THE IMPACT OF NIGHTCLUBS AND RESTAURANT BARS NOISE POLLUTION ON THE POPULATION OF MELVILLE, JOHANNESBURG, SOUTH AFRICA

By

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DEDICATIONS

I dedicate this thesis to my mother: Edith Dikeledi Khomo; My husband: Samuel Mahapa; My kids: Thato, Thabang and Palesa Mahapa. Thank you so much for your encouragement, love and support. Even when I wanted to give up you were always there to give me strength and hope when I didn't have any left in me.

Your constant encouragement has enabled me to reach my dreams. Love you always.

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ABSTRACT

Nightclubs and restaurant bars have become major sources of noise pollution particularly in areas close to residential dwellings. The purpose of this study was to investigate the impact of noise emanating from nightclubs and restaurant bars on the community of Melville, Johannesburg. This study followed both qualitative and quantitative research methods. A total of 100 respondents were randomly sampled within the study area. Qualitative data was collected using a structured questionnaire. A calibrated sound level meter was used to measure environmental noise levels at 10 different measuring points. The research finding revealed that about:

- 87% of noise levels measured with the sound level meter did not comply with officially acceptable levels of 40dB at night.
- 69% of respondents indicated that the main source of noise is pollution is nightclubs.
- 78% of respondents described noise as annoying, disturbing and unwanted.
- 57% of respondents indicated that members of their household have suffered from sleeping disorders due to noise activities at night disrupting their sleep patterns and resulting in irritability and fatigue.

The noise measurements were taken on weekends and public holidays during the day from 10h00 to 14h30 and at night from 22h00 to 02h30. The research findings revealed that the residents of Melville experienced high level of noise at night with nightclub as major source of noise and as a result the majority of the sampled population complained about irritability, fatigue and sleeping disorders due to exposure to noise.

The outcome of this research indicated the need of health education on the adverse effects of noise pollution and the need of sound insulation at places of entertainment. Implementation of a noise management policy is needed in order to effectively control and manage the noise pollution in its area of jurisdiction and regular noise level monitoring by constantly taking noise measurements by law enforcements officers.

Key terms: Melville, Johannesburg, Noise pollution, Nightclubs, Restaurant bars, structured questionnaire, Simple random sampling technique, Ambient noise level and noise level meter.

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ABBREVIATIONS AND ACRONYMS

AC:	Alternating current
ACAPS:	Assessment capacities projects
CAES:	College of Agriculture and Environmental Science
CCOHS:	Canadian Centre for occupational health and safety
dB:	Decibels
DC:	Direct current
DEFRA:	Department of Environmental, Food, Rural Affairs
GPS:	Global positioning systems
HZ:	Hertz
$L_{Rreg\ dB}$:	Equivalent continuous daytime rating level
L_{Rdna}:	Equivalent continuous day/night rating level
L_{Rregnb}:	Equivalent continuous night rating level
$L_{reg}T$:	Equivalent continuous rating level
M/s:	Wind speed
NHIL:	Noise induced hearing loss
NIDCD:	National Institute on deafness and other communication disorders
NIUFDIDC:	Northern Illinois University Faculty of Development and Instructional and Design Centre
OECD:	Organization of Economic Co-operation and development
SANS:	South African Noise Standard
SCENHIR:	Scientific Committee on Emergency and Newly Identified Health Risk
SLM:	Sound Level Meter
WHO:	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background

The majority of South Africans, like people in other African countries, live in communities that are somewhat exposed to noise pollution (Zachiariou & Gladwin, 2014). Noise has the capability to cause conflict between those who are generating it and those who are victims of it. People do tolerate noise to a certain extent, but when noise becomes a nuisance it infringes other people's rights and that can lead to irritation and frustration (Zachiariou & Gladwin, 2014). The concern for government to manage and control the consequences of urban noise level in the cities increases as urbanization increases (Henderson, 2002).

Environmental noise consists of all the unwanted sound in communities apart from noise that originates from inside the workplace (Goines & Hagler, 2007). Adverse health effects of environmental noise pollution are unpredictable as they are direct and cumulative. They also have socio-cultural, aesthetic and economic effects; hence noise can also affect even future generations. Environmental noise results from high population concentrations, high concentration of vehicles and intense industrial and commercial development found in urban areas. The main sources of environmental noise include traffic noise, construction and public works, industrial and institutional activity, social and economic activities (King, 2008). Despite attempts to regulate it, noise pollution has become an unfortunate fact of life across the world. In the 21st Century noise has escalated so dramatically in both severity and extent that it will become a major threat to the quality of human life. Noise pollution has manifested itself in the urban environment and its impact has been a constant threat since the industrial revolution (Sigh & Rao, 2001).

Researches on noise have previously focused on occupational exposure but little has been done to examine the effect of environmental noise at community level (King, 2008). Unfortunately data on noise pollutants are scarce in developing countries (including South Africa). Moreover, there are limited resources to systematically reveal the contribution of noise pollution (Burns, 2007). Nightclubs and restaurant bars have become a major part of the entertainment for many young adults, and attending clubs is the common recreational activity for young people. The general estimated average noise levels emanating from clubs and bars ranges from 100db A-weighted and over 100db, and attendance times have

been estimated to be from 22h00 to 02h00 during the weekends and public holidays (William *et al.*, 2010).

South Africa has recognized noise as a pollutant; however, it is a difficult pollutant to control compared to other environmental pollutants. This is due to the transient nature of noise, which prevents it from collecting in the environment like other types of pollutants. Noise can be controlled at source, which is the most effective method to prevent noise pollution. Control at source may be done either directly or indirectly related to the design process addressing causes of noise. Noise standards and planning strategies can be used effectively to abate noise at source (Bies & Hansen, 1996). If noise cannot be controlled at source, the next step is to abate it at the transmission path e.g. proper land use planning to avoid busy highways cutting across residential development or passing close to sensitive use areas. Other methods to abate noise is by placing walls as barriers between the source and the receiver and applying acoustic absorbing materials on the walls of the room or by placing additional acoustic absorbing surfaces in the room. An effective control procedure, although expensive, is to enclose the sound source in an acoustic enclosure or enclose the receiver in a personnel booth (Barron, 2002).

The most commonly used measures to control noise at the receiver are ear plugs or ear protectors. The Occupational Health and Safety Act No. 85 of 1993 (South Africa, 1993) requires permanent solutions known as engineering or management controls and this can be done by reducing noise at the receiver position by building a partial or complete enclosure around the receiver, listener or the use of active noise measures (Harris, 1991). Therefore, it is important to put more emphasis on the details of designing and building a personal enclosure.

1.2 Problem Statement

The community of Melville, Johannesburg, has for the past seven years (since 2007) been complaining about high levels of noise pollution emitted from nightclubs and bars, according to the noise pollution complaints statistics from the City of Johannesburg complaint register. The Johannesburg Metropolitan Municipality has by-laws and relevant pieces of legislation regulating environmental noise in order to keep noise levels below the minimum requirement of 50 decibels. However, compliance by entertainment business owners is still a major challenge. It has been noted that most of the studies in noise

pollution focus much on mobile sources (such as air traffic noise, road traffic noise and railroad noise) and little attention has been given to immobile sources such as nightclubs and restaurant bars.

1.3 Rationale

The high level of noise has a direct and cumulative adverse effect on the health of the residents and it degrades the residents' social life and learning environments. It interferes with the peacefulness and quietness of the community (Goines and Hagler, 2007). Noise can lead to a number of short-term and long-term health problems. Failure to combat noise pollution can lead to communities suffering from hearing loss, cardiovascular effects, children performing poorly at school and sleep disturbances. According to Johannesburg Metropolitan Municipality, Environmental Health Department Region B (City of Johannesburg website, 2015), an increase in the number of complaints from Melville residents with regard to noise has been noted since 2007.

The majority of households in Melville are in close proximity to night bars and restaurant bars. Given the health effects mentioned, research had to be done to investigate whether the noise emanating from these entertainment venues had an impact on the populations, therefore, this research aims is to provide the baseline information that can be used by law enforcement officers in controlling environmental noise emanating from nightclubs and bars within the community of Melville. This research has never been done before; previous researchers have based their research on occupational noise, traffic noise and aircraft noise.

1.4 Research Goal

The goal of this research was to determine the impact of environmental noise pollution emanating from nightclubs and restaurant bars within the community of Melville.

To achieve the above-mentioned goal the following objectives were considered:

- Investigate the occurrence of noise pollution by conducting physical measurements of environmental noise pollution using a sound level meter.

- Evaluate the environmental noise pollution levels in Melville community by using relevant by-laws and legislation as the standard.
- Assess the health effects of environmental noise pollution on the Melville population by conducting a household survey using a structured questionnaire.
- Make recommendations to the relevant authorities in order to mitigate environmental noise emanating from noise pollution sources within the community of Melville.

1.5 Research Methodology

Both qualitative and quantitative methods were used to generate the data. A structured questionnaire was used to collect data and a noise level meter was used to measure actual noise levels. Melville was chosen as the study area and it consists of a total population just over 2983. A simple random technique was used to select households by placing all streets and avenues targeted for sampling in a hat, and then selecting a subset by pulling out 100 residential addresses and then breaking those down to 10 each street and avenues. The total number of households from which the sample was drawn from was 1100, therefore given the size of the population, the level of precision selected was ±10% where confidence level is 95%.Hence a total of 100 households were sampled.

The questionnaire was used to obtain information from respondents with regard to noise emanating from nightclubs and bars in the study area. Data administered by the researcher was collected from 100 household in the study area. All participants were briefed prior to the interview about the study and what it entailed. They were briefed about their rights and were assured that their personal details will be kept secret. Participants were assured that they also had the right to withdraw at any given time from participating in this study.

1.6 Limitation of the Study

The challenges experienced were that some respondents were not available to partake in the study and some of them could not be reached on Saturdays, hence Sundays were also included for the administration of questionnaire in the actual study to ensure that all the selected households were covered. Another obstacle was getting access to the Sound Level Meter as it used by Auxiliary Services Department for measuring and monitoring of noise in the region.

1.7 Outline of the Dissertation

Chapter 1, Introduction**:** Provides the background of noise pollution worldwide. It also covers the health effects of environmental noise, problem statement, and rationale and research goal.

Chapter 2, Literature review**:** Focuses on literature review of noise pollution in South Africa as well as other countries, placing more emphasis on noise emanating from nightclubs and restaurant bars. It also looks at international, national and local policies and legislation on noise pollution. Current management strategies for combating noise pollution are also discussed.

Chapter 3, Research methodology: Outlines a brief overview of the study area, the research methodology used during the study, sampling methods, data collection, data analysis and limitation of the study.

Chapter 4, Research results and discussion**:** Provides the result of the study in the form of descriptive statistics and discussion. The results are presented and discussed in this chapter.

Chapter 5, Conclusion and Recommendations**:** Summarizes and makes recommendations based on findings of the study.

1.8 Conclusion

Noise pollution control or management is one of the most critical functions that the City of Johannesburg Metropolitan Municipality, Environmental Health Department should perform. Failure to combat noise pollution can lead to communities suffering from hearing loss, cardiovascular effects, children performing poorly at school and sleep disturbances. The information provided in this study will assist the law enforcement officers in the City of Johannesburg Metropolitan Municipality - especially region B - to effectively control or manage environmental noise emanating from nightclubs and bars within the community of Melville. The next chapter will provide a literature review of noise pollution nationally and internationally. It looks at international, national and local policies and legislation on noise

pollution and different management strategies for combating noise, especially on the management of noise in nightclubs and restaurant bars.

CHAPTER 2:

LITERATURE REVIEW

2. Introduction

The previous chapter dealt with noise pollution management in South Africa as well as other countries with an emphasis on the noise emanating from nightclubs and restaurant bars. This chapter looks at international, national and local policies and legislations on noise pollution. The current management strategies of combating noise pollution as well as the challenges related to current South African environmental noise legislation are discussed in this chapter.

2.1 Key Terms and Concepts

In order to understand environmental noise, some terms and concepts need to be defined, as follows:

2.1.1 Noise

Noise is defined as an unwanted and or undesirable sound and it is perceived as an environmental stressor and nuisance (Stansfield & Matheson, 2008).

2.1.2 Sound

Sound is defined as vibrations that travel through air or another medium and it is what the human ear can hear (Glazewski, 2000). The pitch of the sound is dependent on rapid fluctuation audible sound. Sound is considered to be loud depending on the amount by which air pressure deviates from its static value. The unit that is used to measure sound is decibel (dB) (Glazewski, 2000).

2.1.3 Measuring noise

Regulation of noise requires a full understanding of how noise is measured. Noise is measured in decibels (dB), which is a logarithmic measure (Glazewski, 2000). Noise levels, including music, are measured by a calibrated sound level meter to determine the risk of hearing loss to humans and to ensure compliance (SCENIHR, 2008).

The ear of a human being is not equally sensitive to all frequencies, and consequently the sensitivity of the noise measuring instrument is adapted so that it reacts in the same

manner as the human ear (Waheeda, 2014). People react differently to the same noise or sound, which creates a problem when the impact of the noise needs to be controlled and furthermore, when one intends to set limitations. When assessing noise in any given situation it is advisable to look at the level beyond which a significant number of people could be expected to start complaining (Fuggle & Rabie, 1983).

2.1.4 Disturbing noise

Disturbing noise is defined as noise levels that exceed the ambient sound level as measured by a sound level meter. Noise Control Regulation (South Africa, 1999) states that every person is prohibited from causing, making or producing a disturbing noise. It is also stated that persons are prohibited from allowing a disturbing noise to be made, produced or caused by other animals, persons, equipment and machines (South Africa, 1999).

2.1.5 Noise nuisance

Noise nuisance is defined as a continuous or intermittent sound that affects the comfort and quality of life of the community (South Africa, 1999). This type of noise is illegal at all times and enforceable at any time of the day. It includes playing loud music or musical instruments or operating a television set loudly, operating machinery or power tools that cause a noise nuisance. Noise control regulation in terms of Section 25 of the Environment Conservation Act (South Africa, 1989) states that the Minister of Environmental Affairs and Tourism is empowered to make regulation regarding noise nuisance and the powers of provincial and local authorities to control the noise prevention, reduction and elimination (Zachariou & Gladwin, 2014).

2.1.6. Distinction between disturbing noise and noise nuisance

Disturbing noise is one that disturbs the quality of life and peace of the community, it exceeds the ambient sound level by 7dB (A) or more, meaning that this is an objective measurement; whereas a noise nuisance is a sound that disturbs or impairs or disturbs the peace of any person, therefore it is a subjective measurement (Kidd, 2014).

2.2 Acoustical Measures of Noise

The aim of acoustic measurement is to provide objective physical measurements of noise that can be compared with predetermined criteria in order to judge its acceptability. To

ensure that the noise measurements and monitoring results are of quality and uniformity, the noise measurement instrument's specifications and measurements procedures are subjected to national and international standards (Ziaran, 2005).

2.2.1 The sound pressure level

The sound pressure level is a measure of force per unit area. When sound waves reach the human ear or the sound level meter the change of pressure can be measured and the sound intensity is expressed in decibels of sound pressure level (SCENIHR, 2008). Sound pressure levels in decibels are based on a logarithmic scale, which means they cannot be added or subtracted in the usual arithmetical way (CCOHS, 2014). All measurements of sound pressure levels and their variations should be made using the fast response time, in order to provide sound pressure measurements that represent human hearing (Akinkuande & Fasae, 2015).

2.2.2 Frequency

Frequency is measured in Hertz (Hz) - it differs for each sound. Human beings cannot hear sounds of every frequency. A young healthy individual's hearing ranges from 20 to 20 000 Hz and it worsens with ageing. Low frequency is below a frequency of above 100 to 150Hz. It does not raise the same level of concern as neighbourhood noise but it can have a serious effect on the quality of life of those attenuated by it. Low frequency sounds are usually industry related, commercial noise sources such as pumps, electrical installation, amplified music for entertainment (DEFRA, 2001). A minority of people experience an increased sensitivity to low-frequency sound. It may have serious health effects such as disturbed sleep, stress, cardiovascular disorders and hypertension (Oud, 2012).

On the other hand the higher the frequency the more high pitched a sound is perceived. It is usually directional and can be easily blocked with partitions or panels. As we grow older we usually lose sensitivity to high frequency noise (Witt, 2013).

2.2.3 Frequency weighting

In a sound level meter the frequency weightings are related to the response of the human ear, to ensure that the instrument used is measuring the noise that the human ear can hear. It is important that when measuring sound the current frequency weighting is used. The

frequency that is commonly used to measure noise is A-Weighting. Similar to the human ear, A-Weighting effectively distinguishes the low frequency/high frequencies that an average human being cannot hear (noise meter Inc., 2010). A-Weighting can easily predict the damage caused by noise to the human ear. A sound level meter that is set to the A-Weighting scale will filter out much of the low frequency noise it measures. Noise measurements made with the A-Weighting scale are called dBA (Witt, 2013).

2.2.4 Equivalent continuous sound pressure level

The equivalent continuous sound pressure level is defined as a steady sound pressure which over a period of time has the same total energy as the actual fluctuating noise. It is measured in a dB (A) scale and it is used for most community noise and industrial noise measurements (Bruel & Kjaer, 2010).

2.3 Health Effects of Environmental Noise

Noise poses a health problem to any community as it can lead to temporary or permanent damage to hearing. In a day, people residing in urban areas can experience a wide range of sounds in several locations including places of education, hospitals, workplaces, places of worship and at home. According to the World Health Organisation (WHO, 2014) noise can lead to a number of short-term and long-term health problems and examples of adverse health effects of noise are discussed as follows:

2.3.1 Hearing impairment

Some form of sound is experienced every day in the environment, such as the sounds from radio and television, household appliances and traffic. Normally, these types of sounds are at safe levels that don't damage our hearing. When sounds are too loud, even for a short time or when they are both loud and long-lasting, they can be harmful. These sounds can cause damage to sensitive structures in the inner ear and cause noise–induced hearing loss (NIDCD, 2015). Noise-induced hearing loss can be immediate or take a long time to be noticed. It can be temporary or permanent, and it can affect one or both ears. Exposure to harmful noise can happen at any age. People of all age groups, including adults, young adults, teenagers and children can develop NIHL. Noise-induced hearing loss can be preventable if the hazards of noise are reduced (NIDCD, 2015).

2.3.2 Sleep disturbances

Sleep is a fundamental human behaviour that is essential for development, health and well-being. It is a reversible process that can be readily disturbed by noise to cause a full range of perturbation from awakening to minor unconscious autonomic effect (Hume, 2010). Noise can cause difficulties in falling asleep, alterations in sleep rhythm or depth sleep, and also through being woken up (Goines & Hagler, 2007). Long-term effects of noise-induced sleep interruption could lead to fatigue, changes in performance and objective mood changes.

