.5	38.5	
18:00								55.0	No	72.9	57.0	38.0	60.3
Background								56.1	No	78.6	56.5	36.5	
18:25								55.5	No	78.6	53.5	34.0	67.0
Background													
19:15								55.5	No	74.1	58.0	33.0	63.0
Background													

Appendix C: Sound Level Measurements: Casella Reports

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Instrument Model	**CEL-621C**		
Run No	5	LAFmax	71.1 dB
Start Date & Time	2016-09-03 08:41:12 AM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	50.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	43 dB
Overload	No	LAFmin	39.3 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	6	LAFmax	70.8 dB
Start Date & Time	2016-09-03 08:56:46 AM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	49.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42.5 dB
Overload	No	LAFmin	39.6 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	7	LAFmax	69.7 dB
Start Date & Time	2016-09-03 12:57:15 PM	LAF10	53 dB
Duration	00:15:00 HH:MM:SS	LAeq	51.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42.5 dB
Overload	No	LAFmin	39.7 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	8	LAFmax	59.5 dB
Start Date & Time	2016-09-03 01:12:36 PM	LAF10	47.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	44.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41 dB
Overload	No	LAFmin	38.6 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	9	LAFmax	63.5 dB
Start Date & Time	2016-09-03 01:40:36 PM	LAF10	50.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	47.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41.5 dB
Overload	No	LAFmin	38.9 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	10	LAFmax	67.8 dB
Start Date & Time	2016-09-03 01:55:51 PM	LAF10	52 dB
Duration	00:15:00 HH:MM:SS	LAeq	49.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42.5 dB
Overload	No	LAFmin	39.4 dB

Report Generated By Insight CEL-62x - Casella CEL Ltd - On 2016-09-14 At 11:58:12 AM Page 1 of 21

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	11	LAFmax	59.2 dB
Start Date & Time	2016-09-04 01:06:11 PM	LAF10	51 dB
Duration	00:15:00 HH:MM:SS	LAeq	47.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42 dB
Overload	No	LAFmin	36.2 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	12	LAFmax	72.5 dB
Start Date & Time	2016-09-04 01:21:16 PM	LAF10	56 dB
Duration	00:15:00 HH:MM:SS	LAeq	53.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44 dB
Overload	No	LAFmin	36.8 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	13	LAFmax	72.7 dB
Start Date & Time	2016-09-04 01:40:20 PM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	53.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44.5 dB
Overload	No	LAFmin	37.8 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	14	LAFmax	70.9 dB
Start Date & Time	2016-09-04 01:56:57 PM	LAF10	60 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47 dB
Overload	No	LAFmin	39.3 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	15	LAFmax	63.9 dB
Start Date & Time	2016-09-04 04:14:23 PM	LAF10	54.5 dB
Duration	00:11:09 HH:MM:SS	LAeq	50.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41.5 dB
Overload	No	LAFmin	33.9 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	16	LAFmax	60.8 dB
Start Date & Time	2016-09-04 04:28:36 PM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	48.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42 dB

Report Generated By Insight CEL-62x - Casella CEL Ltd - On 2016-09-14 At 11:58:12 AM Page 2 of 21

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Overload	No	LAFmin	38.2 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	17	LAFmax	64.3 dB
Start Date & Time	2016-09-04 04:44:37 PM	LAF10	52 dB
Duration	00:15:00 HH:MM:SS	LAeq	49 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41.5 dB
Overload	No	LAFmin	37.3 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	18	LAFmax	73.6 dB
Start Date & Time	2016-09-04 05:00:27 PM	LAF10	55.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	53.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	43 dB
Overload	No	LAFmin	35.6 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	19	LAFmax	67 dB
Start Date & Time	2016-09-04 05:44:05 PM	LAF10	49.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	48.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38 dB
Overload	No	LAFmin	34.7 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	20	LAFmax	57.5 dB
Start Date & Time	2016-09-04 05:59:44 PM	LAF10	48.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	45.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39 dB
Overload	No	LAFmin	36.4 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	21	LAFmax	66 dB
Start Date & Time	2016-09-05 06:47:30 AM	LAF10	57.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	53.5 dB
Overload	No	LAFmin	50.5 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	22	LAFmax	61.2 dB
Start Date & Time	2016-09-05 07:04:21 AM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.5 dB

Report Generated By Insight CEL-62x - Casella CEL Ltd - On 2016-09-14 At 11:58:12 AM Page 3 of 21

