



A Study of Air Quality Issues at the Bulbul Drive Landfill, South Africa

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As the candidate's supervisor I have/have not approved this thesis/dissertation for submission.

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Preface

The work described in this dissertation was carried out in School of Agriculture, Earth and Environmental Sciences, University of KwaZulu-Natal, Durban, from April 2010 to October 2015, initially under the supervision of Dr. Lisa Ramsay, and completed under the supervision of Prof. Serban Proches.

This dissertation is the result of my own work and includes nothing that is the outcome of work done in collaboration except where specifically indicated in the text.

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Abstract

A landfill impacts on the environment through various pathways. However, it is through the air that those living near the site experience most of these impacts. The Bulbul Drive Landfill is a hazardous waste disposal facility near Chatsworth and Umlazi in the eThekweni Municipality. The aim of this study is to assess ambient air quality issues in the region neighbouring the Bulbul Drive Landfill. Ambient air quality parameters were measured using passive sampling. H₂S concentrations were found to be below threshold levels and it is likely that odour issues are attributed to other components of landfill gas. These include benzene, 1, 2, 4-trimethyl-1-ethyl-2-methyl; decane; heptane and tetrachloroethylene benzene, toluene, ethylbenzene, xylene, dichloroethylene, dichloromethane, trichloroethylene, tetrachloroethylene and vinyl chloride (Berger & Mann, 2001). The concentrations of gaseous pollutants did not exceed the relevant ambient air quality standards but cumulative effects and the applicability of averaging times need to be considered further. There was an incidence of non-compliance with the South African National Dust Control Regulation implying that fallout dust in the Bulbul Drive Landfill area has a negative impact on ambient air quality. An elemental analysis of dust samples revealed that there is a potential for heavy metal contamination on a larger scale. The results of the household survey showed that there were diverse and complex perceptions of air pollution amongst the residents of Chatsworth and Umlazi. Most respondents experienced dust, odour and poor visibility but the nature of this experience varied from Chatsworth to Umlazi. The presence of the Bulbul Drive landfill was acknowledged as a negative aspect of both neighbourhoods, respondents were happy that the landfill was closing. However, emission of pollutants from a landfill, be they solid or gaseous in nature, can be produced for 30 – 300 years after a landfill has closed. The communities of Chatsworth and Umlazi will continue to bear the burden of air quality risks associated with the Bulbul Drive landfill. Despite a shift in environmental governance in South Africa and attempts to address the uneven distribution of environmental risk, air quality management remains a challenge. An interdisciplinary approach is required to address the inequitable distribution of risks associated with air pollution. Policy makers and practitioners alike need to augment technical measurements with an understanding of the social dimension of air pollution.

Keywords: Air pollution, Hazardous waste landfills, Dust fallout, Perceptions of environmental risk

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List of acronyms

| | |
|--------------------------|--|
| $\mu\text{g}/\text{m}^3$ | micrograms per cubic metre |
| APPA | Atmospheric Pollution Prevention Act |
| AQA | National Environmental Management: Air Quality Act |
| ATSDR | American Toxic Substances and Disease Registry |
| ANOVA | One-Way Analysis of Variance |
| BTEX | Benzene, toluene, ethylbenzene and xylene |
| C_6H_6 | Benzene |
| CO | Carbon monoxide |
| DANIDA | Ministry of foreign affairs of Denmark |
| DEA | Department of Environmental Affairs |
| DEFRA | Department for Environment Food and Rural Affairs, |
| DFO | Dust fallout |
| EPA | Environmental Protection Agency |
| GHG | Greenhouse gas |
| HAP | Hazardous air pollutant |
| H_2S | Hydrogen sulphide |
| ICP-OES | Inductively Coupled Plasma Optical Emission Spectrometer |
| KZN | KwaZulu-Natal |
| KS | Kolmogorov- Smirnov test |
| Land GEM | Landfill gas emissions model |
| NEMA | National Environmental Management Act |
| NILU | Norwegian Institute for Air Research |
| NWMS | National Waste Management Strategy |
| NMOC | Non-methane organic compounds |
| Pb | Lead |
| PM | Particulate matter |
| PM_{10} | Particulate matter of aerodynamic diameter less than 10 |
| micrometres | |
| $\text{PM}_{2.5}$ | Particulate matter of aerodynamic diameter less than 2.5 |
| micrometres | |
| ppb | parts per billion |
| ppm | parts per million |
| SAWS | South African Weather Service |
| SDCEA | South Durban Community Environmental Alliance |
| SPSS | Statistical Package for the Social Sciences |
| Stats SA | Statistics South Africa |
| SO_2 | Sulphur dioxide |
| TSP | Total suspended particulates |
| VOC | Volatile organic compounds |
| WHO | World Health Organisation |