2.3.3 Cardiovascular effects

New data has revealed that noise pollution is causing more deaths from heart diseases than was previously thought (Mead, 2007). It is known that noise levels below the hearing damaging criterion cause cardiovascular disorders (Babisch, 2011). The cardiovascular effects of noise have been the source of growing interest in recent years because there is sufficient evidence indicating an increase in cardiovascular effects due to noise pollution. Bringing cardiovascular effects to a manageable level depends on finding ways to tackle noise pollution (Babisch, 2011).

2.3.4 Poor school performance

Children living in noisy environments can exhibit poor academic performance. There is evidence that noise can lead to shortened concentration span, hearing impairment, and violent/aggressive behaviour - all resulting in poor school performance (Karande & Kulkami, 2005).

2.4 Legislation Related to Noise

2.4.1 International approach

The WHO in partnership with the Organisation for Economic Co-operation and Development (OECD) conducted a survey and from their findings they developed a noise assessment program on the effects of exposure to noise pollution. The results obtained in the assessment standard guidelines values for average outdoor equivalent noise levels were recommended to ensure that the levels of noise are not exceeded (WHO, 1999)

2.4.2 Constitution of the Republic of South Africa Act No.108 of 1996

The Constitution of the Republic of South Africa Act No.108 of 1996 (South Africa, 1996) makes provision for regulating noise. Noise pollution management is a directive of local authorities but provincial government remains liable for taking effective measures to provide for monitoring and support of local government in the province. The Constitution expects local authorities to manage and regulate noise pollution in accordance with legislation.

2.4.3 National Legislation South Africa

2.4.3.1 Environmental Conservation Act, 1989 (Act No. 73 of 1989)

The Environmental Conservation Act No. 73 of 1989 (South Africa, 1989) makes provision for the issue of regulations such as the National Noise Control Regulations promulgated in January 1992. The regulation relates to the control of noise by local authorities. In 1999 the responsibility to apply the noise control regulations was assigned to provincial government, but as at June 2004 only Gauteng and the Western Province had implemented their noise regulation.

2.4.3.2 The Noise Control Regulation (Act No. 79 of 1999)

The Noise Control Regulation Act No. 79 of 1999 (South Africa, 1999) forbids people to operate or play a musical instrument, drum, radio, sound loudspeakers, system or other types of device producing sound that causes a noise nuisance. It also goes further and explains that no person is allowed to play or operate instruments that exceed the acceptable ambient noise levels as classified in the Act. The local authority may take necessary steps that they deem necessary if there is noise coming from building premises therefore, any

person who does not adhere to the provisions of the regulation will be guilty of an offence and liable for conviction.

2.4.3.3 National Measuring Units and Measuring Standards Act No. 18 of 2006

The National Measuring Units and Measuring Standards Act No. 18 of 2006 (South Africa, 2006) states that in order to ensure that the measuring instrument to be used is checked before and after every use by using a calibration machine, the sound level meter

must be verified by the specifications of accuracy of National Codes of Practices of Acoustics. The sound level meter must be calibrated by an accredited laboratory or the original manufacturer of the equipment and calibration should be done on an annual basis (Bruel & Kjaer, 2000).

2.4.3.4 South African Noise Standards (SANS) 10103: 2008

South African Noise Standards (SANS 10103, 2008) for measurements and rating with respect to annoyance and speech communication provide guidelines on noise impact criteria limits and standards. The standards are used by local authorities to control noise. The ambient zone noise level in suburban areas must not exceed 50dB (A) in day time and night time and not exceeding 45dB (A) if windows are opened.

2.5 Challenges Related to the Current South African Environmental Noise Legislation

South African Environmental Noise legislation has challenges that need to be addressed. The local authorities have been unable to act effectively to combat noise pollution as noise management and control is disseminated across several acts, regulations and standards. The legislation has no clear guidelines for acceptable standards related to maximum ambient noise levels, thus making the legal interpretation of specific problems difficult, and often limiting local authorities' from acting effectively against offenders. There are discrepancies in technical requirements across several acts, legislation and standards and this has resulted in inconsistencies in the manner in which noise pollution issues are evaluated. Currently in South Africa these challenges are being addressed through the revision of standards and the Noise Control Regulation (Calyx Environment CC, 2014).

2.6 Management of Environmental Noise by Metropolitan Municipalities in South Africa

2.6.1 City of Johannesburg Metropolitan Municipality

Geldenhuys (2010) of the City of Johannesburg Metropolitan Municipality states that if a person experiences any sound that disturbs or impairs the activities of peace of that person, then the person is entitled to lodge a complaint with the Environmental Health Department within Johannesburg Metropolitan Municipality. The official investigating the complaint will conduct an appropriate inspection in order to take further steps to eliminate the noise. The official will conduct noise measurements at the establishment and issue the offender with a statutory notice. The transgression as stipulated in the Gauteng Noise Control Regulation of 1999 is a criminal offence and the accused can be fined up to R20 000 or imprisoned for up to 2 years (Geldenhuys, 2010).

2.6.2 City of Cape Town Metropolitan Municipality

Cape Town Metropolitan Municipality Environmental Health Section has implemented a noise control plan that is formulated to control and measure noise nuisance or pollution occurring in all residential, commercial and industrial areas (MsSweeng, 2014). The noise control plan includes requesting an evaluation of noise management plans and investigates noise complaints and concerns relating to disturbing noise aspects and conducting noise level measurements. The Cape Town noise control program forbids people to operate or play a musical instrument, drum, radio, sound loudspeakers, system or similar type of device producing sound that causes a noise nuisance. The Cape Town Metropolitan Municipality may take the necessary steps if there is noise coming from building premises. Therefore, any person who does not adhere to the provisions of the regulation will be guilty of an offence and liable for conviction (MsSweeng, 2014).

2.6.3 City of Tshwane Metropolitan Municipality

The City of Tshwane Metropolitan Municipality has its own noise management policy to manage and control environmental noise within its jurisdiction. The policy has specified procedures to combat existing noise problems ensuring the application of measures that limit or prevent environmental impact due to noise. The policy also provides law enforcers

with the legal powers necessary to effect management and control of noise, and sets the basis for the promulgation of by-laws (Calyx Environment CC, 2014).

In Tshwane Metropolitan Municipality the main sources of environmental pollution are places where playing of musical instruments is allowed, such as restaurants, taverns, discotheques, halls and stadiums. The Municipality ensures that noise producers are separated from noise-sensitive areas in terms of land use planning processes. This procedure is done to ensure that environmental noise pollution will not have an adverse effect on the nearby residents or properties (Calyx Environmental CC, 2014).

2.6.4 City of eThekwini Metropolitan Municipality

For many years eThekwini Metropolitan Municipality has lagged behind with regard to laws protecting people from high levels of ambient noise. The municipality has recently in 2015 promised to control noise pollution as it revamps the city centre for the 2022 Commonwealth Games (Rondganger, 2015).

The city of eThekwini implemented the "Nuisances Behaviour in Public Places" by-law, which came into effect on 24 June 2015 and it states that any person who allows the cause of any disturbances or impairment of peace of any person or makes persistent noise or sound, including an amplified noise or sound will be convicted of an offence under the by-law and will be liable to a fine of an amount not exceeding R40 000 or to imprisonment for a period not exceeding 2 years, or both the fine and imprisonment (eThekwini Municipality,2015).

2.7 Efforts in Developing Countries to Control Noise Pollution

The urban areas in the developing countries have increased not only in size but also in terms of the living conditions; as a result there has been a notable increase in noise pollution, which has become part of day-to day life. The situation requires looking at various control measures available in South Africa and other developing countries to establish if they are effective and efficient (Kumar *et al.*,2004).

2.7.1 South African context

Development in urban areas, traffic, aeroplanes, taxis and construction sites are among the many sources of noise that pollutes our cities. People tolerate the noise but when it

becomes annoying or irritating it infringes upon the rights of people's quality of life and peace and as a result it needs to be dealt with (Zichariou & Gladwin, 2014).

According to Zichariou and Gladwin (2014) when noise nuisance occurs the first available option is for an individual to lay a complaint with the local authority by either a written statement or telephonically. Most of the local authorities in South Africa have departments dealing with noise control; these departments are given powers to take reasonable steps necessary to control the noise and associated complaints. Law enforcement officials conduct investigations to determine the extent of the problem. If the person causing the noise nuisance is found guilty of an offence they are instructed to reduce the noise and if they don't comply, they are issued with a fine and in some instances the equipment is confiscated. If the offender persists with the noise the courts can be approached (Zichariou & Gladwin, 2014).

2.7.2 Nigerian context

Noise pollution in Nigeria is a major problem and it exceeds the specified noise criteria standards and limits (Oyedepo, 2009). The study conducted in Nigeria reveals that the noise levels in the city is above 3dB (A) to 10dB (A) above the upper limit of 82dB (A). In Nigeria the main sources of noise are generator plants, vehicular engines, and household noise, noise from religious worship and nightlife noise (Ijaiya, 2014). Nigeria does not have existing law enforcement dealing with the problem of noise or its management. Noise issues are dealt with under the common law perspectives through the court of law. The person found causing a noise nuisance is charged and issued an injunction restraining them from further act of noise nuisance. The common law remedy through court action is not a permanent solution to abating noise in Nigeria (Ijaiya, 2014)

2.7.3 Brazilian context

In Brazil several studies have been conducted to determine the ambient noise levels and motor vehicles came out as the highest source of noise pollution, followed by noise from barking dogs, audio entertainment, loudspeaker equipment and appliances (Jamir *et al*., 2014). Sao Paolo, one of the major cities in Brazil, implemented a noise management programme aimed at controlling ambient noise levels in the city, ensuring that the health and well-being of the population is protected. The noise standards in Brazil specify that the

maximum limit for environmental noise in residential areas should not exceed 50dB (A) respectively (De-Sousa & Cardoso, 2002).

2.7.4 Argentinian context

According to Schweimier (2010) noise pollution is increasing year after year in Argentina and as a result Argentina has become the fourth loudest country in the world. The main sources of noise in Argentina are from hand tools, staff turnover, light vehicles, mobile equipment and machinery and entertainment equipment.

The Argentinean government has come up with stringent laws to eliminate noise pollution, but is not improving. The WHO states that noise levels should not exceed 55dB (A) during the day and 45dB (A) at night, but measurements that have been taken in Argentina's cities exceed these limits. Policies and regulations developed to combat the noise problem have still not been effective (Schweimier, 2010).

2.7.5 Indian context

Noise is a major problem in India and unfortunately most of the people are unaware of the dangers it can cause. During the last decade (2001-2011) the highest average level of 73,33dB (A) day-time noise was detected at silence zones not less than 100m from hospitals, educational institutions and religious places, and the lowest of 63.5dB (A) in residential areas. The highest average noise level of 71.18dB (A) experienced at night (Jamir *et al.*; 2014). The main sources of noise in India are from automobiles on roads, construction activities, fireworks and loudspeakers. The Central Pollution Board in India has implemented noise standards for different sources of noise and strict legislation to solve the problem of noise pollution has been a matter of urgency (Kumar *et al.*, 2004).

2.8 Conclusion

Developing countries have made efforts to control the noise nuisance but their efforts are not adequate to curb the problem of noise. Due to advancement of science and technology the problem of noise pollution has increased to a large extent. Therefore, developing countries need to implement strict laws and increase public awareness about the problem of noise pollution. The next chapter focuses on the methodology used in this research and will give a brief overview of Melville, sampling methods and data collection methods used. It will also look at the various challenges experienced whilst conducting the study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter focused on literature review of noise pollution in South Africa as well as other countries; it also looked at international, national and local policies and legislation on noise pollution. The current management strategies of combating noise pollution were also discussed. Research methodology is a method used in a research to state how the research question and hypothesis are addressed. Research methodology describes full details of the study and every step is explained and justified with reason for choice of the study (Wisker, 2007).

In this chapter methods used to collect data are discussed. The study focuses on quantitative methods that used a structured questionnaire and a sound level meter for data collection respectively.

3.2 Study Area

The study will be conducted within the bohemian Suburb of Melville, Johannesburg. It is one of the few areas of northern suburbs to have cafes, restaurants, shops, pubs, restaurant bars and nightclubs lining the streets rather than in enclosed shopping centres Situated just a short distance from city parks, this suburb is mainly comprised of residential and commercial properties (South African Tourism, 2015). It is a meeting point and general hangout for most of the students as it is situated close to two universities, the University of Johannesburg; and University of Witwatersrand. Melville falls within the boundaries of Region B, City of Johannesburg. Study population in a research refers to the object, subjects, phenomena, cases, events or activities for the purpose of sampling (Brynard & Hanekom, 2005). In this study the residents of Melville community comprised the study population.

According to the City of Johannesburg (City of Johannesburg, 2015) population is estimated at just over 2983 individuals and consists of 2890 employed and 93 unemployed residences. The population is stable and economically active with high levels of education and disposable income. Melville community comprises of 1635 males and 1722 females (Frith, 2011). Unlike the majority of other suburbs within the city that fall under the ruling

party the African National Congress (ANC), Melville is under the political administration of the opposition party, the Democratic Alliance (DA) (City of Johannesburg, 2015). The majority of nightclubs are located along 7th Street, and a few relatively new nightclubs along Main Street. The sampled streets of the study area are marked in green as illustrated in Figure1.1 the boundary of the study site (Melville). This study focuses on nightclubs and restaurant bars along 7th Street and Main Street as the major source of environmental noise.

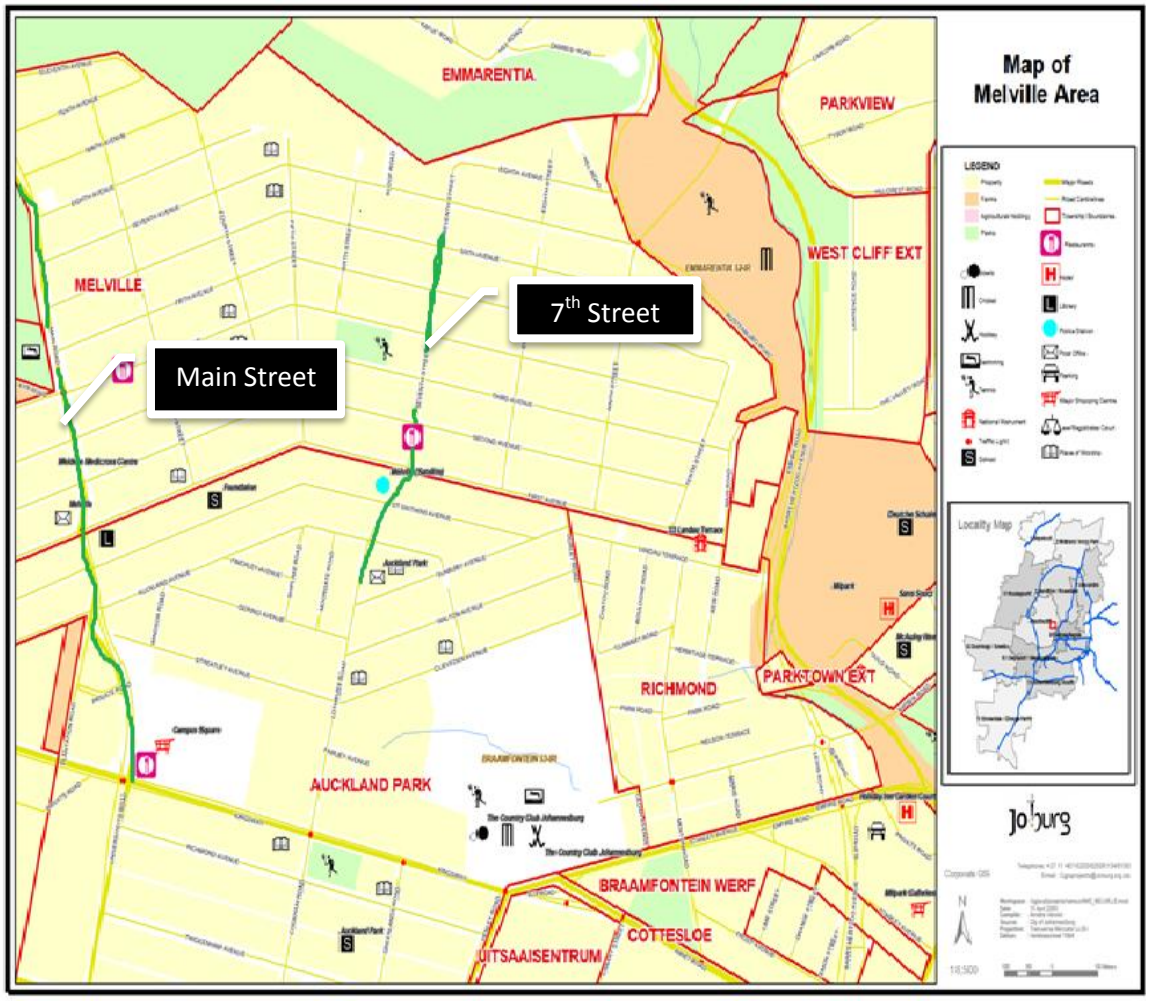

Figure 1.1 Study Area: Melville (City of Johannesburg, 2015)

3.3 Research design and Methodology

Research design promotes systematic management of data collection. The function of the research design is to ensure that the data collection and results enable the researcher to effectively address the research questions logically and as unambiguously as possible (De Vaus, 2001).

3.4 Pilot Study

The pilot study examines the feasibility of the approach intended to be used in the study. The results obtained from the study identify modifications required in the design of the data collection to be used in the research (Leon *et al.*, 2010).

A pilot study was conducted in Melville to test the validity and reliability of the questionnaire and noise level measurement methods. Ten households were randomly sampled by putting the street names targeted for sampling in a hat and then selecting a subset by pulling out ten residential addresses.

3.4.1 Pretesting of questionnaire

Pretesting of the questionnaire is a very important step in a research. It detects all errors in the data collection tool to help to improve the quality of data. The pretesting is done on the small sample of respondents from the targeted population (Grimm, 2010). The questionnaire was modified accordingly following the mistakes and misinterpretation of some statements and questions that were identified during the pilot study. The challenges experienced were that respondents were not there to partake in the study and some of them could not be reached on Saturdays hence Sundays were also included for the administration of questionnaire in the actual study to ensure that all the selected households were covered.

3.4.2 Validity and reliability

3.4.2.1 Validity

Validity refers to the degree to which an instrument is doing what it is intended to do and evidence of validity is provided by several sources (Litwin, 1995). During the pilot study a structured questionnaire was used to ensure content validity. A structured questionnaire has been successfully used before in other similar studies and it has been proved to be an effective and efficient for data collection (moela, 2010)

Face validity was sought through noise measurements using a calibrated sound level meter at different measuring points (De Vos *et al.*, 2002). The sound level meter has been used in other similar studies to measure ambient noise in accordance with South African National Standard (SANS 10103: 2008). The findings of the research were pilot tested to maximise

the reliability and validity of the study and to justify the decision taken (De Vos *et al.*, 2002).