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Paused Duration	00:00:00 HH:MM:SS	LAF90	53.5 dB
Overload	No	LAFmin	50.8 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	23	LAFmax	62.1 dB
Start Date & Time	2016-09-05 07:36:29 AM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	54.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52 dB
Overload	No	LAFmin	50.2 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	24	LAFmax	81.4 dB
Start Date & Time	2016-09-05 07:54:46 AM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52 dB
Overload	No	LAFmin	49.3 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	25	LAFmax	66.3 dB
Start Date & Time	2016-09-05 08:25:30 AM	LAF10	54.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	52.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	50 dB
Overload	No	LAFmin	47 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	26	LAFmax	73.5 dB
Start Date & Time	2016-09-05 08:41:52 AM	LAF10	53.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	51.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	49 dB
Overload	No	LAFmin	45.7 dB
Cal. (Before) Date	2016-08-29 10:20:44 PM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	27	LAFmax	56.9 dB
Start Date & Time	2016-09-05 12:52:37 PM	LAF10	48.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	44 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	36.5 dB
Overload	No	LAFmin	34.8 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	28	LAFmax	64.4 dB
Start Date & Time	2016-09-05 01:11:30 PM	LAF10	50 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Duration	00:15:00 HH:MM:SS	LAeq	46.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	34.5 dB
Overload	No	LAFmin	32.3 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	29	LAFmax	66.1 dB
Start Date & Time	2016-09-05 01:33:48 PM	LAF10	49.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	45 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	33.5 dB
Overload	No	LAFmin	31.5 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	30	LAFmax	65.8 dB
Start Date & Time	2016-09-05 01:49:22 PM	LAF10	50.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	46.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	35.5 dB
Overload	No	LAFmin	32.5 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	31	LAFmax	66.8 dB
Start Date & Time	2016-09-05 04:26:49 PM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	49.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39.5 dB
Overload	No	LAFmin	35.2 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	32	LAFmax	61.5 dB
Start Date & Time	2016-09-05 04:44:06 PM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	47.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39.5 dB
Overload	No	LAFmin	36 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	33	LAFmax	62.6 dB
Start Date & Time	2016-09-05 04:59:11 PM	LAF10	50.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	46.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	37.5 dB
Overload	No	LAFmin	33 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	34	LAFmax	62.5 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Start Date & Time	2016-09-05 05:14:59 PM	LAF10	52 dB
Duration	00:15:00 HH:MM:SS	LAeq	48.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39 dB
Overload	No	LAFmin	34.9 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	35	LAFmax	65.6 dB
Start Date & Time	2016-09-05 05:39:24 PM	LAF10	52 dB
Duration	00:15:00 HH:MM:SS	LAeq	49.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38 dB
Overload	No	LAFmin	34.3 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	36	LAFmax	59.7 dB
Start Date & Time	2016-09-05 05:56:41 PM	LAF10	49 dB
Duration	00:15:00 HH:MM:SS	LAeq	45.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38.5 dB
Overload	No	LAFmin	33.7 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	37	LAFmax	61.8 dB
Start Date & Time	2016-09-05 06:14:57 PM	LAF10	50.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	46.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39.5 dB
Overload	No	LAFmin	35.9 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	38	LAFmax	63.8 dB
Start Date & Time	2016-09-05 06:33:37 PM	LAF10	49.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	46 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39.5 dB
Overload	No	LAFmin	37.1 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	39	LAFmax	65 dB
Start Date & Time	2016-09-05 06:50:13 PM	LAF10	47 dB
Duration	00:15:00 HH:MM:SS	LAeq	47.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39.5 dB
Overload	No	LAFmin	37 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Run No	40	LAFmax	56.9 dB
Start Date & Time	2016-09-05 07:06:50 PM	LAF10	46.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	44 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	40 dB
Overload	No	LAFmin	36.7 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	41	LAFmax	88.8 dB
Start Date & Time	2016-09-06 06:41:48 AM	LAF10	53 dB
Duration	00:15:00 HH:MM:SS	LAeq	64.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47 dB
Overload	No	LAFmin	44.3 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	42	LAFmax	60.7 dB
Start Date & Time	2016-09-06 06:57:46 AM	LAF10	52.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	50.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	45.1 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	43	LAFmax	73.5 dB
Start Date & Time	2016-09-06 07:58:55 AM	LAF10	55 dB
Duration	00:15:00 HH:MM:SS	LAeq	54.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41 dB
Overload	No	LAFmin	37.1 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	44	LAFmax	64.8 dB
Start Date & Time	2016-09-06 08:17:24 AM	LAF10	46.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	44.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	40.5 dB
Overload	No	LAFmin	36.8 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	45	LAFmax	87.5 dB
Start Date & Time	2016-09-06 08:43:13 AM	LAF10	51 dB
Duration	00:15:00 HH:MM:SS	LAeq	64.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	40 dB
Overload	No	LAFmin	37.2 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Instrument Model	**CEL-621C**		
Run No	46	LAFmax	57.2 dB
Start Date & Time	2016-09-06 08:58:20 AM	LAF10	47.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	44.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	40 dB
Overload	No	LAFmin	36.6 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	47	LAFmax	82.7 dB
Start Date & Time	2016-09-06 12:54:50 PM	LAF10	53.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42.5 dB
Overload	No	LAFmin	38.5 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	48	LAFmax	77.2 dB
Start Date & Time	2016-09-06 01:11:18 PM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	50.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	43.5 dB
Overload	No	LAFmin	41 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	49	LAFmax	87 dB
Start Date & Time	2016-09-06 01:45:18 PM	LAF10	52.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	60.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42 dB
Overload	No	LAFmin	38.1 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	50	LAFmax	72.2 dB
Start Date & Time	2016-09-06 02:01:14 PM	LAF10	52 dB
Duration	00:15:00 HH:MM:SS	LAeq	52.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42.5 dB
Overload	No	LAFmin	38.2 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	51	LAFmax	79.5 dB
Start Date & Time	2016-09-06 04:28:20 PM	LAF10	58 dB
Duration	00:15:00 HH:MM:SS	LAeq	57.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	49 dB
Overload	No	LAFmin	45.2 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	52	LAFmax	85.6 dB
Start Date & Time	2016-09-06 04:54:17 PM	LAF10	60 dB
Duration	00:15:00 HH:MM:SS	LAeq	64.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	46.5 dB
Overload	No	LAFmin	41.8 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	53	LAFmax	66 dB
Start Date & Time	2016-09-06 05:09:26 PM	LAF10	55 dB
Duration	00:15:00 HH:MM:SS	LAeq	51.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44.5 dB
Overload	No	LAFmin	40.8 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	54	LAFmax	76.1 dB
Start Date & Time	2016-09-06 05:46:40 PM	LAF10	56 dB
Duration	00:15:00 HH:MM:SS	LAeq	56 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	45 dB
Overload	No	LAFmin	39.2 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	56	LAFmax	83 dB
Start Date & Time	2016-09-06 06:17:01 PM	LAF10	59 dB
Duration	00:15:00 HH:MM:SS	LAeq	62 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	46.5 dB
Overload	No	LAFmin	38.8 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	57	LAFmax	70.4 dB
Start Date & Time	2016-09-06 06:32:46 PM	LAF10	54 dB
Duration	00:15:00 HH:MM:SS	LAeq	51.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	43.5 dB
Overload	No	LAFmin	38.8 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	58	LAFmax	76.7 dB
Start Date & Time	2016-09-06 07:05:04 PM	LAF10	55.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41 dB