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Chapter 1

1. Introduction

Solid waste landfills are the most commonly used and cost effective approach for waste disposal and **South Africa's** infrastructure development has necessitated an increase in these facilities. However, municipal solid waste disposal and treatment facilities have become an environmental and public health concern. Particularly, those landfill sites established prior to the promulgation of the National Environmental Management Act (NEMA) in 2008, and the eThekweni Municipality has several of these waste disposal sites. One of which is the Bulbul Drive Landfill Site, established in 1989 in the vicinity of Chatsworth and Umlazi. Ramsay (2010) highlighted the potential impacts of air pollution on communities living near the Bulbul Drive landfill. People living near waste disposal sites may be exposed to potentially harmful chemicals via air, water or through the soil medium but the main risks to human health from a waste disposal site are likely to be a consequence of air pollution (Richardson et al., 2010).

Landfill gas is composed largely of methane and carbon monoxide and the majority of air pollution studies at landfill sites have been focused on these gases. However, numerous air pollutants identified as trace components in landfill gas from hazardous waste landfill sites are either known or suspected carcinogens. There are various activities that contribute to dust emission at a landfill site and the dispersion of particulate matter from landfill sites occurs through a number of mechanisms (Jia et al., 2013). Health impacts can occur because of inhalation through the respiratory tract (Manahan, 2005). Fugitive dust emission from landfill activities represent a pathway for input of heavy metals into the surface environment (Marrugo-Negrete et al., 2014).

Epidemiological studies have established a direct correlation between air pollution and health impacts (Gurjar et al., 2010). Guidelines, policies and standards, based on comprehensive scientific research have been devised to manage air pollution. The World Health Organisation (WHO) air quality guidelines offer global guidance on thresholds and limits for key air pollutants that pose health risks. The guidelines are based on expert evaluation of current scientific evidence (WHO, 2000). The United States Environmental Protection Agency ambient air quality standards under the authority of the Clean Air Act, provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including the protection against decreased visibility and damage to animals, crops, vegetation and buildings (US EPA, 1995).

The quality of air is compromised in parts of South Africa (DEA, 2009; DEA, 2012). This is largely attributed to an increase of air pollution in towns, cities and industrialised areas such as the Vaal Triangle and the Highveld. Additional sources include biomass burning, waste burning and cross-boundary transportation of pollutants (DEA, 2009). In South Africa, the Bill of Rights contained in the Constitution protects the civil, political and socio-

economic rights of all people in South Africa. Section 24 states that everyone has the right to an environment that is not harmful to their health or well-being (Act 108 of 1996). This includes clean air for all South Africans.

The National Framework for Air Quality Management (DEA, 2007; DEA, 2012) provides guidance for government to meet the requirements of Section 24 of the Bill of Rights (Republic of South Africa, 1996). Health based ambient air quality standards have been established for five criteria pollutants and one toxic pollutant (DEA, 2009; DEA 2012). These national ambient air quality standards comprise a limit value and tolerance value or a permitted frequency of exceedance. The former is a fixed pollutant concentration and the latter is the 99th percentile, representative of the tolerated exceedance of the limit value and takes into consideration elevated concentrations attributed to abnormal events. Compliance with the national ambient air quality standard implies that the frequency of exceedance does not exceed the limit value.

However, the management of air pollution is complex, because, unlike a wetland or a forest, the clean air resource is not easily quantifiable. Transcending political borders and scales of reference, the spatial extent and levels of air pollution are influenced by many climatic, social, economic and political factors (Véron, 2006). Exposure to and experiences of air pollution are not uniform, such that air quality management can often result in, or perpetuate, socially uneven outcomes (Véron, 2006).

There have been very few studies that have addressed concentrations of volatile organic compounds at landfill sites (Durmusoglu et. al, 2010). While the nuisance impacts of fallout dust is acknowledged, the deposition of metals associated with hazardous waste landfills has potential implications for human and environmental health (Amodio et al., 2014). The Bulbul Drive Landfill has been the focus of media attention and community anguish during its lifespan (Cole, 2011). Odours and dust from land filling activities, have been identified as air pollutants of concern in this area the past (Metamorphosis, 2008). Activist groups such as South Durban Community Environmental Alliance (SDCEA) disputed that these were the only air quality issues, and stressed the need to investigate the presence of toxic chemicals. The closure of the Bulbul Drive landfill in 2011 provided an opportunity to monitor ambient air quality at a hazardous waste landfill in a residential area, while it was functional, during the closure process, and post-closure.