3.4.2.2 Reliability

Reliability is described as being concerned with internal consistency; that is, whether data collected, measured or generated are the same under repeated trials (O'Leary, 2004). The data collection tools in this study have previously been trialled and tested for reliability.

3.5 Sampling

Sampling is defined as a specific principle used to select members of the population to be included in the study. It is a fact that most populations of interest are too large to work with directly. Techniques of statistical sampling are used to obtain sample taken from larger populations (Proctor, 2003).

3.5.1 Sampling technique

In a research sample is selected in such a way that it is unbiased and represents the population from which it is selected. There are various sampling techniques used in research, such as probability sampling and non-probability sampling (Kumar, 2005).

3.5.1.1 Probability sampling

Probability sampling is used to identify a representative sample from which data is collected. If a researcher uses random sampling to draw a sample they will be able to estimate how closely the sample represents the larger population (Blackstone, 2012).

The main types of probability sampling are simple random sampling, stratified sampling, systematic sampling and multi-stage random sampling (Neill, 2003).

3.5.1.2 Non probability sampling

Non-probability study sampling does not involve random selection and the samples taken are not representative of the population. This type of sampling is not dependent on the rationale of probability theory (Trochim, 2006).

Types of non-probability sampling include quota sampling, convenience sampling, purposive sampling, self- selection sampling and snowball sampling (Trochim, 2006).

3.5.2 Simple random sampling

According to Easton & McColl (2004) simple random sampling is defined as a basic technique where a group of subjects is selected from a larger group. In this study a simple random study was chosen as it is a fair way to select a sample, it is reasonable to generalize the results from the sample back to the population (Neill, 2003). The households targeted for sampling were put in a hat, and then a subset was selected by pulling out 100 residential addresses for administration of questionnaires and 10 households were randomly selected for noise measurements.

3.5.3 Sampling size

Sample size depends on the nature of the analysis to be performed, the desired precision of the estimates one wishes to achieve, the kind and number of comparisons and the number of variables that have to be examined in the research (Mugo, 2002). The sample size for this study was 100 households in Melville.

3.6 Data Collection

Data collection is the process of gathering and measuring information on variables of interest to enable the researcher to answer stated research questions, test hypotheses and evaluate outcomes (NIUFDIDC, 2015). In this study, two data collection tools were used i.e. a structured questionnaire and a sound level meter for noise measurements.

3.6.1 Structured questionnaire

The questionnaire was designed based on the research aim and objectives. Questionnaires were administered to 100 selected households. An introductory statement was prepared to provide the participants with a clear explanation of the aim of the study in order to allow them to feel comfortable in answering the questions and thereby enhancing credibility. The introductory statement also assisted in monitoring consistency from one interview to the other. The language of the questionnaire was English as most of the people in Melville are highly literate. The administration period of the questionnaires was two months from July to August 2015.

3.7 Sound Level Meter Measurements

3.7.1 Measuring instrument

A calibrated sound level meter (SLM) type 1 SLM Bruel & Kjaer 2238 was used to take measurements. The sound level meter was calibrated by an approved external private laboratory prior to use in order to ensure the validation of the measuring instrument. The sound level meter is designed to measure a frequency weighted value of sound pressure level in accordance with acceptable national or international standards. It consists of a microphone, amplifier, logging board band, markers in logging profile, back-erase, triggers, DC and AC outputs and serial interface (Maxim Instrument Corp, 2015).

The measurements can be controlled manually or the measurement time can be pre-set and therefore the results are automatically saved to a file and the measurements can also be set up to repeat 1-99 times in a sequence where each measurement is saved and when it finishes reading a new measurement is immediately started. This instrument can be used to generate a sequence of periodic reports and it can be combined with the auto-start, enabling measurements to start unattended. The auto-start feature enables the instrument to start and stop measuring at predetermined times or it can be collected via a modem (Maxim Instrument Corp, 2015).

Figure 3.1 Type 1 SLM Bruel & Kjaer 2238 Sound Level Meter (Maxim Intrument Corp, 2015)

3.7.2 Noise measuring points in Melville

The noise measurements were conducted at 10 households in Melville using simple random sampling technique to select households by putting all streets names and house numbers targeted for sampling in a hat, and the selecting of subsets by pulling out 10 residential addresses. Ten measuring points were set up at 10 selected households in Melville to determine the environmental noise levels (see Figure 3.2). The measuring

instrument used in the study was obtained from City of Johannesburg, Environmental Health Department Region B. The measuring points in the study were identified by using a Geographical Point system (GPS) and co-ordinates were recorded. The South African Bureau of Standards and the noise control regulation specified the parameters to measure.

South African Bureau of standards (SABS) provides range of requirements or standards covering the demands of acoustic industries. South African National Standards under the SABS are used by local authorities to control noise states that the ambient sound level in the suburban area must not exceed 50dB (A) in daytime and at night (SANS 10103: 2008). The noise control regulations states that no person is allowed to play or operate instruments that exceed the acceptable ambient noise levels as classified in the Act. The local authority may take necessary steps that they deem necessary if there is noise coming from building premises therefore, any person who does not adhere to the provisions of the regulation will be guilty of an offence and liable for conviction (South Africa, 1999)

Noise measurements were taken at night between 22h00 and 02h00 and during the day between 10h00 and 14h00 during weekends and public holidays. Measurements were taken at 30 minutes intervals for a period of 2 months in July and August. The measurement sites were located at least 3.5 metres from an acoustically reflective surface other than the ground. Test sites were such that the nearby obstacles such as building and topographical features did not introduce acoustic screening effects at the site that was being measured; the measurements microphone was located 1.2 above ground level.

The test site was free from wind influence and there were no persons present near the measuring microphone which might negatively influence the sound pressure level obtained. Noise from talking or movement was strictly excluded from the measurement site. The sound levels were reported in dB (decibels) relative to the microphone. The measuring tool had a valid calibration certificate from the external private laboratory .Environmental noise limits are stated in the South African National Standard (SANS 10103: 2008) and the Environment Conservation Act (Act No: 73 of 1989).

Figure 3.2 Ten Measuring points in Melville

3.8 Data Analysis

The data collected during the research were captured in a Microsoft Excel spread sheet. These data were then analysed using descriptive statistics. The results were presented in the form of bar-charts as well as tables and percentages. In addition some of the results were presented by means of photos.

3.9 Ethical Considerations

A letter was sent to the Executive Director of the Health Department Johannesburg and the ward councillor for Melville on 24 September 2014 seeking permission to conduct this study in Melville. A permission letter from the City of Johannesburg is included under Appendix II. The College of Agriculture and Environmental Sciences (CAES) ethics committee from the University of South Africa (UNISA) approved the ethical application in November 2014 (see Appendix I).

The structured questionnaire was written in English and the researcher was responsible for administering it (see Appendix III). A turn –it –in plagiarism software was used to ensure that the content of the report adhere to the required % similarity levels (see Appendix IV) The ethical principles such as respecting a person's independence, beneficiaries without malice, honesty and the participant's anonymity were upheld throughout the study. The participants were asked to complete the consent form. This was done to ensure that they exercised their right to freedom of choice and that they made an independent decision and understood the goal of the study. Ethics were applied to protect the privacy, dignity, integrity and self-esteem of the respondents.

3.10 Conclusion

In this chapter, a detailed description of the study area was provided. The research methodology used during the study, sampling techniques, data collection tools, data analysis methods and limitations of the study were discussed. The next chapter will provide the results of the study in a form of descriptive statistics and discussion. The results are presented by using bar charts, tables and figures. In addition some results are presented by means of photos.

CHAPTER 4:

DATA ANALYSIS AND INTERPRETATION OF RESULTS

4 .1Introduction

The previous chapter gave a detailed description of the study area and various methods used when conducting the research. This chapter provides results of the study in the form of descriptive statistics and discussion. In this chapter, the results of data collection from 100 respondents are presented. The discussion therefore will be based on the responses from residents who completed the questionnaires as well as noise measurement results taken in 10 different sampled residences.

4.2 Melville household noise pollution questionnaire

The questionnaire covered socio-demographics such as age, gender, educational level of the study population as well as their reactions and attributes towards environmental noise and its effects on their health and daily activities.

4.2.1 Socio - demographic attributes of respondents

Demographics are the study of the behaviours and other characteristics of groups of human beings in terms of statistics (Rouse, 2005). Socio-economic groups are characterized by age, sex, education, income, occupation, etc.

4.2.1.1 Gender of Respondents

Figure 4.1 below presents the gender distribution of 100 respondents who participated in the study and shows that the majority (53%) of respondents are female followed by 47% of males. This is in line with the population profile of Melville of more females than males.

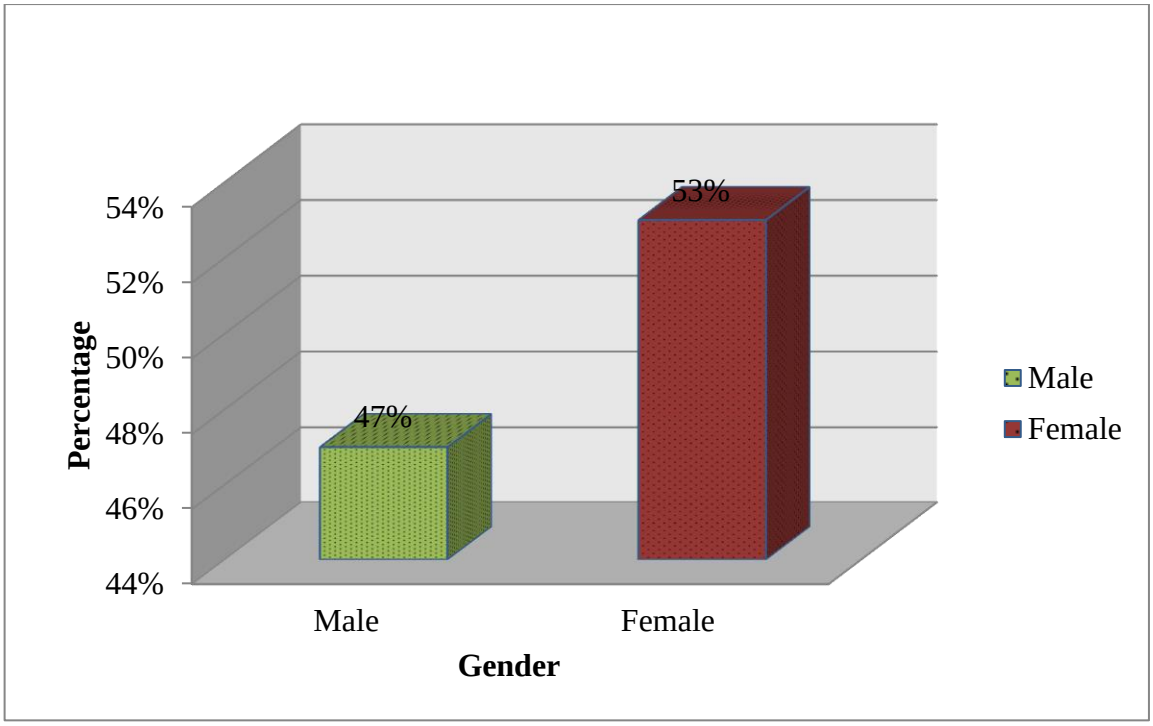

Figure 4.1 Gender distribution

4.2.1.2 Age of respondent

Table 4.1 below presents the age of respondents who participated in this study. The study indicates that the majority (37%) of the respondents are young adults (20-35 years) followed by 36% of participants above 46 years, indicating that Melville is comprised mostly of people under 35 years of age e.g. students and young graduates.

Table 4.1: Age distribution of respondents

Age of respondents	**Frequency**	**Percentage (%)**
20 to 35 Years	37	37%
36 to 45 years	27	27%
Above 46 years	36	36%
Total	100	100

4.2.1.3 Educational level of respondents

The values in Figure 4.2 show that almost 100% of respondents have matriculate level and 48% have degrees. The outcome of the results indicates that Melville residents are highly educated individuals.

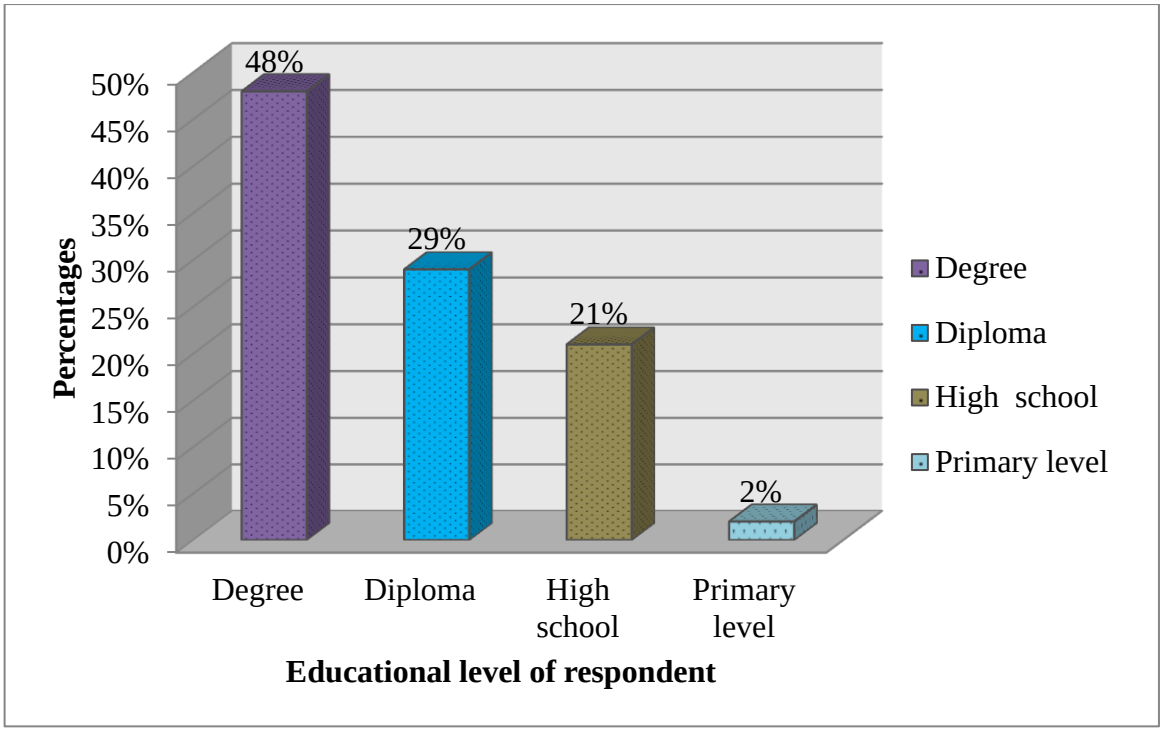

Figure 4.2 Educational levels of respondent

4.2.1.4 Age group of people residing in the households

Table 4.2 below shows that all age groups are likely to be exposed to environmental noise pollution especially when it happens at night.

Table 4.2: Age category of household members

Age Category of people in the household	**Frequency**	**Percentage (%)**
0-5 years	15	15%
6-12 Years	9	9%
13-19 Years	7	7%
20-35 Years	36	36%
36-45 years	20	20%
Above 46 years	13	13%
total	100	100%

4.2.1.5 Number of people residing in the households

Figure 4.3 below provides data of the number of people residing in the sampled households. Out of the 100 household sampled, 52% of the households in Melville are

occupied by families of four or five people, 43% of the households comprised of 2 people and 5% are single occupancy.

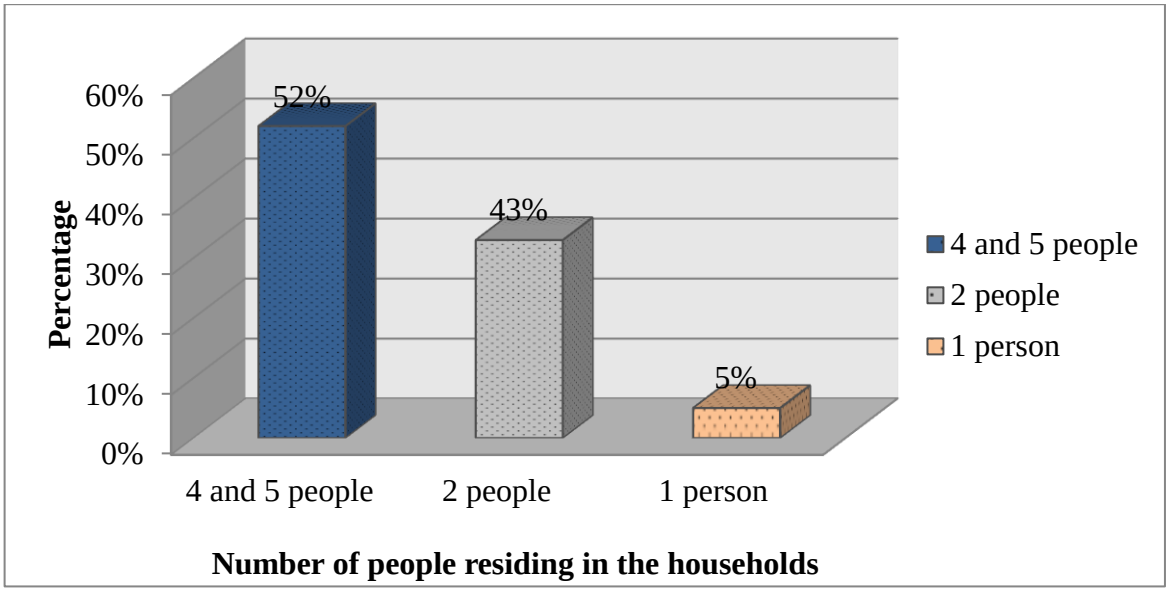

Figure 4.3 Total numbers of people residing in each sampled household

4.2.2 Respondents reaction, attitudes and understanding of noise pollution

4.2.2.1 Definition of noise

Table 4.3 presents information of respondents' knowledge regarding noise in percentages. Out of 100 respondents the majority (78%) defined noise as an annoying, disturbing and unwanted sound. From these findings it is evident that most of the respondents are aware of what noise is.

Table 4.3: Respondent's knowledge with regards to noise pollution

Respondents definition of noise	**Frequency**	**Percentage (%)**
All of the above (annoying, unwanted & disturbing)	78	78%
annoying	22	22%
Total	100	100%

4.2.2.2 Community experience of noise during the day

Figure 4.4 provides data of the community of noise during the day. Out of 100 respondents interviewed 37% described their experience of noise during the day as somewhat noisy.