Overload	No	LAFmin	33.5 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	59	LAFmax	114.1 dB
Start Date & Time	2016-09-07 06:18:31 AM	LAF10	0 dB
Duration	00:00:03 HH:MM:SS	LAeq	114 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	0 dB
Overload	No	LAFmin	114 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	60	LAFmax	114 dB
Start Date & Time	2016-09-07 06:18:46 AM	LAF10	0 dB
Duration	00:00:02 HH:MM:SS	LAeq	114 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	0 dB
Overload	No	LAFmin	114 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	61	LAFmax	114 dB
Start Date & Time	2016-09-07 06:18:55 AM	LAF10	114 dB
Duration	00:00:22 HH:MM:SS	LAeq	114 dB
Paused Duration	00:00:14 HH:MM:SS	LAF90	114 dB
Overload	No	LAFmin	114 dB
Cal. (Before) Date	2016-09-05 11:24:03 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	62	LAFmax	84.7 dB
Start Date & Time	2016-09-07 06:37:50 AM	LAF10	59.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	61.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47 dB
Overload	No	LAFmin	44 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	63	LAFmax	79 dB
Start Date & Time	2016-09-07 06:55:17 AM	LAF10	61.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	59.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	46.5 dB
Overload	No	LAFmin	43.8 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	64	LAFmax	69.4 dB
Start Date & Time	2016-09-07 07:13:41 AM	LAF10	65.5 dB
Duration	00:00:31 HH:MM:SS	LAeq	59.1 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	46.3 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	65	LAFmax	90.8 dB
Start Date & Time	2016-09-07 07:52:47 AM	LAF10	57.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	58.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44 dB
Overload	No	LAFmin	42.1 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	66	LAFmax	77.5 dB
Start Date & Time	2016-09-07 08:07:52 AM	LAF10	56 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42.5 dB
Overload	No	LAFmin	40.2 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	67	LAFmax	88.9 dB
Start Date & Time	2016-09-07 08:39:37 AM	LAF10	52 dB
Duration	00:15:00 HH:MM:SS	LAeq	64.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41 dB
Overload	No	LAFmin	38.7 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	68	LAFmax	82.1 dB
Start Date & Time	2016-09-07 08:57:59 AM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	40 dB
Overload	No	LAFmin	38.3 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	1	LAFmax	75.1 dB
Start Date & Time	2016-09-07 01:09:59 PM	LAF10	50 dB
Duration	00:15:00 HH:MM:SS	LAeq	54.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	37.5 dB
Overload	No	LAFmin	35.3 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	2	LAFmax	81.5 dB
Start Date & Time	2016-09-07 01:25:01 PM	LAF10	50.5 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Duration	00:15:00 HH:MM:SS	LAeq	55.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38.5 dB
Overload	No	LAFmin	35.9 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	3	LAFmax	73.3 dB
Start Date & Time	2016-09-07 01:43:51 PM	LAF10	53.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	53.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41 dB
Overload	No	LAFmin	37.6 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	4	LAFmax	79 dB
Start Date & Time	2016-09-07 04:23:10 PM	LAF10	59.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	59.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	43.5 dB
Overload	No	LAFmin	40.1 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	5	LAFmax	69.5 dB
Start Date & Time	2016-09-07 04:38:12 PM	LAF10	53 dB
Duration	00:15:00 HH:MM:SS	LAeq	51.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	45 dB
Overload	No	LAFmin	41.7 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	6	LAFmax	75.5 dB
Start Date & Time	2016-09-07 04:53:15 PM	LAF10	59.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	58 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44 dB
Overload	No	LAFmin	40.2 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	7	LAFmax	81.4 dB
Start Date & Time	2016-09-07 05:08:17 PM	LAF10	62.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	59.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	43 dB
Overload	No	LAFmin	40.4 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	8	LAFmax	75.7 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Start Date & Time	2016-09-07 05:52:02 PM	LAF10	54.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41.5 dB
Overload	No	LAFmin	38.6 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	9	LAFmax	77.1 dB
Start Date & Time	2016-09-07 06:18:16 PM	LAF10	59.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	57.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	40.5 dB
Overload	No	LAFmin	37.9 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	10	LAFmax	73.8 dB
Start Date & Time	2016-09-07 06:36:32 PM	LAF10	50 dB
Duration	00:15:00 HH:MM:SS	LAeq	52.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38.5 dB
Overload	No	LAFmin	35.8 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	11	LAFmax	76.5 dB
Start Date & Time	2016-09-07 07:00:55 PM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39.5 dB
Overload	No	LAFmin	37.4 dB
Cal. (Before) Date	2016-09-07 06:20:01 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	12	LAFmax	92 dB
Start Date & Time	2016-09-08 06:37:22 AM	LAF10	56 dB
Duration	00:15:00 HH:MM:SS	LAeq	68.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	43.4 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	13	LAFmax	72.4 dB
Start Date & Time	2016-09-08 06:52:25 AM	LAF10	56.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	53.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	49 dB
Overload	No	LAFmin	44.7 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		