Aim:

The aim of this study was to assess air quality in the region of the Bulbul Drive Landfill Site and to determine the potential impact on the neighbouring residential areas of Chatsworth and Umlazi.

Hypotheses:

- It is predicted that ambient air quality in the region of the Bulbul Drive Landfill is impacted by gaseous pollutants and fugitive dust emissions.
- It is predicted that residents perceive that the Bulbul Drive Landfill has an impact on their environment and their health and wellbeing.

The main research questions posed are:

- What is the status quo of ambient air quality in the region of the Bulbul Drive Landfill?
- What are the air quality perceptions of the residents?
- Do community perceptions on air quality correlate with technical, scientific measurements of air pollution?

The research objectives formulated from these questions are to:

- Assess the ambient air quality in the region of the Bulbul Drive Landfill.
- Assess the socio-economic context of the in the region of the Bulbul Drive Landfill.
- Consider the relationships between air quality measurements and community concerns in the region of the Bulbul Drive Landfill.

1.1. Structure of the dissertation

This dissertation comprises the six chapters listed below:

Chapter 1 presents an introduction to the topic of air pollution at landfill sites and details the importance of the case study, the Bulbul Drive landfill.

Chapter 2 provides a theoretical framework for the study. Political ecology and the theory of environmental risk are presented as frameworks that can be used to effectively combine qualitative and quantitative air quality research. The political, social and economic context of the study area is elaborated on with reference to the environmental history of the Bulbul Drive Landfill and of the two communities of interest for this study, namely Umlazi and Chatsworth.

Chapter 3 outlines the methodologies pursued to obtain the different types of data required for the project.

Chapter 4 details the results of the ambient air quality assessment and household surveys

Chapter 5 is a discussion of the results with regards to the aim of the study and relevant literature. Limitations to the study and recommendations for future work are provided.

Chapter 6 derives conclusions based on the empirically collected data

1.2. Summary

In this chapter the relationship between air quality, health impacts and waste disposal has been introduced. The importance of the case study, the Bulbul Drive landfill site has been presented. The aims, objectives, associated hypothesis and research questions underlying the study are detailed. The structure of the dissertation is outlined.

Chapter 2

2. Literature review

Landfilling is the predominant method of solid waste disposal globally (Durmusoglu et al., 2010). Landfills impact on the environment through various pathways and air pollution from landfills present some of the main risks to human health (Richardson et al., 2010). Air pollution is defined as the presence of one or more contaminants in the atmosphere, with the potential to impact negatively on human, animal or plant life. Air pollution can originate from both natural and anthropogenic sources (Gurjar et al., 2010). Human activities have led to a significant increase of air pollution in both rural and urban areas (Murray, 2013). Epidemiological studies have established a direct relationship between air pollution and health hazards. The effects of air pollutants on human and ecological health vary with the type and quantities of pollutant emitted, and the sensitivity of individuals exposed to the pollutants (Gurjar et al., 2010).

The World Health **Organisation (WHO) acknowledged air pollution to be the world's single largest environmental risk** (WHO, 2015). Approximately 4.3 million deaths each year are attributed to exposure to household (indoor) air pollution and 3.7 million deaths to ambient (outdoor) air pollution (WHO, 2015). Concerns over air pollution have a long history. The first documented air quality complaint was from an Egyptian Pharaoh in 900BC (Brimblecombe, 1995). The citizens of ancient Athens and Rome voiced their complaints about its effects on human health and the environment (Mosley, 2014). It was during the industrial revolution that urban air quality deteriorated significantly. Coal was widely used **in German, British and American factories, during what became known as the 'age of smoke'** (Mosley, 2014). Despite the palpable nature of this type of pollution, measures to control emissions from coal burning were weak and ineffective. In 1948, severe industrial air pollution created deadly smog in Donora, Pennsylvania, but it was the London Fog incident of 1952 that led to the first conclusively established association between air pollution and increased mortality (Mosley, 2014). Pollutants from factories and home fireplaces killed approximately 4 000 people over the course of several days.