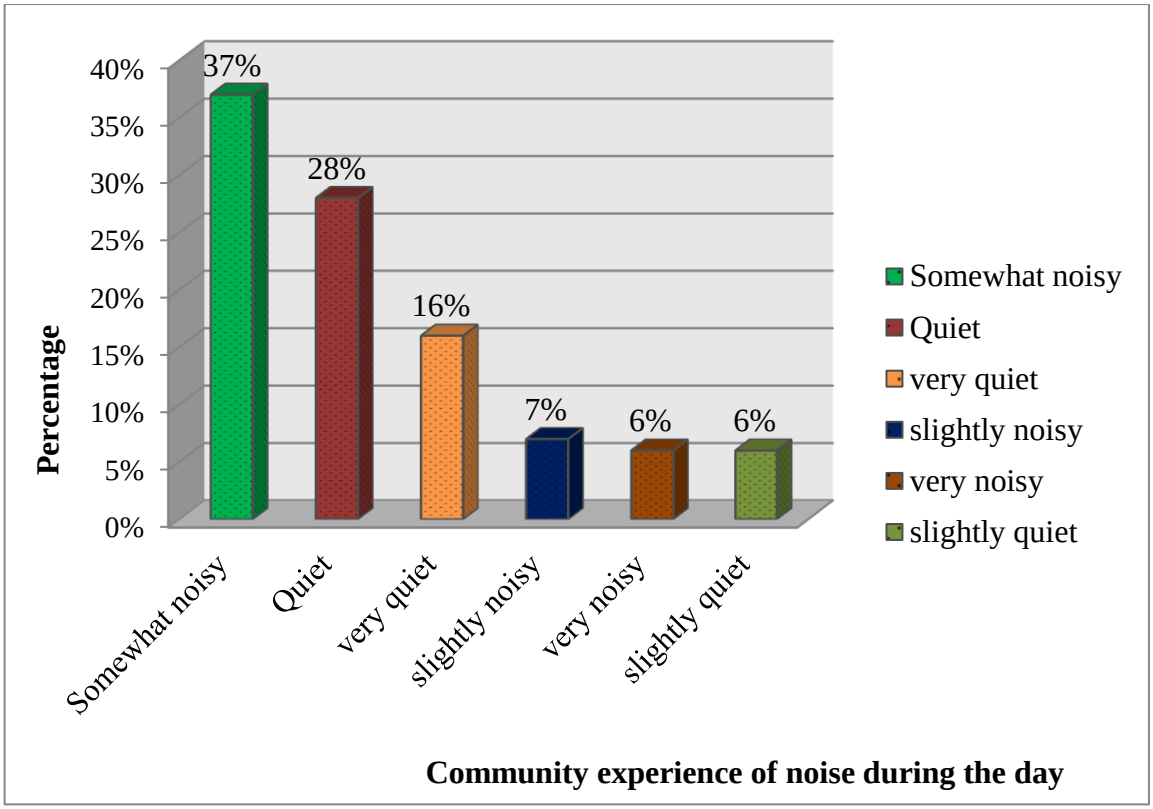

Figure 4.4 Community experience of noise in day time

4.2.2.3 Time of day when most noise is experienced

Table 4.4 provides information of the time of the day when respondents experience noise the most. Out of the 100 respondents interviewed 51% stated that there is actually no noise experienced during the day.

Table 4.4: Time of day when most noise is experienced

Time of day when most noise is experienced	**Frequency**	**Percentage (%)**
No noise	51	51%
Late afternoon	15	15%
Morning	10	10%
Afternoon	10	10%
All of the above (all day)	4	4%
Midday	3	3%
Afternoon & late afternoon	7	7%
Total	100	100%

From these findings it is clear that most of the respondents have no problems with regards to noise during the day and if it is noisy it will be in the morning, afternoon and late afternoon due to traffic noise and passers-by.

4.2.2.4 Duration of noise at day time

Figure 4.5 presents data of the duration of noise during the day. Large numbers of people interviewed stated that the duration of noise during the day lasts for < 1hour. This means that people experience noise for a short period of time

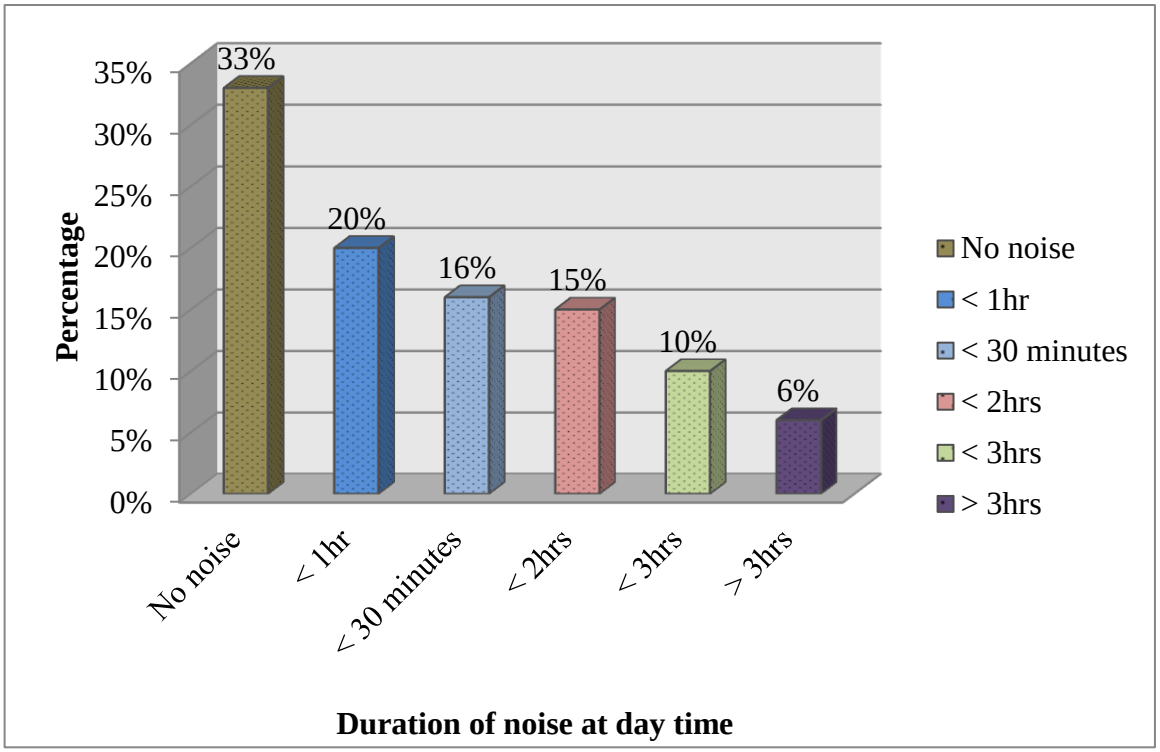

Figure 4.5 Duration of noise at day time

4.2.2.5 Description of noise period during the day

Table 4.5 provides data of how respondents describe the noise during the day. The majority of the respondents (55%) described that noise at day time is experienced continually meaning that noise is experienced in intervals and from time to time during the day.

Table 4.5: description of noise period during the day

Description of noise period during the day	Frequency	Percentage (%)
Continually	55	55%
Continuous	32	32%
No noise	13	13%
Total	100	100%

4.2.2.6 Pitch of sound during the day

Figure 4.6 presents data on the pitch of sound experienced by respondents during the day. Most respondents (44%) described the pitch of sound during the day as slightly high. This result shows that noise experienced during the day is not due to loudspeakers or musical instruments. Loudspeakers and musical instruments are low pitched.

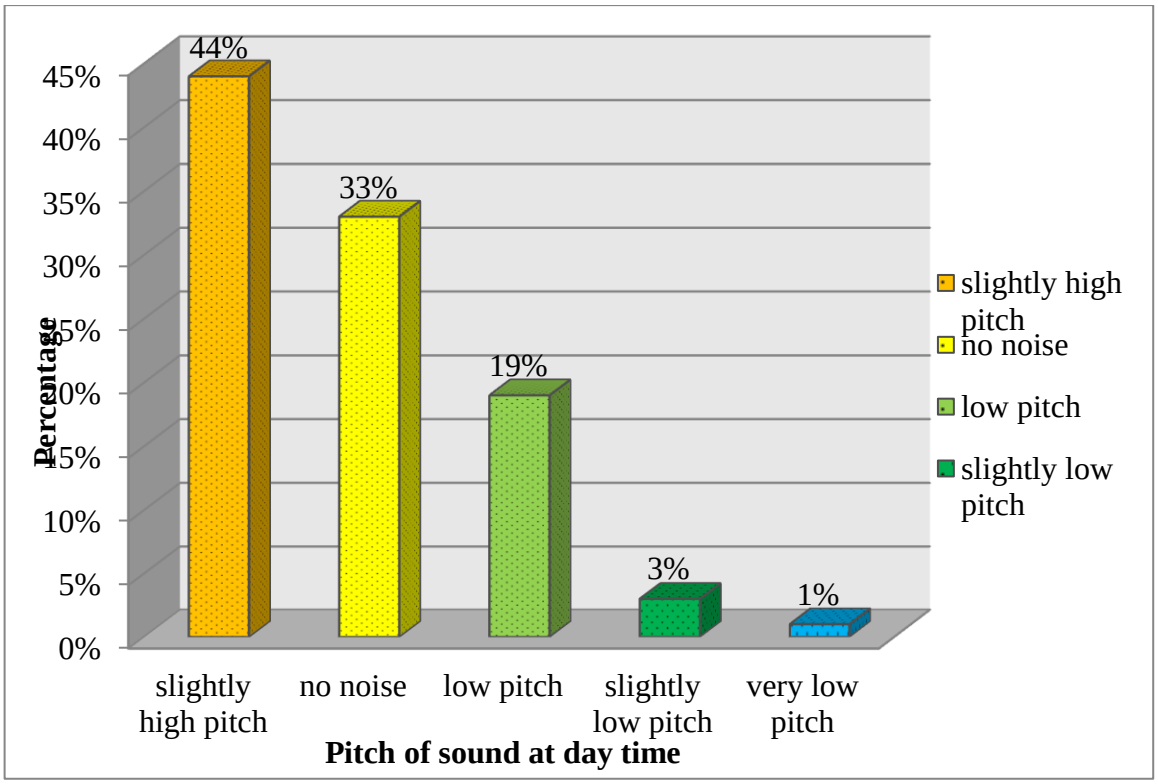

Figure 4.6 Pitch of sound at day time

4.2.2.7 Community experience of noise at night

Table 4.6 provides data of the community experience of noise during the night. Most of the respondents interviewed described their community as very noisy during the night (42%).

Table: 4.6: Community experience of noise at night

Community experience of noise during the night	**Frequency**	**Percentage (%)**
Very noisy	42	42%
Slightly noisy	33	33%
Somewhat noisy	11	11%
Quiet	7	7%
Very quiet	3	3%
Slightly quiet	3	3%
Very low	1	1%
Total	100	100%

4.2.2.8 Time of night when most noise is experienced

Table 4.7 presents information as to when at night respondents experience noise the most. Out of the 100 respondents interviewed 39% stated that they have experienced noise during early hours of the morning. From these findings it is clear that Melville is mostly noisy during early hours of the morning.

Table 4.7 Time of night when noise is experienced the most

Time of night when most noise is experienced	**Frequency**	**Percentage (%)**
Early hours of the morning	39	39%
Mid-night	20	20%
Evening	19	19%
Evening to Mid-Night	13	13%
Mid-night to early hours of the morning	2	2%
All night	7	7%
Total	100	100%

4.2.2.9 Duration of noise at night time

Figure 4.7 provides data of the duration of noise during the night. The majority (36%) of respondents interviewed indicated that the noise period lasted for more than 3 hours at night, meaning that noise activities have a huge impact on the community.

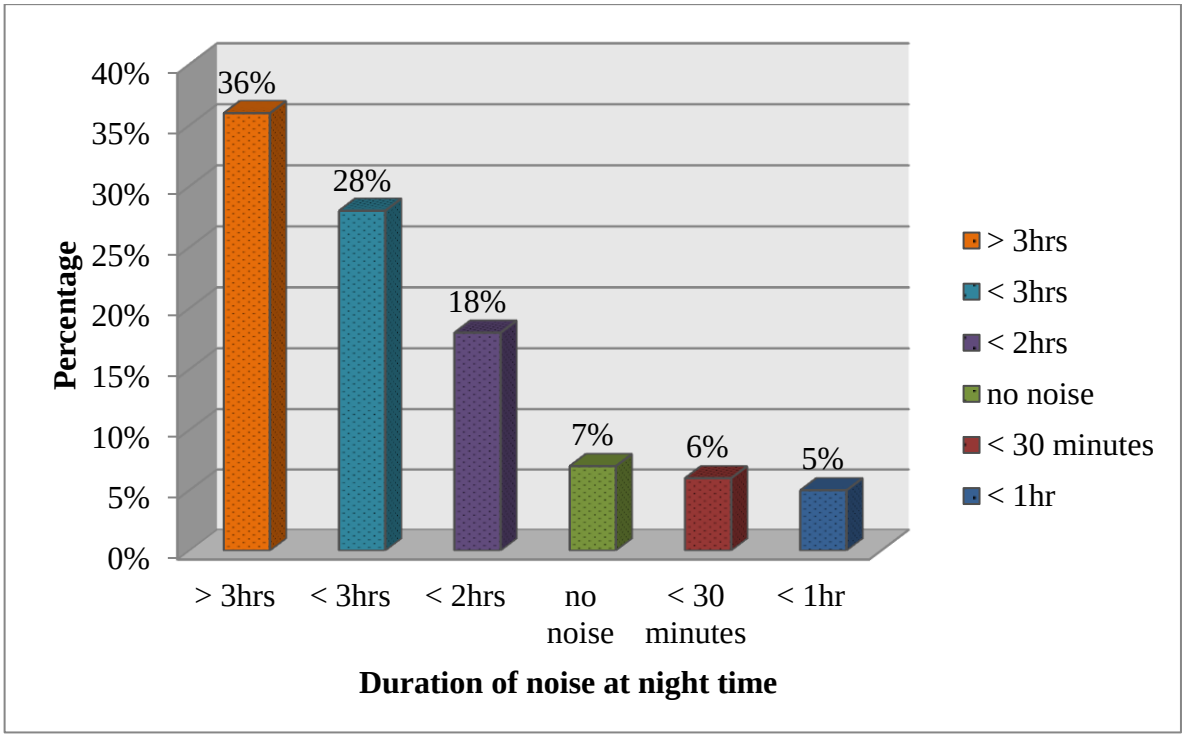

Figure 4.7 Duration of time noise experienced at night

4.2.2.10 Description of noise period during the night

Table 4.8 presents data of how respondents described the noise experienced at night. Most (70%) of the respondents described that noise experienced at night time is continuous, for a long period at night.

Table 4.8 description of noise period at night

Description of noise period during the night	**Frequency**	**Percentage (%)**
continuous	70	70%
Continually	30	30%
Total	100	100%

4.2.2.11 Pitch of sound at the night

Figure 4.8 provides data on the pitch of sound experienced during the night. A large number of the respondents described the pitch of sound during the night as low pitched (36%). This means that noise experienced during night comes from loudspeakers or musical instruments.

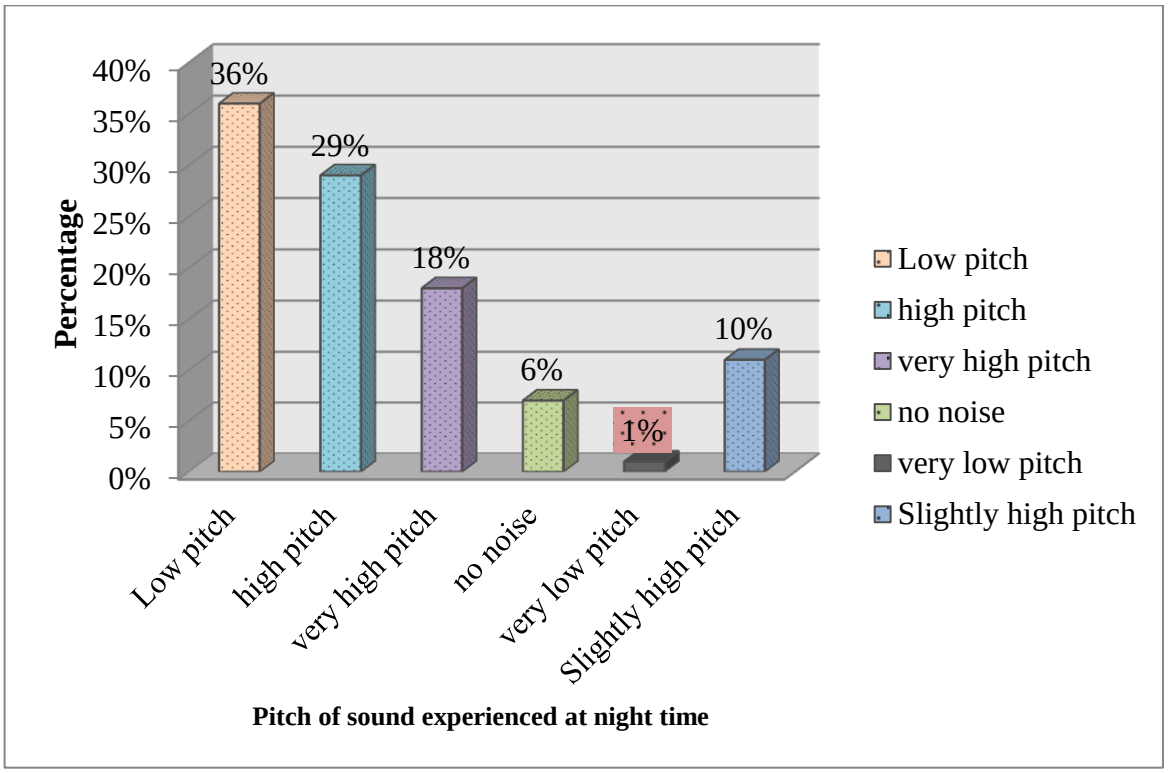

Figure 4.8 Pitch of sound experienced at night time

4.2.2.12 Sources of noise pollution

Table 4.9 provides data of the sources of noise pollution from the noisiest to the least noisy. The majority (69%) of respondents indicated that the major source of noise in Melville is nightclubs. The results obtained show that the major source of noise in Melville comes from nightclubs.

Table 4.9 Sources of noise pollution from the noisiest to least noisy

Sources of noise pollution	Frequency	Percentage (%)
Nightclub	69	69%
Restaurant bar	13	13%
Sport fields	3	3%
Sports bars	2	2%
Other: Barking dogs and revving cars	13	13%
Total	100	100%

4.2.2.13 Complaints lodged to the local authority with regards to noise

Figure 4.9 presents data of the total number of respondents who have lodged noise complaints with the local municipality. Out of the 100 respondents the majority (85%) have not lodged complaints to local authority with regards to noise. This could be an indication that noise pollution (within Melville community) is under-reported. The possible reasons for under –reporting is that the residents usually report noise pollution cases to SAPS as they had an impression that Environmental Health auxiliary services officials can only be contacted during office hours and not at night.