SLM Results: PMB Airport: 20160903 - 20160912

Run No	14	LAFmax	80.1 dB
Start Date & Time	2016-09-08 07:53:15 AM	LAF10	58.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	59.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47 dB
Overload	No	LAFmin	43.5 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	15	LAFmax	78 dB
Start Date & Time	2016-09-08 08:08:46 AM	LAF10	59.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	57 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48.5 dB
Overload	No	LAFmin	43.1 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	16	LAFmax	88.8 dB
Start Date & Time	2016-09-08 08:39:48 AM	LAF10	64 dB
Duration	00:15:00 HH:MM:SS	LAeq	66.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	43.9 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	17	LAFmax	80.3 dB
Start Date & Time	2016-09-08 01:04:19 PM	LAF10	64.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	62.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	50 dB
Overload	No	LAFmin	45.7 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	18	LAFmax	77.6 dB
Start Date & Time	2016-09-08 01:19:22 PM	LAF10	57.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48.5 dB
Overload	No	LAFmin	44.6 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	19	LAFmax	87.9 dB
Start Date & Time	2016-09-08 01:43:51 PM	LAF10	71 dB
Duration	00:15:00 HH:MM:SS	LAeq	67.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	58.5 dB
Overload	No	LAFmin	50.4 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Instrument Model	**CEL-621C**		
Run No	20	LAFmax	91 dB
Start Date & Time	2016-09-08 04:21:55 PM	LAF10	66.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	66.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52 dB
Overload	No	LAFmin	46.9 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	21	LAFmax	83.3 dB
Start Date & Time	2016-09-08 04:36:59 PM	LAF10	62 dB
Duration	00:15:00 HH:MM:SS	LAeq	60.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	53 dB
Overload	No	LAFmin	48.3 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	22	LAFmax	78.7 dB
Start Date & Time	2016-09-08 04:52:30 PM	LAF10	63.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	61.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52 dB
Overload	No	LAFmin	47.2 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	23	LAFmax	82.1 dB
Start Date & Time	2016-09-08 05:07:59 PM	LAF10	66 dB
Duration	00:15:00 HH:MM:SS	LAeq	63.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52 dB
Overload	No	LAFmin	44.8 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	24	LAFmax	77.5 dB
Start Date & Time	2016-09-08 05:23:55 PM	LAF10	65 dB
Duration	00:15:00 HH:MM:SS	LAeq	61.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	50 dB
Overload	No	LAFmin	42 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	25	LAFmax	80.8 dB
Start Date & Time	2016-09-08 05:50:47 PM	LAF10	64.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	61.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	42.7 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	26	LAFmax	88.2 dB
Start Date & Time	2016-09-08 06:19:57 PM	LAF10	63.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	64.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	46 dB
Overload	No	LAFmin	41 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	27	LAFmax	74.6 dB
Start Date & Time	2016-09-08 06:35:14 PM	LAF10	62 dB
Duration	00:15:00 HH:MM:SS	LAeq	58.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	45.5 dB
Overload	No	LAFmin	41.8 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	28	LAFmax	75.6 dB
Start Date & Time	2016-09-08 07:05:56 PM	LAF10	62 dB
Duration	00:15:00 HH:MM:SS	LAeq	58.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	45.5 dB
Overload	No	LAFmin	40.7 dB
Cal. (Before) Date	2016-09-08 06:23:15 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	29	LAFmax	84.6 dB
Start Date & Time	2016-09-09 06:36:57 AM	LAF10	66.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	65.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	53 dB
Overload	No	LAFmin	47.6 dB
Cal. (Before) Date	2016-09-09 06:11:58 AM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	30	LAFmax	79.8 dB
Start Date & Time	2016-09-09 06:54:02 AM	LAF10	67 dB
Duration	00:15:00 HH:MM:SS	LAeq	63.6 dB
Paused Duration	00:00:10 HH:MM:SS	LAF90	54 dB
Overload	No	LAFmin	49.6 dB
Cal. (Before) Date	2016-09-09 06:11:58 AM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	31	LAFmax	72.3 dB
Start Date & Time	2016-09-09 07:52:12 AM	LAF10	63.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	59.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48 dB

Report Generated By Insight CEL-62x - Casella CEL Ltd - On 2016-09-14 At 11:58:12 AM — Page 16 of 21

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Overload	No	LAFmin	41.8 dB
Cal. (Before) Date	2016-09-09 06:11:58 AM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	32	LAFmax	90.1 dB
Start Date & Time	2016-09-09 08:07:43 AM	LAF10	64.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	61 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	42.3 dB
Cal. (Before) Date	2016-09-09 06:11:58 AM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	33	LAFmax	80.2 dB
Start Date & Time	2016-09-09 08:22:56 AM	LAF10	61.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	58.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	46.5 dB
Overload	No	LAFmin	42.1 dB
Cal. (Before) Date	2016-09-09 06:11:58 AM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	34	LAFmax	81.1 dB
Start Date & Time	2016-09-09 08:38:51 AM	LAF10	62.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	59.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	43.4 dB
Cal. (Before) Date	2016-09-09 06:11:58 AM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	35	LAFmax	81.8 dB
Start Date & Time	2016-09-09 01:10:24 PM	LAF10	66 dB
Duration	00:15:00 HH:MM:SS	LAeq	61.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48 dB
Overload	No	LAFmin	43.2 dB
Cal. (Before) Date	2016-09-09 06:11:58 AM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	36	LAFmax	77.8 dB
Start Date & Time	2016-09-09 01:25:27 PM	LAF10	67 dB
Duration	00:15:00 HH:MM:SS	LAeq	62.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	49.5 dB
Overload	No	LAFmin	44.2 dB
Cal. (Before) Date	2016-09-09 06:11:58 AM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	37	LAFmax	86 dB
Start Date & Time	2016-09-09 01:45:03 PM	LAF10	65 dB
Duration	00:15:00 HH:MM:SS	LAeq	61.4 dB

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SLM Results: PMB Airport: 20160903 - 20160912

Paused Duration	00:00:00 HH:MM:SS	LAF90	49.5 dB
Overload	No	LAFmin	28.8 dB
Cal. (Before) Date	2016-09-09 06:11:58 AM	Cal. Drift	-0.100000000 dB
Instrument Model	**CEL-621C**		
Run No	38	LAFmax	65.3 dB
Start Date & Time	2016-09-11 01:05:59 PM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	54.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51.5 dB
Overload	No	LAFmin	47.6 dB
Cal. (Before) Date	2016-09-11 01:05:39 PM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	39	LAFmax	64.9 dB
Start Date & Time	2016-09-11 01:52:17 PM	LAF10	59 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	53 dB
Overload	No	LAFmin	49.7 dB
Cal. (Before) Date	2016-09-11 01:05:39 PM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	40	LAFmax	71 dB
Start Date & Time	2016-09-11 04:47:55 PM	LAF10	58.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	54 dB
Overload	No	LAFmin	51.4 dB
Cal. (Before) Date	2016-09-11 01:05:39 PM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	41	LAFmax	78.7 dB
Start Date & Time	2016-09-11 05:03:46 PM	LAF10	58.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	58.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	50.5 dB
Overload	No	LAFmin	47.1 dB
Cal. (Before) Date	2016-09-11 01:05:39 PM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	42	LAFmax	74.4 dB
Start Date & Time	2016-09-11 05:37:04 PM	LAF10	56 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	50.5 dB
Overload	No	LAFmin	46.8 dB
Cal. (Before) Date	2016-09-11 01:05:39 PM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	43	LAFmax	61.7 dB
Start Date & Time	2016-09-11 05:52:06 PM	LAF10	56 dB

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SLM Results: PMB Airport: 20160903 - 20160912

Duration	00:15:00 HH:MM:SS	LAeq	54.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51.5 dB
Overload	No	LAFmin	47.9 dB
Cal. (Before) Date	2016-09-11 01:05:39 PM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	45	LAFmax	81.6 dB
Start Date & Time	2016-09-12 06:40:18 AM	LAF10	62 dB
Duration	00:15:00 HH:MM:SS	LAeq	60.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	56.5 dB
Overload	No	LAFmin	54.2 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	47	LAFmax	82.1 dB
Start Date & Time	2016-09-12 07:01:34 AM	LAF10	63.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	61 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	56.5 dB
Overload	No	LAFmin	52.9 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	48	LAFmax	66.8 dB
Start Date & Time	2016-09-12 12:54:46 PM	LAF10	42.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	40.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	34.5 dB
Overload	No	LAFmin	31.8 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	49	LAFmax	68.5 dB
Start Date & Time	2016-09-12 01:17:55 PM	LAF10	45.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	48.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	36.5 dB
Overload	No	LAFmin	33.3 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	50	LAFmax	74.8 dB
Start Date & Time	2016-09-12 02:01:01 PM	LAF10	48.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	46.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	37.5 dB
Overload	No	LAFmin	34.3 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	51	LAFmax	76.9 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Start Date & Time	2016-09-12 04:16:42 PM	LAF10	50 dB
Duration	00:15:00 HH:MM:SS	LAeq	50.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41.5 dB
Overload	No	LAFmin	34.7 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	52	LAFmax	67.5 dB
Start Date & Time	2016-09-12 04:33:15 PM	LAF10	49 dB
Duration	00:15:00 HH:MM:SS	LAeq	47.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	43 dB
Overload	No	LAFmin	37.9 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	53	LAFmax	66.8 dB
Start Date & Time	2016-09-12 04:53:15 PM	LAF10	47 dB
Duration	00:15:00 HH:MM:SS	LAeq	46 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42.5 dB
Overload	No	LAFmin	34 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	54	LAFmax	83 dB
Start Date & Time	2016-09-12 05:45:25 PM	LAF10	54 dB
Duration	00:15:00 HH:MM:SS	LAeq	55 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	46 dB
Overload	No	LAFmin	42.6 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	55	LAFmax	60.1 dB
Start Date & Time	2016-09-12 06:20:22 PM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	50 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48 dB
Overload	No	LAFmin	45.8 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		
Run No	56	LAFmax	52.4 dB
Start Date & Time	2016-09-12 06:42:27 PM	LAF10	50.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	49.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	45.3 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB
Instrument Model	**CEL-621C**		

Casella CEL Ltd.

SLM Results: PMB Airport: 20160903 - 20160912

Run No	57	LAFmax	66.9 dB
Start Date & Time	2016-09-12 07:04:25 PM	LAF10	51 dB
Duration	00:15:00 HH:MM:SS	LAeq	51.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	45.3 dB
Cal. (Before) Date	2016-09-12 06:40:12 AM	Cal. Drift	0.200000000 dB

Report Generated By Insight CEL-62x - Casella CEL Ltd - On 2016-09-14 At 11:58:12 AM Page 21 of 21

Casella CEL Ltd.

SLM Results: PMB Airport: 20160914 - 20160916

Instrument Model	**CEL-621C**		
Run No	60	LAFmax	69.2 dB
Start Date & Time	2016-09-14 07:53:37 AM	LAF10	60 dB
Duration	00:15:00 HH:MM:SS	LAeq	57.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51.5 dB
Overload	No	LAFmin	47 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	61	LAFmax	71.7 dB
Start Date & Time	2016-09-14 08:09:40 AM	LAF10	58.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	41.8 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	62	LAFmax	72.1 dB
Start Date & Time	2016-09-14 08:40:17 AM	LAF10	58 dB
Duration	00:15:00 HH:MM:SS	LAeq	54.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	40.7 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	63	LAFmax	65.9 dB
Start Date & Time	2016-09-14 09:02:46 AM	LAF10	57.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	53.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47 dB
Overload	No	LAFmin	42.3 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	64	LAFmax	70.1 dB
Start Date & Time	2016-09-14 01:10:00 PM	LAF10	58.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47 dB
Overload	No	LAFmin	39.2 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	65	LAFmax	68.5 dB
Start Date & Time	2016-09-14 01:25:18 PM	LAF10	56 dB
Duration	00:15:00 HH:MM:SS	LAeq	53.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47.5 dB
Overload	No	LAFmin	43.6 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160914 - 20160916

Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	66	LAFmax	54.5 dB
Start Date & Time	2016-09-14 01:45:22 PM	LAF10	51 dB
Duration	00:00:13 HH:MM:SS	LAeq	49.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	47 dB
Overload	No	LAFmin	46.6 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	67	LAFmax	75.6 dB
Start Date & Time	2016-09-14 01:45:48 PM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	46.5 dB
Overload	No	LAFmin	41.5 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	68	LAFmax	81.2 dB
Start Date & Time	2016-09-14 04:24:16 PM	LAF10	58.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	57.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51 dB
Overload	No	LAFmin	46 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	69	LAFmax	70.5 dB
Start Date & Time	2016-09-14 04:39:51 PM	LAF10	59 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52 dB
Overload	No	LAFmin	45.6 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	70	LAFmax	70.3 dB
Start Date & Time	2016-09-14 04:55:22 PM	LAF10	59.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	57.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52 dB
Overload	No	LAFmin	47.1 dB
Cal. (Before) Date	2016-09-14 07:20:58 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	71	LAFmax	75.6 dB
Start Date & Time	2016-09-15 06:44:41 AM	LAF10	62 dB
Duration	00:15:00 HH:MM:SS	LAeq	58.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160914 - 20160916

Overload	No	LAFmin	48.4 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	72	LAFmax	76.5 dB
Start Date & Time	2016-09-15 07:00:08 AM	LAF10	62.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	59.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51.5 dB
Overload	No	LAFmin	49.6 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	73	LAFmax	77.8 dB
Start Date & Time	2016-09-15 07:56:51 AM	LAF10	56.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	50 dB
Overload	No	LAFmin	48.2 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	74	LAFmax	83.9 dB
Start Date & Time	2016-09-15 08:11:59 AM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	58.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48.5 dB
Overload	No	LAFmin	46.8 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	75	LAFmax	60.4 dB
Start Date & Time	2016-09-15 08:41:52 AM	LAF10	51 dB
Duration	00:15:00 HH:MM:SS	LAeq	49.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48.5 dB
Overload	No	LAFmin	46.3 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	76	LAFmax	73.1 dB
Start Date & Time	2016-09-15 01:10:31 PM	LAF10	49 dB
Duration	00:15:00 HH:MM:SS	LAeq	50.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44.5 dB
Overload	No	LAFmin	42 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	77	LAFmax	69.1 dB
Start Date & Time	2016-09-15 01:27:56 PM	LAF10	50 dB
Duration	00:15:00 HH:MM:SS	LAeq	48.4 dB

Report Generated By Insight CEL-62x - Casella CEL Ltd - On 2016-09-16 At 12:23:48 PM Page 3 of 6

Casella CEL Ltd.