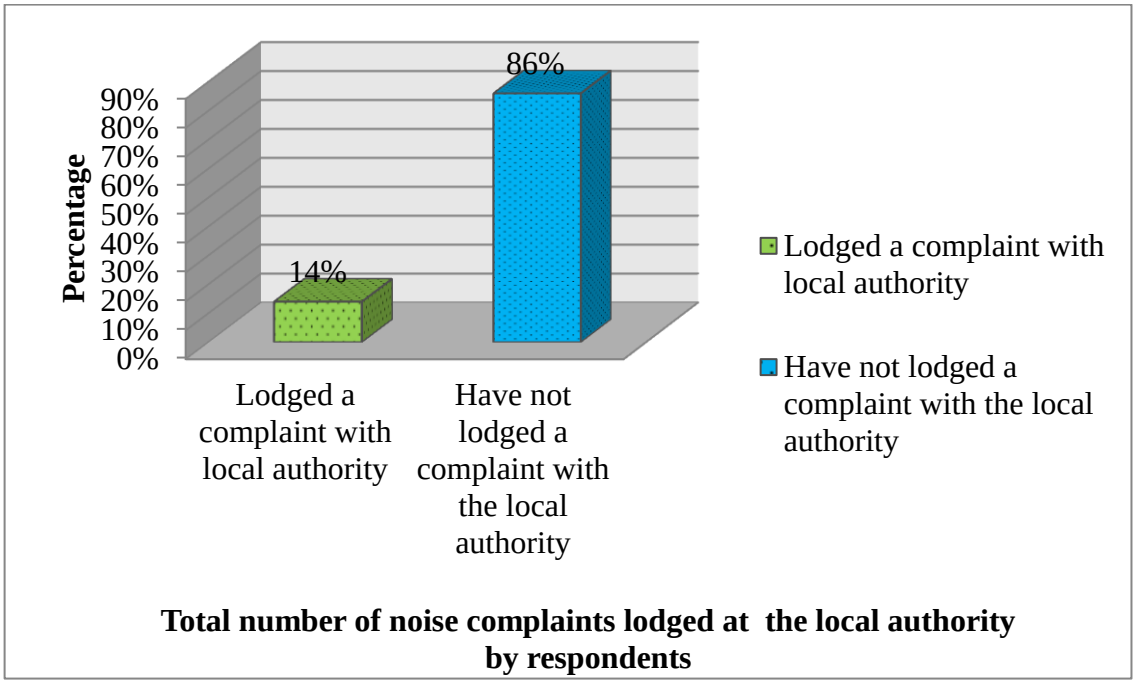

Figure 4.9 Total number of noise complaints lodged to the local authority by respondent

4.2.2.14 City of Johannesburg Metropolitan Municipality's by-laws regulating noise

Table 4.10 provides data on the total number of respondents interviewed that are aware that the local municipality has by-laws regulating noise. Out of 100 respondents 76% of the respondents interviewed stated that they were aware of the existence of by-laws regulating noise pollution. This indicates that the majority of the respondents are knowledgeable with regards to the local authority's by-laws regulating noise.

Table 4.10: Knowledge of respondents regarding the local authority's by-laws regulating noise

Local municipality's By-laws regulating noise	**Frequency**	**Percentage (%)**
Have knowledge that Local Municipality has by-laws regulating noise	76	76%
No knowledge that local municipality has by-laws regulating noise	24	24%
Total	100	100%

4.2.3 Health effects due to exposure to noise

High levels of noise can lead to permanent hearing loss. When a human being is exposed to high levels of noise neither hearing aid nor surgery can help to correct this type of hearing loss. Loud noise creates physical and psychological stress, reduces productivity, and interferes with communication and concentration (O'Connor, 2015).

4.2.3.1 Households members suffering from hearing conditions

Figure 4.10 provides data on the total number of household's members suffering from hearing conditions. According to the results obtained only 6% of the respondents indicated that they have family members suffering from some form of hearing loss.

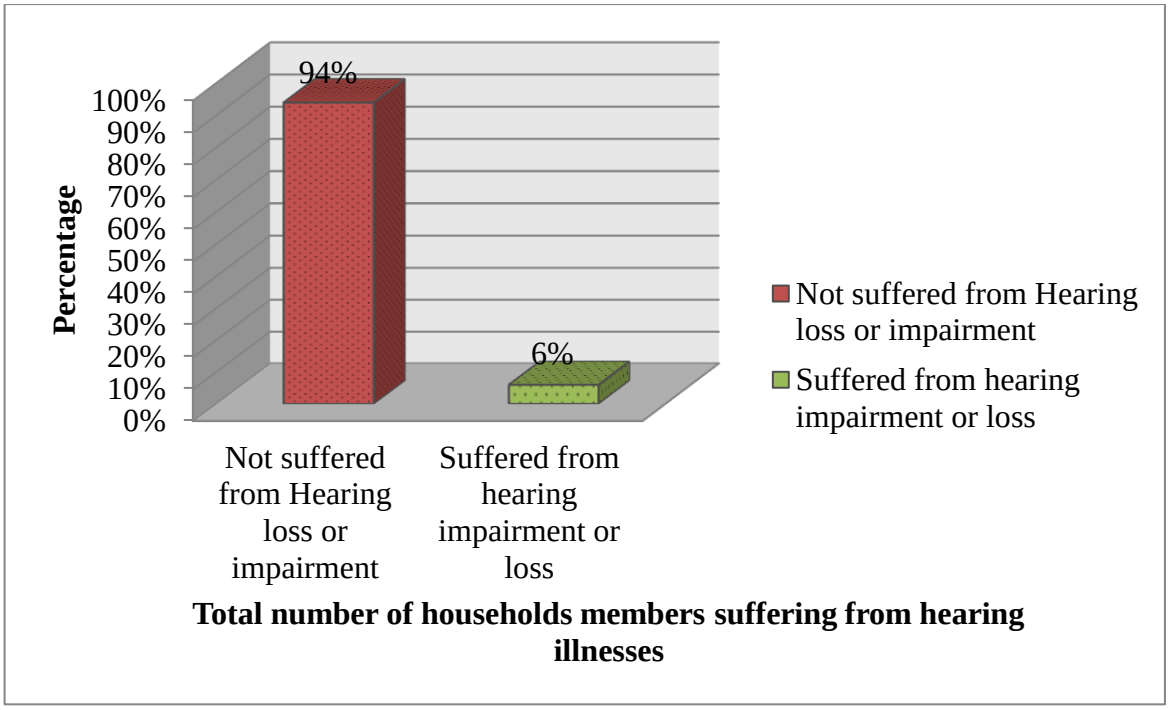

Figure 4.10 Number of households members suffering from hearing condition

4.2.3.2 Number of household members who complained about health effects due to exposure to noise

Table 4.11 presents data on the number of family members from sampled households who have complained about health effects due to exposure to noise. The majority of the respondents (52%) stated that some members of their household have suffered from irritability during the noise exposure; followed by 35% of the respondents who stated that members of their households suffered from fatigue during the noise pollution. From these findings it is derived that the majority of families are adversely affected by the noise in Melville. The noise is disturbing their peace.

Table 4.11: Total number of household members who complained about health effects due to noise exposure

Number of Household members who complained about health effects due to exposure to noise	**Frequency**	**Percentage (%)**
irritability	52	52
fatigue	35	35
headaches	13	13
total	100	100

4.2.3.3 Households members suffering from sleeping disorders due to noise exposure

Figure 4.11 provides data on the number of household members suffered from sleeping disorders due to noise. Fifty seven (57%) of respondents stated that some members of their households have suffered from sleeping disorders – as a result they find it difficult to fall asleep due to high levels of noise at night. From the results obtained it is clear that the peace of the community is interrupted by the high level of noise at night. The majority of household members who suffered from sleeping disorders live close to the nightclubs and restaurant bars.

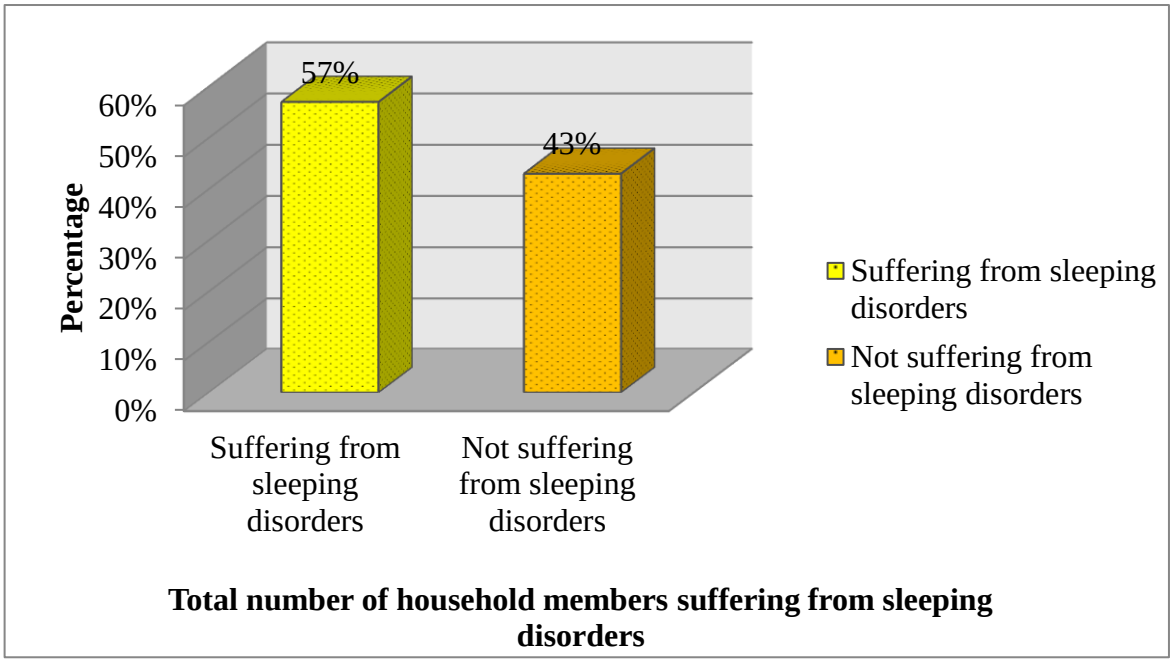

Figure 4.11 Number of households members suffering from sleeping disorders

4.2.4 Residential preferences and type of material used to build the preferred residence

The majority (83%) of respondents interviewed live in free-standing houses. These dwellings are built of brick, have a ceiling and most have metal sheet roofing. This information is important to establish whether noise can penetrate through the type of material used to build these houses. Good design of the external walls. Roof and ceiling will significantly reduce ingress into a residence and as such, the construction of these elements is important to the overall acoustic design of a building. Table 4.12 illustrates the household's residential preferences and type of materials used to build the dwellings.

Table 4.12: Residential preferences and type of material used to build the houses

Variables	**Percentages**
Residential preferences	
Free standing	83%
Flat/ apartment	1%
Semi-detached	16%
Walls	
Bricks	100%
Roof	
Clay and Concrete tiles	27%
Metal Roof	69%
Wooden Roof	1%
Slates	3%
Ceiling	100%

4.2.5 How often do respondents sleep with their windows open?

Figure 4.12 provides data of the number of respondents sleeping with their windows open. The majority (40%) slept occasionally with their windows open. This information is important in order to establish whether noise penetrates easily in the households or not as it is a fact that noise will easily penetrate through the windows if they are open.

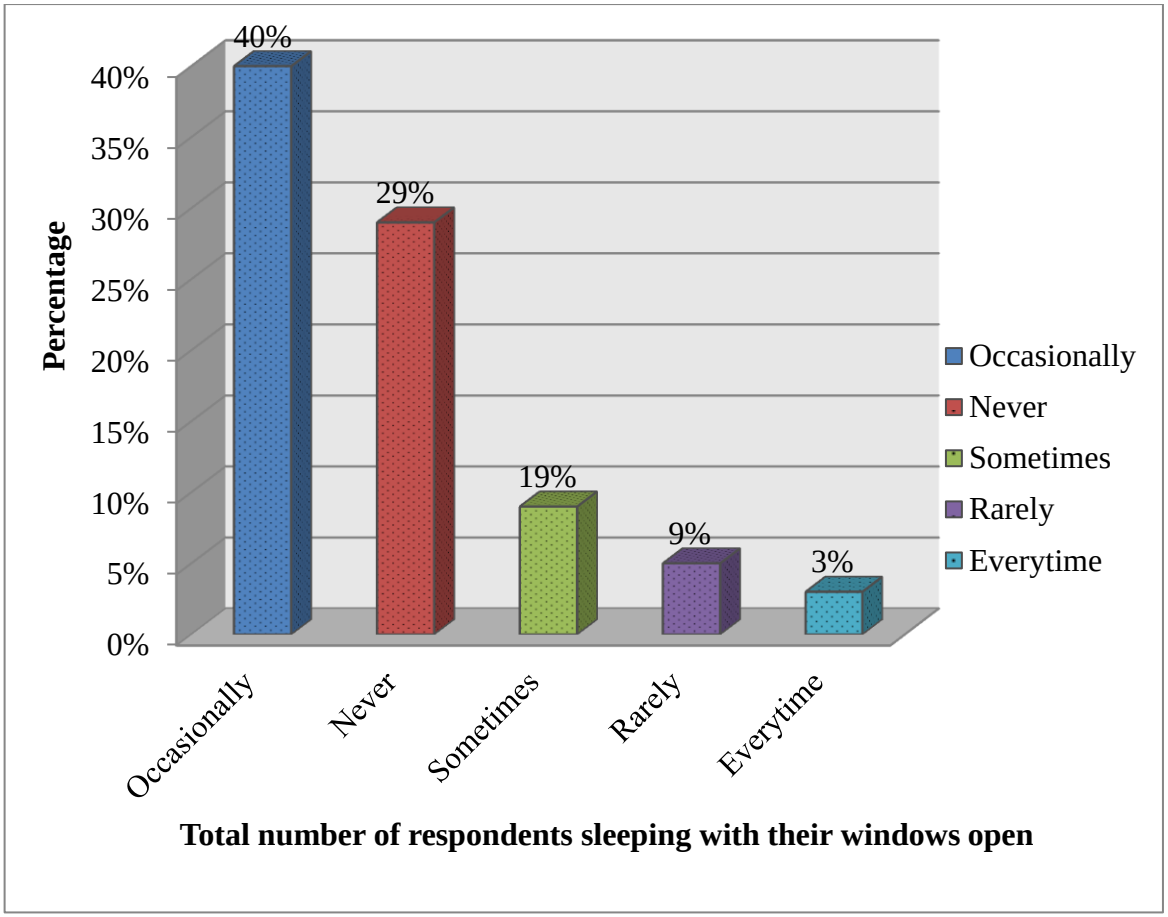

Figure 4.12 Number of respondents sleeping with their windows open

4.3 Acceptable Zone Sound Levels for Noise in Districts

According to South African National Standard (SANS 10103,2008) the recommended levels of noise in suburban areas range from 50dB during the day and 40dB during the night (outdoor) and range from 40 dB during the day and 30 dB during the night when windows are open. The ratings are higher in the suburban area due to the fact that there is more commotion as it is situated next to restaurants; malls, etc. (see Table 4.13).

Table 4.13: Acceptable zone sound levels for noise in districts (SANS 10103*)*

Type of district	**Equivalent continuous rating level for(Lreq.T) ambient noise dB(A)**					
	Outdoors			**Indoors with windows open**		
	Day/night LR,dna	Day time LReq.db	Night time LReq.nb	Day/night LR,dna	Day time LReq.db	Night time LReq.nb
Rural districts	45	45	35	35	35	25
Suburban districts	50	50	40	40	40	40
Urban districts	55	55	45	45	45	35
Urban districts with one or more of the following: workshops; business premises; main roads	60	60	50	50	50	40
Central business districts	65	65	55	55	55	45
Industrial districts	70	70	60	60	60	50

SANS 10103: 2008 provides the maximum average background ambient sound levels, LReq,db and LReq,nb, during the day and night respectively to which different types of developments may be exposed. Based on onsite measurements, the ambient sound levels on and around the proposed project site correspond to the rating levels for a rural area. As such, the acceptable Zone Sound Levels used include: Day (06:00 to 22:00) - LReq, d = 45 dBA and night (22:00 to 06:00) - LReq, n = 35 dBA.

4.4 Measuring points 1- 10 during the day

The measurements were taken during the day from 10h00 to 14h30 next to 10 households chosen for sampling at 30 minute intervals.

4.4.1 Measuring point 1 during the day

The measurement readings were taken during the day on a clear sunny day next to house number 97 1st Avenue in Melville.

4.4.1.1 Measuring point 1 data in July 2015

First measurements taken on Saturday 04 July 2015 during the day at10h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 14h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.14 & Figure 4.14)

4.4.1.2 Measuring point 1 data in August 2015

Third measurement were taken on Monday (Public holiday) 10 August 2015 during the day at 14h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 10h00 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.14 & Figure 4.14)

Table 4.14: Measuring point 1 Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	10h00	19°C	0.3m/s	28°00’ 34.5”E 26°10’40”S
18 July 2015	14h30	18°C	0.7m/s	28°00’ 34.5”E 26°10’40”S
10 August 2015	10h00	23°C	0.5m/s	28°00’ 34.5”E 26°10’40”S
21 August 2015	14h30	27°C	0.6m/s	28°00’ 34.5”E 26°10’40”S

Figure 4.14: Measuring point 1 (97 1st Avenue Melville

4.4.2 Measuring point 2 during the day

The measurement were taken next to sample house number 90 2nd Avenue in Melville

4.4.2.1 Measuring point 2 data in July 2015

First measurements taken on Saturday 04 July 2015 during the day at 10h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 14h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.15 & Figure 4.15)

4.4.2.2 Measuring point 2 data in August 2015

The third measurement were taken on Monday (Public holiday) 10 August 2015 during the day at 14h00 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 10h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.15 & Figure 4.15).

Table 4.15: Measuring point 2 Data

Date	Time	Temperature	Wind speed	Co-ordinates
04 July 2015	10h30	19°C	0.3m/s	28°00’32.5”E 26°10’38.2”S
18 July 2015	14h00	18°C	0.7m/s	28°00’32.5”E 26°10’38.2”S
10 August 2015	10h30	23°C	0.5m/s	28°00’32.5”E 26°10’38.2”S
21 August 2015	14h00	27°C	0.6m/s	28°00’32.5”E 26°10’38.2”S

Figure 4.15: Measuring point 1 during the day (92 2nd Avenue Melville)

4.4.3 Measuring point 3 during the day

The measurement were taken next to sample house number 84 3rd Avenue in Melville

4.4.3.1 Measuring point 3 data in July 2015

First measurements taken on Saturday 04 July 2015 during the day at 11h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 13h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.16& Figure 4.16).