SLM Results: PMB Airport: 20160914 - 20160916

Paused Duration	00:00:00 HH:MM:SS	LAF90	44 dB
Overload	No	LAFmin	41.7 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	78	LAFmax	69.5 dB
Start Date & Time	2016-09-15 01:49:58 PM	LAF10	53.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	51.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44.5 dB
Overload	No	LAFmin	42.6 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	79	LAFmax	70.5 dB
Start Date & Time	2016-09-15 04:25:27 PM	LAF10	57.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48.5 dB
Overload	No	LAFmin	46.6 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	80	LAFmax	77 dB
Start Date & Time	2016-09-15 04:40:30 PM	LAF10	56.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	54.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48.5 dB
Overload	No	LAFmin	46.4 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	81	LAFmax	78.8 dB
Start Date & Time	2016-09-15 04:58:24 PM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48 dB
Overload	No	LAFmin	45.8 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	82	LAFmax	83.4 dB
Start Date & Time	2016-09-15 05:13:28 PM	LAF10	56 dB
Duration	00:15:00 HH:MM:SS	LAeq	57.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48 dB
Overload	No	LAFmin	46 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	83	LAFmax	79.9 dB
Start Date & Time	2016-09-15 05:53:14 PM	LAF10	55.5 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160914 - 20160916

Duration	00:15:00 HH:MM:SS	LAeq	57.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	48 dB
Overload	No	LAFmin	45.8 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	84	LAFmax	75.9 dB
Start Date & Time	2016-09-15 06:24:41 PM	LAF10	57.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	57.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	50.5 dB
Overload	No	LAFmin	46 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	85	LAFmax	67.8 dB
Start Date & Time	2016-09-15 06:39:52 PM	LAF10	55.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	54 dB
Overload	No	LAFmin	50.8 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	86	LAFmax	72 dB
Start Date & Time	2016-09-15 07:08:58 PM	LAF10	56.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	50 dB
Overload	No	LAFmin	45.7 dB
Cal. (Before) Date	2016-09-15 06:19:04 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	87	LAFmax	84.8 dB
Start Date & Time	2016-09-16 06:43:03 AM	LAF10	71.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	68.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	57.5 dB
Overload	No	LAFmin	48.4 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	88	LAFmax	82.2 dB
Start Date & Time	2016-09-16 06:58:07 AM	LAF10	69.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	66.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	60 dB
Overload	No	LAFmin	54.1 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	89	LAFmax	77.6 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160914 - 20160916

Start Date & Time	2016-09-16 07:53:54 AM	LAF10	68.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	64.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51 dB
Overload	No	LAFmin	45.5 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	90	LAFmax	81.2 dB
Start Date & Time	2016-09-16 08:13:06 AM	LAF10	67 dB
Duration	00:15:00 HH:MM:SS	LAeq	62.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	49.5 dB
Overload	No	LAFmin	46.4 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	91	LAFmax	75.9 dB
Start Date & Time	2016-09-16 08:41:56 AM	LAF10	66 dB
Duration	00:15:00 HH:MM:SS	LAeq	61 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	45.5 dB
Overload	No	LAFmin	42.7 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160916 - 20160921

Instrument Model	**CEL-621C**		
Run No	1	LAFmax	80.1 dB
Start Date & Time	2016-09-16 01:12:21 PM	LAF10	67.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	63.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52 dB
Overload	No	LAFmin	47.8 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	2	LAFmax	76.9 dB
Start Date & Time	2016-09-16 01:29:37 PM	LAF10	67.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	63.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51.5 dB
Overload	No	LAFmin	47.1 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	3	LAFmax	77 dB
Start Date & Time	2016-09-16 01:47:30 PM	LAF10	68 dB
Duration	00:15:00 HH:MM:SS	LAeq	63.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52.5 dB
Overload	No	LAFmin	46.3 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	4	LAFmax	72 dB
Start Date & Time	2016-09-16 04:29:27 PM	LAF10	65.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	62.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	55 dB
Overload	No	LAFmin	47.9 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	5	LAFmax	80.7 dB
Start Date & Time	2016-09-16 04:45:02 PM	LAF10	65 dB
Duration	00:15:00 HH:MM:SS	LAeq	62.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	54.5 dB
Overload	No	LAFmin	48.1 dB
Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	6	LAFmax	92.6 dB
Start Date & Time	2016-09-16 05:00:05 PM	LAF10	66 dB
Duration	00:15:00 HH:MM:SS	LAeq	70 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	54 dB
Overload	No	LAFmin	47.4 dB

Report Generated By Insight CEL-62x - Casella CEL Ltd - On 2016-09-21 At 10:31:13 AM Page 1 of 7

Casella CEL Ltd.

SLM Results: PMB Airport: 20160916 - 20160921

Cal. (Before) Date	2016-09-16 06:09:33 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	7	LAFmax	69.2 dB
Start Date & Time	2016-09-19 06:41:54 AM	LAF10	56.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51.5 dB
Overload	No	LAFmin	49.4 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	8	LAFmax	71.9 dB
Start Date & Time	2016-09-19 06:59:38 AM	LAF10	55.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	54.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	50 dB
Overload	No	LAFmin	47.5 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	9	LAFmax	68.5 dB
Start Date & Time	2016-09-19 07:54:01 AM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	51.4 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	46 dB
Overload	No	LAFmin	43.6 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	10	LAFmax	71.3 dB
Start Date & Time	2016-09-19 08:15:26 AM	LAF10	50 dB
Duration	00:15:00 HH:MM:SS	LAeq	50.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42.5 dB
Overload	No	LAFmin	39.9 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	11	LAFmax	68.3 dB
Start Date & Time	2016-09-19 08:42:11 AM	LAF10	49 dB
Duration	00:15:00 HH:MM:SS	LAeq	48.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41.5 dB
Overload	No	LAFmin	39.2 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	12	LAFmax	66.3 dB
Start Date & Time	2016-09-19 01:11:45 PM	LAF10	43 dB
Duration	00:15:00 HH:MM:SS	LAeq	43.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	35.5 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160916 - 20160921

Overload	No	LAFmin	33.4 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	13	LAFmax	66.8 dB
Start Date & Time	2016-09-19 01:27:19 PM	LAF10	43.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	42.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	34.5 dB
Overload	No	LAFmin	32.4 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	14	LAFmax	70.8 dB
Start Date & Time	2016-09-19 01:48:02 PM	LAF10	50.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	49.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	36 dB
Overload	No	LAFmin	32.7 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	15	LAFmax	66.7 dB
Start Date & Time	2016-09-19 04:26:51 PM	LAF10	47 dB
Duration	00:15:00 HH:MM:SS	LAeq	47.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39 dB
Overload	No	LAFmin	36.7 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	16	LAFmax	63.1 dB
Start Date & Time	2016-09-19 04:42:07 PM	LAF10	46.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	45.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38.5 dB
Overload	No	LAFmin	36.4 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	17	LAFmax	74.6 dB
Start Date & Time	2016-09-19 04:57:19 PM	LAF10	49 dB
Duration	00:15:00 HH:MM:SS	LAeq	52.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39.5 dB
Overload	No	LAFmin	35.9 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	18	LAFmax	69.2 dB
Start Date & Time	2016-09-19 05:12:22 PM	LAF10	47.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	46.7 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160916 - 20160921

Paused Duration	00:00:00 HH:MM:SS	LAF90	39.5 dB
Overload	No	LAFmin	37 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	19	LAFmax	71.4 dB
Start Date & Time	2016-09-19 05:56:55 PM	LAF10	46 dB
Duration	00:15:00 HH:MM:SS	LAeq	46.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39 dB
Overload	No	LAFmin	35.9 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	20	LAFmax	67.7 dB
Start Date & Time	2016-09-19 06:18:00 PM	LAF10	41.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	47 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	35.5 dB
Overload	No	LAFmin	33.3 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	21	LAFmax	59.9 dB
Start Date & Time	2016-09-19 06:33:02 PM	LAF10	43 dB
Duration	00:15:00 HH:MM:SS	LAeq	40.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	34.5 dB
Overload	No	LAFmin	32 dB
Cal. (Before) Date	2016-09-19 06:27:13 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	22	LAFmax	60.7 dB
Start Date & Time	2016-09-20 06:44:39 AM	LAF10	48.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	47 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44.5 dB
Overload	No	LAFmin	42.3 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	23	LAFmax	60.9 dB
Start Date & Time	2016-09-20 06:59:49 AM	LAF10	48 dB
Duration	00:15:00 HH:MM:SS	LAeq	46.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44.5 dB
Overload	No	LAFmin	41.8 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	24	LAFmax	71 dB
Start Date & Time	2016-09-20 07:58:21 AM	LAF10	49 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160916 - 20160921

Duration	00:15:00 HH:MM:SS	LAeq	48.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	43.5 dB
Overload	No	LAFmin	41 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	25	LAFmax	71.6 dB
Start Date & Time	2016-09-20 08:17:38 AM	LAF10	46 dB
Duration	00:15:00 HH:MM:SS	LAeq	46 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	42.5 dB
Overload	No	LAFmin	40 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	26	LAFmax	56 dB
Start Date & Time	2016-09-20 08:43:49 AM	LAF10	44 dB
Duration	00:15:00 HH:MM:SS	LAeq	42.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	40.5 dB
Overload	No	LAFmin	38.5 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	27	LAFmax	67.3 dB
Start Date & Time	2016-09-20 01:11:22 PM	LAF10	42 dB
Duration	00:15:00 HH:MM:SS	LAeq	43.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	37 dB
Overload	No	LAFmin	35.3 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	28	LAFmax	56.3 dB
Start Date & Time	2016-09-20 01:27:05 PM	LAF10	42 dB
Duration	00:15:00 HH:MM:SS	LAeq	40.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38.5 dB
Overload	No	LAFmin	35.6 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	29	LAFmax	58 dB
Start Date & Time	2016-09-20 01:47:45 PM	LAF10	41 dB
Duration	00:15:00 HH:MM:SS	LAeq	39.6 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	37.5 dB
Overload	No	LAFmin	34.7 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	30	LAFmax	65.1 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160916 - 20160921

Start Date & Time	2016-09-20 04:27:05 PM	LAF10	48.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	48.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	44.5 dB
Overload	No	LAFmin	41.9 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	31	LAFmax	60.7 dB
Start Date & Time	2016-09-20 04:42:09 PM	LAF10	48.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	47.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	45.5 dB
Overload	No	LAFmin	42.6 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	32	LAFmax	73.3 dB
Start Date & Time	2016-09-20 04:57:46 PM	LAF10	53 dB
Duration	00:15:00 HH:MM:SS	LAeq	50.8 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	45.5 dB
Overload	No	LAFmin	43.3 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	33	LAFmax	89.5 dB
Start Date & Time	2016-09-20 05:16:00 PM	LAF10	49 dB
Duration	00:15:00 HH:MM:SS	LAeq	57.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	45 dB
Overload	No	LAFmin	43.3 dB
Cal. (Before) Date	2016-09-20 06:28:14 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	36	LAFmax	78.7 dB
Start Date & Time	2016-09-21 06:41:22 AM	LAF10	70 dB
Duration	00:15:00 HH:MM:SS	LAeq	67.3 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	61.5 dB
Overload	No	LAFmin	53.6 dB
Cal. (Before) Date	2016-09-21 06:18:48 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	37	LAFmax	80 dB
Start Date & Time	2016-09-21 06:56:33 AM	LAF10	69.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	66.7 dB
Paused Duration	00:00:24 HH:MM:SS	LAF90	60 dB
Overload	No	LAFmin	54.4 dB
Cal. (Before) Date	2016-09-21 06:18:48 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		

Casella CEL Ltd.