4.43.2 Measuring point 3 data in August 2015

The third measurements were taken on Monday (Public holiday) 10 August 2015 during the day at 13h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 11h00 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.16 & Figure 4.16)

Table 4.16: Measuring point 3 Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	11h00	19°C	0.3m/s	28°00’28.8”E 26°10’35.4”S
18 July 2015	13h30	18°C	0.7m/s	28°00’28.8”E 26°10’35.4”S
10 August 2015	11h00	23°C	0.5m/s	28°00’28.8”E 26°10’35.4”S
21 August 2015	13h30	27°C	0.6m/s	28°00’28.8”E 26°10’35.4”S

Figure 4.16 Measuring point 3 during the day (84 3rd Avenue Melville)

4.4.4 Measuring point 4 during the day

The measurement were taken next to sample house number 57 5th avenue in Melville

4.4.4.1 Measuring point 4 data in July 2015

First measurements taken on Saturday 04 July 2015 during the day at 11h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 13h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.17 & Figure 4.17)

4.4.4.2 Measuring point 4 data in August 2015

The third measurement was taken on Monday (Public holiday) 10 August 2015 during the day at 11h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 13h00 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.17 & Figure 4.17).

Table 4.17: Measuring point 4 Data

Date	Time	Temperature	Wind speed	Co-ordinates
04 July 2015	11h30	19°C	0.3m/s	28°00’28.6”E 26°10’28.5”S
18 July 2015	13h00	18°C	0.7m/s	28°00’28.6”E 26°10’28.5”S
10 August 2015	11h30	23°C	0.5m/s	28°00’28.6”E 26°10’28.5”S
21 August 2015	13h00	27°C	0.6m/s	28°00’28.6”E 26°10’28.5”S

Figure 4.17: Measuring point 4 during the day (57 5th Avenue Melville)

4.4.5 Measuring point 5 during the day

The measurement were taken next to sample house number 4 6th Avenue in Melville

4.4.5.1 Measuring point 5 data in July 2015

First measurements taken on Saturday 04 July 2015 during the day at 12h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 12h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.18 & Figure 4.18)

4.4.5.2 Measuring point 5 data in August 2015

Third measurements were taken on Monday (Public holiday) 10 August 2015 during the day at 12h00 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 12h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.18 & Figure 4.18).

Table 4.18: Measuring point 5 Data

Date	Time	Temperature	Wind speed	Co-ordinates
04 July 2015	12h00	19°C	0.3m/s	28°00'25.7"E 26°10'29.65"S
18 July 2015	12h30	18°C	0.7m/s	28°00'25.7"E 26°10'29.65"S
10 August 2015	12h00	23°C	0.5m/s	28°00'25.7"E 26°10'29.65"S
21 August 2015	12h30	27°C	0.6m/s	28°00'25.7"E 26°10'29.65"S

Figure 4.18: Measuring point 5 during the day (4 6th street Melville)

4.4.6 Measuring point 6 during the day

The measurement were taken next to sample house number 6A 6th Avenue in Melville

4.4.6.1 Measuring point 6 data in July 2015

First measurements taken on Saturday 04 July 2015 during the day at 12h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 12h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.19 & Figure 4.19)

4.4.6.2 Measuring point 6 data in August 2015

Third measurements were taken on Monday (Public holiday) 10 August 2015 during the day at 12h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 12h00 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.19 & Figure 4.19).

Table 4.19: Measuring point 6 Data

Date	Time	Temperature	Wind speed	Co-ordinates
04 July 2015	12h30	19°C	0.3m/s	28°00’47”E 29°10’30.4”S
18 July 2015	12h00	18°C	0.7m/s	28°00’47”E 29°10’30.4”S
10 August 2015	12h30	23°C	0.5m/s	28°00’47”E 29°10’30.4”S
21 August 2015	12h00	27°C	0.6m/s	28°00’47”E 29°10’30.4”S

Figure 4.19: Measuring point 6 during the day (6A 6thAvenue Melville

4.4.7 Measuring point 7 during the day

The measurement were taken next to sample house number 30 8th Street Melville.

4.4.7.1 Measuring point 7 data in July 2015

First measurements taken on Saturday 04 July 2015 during the day at 13h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 11h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.20 & Figure 4.20)

4.4.7.2 Measuring point 7 data in August 2015

Third measurements were taken on Monday (Public holiday) 10 August 2015 during the day at 13h00 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 11h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.20 & Figure 4.20).

Table 4.20: Measuring point 7 Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	13h00	19°C	0.3m/s	28°00”13.9”E 26°10’23.3”S
18 July 2015	11h30	18°C	0.7m/s	28°00”13.9”E 26°10’23.3”S
10 August 2015	13h00	23°C	0.5m/s	28°00”13.9”E 26°10’23.3”S
21 August 2015	11h30	27°C	0.6m/s	28°00”13.9”E 26°10’23.3”S

Figure 4.20: Measuring point 7 during the day (30 8th Street Melville)

4.4.8 Measuring point 8 during the day

The measurements were taken next to sample house number in Melville

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4.4.8.1 Measuring point 8 in July 2015

First measurements taken on Saturday 04 July 2015 during the day at 13h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 11h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.21 & Figure 4.21)

4.4.8.2 Measuring point 8 data in August 2015

Third measurements were taken on Monday (Public holiday) 10 August 2015 during the day at 13h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 11h00 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.21 & Figure 4.21).

Table 4.21: Measuring point 8 Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	13h30	19°C	0.3m/s	28°00’38.6”E 26°10’24.1”S
18 July 2015	11h00	18°C	0.7m/s	28°00’38.6”E 26°10’24.1”S
10 August 2015	13h30	23°C	0.5m/s	28°00’38.6”E 26°10’24.1”S
21 August 2015	11h00	27°C	0.6m/s	28°00’38.6”E 26°10’24.1”S

Figure 4.21: Measuring point 8 during the day at 54 8th Avenue Melville

4.4.9 Measuring point 9 during the day

The measurement were taken next to sample house number in Melville

4.4.9.1 Measuring point 9 data in July 2015

First measurements taken on Saturday 04 July 2015 during the day at 14h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 10h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.22 & Figure 4.22)

4.4.9.2 Measuring point 9 in August 2015

Third measurements were taken on Monday (Public holiday) 10 August 2015 during the day at 14h00 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 10h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.22 & Figure 4.22).

Table 4.22: Measuring point 9 Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	14h00	19°C	0.3m/s	28°00’46.3”E 26°10’28.15”S
18 July 2015	10h30	18°C	0.7m/s	28°00’46.3”E 26°10’28.15”S
10 August 2015	14h00	23°C	0.5m/s	28°00’46.3”E 26°10’28.15”S
21 August 2015	10h30	27°C	0.6m/s	28°00’46.3”E 26°10’28.15”S

Figure 4.22: Measuring point 9 during the day (Flats: 100 7th Avenue Melville)

4.4.10 Measuring point 10 during the day

The measurement were taken next to sample house number in Melville

4.4.10.1 Measuring point 10 data in July 2015

First measurements taken on Saturday 04 July 2015 during the day at 14h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the day at 10h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.23 & Figure 4.23)

4.4.10.2 Measuring point 10 data in August 2015

Third measurements were taken on Monday (Public holiday) 10 August 2015 during the day at 14h00 with temperature at 23°C and the wind speed of 0.5m/s and the fourth

measurement on 21 August 2015 at 10h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.23 & Figure 4.23).

Table 4.23: Measuring point 10 Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	14h30	19°C	0.3m/s	27°59’57.8”E 26°10’37.2”S
18 July 2015	10h00	18°C	0.7m/s	27°59’57.8”E 26°10’37.2”S
10 August 2015	14h30	23°C	0.5m/s	27°59’57.8”E 26°10’37.2”S
21 August 2015	10h00	27°C	0.6m/s	27°59’57.8”E 26°10’37.2”S

Figure 4.23: Measuring point 10 during the day (19 4Th Avenue Melville)

4.4.11 Noise levels for measuring points 1- 10 during the day

Noise levels were taken in ten respective measuring points during the day. SANS 10103: (2008) specifications were used for the purpose of measuring and rating levels of noise. Table 4.25 shows measurements that were taken at ten measuring points during the day. The total average noise was 32.64dB (A) during the day in the month of July 2015 and 34dB (A) in the month of August 2015. The results for both months are below the acceptable zone sound level for noise.

Table 4.25: Noise levels for measuring points 1-10 at day time

points	**Distance from source**		**Day**	**Time**	**Average dB(A)**	**GPS Co-ordinates**	
						Longitude	**Latitude**
	7th Street	**Main Street**					
1	174m	861m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	10h00 14h30 14h30 10h00	37.1 30.4 30.4 31.3	28°00’34,5 ”E	26°10’40 ”S
2	42.7m	804m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	10h30 14h00 14h00 10h30	20,2 35.8 39.4 34.3	28°00’32,0 ”E	26°10’38 ,2S
3	77m	708m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	11h00 13h30 13h30 11h00	30.7 33.2 35.5 38.8	28°00’28.8 ”E	26°10’35 .4”S
4	217m	760m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	11h30 13h00 13h00 11h30	37.2 36.3 39.3 44.4	28°00’28,6 ”E	26°10’28 .5”S
5	235m	675m	04 Jul 2015 18 Jul 2015 10 Aug 2015	12h00 12h30 12h30	30.9 37.7 38.7	28°00’25.7 ”E	26°10’29 .65”S

			21 Aug 2015	12h00	39.4		
6	756m	241m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	12h30 12h00 12h00 12h30	34.6 31.5 25.2 32.7	28°00'047"E	26°10'30.4"S
7	620m	570m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	13h00 11h30 11h30 13h00	26.9 36.2 26.7 37.6	28°00'41.7"E	26°10'23.3"S
8	465m	1.163m	04 July 2015 18 July 2015 10 Aug 2015 21 Aug 2015	13h30 11h00 11h00 13h30	30.4 34.0 38.2 30.3	28°00'38.6"E	26°10'24.1"S
9	464m	1.228m	04 July 2015 18 July 2015 10 Aug 2015 21 Aug 2015	14h00 10h30 10h30 14h00	30.1 33.1 39.2 22.8	28°00'46.3"E	26°10'28.15"S
10	939m	156m	04 July 2015 18 July 2015 10 Aug 2015 21 Aug 2015	14h30 10h00 10h00 14h30	37.2 39.3 24.6 31.0	27°59'57.8"E	26°10'37.2"

Total average noise levels - July 2015: 32dB (A) & August 2015:33dB (A)

4.5 Measuring points 1-10 at night

The readings were taken at night from 22h00 to 02h30 next to 10 households chosen for sampling at 30 minute intervals.

4.5.1 Measuring point 1 at night

The measurement readings were taken during next to house number 97 1st Avenue in Melville.

4.5.1.1 Measuring point 1 data in July 2015

First measurements taken on Saturday 04 July 2015 during the night at 22h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Sunday early hours of the morning on 19 July 2015 during the night at 02h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.26& Figure 4.26)

4.5.1.2 Measuring point 1 data in August 2015

Third measurements were taken on Tuesday 11 August 2015 during early hours of the morning at 02h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 22h00(Friday) with temperature at 27°C and wind speed of 0.6m/s (see Table 4.26 & Figure 4.26)

Table 4.26: Measuring point 1 Data at night

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	22h00	19°C	0.3m/s	28°00’ 34.5”E 26°10’40”S
19 July 2015	02h30	18°C	0.7m/s	28°00’ 34.5”E 26°10’40”S
11 August 2015	02h30	23°C	0.5m/s	28°00’ 34.5”E 26°10’40”S
21 August 2015	22h00	27°C	0.6m/s	28°00’ 34.5”E 26°10’40”S

Figure 4.26: Measuring point 1 at night (97 1st Avenue Melville)

4.5.2 Measuring point 2 at night

The measurement were taken next to sample house number 90 2nd Avenue in Melville

4.5.2.1 Measuring point 2 data in July 2015

First measurements taken on Saturday 04 July 2015 during the night at 22h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Sunday early hours of the morning 19 July 2015 during the night at 02h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.27 & Figure 4.27). The findings from the noise measurements clearly state that Melville community is not exposure to noise during the day and if it is noisy it will be due to barking dogs and early hour traffic noise and late in the afternoon traffic noise not from restaurant bars and nightclub.

4.5.2.2 Measuring point 2 data in August 2015

Third measurement were taken on Tuesday early hours of the morning after the public holiday 11 August 2015 during the night at 02h00 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 (Friday) at 22h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.27 & Figure 4.27).

Table 4.27: Measuring point 2 at night Data

Date	Time	Temperature	Wind speed	Co-ordinates
04 July 2015	22h30	19°C	0.3m/s	28°00’32.5”E 26°10’36.6”S
19 July 2015	02H00	18°C	0.7m/s	28°00’32.5”E 26°10’36.6”S
11 August 2015	02h00	23°C	0.5m/s	28°00’32.5”E 26°10’36.6”S
21 August 2015	22h30	27°C	0.6m/s	28°00’32.5”E 26°10’36.6”S

Figure 4.27: Measuring point 2 at night (90 2nd Avenue Melville

4.5.3 Measuring point 3 at night

The measurements were taken next to sample house number in 84 3rd Avenue Melville

4.5.3.1 Measuring point 3 data in July 2015

First measurements taken on Saturday 04 July 2015 during the night at 23h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Sunday early hours of the morning 19 July 2015 during the day at 01h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.28 & Figure 4.28)

4.5.3.2 Measuring point 3 data in August 2015

Third measurements were taken on Tuesday early hours of the morning after the public holiday 11 August 2015 during the night at 01h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 at 23h00 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.28 & Figure 4.28).

Table 4.28: Measuring point 3 at night Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	23h00	19°C	0.3m/s	28°00’32.5”E 26°10’36.6”S
19 July 2015	01H30	18°C	0.7m/s	28°00’32.5”E 26°10’36.6”S
11 August 2015	01H30	23°C	0.5m/s	28°00’32.5”E 26°10’36.6”S
21 August 2015	23h00	27°C	0.6m/s	28°00’32.5”E 26°10’36.6”S

Figure 4.28: Measuring point 3 at night (84 3rd Avenue Melville

4.5.4 Measuring point 4 at night

The measurement were taken next to sample house number 57 5th Avenue in Melville

4.5.4.1 Measurements in July 2015

First measurements taken on Saturday 04 July 2015 during the night at 23h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Sunday early hours of the morning 19 July 2015 during the day at 01h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.29 & Figure 4.29)

4.5.4.2 Measuring point 4 data in August 2015

Third measurements were taken on Tuesday early hours of the morning after the public holiday 11 August 2015 during the night at 01h00 with temperature at 23°C and the wind

speed of 0.5m/s and the fourth measurement on 21 August 2015 at 23h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.29 & Figure 4.29).

Table 4.29: Measuring point 4 at night Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	23h30	19°C	0.3m/s	28°00’32.5”E 26°10’36.6”S
19 July 2015	01H00	18°C	0.7m/s	28°00’32.5”E 26°10’36.6”S
11 August 2015	01H00	23°C	0.5m/s	28°00’32.5”E 26°10’36.6”S
21 August 2015	23h30	27°C	0.6m/s	28°00’32.5”E 26°10’36.6”S

Figure 4.29 Measuring point 4 at night (57 5th Avenue Melville)

4.5.5 Measuring point 5 at night

The measurement were taken next to sample house number 4 6th street in Melville

4.5.5.1 Measuring point 5 data in July 2015

First measurements taken on Saturday 04 July 2015 during the night at 00h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the night at 00h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.30 & Figure 4.30)

4.5.5.2 Measuring point 5 data in August 2015

Third measurements were taken on Monday (public holiday) 11 August 2015 during the night at 00h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 21 August 2015 during the night at 00h00 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.30 & Figure 4.30).

Table 4.30: Measuring point 5 at night Data

Date	Time	Temperature	Wind speed	Co-ordinates
04 July 2015	00h00	19°C	0.3m/s	28°00’32.5”E 26°10’36.6”S
18 July 2015	00H30	18°C	0.7m/s	28°00’32.5”E 26°10’36.6”S
11 August 2015	00H30	23°C	0.5m/s	28°00’32.5”E 26°10’36.6”S
21 August 2015	00h00	27°C	0.6m/s	28°00’32.5”E 26°10’36.6”S

Figure 4.30 Measuring point 5 at night (4 6th Street Melville)

4.5.6 Measuring point 6 at night

The measurement were taken next to sample house number 6A 6thAvenue in Melville

4.5.6.1 Measuring point 6 data in July 2015

First measurements taken on Saturday 04 July 2015 during the night at 00h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the night at 00h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.31 & Figure 4.31)

4.5.6.2 *Measuring point 6 data in August 2015*

Third measurements taken on Monday (public holiday) 11 August 2015 during the night at 00h00 with temperature at 23°C and the wind speed of 0.5m/s and the fourth

measurement on 21 August 2015 during the night at 00h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.31 & Figure 4.31).

Table 4.31: Measuring point 6 at night Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
04 July 2015	00h30	19°C	0.3m/s	28°00’32.5”E 26°10’36.6”S
18 July 2015	00H00	18°C	0.7m/s	28°00’32.5E 26°10’36.6”S
11 August 2015	00H00	23°C	0.5m/s	28°00’32.5”E 26°10’36.6”S
21 August 2015	00h30	27°C	0.6m/s	28°00’32.5”E 26°10’36.6”S

Figure 4.31: Measuring point 6 at night (6A 6thAvenue Melville)

4.5.7 Measuring point 7 at night

The measurement were taken next to sample house number 30 8th Street in Melville

4.5.7.1 Measuring point 7 data in July 2015

First measurements taken on Sunday early hours of the morning 05 July 2015 at 01h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the night at 23h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.32 & Figure 4.32)

4.5.7.2 Measuring point 7 data in August 2015

Third measurements were taken on Monday (public holiday) 11 August 2015 during the night at 23h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 22 August 2015 early hours of the morning (Saturday) during the night at 01h00 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.32 & Figure 4.32).