SLM Results: PMB Airport: 20160916 - 20160921

Run No	38	LAFmax	76.5 dB
Start Date & Time	2016-09-21 07:55:41 AM	LAF10	69 dB
Duration	00:15:00 HH:MM:SS	LAeq	65.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	57 dB
Overload	No	LAFmin	47.2 dB
Cal. (Before) Date	2016-09-21 06:18:48 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	39	LAFmax	77.8 dB
Start Date & Time	2016-09-21 08:14:07 AM	LAF10	69.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	65.8 dB
Paused Duration	00:01:33 HH:MM:SS	LAF90	56 dB
Overload	No	LAFmin	47.8 dB
Cal. (Before) Date	2016-09-21 06:18:48 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	40	LAFmax	75.1 dB
Start Date & Time	2016-09-21 08:40:10 AM	LAF10	68.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	64.9 dB
Paused Duration	00:06:06 HH:MM:SS	LAF90	53.5 dB
Overload	No	LAFmin	49.6 dB
Cal. (Before) Date	2016-09-21 06:18:48 AM	Cal. Drift	0.000000000 dB

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SLM Results: PMB Airport: 20160921 (Additional)

Instrument Model	**CEL-621C**		
Run No	41	LAFmax	79.2 dB
Start Date & Time	2016-09-21 01:08:57 PM	LAF10	67.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	64.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52.5 dB
Overload	No	LAFmin	45.3 dB
Cal. (Before) Date	2016-09-21 06:18:48 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	42	LAFmax	82.8 dB
Start Date & Time	2016-09-21 01:23:59 PM	LAF10	68 dB
Duration	00:15:00 HH:MM:SS	LAeq	65.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	55 dB
Overload	No	LAFmin	46.2 dB
Cal. (Before) Date	2016-09-21 06:18:48 AM	Cal. Drift	0.000000000 dB

Instrument Model	**CEL-621C**		
Run No	43	LAFmax	74.7 dB
Start Date & Time	2016-09-21 01:45:29 PM	LAF10	67.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	64 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	56 dB
Overload	No	LAFmin	49.3 dB
Cal. (Before) Date	2016-09-21 06:18:48 AM	Cal. Drift	0.000000000 dB

Report Generated By Insight CEL-62x - Casella CEL Ltd - On 2016-09-23 At 11:32:40 AM

Page 1 of 1

Casella CEL Ltd.

SLM Results: PMB Airport: 20160929

Instrument Model	**CEL-621C**		
Run No	44	LAFmax	56.4 dB
Start Date & Time	2016-09-29 06:50:02 AM	LAF10	55.5 dB
Duration	00:00:26 HH:MM:SS	LAeq	54.4 dB
Paused Duration	00:00:10 HH:MM:SS	LAF90	53 dB
Overload	No	LAFmin	51.9 dB
Cal. (Before) Date	2016-09-21 06:18:48 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	45	LAFmax	71.9 dB
Start Date & Time	2016-09-29 06:51:04 AM	LAF10	56 dB
Duration	00:15:00 HH:MM:SS	LAeq	54.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	52 dB
Overload	No	LAFmin	50.1 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	46	LAFmax	63.1 dB
Start Date & Time	2016-09-29 07:10:33 AM	LAF10	56 dB
Duration	00:15:00 HH:MM:SS	LAeq	54 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	51.5 dB
Overload	No	LAFmin	48.7 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	47	LAFmax	72.9 dB
Start Date & Time	2016-09-29 07:58:54 AM	LAF10	47.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	52.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39 dB
Overload	No	LAFmin	36.5 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	48	LAFmax	61.3 dB
Start Date & Time	2016-09-29 08:15:12 AM	LAF10	50.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	47.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38.5 dB
Overload	No	LAFmin	35.9 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	49	LAFmax	68.6 dB
Start Date & Time	2016-09-29 08:41:29 AM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	50.9 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	43 dB
Overload	No	LAFmin	40.7 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160929

Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	50	LAFmax	79.3 dB
Start Date & Time	2016-09-29 12:59:50 PM	LAF10	51.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	58.7 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	41.5 dB
Overload	No	LAFmin	38.5 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	51	LAFmax	62.2 dB
Start Date & Time	2016-09-29 01:20:19 PM	LAF10	45.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	44.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	40.5 dB
Overload	No	LAFmin	37.4 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	52	LAFmax	82.3 dB
Start Date & Time	2016-09-29 02:32:02 PM	LAF10	51 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.2 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	39 dB
Overload	No	LAFmin	36.4 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	53	LAFmax	62.7 dB
Start Date & Time	2016-09-29 06:03:49 PM	LAF10	48.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	46.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38.5 dB
Overload	No	LAFmin	36.2 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	54	LAFmax	72.9 dB
Start Date & Time	2016-09-29 06:56:16 PM	LAF10	57 dB
Duration	00:15:00 HH:MM:SS	LAeq	55 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	38 dB
Overload	No	LAFmin	35.4 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	55	LAFmax	78.6 dB
Start Date & Time	2016-09-29 07:13:03 PM	LAF10	56.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	56.1 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	36.5 dB

Casella CEL Ltd.

SLM Results: PMB Airport: 20160929

Overload	No	LAFmin	33 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	56	LAFmax	78.6 dB
Start Date & Time	2016-09-29 07:29:34 PM	LAF10	53.5 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	34 dB
Overload	No	LAFmin	32 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB
Instrument Model	**CEL-621C**		
Run No	57	LAFmax	74.1 dB
Start Date & Time	2016-09-29 08:09:48 PM	LAF10	58 dB
Duration	00:15:00 HH:MM:SS	LAeq	55.5 dB
Paused Duration	00:00:00 HH:MM:SS	LAF90	33 dB
Overload	No	LAFmin	30.3 dB
Cal. (Before) Date	2016-09-29 06:50:45 AM	Cal. Drift	0.000000000 dB

Report Generated By Insight CEL-62x - Casella CEL Ltd - On 2016-10-03 At 11:57:51 AM

Page 3 of 3

Appendix D: Field Observation Sheets

Scanned copies available on request owing to document size