Table 4.32: Measuring point 7 at night Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
05 July 2015	01h00	19°C	0.3m/s	28°00’32.5”E 26°10’36.6”S
18 July 2015	23h30	18°C	0.7m/s	28°00’32.5”E 26°10’36.6”S
11 August 2015	23h30	23°C	0.5m/s	28°00’32.5”E 26°10’36.6”S
22 August 2015	01h00	27°C	0.6m/s	28°00’32.5”E 26°10’36.6”S

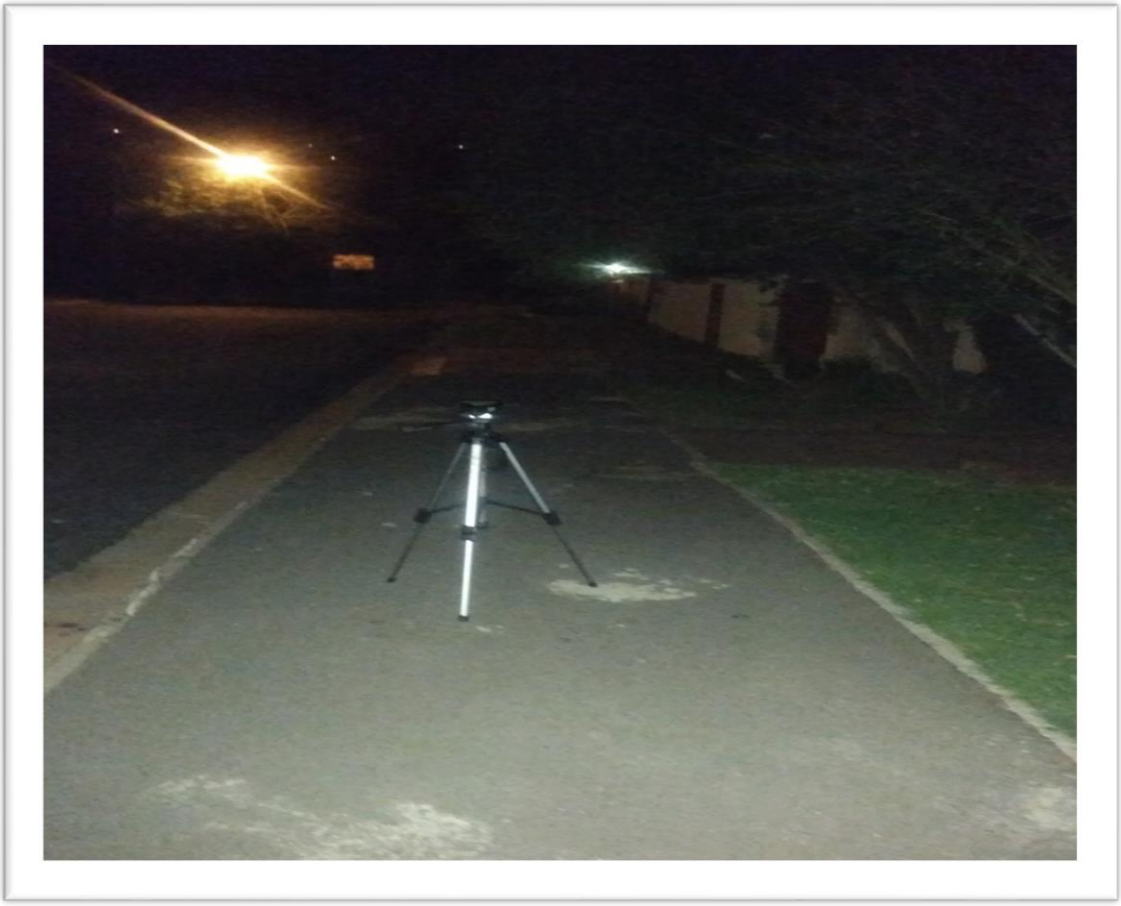

Figure 4.32: Measuring point 6 at night (30 8th street Melville)

4.5.8 Measuring point 8 at night

The measurement were taken next to sample house number 54 8thAvenue in Melville

4.5.8.1 Measuring point 8 data in July 2015

First measurements taken on Sunday early hours of the morning 05 July 2015 at 01h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the night at 23h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.33 & Figure 4.33)

4.4.8.2 Measuring point 8 data in August 2015

Third measurements taken on Monday (public holiday) 11 August 2015 during the night at 23h00 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 22 August 2015 early hours of the morning (Saturday) during the night at 01h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.33 & Figure 4.33).

Table 4.33: Measuring point 8 at night Data

Date	Time	Temperature	Wind speed	Co-ordinates
05 July 2015	01h30	19°C	0.3m/s	28°00’32.5”E 26°10’36.6”S
18 July 2015	23h00	18°C	0.7m/s	28°00’32.5”E 26°10’36.6”S
11 August 2015	23h00	23°C	0.5m/s	28°00’32.5”E 26°10’36.6”S
22 August 2015	01h30	27°C	0.6m/s	28°00’32.5”E 26°10’36.6”S

Figure 4.33: Measuring point 8 at night (54 8th Avenue Melville)

4.5.9 Measuring point 9 at night

The measurement were taken next to sample Flats number 100 7thAvenue in Melville

4.5.9.1 Measuring point 9 data in July 2015

First measurements taken on Sunday early hours of the morning 05 July 2015 at 02h00 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the night at 22h30 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.34 & Figure 4.34)

4.5.9.2 Measuring point 9 data in August 2015

Third measurements taken on Monday (public holiday) 11 August 2015 during the night at 22h30 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement on 22 August 2015 early hours of the morning (Saturday) during the night at 02h00 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.34 & Figure 4.34).

Table 4.34: Measuring point 9 at night Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
05 July 2015	02h00	19°C	0.3m/s	28°00’32.5”E 26°10’36.6”S
18 July 2015	22h30	18°C	0.7m/s	28°00’32.5”E 26°10’36.6”S
11 August 2015	22h30	23°C	0.5m/s	28°00’32.5”E 26°10’36.6”S
22 August 2015	02h00	27°C	0.6m/s	28°00’32.5”E 26°10’36.6”S

Figure 4.34: Measuring point 9 at night (Flats: 100 7th Avenue Melville)

4.5.10 Measuring point 10 at night

The measurement were taken next to sample house number 19 4thAvenue in Melville

4.5.10.1 Measuring point 10 data in July 2015

First measurements taken on Sunday early hours of the morning 05 July 2015 at 02h30 with temperature at 19°C and the wind speed at 0,3m/s and second measurement on Saturday 18 July 2015 during the night at 22h00 with temperature at 18°C and the wind speed 0,7m/s. (see Table 4.35 & Figure 4.35

4.5.10.2 Measuring point10 data in August 2015

Third measurements taken on Monday (public holiday) 11 August 2015 during the night at 22h00 with temperature at 23°C and the wind speed of 0.5m/s and the fourth measurement

on 22 August 2015 early hours of the morning (Saturday) during the night at 02h30 with temperature at 27°C and wind speed of 0.6m/s (see Table 4.5.10& Figure 4.5.10).

Table 4.5.10: Measuring point 10 at night Data

Date	**Time**	**Temperature**	**Wind speed**	**Co-ordinates**
05 July 2015	02h30	19°C	0.3m/s	28°00'32.5"E 26°10'36.6"S
18 July 2015	22h00	18°C	0.7m/s	28°00'32.5"E 26°10'36.6"S
11 August 2015	22h00	23°C	0.5m/s	28°00'32.5"E 26°10'36.6"S
22 August 2015	02h30	27°C	0.6m/s	28°00'32.5"E 26°10'36.6"S

Figure 4.35: Measuring point 10 at night (18 4th Avenue Melville)

4.5.11 Noise levels for measuring points 1- 10 at night

Noise levels were taken in ten respective measuring points at night. SANS 10103:2008 specifications were used for the purpose of measuring and rating levels of noise. Table 4.5.11 shows measurements that were taken at ten measuring points at night. From a total of 40 noise level measurements undertaken, only 5 measurements were below the SANS 101103(2008) threshold of 40dB at night. This implies that only 12.5 % complied with officially acceptable levels and 87 % of the measurements did not comply with SANS 10103 (2008) standard levels. The range of noise levels higher than the acceptable levels was from 40.2 dB measured at 23h30 on the 18 July 2015 at point 9 to 78.1 dB measured at 02h00 of same day at point 2.

The highest levels of noise were measured at point 2 and 3 respectively possibly because they are relatively closer to the sources on 7th street as compared to other points. The lowest noise levels were measured at point 7 and 9, which are intermediate distances. The readings marked in red are higher than the acceptable noise levels according to SANS 10103 (2008) (see Table 4.36).

Table 4.36: Noise levels for measuring points 1-10 at night

Points	**Distance from source**		**Day**	**Time**	**Average dB(A)**	**GPS Co-ordinates**	
						Longitude	**Latitude**
	7th Street	**Main Street**					
1	174m	861m	04 Jul 2015 18 July 2015 10 Aug 2015 21 Aug 2015	22h00 02h30 02h30 22h00	54.3 53.2 60.5 56.3	28°00’34,5 ”E	26°10’40” S
2	42.7m	804m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	22h30 02h00 02h00 22h30	75.2 78.1 74.2 70.3	28°00’32,0 ”E	26°10’38, 2”S

3	77m	708m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	23h00 01h30 01h30 23h00	70.3 70.2 69.5 67.4	28°00’28.8”E	26°10’35.4”S
4	217m	760m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	23h30 01h00 01h00 23h30	49.8 57.1 57.8 54.3	28°00’28,6”E	26°10’28.5”S
5	235m	675m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	00h00 00h30 00h30 00h00	57.5 55.2 53.4 51.2	28°00’25.7”E	26°10’29.65”S
6	756m	241m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	00h30 00h00 00h00 00h30	55.3 53.5 50.5 50.7	28°00’047”E	26°10’30.4”S
7	620m	570m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	01h00 23h30 23h30 01h00	38.5 32.2 36.8 40.4	28°00’41.7”E	26°10’23.3”S
8	465m	1.163 m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	01h30 23h00 23h00 01h30	40.4 40.8 45.3 49.3	28°00’38.6”E	26°10’24.1”S
9	464m	1.228 m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	02h00 23h30 23h30 02h00	42,5 40.2 37.6 35.2	28°00’46.3”E	26°10’28.15”S
10	939m	156m	04 Jul 2015 18 Jul 2015 10 Aug 2015 21 Aug 2015	02h30 00h00 00h00 02h30	59.6 62.3 63.3 62.8	27°59’57.8”E	26°10’37.2”

Total average noise levels- July 2015:54.11dB (A) & August 2015: 54.34dB (A)

4.6 Conclusion

In this chapter the data was analysed and presented in a form of bar charts, tables and Figures. Melville falls under a suburban area in according with the requirements prescribed in SANS 10103: 2008 guidelines. During the noise survey it was discovered that the ambient noise levels at night were higher (above 50dB) (A) than the acceptable ambient noise levels as prescribed by SANS 10103: 2008 and results obtained during the day (less than 40dB (A) fall within the prescribed ambient noise levels. This indicates that Melville is actually not too noisy during the day.

More than 40% of participants stated that noise levels at night were high, the source being the nightclub on the corner of Main and 3rd Avenue. The majority experienced noise during early hours of the morning on weekends and public holidays between 00h00 and 03h00 (more than 3 hours continuously).One of the outcomes of this study is to generate a draft article for publication (see Appendix VI).

The next chapter will present a brief summary of the study and results or findings obtained from the structured questionnaires and noise readings from the noise measuring instrument. The recommendations in this chapter will serve as guidelines to the relevant authorities in order to mitigate environmental noise sources within the population of Melville, Johannesburg.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Summary

This chapter summarises and assesses the findings of the research. Recommendations are also provided at the end of this chapter.

The aim of the study was to investigate the health impact of noise pollution emanating from nightclubs and restaurant bars within the population of Melville, Johannesburg. To meet this aim a study was conducted using a structured questionnaire and a calibrated sound level meter to measure ambient noise levels.

5.2 Research Results / Findings

5.2.1 Socio demographics

The study revealed that the majority (53%) of the respondents who participated in the interviews were females. Melville is in close proximity to universities and companies – as a result the most prevalent age group was between 20-35 years (37%) meaning that households in the study area are occupied by students and young working class adults. The level of education was high amongst the sampled population – 48% having obtained degrees – therefore it made the administration process of the questionnaire easy and the respondents were knowledgeable with regard to the subject matter.

The majority of people residing in these households are students. The noise activities at night that persists till early hours of the morning disrupt their sleep patterns, resulting in poor performance at school. According to Karande and Kulkarni (2005) there is evidence that noise can lead to shortened concentration span, hearing impairment and aggressive behaviour, all resulting in poor performance.

5.2.2 Respondents reaction, attitudes and understanding of noise pollution

Participants (78%) described noise as an annoying, unwanted and disturbing sound. From this finding it was derived that the majority of the respondents understood what noise is and its impact on the quality of life. The respondents indicated that it is not noisy during the day, and if it is noisy it would be in the morning or late afternoon due to traffic noise or barking dogs as per day time assessment findings. The majority of respondents indicated

that they experienced low pitched noise at night persisting from evening to early hours of the morning continuously for a period more than 3 hours.

About 69% of respondents indicated that the main source of noise pollution is a nightclub, followed by restaurant bars at 13%, barking dogs and revving cars at 13%, sports fields at 3% and sports bars at 2%. This result reveals that the nightclub is a major contributor to the noise problems in Melville. According to the findings only 14% have lodged complaints with the local authority and 85% have not lodged complaints, indicating that there is misrepresentation in terms of reporting. The large number of participants (76%) indicating that they have no knowledge of local authority by–laws regulating noise suggests that the city should start engaging more with the community through awareness campaigns.

5.2.3 Health effects due to exposure to noise

According to the results obtained only 6% of the respondents indicated that their family members have some form of hearing loss due to exposure to noise; however 57% of participants indicated that members of their household have suffered from sleeping disorders due to noise activities at night disrupting their sleep patterns and resulting in irritability and fatigue.

5.2.4 Residential preferences and type of material used to build the houses

The majority of the participants (83%) in the research reside in freestanding houses built of bricks with metal roofs and all of them have ceilings. This means that noise cannot penetrate easily through this type of building material unless it's very loud.

5.3 Noise Measurements Results from 10 Measuring Points

Noise measurements were taken at 30 minute intervals from 10h00 to 14h30 during the day and from 22h00 – 02h30 at night for the period of two months in July and August 2015 using a calibrated sound level meter approved by a certified external private laboratory.

5.3.1 Day time findings

Noise levels were taken in 10 respective measuring points during the day. SANS 10103: (2008) specifications were used for the purpose of measuring and rating levels of noise.

The total average noise was 32.64dB (A) during the day in the month of July 2015 and 34dB (A) in the month of August 2015. The results for both months are below the acceptable zone sound level for noise. The results showed that noise is not a major concern during the day.

5.3.2 Night time findings

Noise levels were taken in 10 respective measuring points at night. SANS 10103: (2008) specifications were used for the purpose of measuring and rating levels of noise. The total average noise was 54.11dB (A) at night in the month of July 2015 and 54.34dB (A) in the month of August 2015. The results obtained from the noise measurements are higher than the acceptable zone sound level for noise in the suburban district. This is a clear indication that Melville is noisy at night. The residents that stay in close proximity to this entertainment venue are mostly affected.

5.4 The Objectives of the Study

The objectives of this research study outlined in Chapter 1 have been met; the goal of this research was to determine the impact of environmental noise pollution emanating from nightclubs and restaurant bars within the community of Melville. To achieve the goals mentioned the following objectives were discussed:

5.4.1 Investigate the occurrence of noise by conducting physical measurements of environmental noise pollution using a sound level meter

Noise assessment conducted through noise measurements at 10 measuring points selected by using a simple random sampling technique. A calibrated sound level meter was used to measure the ambient noise levels and from the results obtained from the measurements it was revealed that Melville is noisy at night with ambient noise levels higher than 40 dB the acceptable zone noise level rating in accordance with SANS 10103: (2008)

5.4.2 Evaluate the environmental noise pollution levels in Melville community by using relevant by-laws and legislation

In order to manage noise effectively and efficiently it requires a spectrum of consideration and options. Regulatory approaches are important in resolving noise problems. In this

study international approach, national legislation and standards were used to support the reliability and validity of noise assessments conducted in order to determine whether the noise in Melville falls within the acceptable zone noise rating levels.

5.4.3 Assess the health effects of environmental noise pollution levels in Melville population by conducting household surveys using a structured questionnaire

A structured questionnaire was administered to 100 participants selected by using a simple random sampling technique. The results from this study shows that the 57% of respondents indicated that some of their family members suffered from psychological effects such as irritability, fatigue and sleep disorders due to noise exposure. The findings indicate that noise disturbs the peace and comfort of the community.

5.5 Recommendation

5.5.1 Education and awareness

The results obtained from the structured questionnaires showed that only 14% of respondents have lodged complaints with the local authority and 86% have not lodged complaints to the local authority with regard to noise. It is the responsibility of the City of Johannesburg Metropolitan Municipality to increase awareness and training programs on the procedures to follow to lodge complaints as most of the respondents claim that they are not aware which departments are responsible for combating noise pollution, they usually call the police but no action is taken.

5.5.2 Noise measurements by law enforcers

Regular noise measurements of the nightclubs and restaurant bars should be conducted to ascertain their compliance in accordance with noise control regulations, South African noise standards and the World Health Organization. Noise assessments are only done retroactively when complaints are lodged with the local authority, but law enforcers should be proactive in this regard.

5.5.3 Noise management policy

The City of Johannesburg Metropolitan Municipality has to consider implementing its own noise management policy in order to effectively control and manage the noise pollution in its area of jurisdiction, as has been done by other municipalities such as City of Tshwane

Metropolitan Municipality. The policy will take into account the requirements of the Gauteng Provincial Government Noise Control Regulation which were promulgated in August 1999.

The noise management policy will assist in setting acceptable noise level standards and noise impact criteria for the City of Johannesburg Metropolitan Municipality. The policy will provide the necessary internal procedures for all relevant departments in the City of Johannesburg Metropolitan Municipality which need to be tasked with aspects of noise management and control. It will also identify necessary procedures for the effective liaison between relevant departments. The policy will also identify legal powers necessary for the City of Johannesburg to effectively combat noise issues in the city.

5.5.4 Sound insulation

Nightclubs and restaurants in Melville should be sound-proofed to control the amount of noise generated by loud music and patrons who becomes a nuisance outdoors. The owners of the entertainment businesses in Melville should consider reducing noise through a range of architectural and sound insulation methods.

This can be done by consulting with sound acoustic specialists or experts certified by South African Bureau of Standards in accordance with South African National Standards (SANS 10103, 2008) to provide advice on acoustic methods to be used and to assist in increasing acoustic absorption in affected rooms through installation of acoustic ceilings, wall lining or carpets to better control sound transmission.

5.6 Conclusion

The results from the study will provide the baseline information that will be used by law enforcement officers in controlling environmental noise emanating from nightclubs and bars within the community of Melville.

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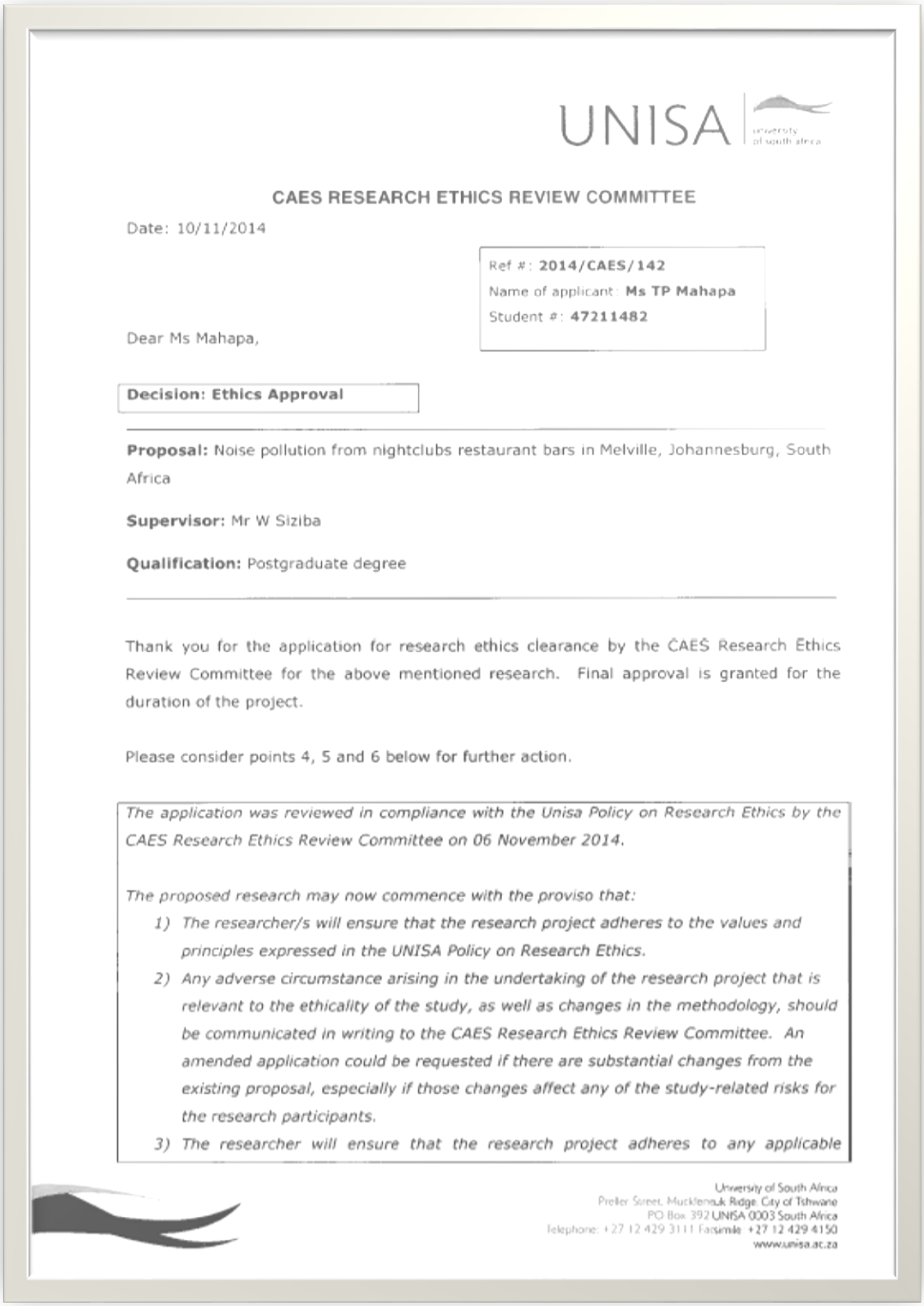
APPENDIX I: UNISA ETHICAL CLEARANCE LETTER



UNISA university of south africa

CAES RESEARCH ETHICS REVIEW COMMITTEE

Date: 10/11/2014

Ref #: **2014/CAES/142**
Name of applicant: **Ms TP Mahapa**
Student #: **47211482**

Dear Ms Mahapa,

Decision: Ethics Approval

Proposal: Noise pollution from nightclubs restaurant bars in Melville, Johannesburg, South Africa

Supervisor: Mr W Siziba

Qualification: Postgraduate degree

Thank you for the application for research ethics clearance by the CAES Research Ethics Review Committee for the above mentioned research. Final approval is granted for the duration of the project.

Please consider points 4, 5 and 6 below for further action.

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the CAES Research Ethics Review Committee on 06 November 2014.

The proposed research may now commence with the proviso that:

1) *The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the CAES Research Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*
3) *The researcher will ensure that the research project adheres to any applicable*

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national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.

4) *The permission letter from Johannesburg City must be submitted to the Committee before data gathering can take place.*
5) *Should the researcher wish to enter the premises of any of the night clubs or restaurants to collect data, a permission letter from the owner must be obtained first and submitted to the Committee.*
6) *The researcher is reminded that respondents to the questionnaire have the right to refuse to provide any of the personal information requested on the form.*

Note:
The reference number [top right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the CAES RERC.

Kind regards,

Signature
CAES RERC Chair: Prof EL Kempen

Signature
CAES Executive Dean: Prof MJ Linington

Please note provisions

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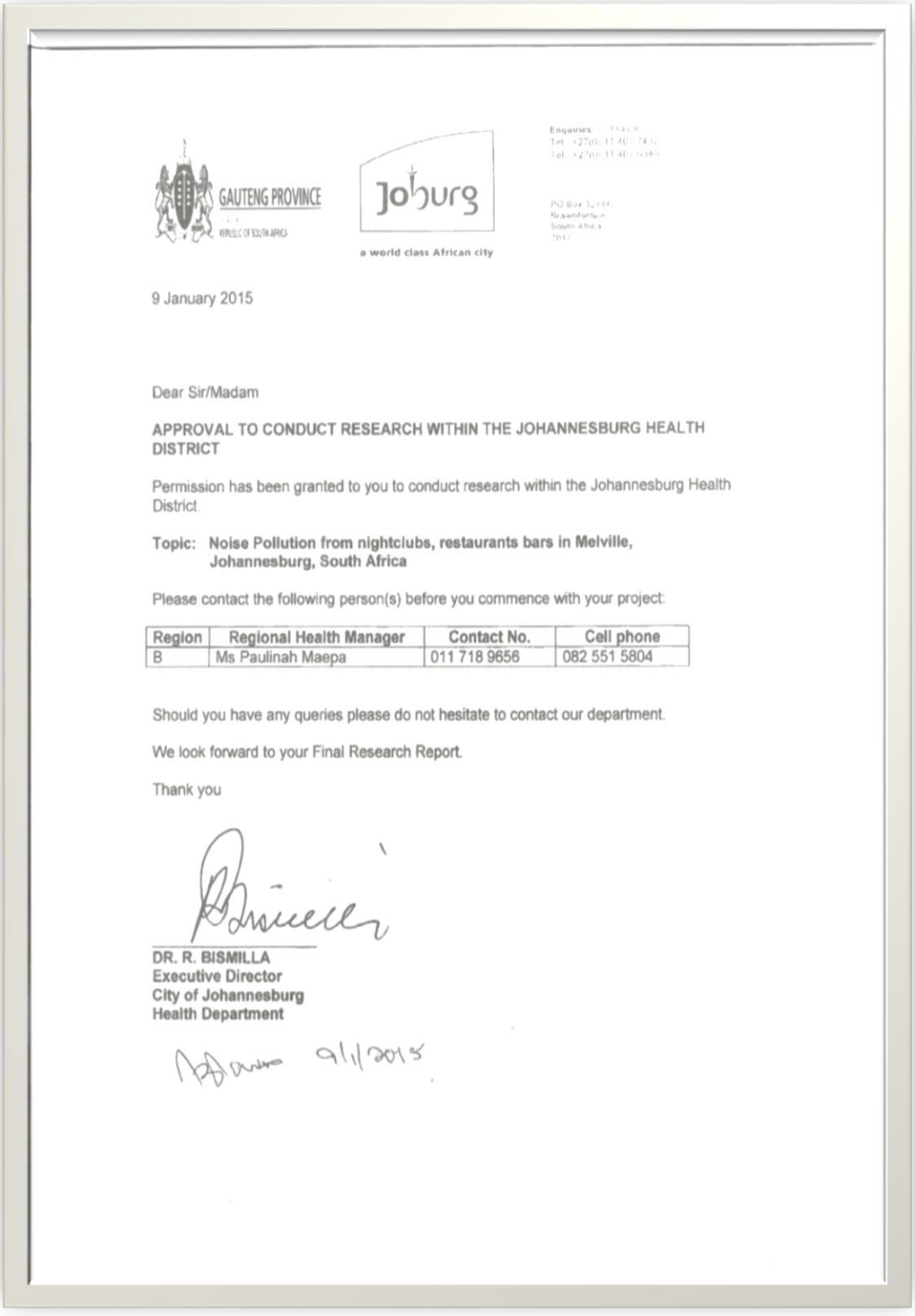
APPENDIX II: CITY OF JOHANNESBURG PERMISSION LETTER



GAUTENG PROVINCE
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

Enquiries:
Tel: +27(0) 11 40[illegible]
Tel: +27(0) 11 40[illegible]

PO Box 32144
Braamfontein
South Africa
2017

9 January 2015

Dear Sir/Madam

APPROVAL TO CONDUCT RESEARCH WITHIN THE JOHANNESBURG HEALTH DISTRICT

Permission has been granted to you to conduct research within the Johannesburg Health District.

Topic: Noise Pollution from nightclubs, restaurants bars in Melville, Johannesburg, South Africa

Please contact the following person(s) before you commence with your project:

Region	Regional Health Manager	Contact No.	Cell phone
B	Ms Paulinah Maepa	011 718 9656	082 551 5804

Should you have any queries please do not hesitate to contact our department.

We look forward to your Final Research Report.

Thank you

DR. R. BISMILLA
Executive Director
City of Johannesburg
Health Department

9/1/2015

APPENDIX III: STRUCTURED QUESTIONNAIRE

The Melville Household Noise Pollution Questionnaire

Status	
Completed questionnaire	
Noise measurements taken (Yes or No)	
Incomplete questionnaire	
Resident not available	
Refused to answer	
Dwelling not found	
Did not get to	

Interview date	D	D	M	M	2	0	1	5

Name of Interviewer	

Respondent's Code					
Telephone/ Cell number:					
Sex of respondent	Male		Female		
Age					

Physical Address (Where sample has been taken)						
GPS coordinates (degrees/minutes/seconds)	Longitude			Latitude		
	º	‘	“	º	‘	“

Please circle or tick the correct answer were applicable

1. How many people are residing in this household?

a. 1

b. 2

c. 3

d. 4

e. 5

f. More than 5

2.1 Age group of people residing in the household?

	AGE GROUP CATEGORIES					
	0-5 Years	**6-12 years**	**13-19 years**	**20-35 years**	**36-45 years**	**46+ years**
Number of each Age Group						

2.2 What is your (respondent) highest educational level?

a. Primary School
b. High school
c. Diploma
d. Degree
e. Other (specify)_____

3. What would you define noise as?

a. Unwanted sound
b. Annoying sound
c. Disturbing sound
d. All of the above
e. Other (Specify)_____

f. 4. How would you describe your community with regards to noise during the day?

a. Very noisy
b. Slightly noisy
c. Somewhat noisy
d. Quiet
e. Slightly quiet
f. Very quiet

5. If it's noisy, what time of the day do you experience noise the most?

a. In the morning
b. Mid-day
c. Afternoon
d. Late Afternoon
e. Other (indicate all that apply)_____

6. For how long does the noise period last at day time?

a. <30mins
b. <1hr
c. <2hrs
d. <3hrs
e. Other (specify)

7. During the time you experience noise at day time, how would you describe your experience of noise?

a. It is continuous
b. It is continually

8. How would you describe the pitch of sound during the day?

a. Very high
b. Slightly high
c. Somewhat high

d. low

e. Slightly low

f. Very low

9. How would you describe your community with regards to noise during the night?

a. Very noisy

b. Slightly noisy

c. Somewhat noisy

d. Quiet

e. Slightly quiet

f. Very quiet

10. If it's noisy, what time of the night do you experience noise the most?

a. In the evening

b. Mid-night

c. Early hour's morning

d. Other (indicate all that apply) _____

11. For how long does the noise period last at night?

a. <30mins

b. <1hr

c. <2hrs

d. <3hrs

e. Other (specify)_____

12. During the time you experience noise at night, how would you describe your experience of noise?

a. It is continuous

b. It is continually

13. How would you describe the pitch of sound at night?

a. Very high

b. Slightly high

c. Somewhat high

d. low

e. Slightly low

f. Very low

14. Select the sources of noise starting with the noisiest to the least noisy from the list below:

a. Night clubs	
b. Restaurant bars	
c. Sports bars	
d. Sports field	
e. Other (specify)_____	

15. Have you ever lodged a formal complaint to the local authority with regards to environmental noise?

a.Yes

b. No

16. Are you aware that Local Municipalities have By-laws or rules regulating environmental noise?

a. Yes

b. No

17. Is there anyone in the household suffering from the following health effects?

	Yes	No
a. Hearing impairment		
b. Hearing loss		
c. Other hearing problems		

18. During noise pollution has anyone felt or complained of the following?

	Yes	No
a. Headaches		
b. Fatigue		
c. Irritability		
d. Stress		
e. Increase in blood pressure		
f. Increased heart rate		

19. Does anyone in the household have sleeping disorders due to noise pollution?

	Yes	No
Difficulties in sleeping during noise pollution		

20. Type of a dwelling used

a. Flat or Apartment building

b. Free standing house

c. cluster

d. Semi- detached (twin)

e. other

21. Type of materials used to build your house

21.1 Walls

	Yes	No
a. Bricks		
b. Concrete		
c. Wood		
d. other, specify_____		

21.2. Roof

	Yes	No
a. Clay and concrete tiles		
b. Metal roof		
c. Wooden Roof		
d. Slates		
e. Other, specify _____		

21.3. Ceiling

	Yes	No
a. Is there any ceiling		

22. How often do you sleep with your windows open?

a. Never

b. Sometimes

c. Occasionally

d. Rarely

e. Every time

f. Almost every time

APPENDIX IV: OBSERVATIONAL DATA COLLECTION SHEET

Month of test _____ Day / Night_____

Sound Level Data

Date	**Time**	**Average dB(A)**	**GPS Coordinates**	
			Longitude	**Latitude**

Total average noise levels _____ dB (A)

Weather conditions

_____

General comments and observations

APPENDIX V: INTRODUCTORY STATEMENT

My name is Tebogo Mahapa I am a Student from the University of South Africa and am conducting interviews to acquire information on the impact of noise pollution in the community. It is envisaged that this study will provide the baseline information that can be used by law enforcement officers in controlling environmental noise within the community of Melville. The interview will approximately take about 30 minutes of your time.

Brief explanation of the process (issuing of a consent form)

For the respondents to participate they need to sign a consent form to show their understanding and willingness to be involved in this study. Having said that, I would like to draw your attention to the following issues:

As a respondent

1. Your privacy and the confidentiality of your personal information shall be respected;
2. Your responses shall be presented in a generalized manner and results of the study shall only be disclosed to the University of South Africa and City of Johannesburg Metropolitan Municipality that are involved in this study and for academic discussions; and
3. Your rights to freedom of choice, expression and access to information will be respected e.g. to discontinue with interviews or refuse to participate in this study.

Question!

Are you willing to participate in this study? If yes!

Thank you very much for willingness to participate, please sign the consent form (collect consent form)

After the interview

Once again thank you so much for your participation. Have a good day.

APPENDIX VI: CONSENT FORM

TITLE OF RESEARCH PROJECT

THE IMPACT OF NIGHTCLUBS AND RESTAURANT BARS NOISE POLLUTION

ON THE POPULATION OF MELVILLE, JOHANNESBURG, SOUTH AFRICA

Dear Mr/Mrs/Miss/Ms _____

Date...…/..…/20...

NATURE AND PURPOSE OF THE STUDY

The purpose of this research project is to determine the impact of environmental noise pollution emanating from nightclubs and restaurant bars within the community of Melville.

RESEARCH PROCESS

1. The study requires your participation in an interview to discuss the impact of environmental noise in your community.
2. The interview will be a form of a questionnaire.
3. The interview offers you the opportunity to express your opinion on the subject.
4. There are no right or wrong answers and all opinions will be valued.
5. You do not need to prepare anything in advance

NOTIFICATION THAT PHOTOGRAPHS WILL BE TAKEN AND SOUND LEVEL METER WILL BE USED TO TAKE MEASUREMENTS.

Your attention is drawn to the fact that during questionnaire interviews photographs will be taken and field workers will be taking noise measurements using a sound level meter.

CONFIDENTIALITY

Your opinions are viewed as strictly confidential, and only the University of South Africa and the City of Johannesburg Metropolitan Municipality will have access to the

information. No data published in dissertations and journals will contain any information through which you may be identified. Your anonymity is therefore ensured.

WITHDRAWAL CLAUSE

I understand that I have the right to withdraw at any time during the study. I therefore participate voluntarily until such time as I request otherwise.

POTENTIAL BENEFITS OF THE STUDY

The research will provide the baseline information that can be used by law enforcement officers in controlling noise emanating from nightclubs and bars within the community of Melville.

INFORMATION (contact information of your supervisor)

If I have any questions concerning the study, I may contact the supervisor, Mr W. Siziba on 0767618379 or Co-supervisor Prof S. J. Moja, at the Department of Agriculture and Environmental Sciences, Unisa, Tel: 011 471 3878.

CONSENT

I, the undersigned …….. (Full name) have read the above information relating to the project and have also heard the verbal version, and declare that I understand it. I have been afforded the opportunity to discuss relevant aspects of the project with the project leader, and hereby declare that I agree voluntarily to participate in the project.

I indemnify the university and any employee or student of the university against any liability that I may incur during the course of the project.

I further undertake to make no claim against the university in respect of damages to my person or reputation that may be incurred as a result of the project/trial or through the fault of other participants, unless resulting from negligence on the part of the university, its employees or students.

I have received a signed copy of this consent form.

Signature of participant:

Signed at …… on ……

WITNESSES

1 .....

.....

APPENDIX VII: PLAGIARISM TEST REPORT

Turnitin Originality Report
MSc Environmental Management dissertation by T.P. Mahapa
From DES 2016 Submissions (DES 2016 Submissions)

- Processed on 19-Apr-2016 10:46 SAST
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APPENDIX VIII: DRAFT ARTICLE

Title: Impact of Noise Pollution from Nightclubs and Restaurant Bars in Melville, Johannesburg, South Africa

Authors: T.P. Mahapa, W. Siziba and Prof S. J. Moja

Targeted Journal: The International Institute for Science, Technology and Education (IISTE): Vol 9, No 10 (2017)

Year: 2017