There are strong linkages between political and socio-economic processes, and environmental issues. Complex environmental issues such as air pollution require an interdisciplinary approach that effectively combines quantitative and qualitative methodologies (Forsyth, 2004). There are costs and benefits associated with environmental risk and the uneven distribution of risk along lines of class, race, and ethnicity or gender. However, environmental risks like air pollution are usually addressed through technical solutions, formulated by scientific experts, who consider only partial aspects of biophysical change (Forsyth, 2004). Air pollution is not independent of society, history or culture (Bickerstaff & Walker, 2003). It is widely acknowledged that the traditional tools of risk analysis are limited in their abilities to arrive at a textured understanding of risk (Brooks et. al., 2010). The natural and social components of the environment cannot be separated and technical risk assessments can be complimented by

the use of qualitative methodologies (Blaikie et al., 2014). Perspectives on global environmental risk have evolved to include the interpretation, judgement, sense making and different modes of perception linked to contextualising risk in a local space (Bickerstaff & Walker, 2001). Perceptions of environmental risks like air pollution are important because they influence the ways in which people allocate responsibility and dictates their responses to risk (Bickerstaff & Walker, 2002). A historical background to the case study is presented in this chapter and the relevant environmental legislation and policy is discussed. The theoretical framework that follows characterises environmental risks associated with air pollution and provides a mechanism for understanding these risks in a local space.

2.1.Waste management

The disposal of household, industrial and commercial waste is essential. There are many ways to manage this waste as depicted in the waste hierarchy in figure 2-1. The National Environmental Management: Waste Act (NEM: WA) (Act No. 59 of 2008) which came into effect on 1 July 2009 supports the waste hierarchy through the promotion of cleaner production, waste minimisation, reuse, recycling and waste treatment with disposal seen as a last resort in the management of waste. In South Africa the most common method is waste disposal at a municipal solid waste landfill. The Minister of Environmental Affairs established the National Waste Management Strategy (NWMS) for achieving the objects of the Act.

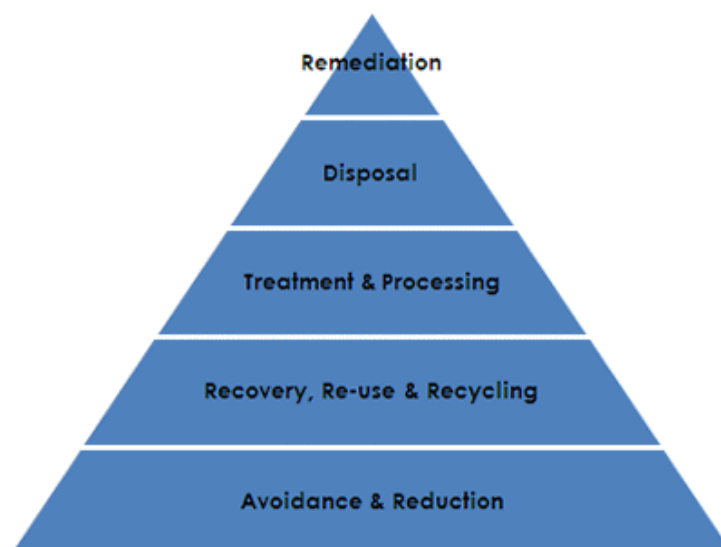


Figure 2-1 Waste hierarchy (DEA, 2011)

Waste generation per capita in South Africa is influenced by income and location (DEA, 2011). Only 61% of the population has access to kerbside removal of waste, most of which occurs in more affluent urban communities with lower levels of access in informal and rural areas. Even in urban areas, there is significant usage of open unmanaged dumps and indiscriminate burning of waste in other areas. The National Waste Management strategy

(DEA, 2011) acknowledged the growing complexity of the waste stream as the population and the economy develops and produces greater volumes of waste.

Waste is divided into two classes based on the risk it poses, namely general waste or hazardous waste. General waste refers to waste that does not pose an immediate hazard or threat to human health or to the environment, and includes domestic waste; building and demolition waste, business waste, or any waste classified as non-hazardous waste and includes non-hazardous substances, materials or objects within the business, domestic, inert or building and demolition wastes (DEA, 2011). Hazardous waste refers to any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within the business waste, residue deposits and residue stockpiles.

2.2. Air pollution and landfill sites

The impact of a landfill site on air quality is dependent on waste material, emission rates of pollutants, local meteorological conditions and the proximity of sensitive areas to the site (Richardson et al., 2010). Landfill gas is predominantly composed of methane and carbon dioxide (40%-60%). However, landfill gas also contains trace organic constituents commonly referred to as non-methane organic compounds (NMOCs) such as trichloroethylene, benzene, and vinyl chloride. More than 500 substances have been reported in landfill gas (Parker et al., 2002). Many of these substances are not a threat to human health or occur at very low concentrations. These include higher alkanes and alkenes; ketones; cycloalkanes and cycloalkenes; esters, monocyclic and polycyclic aromatic hydrocarbons and derivatives; organosulphur compounds; organohalogens; oxygenated compounds; alcohols and aldehydes.

Landfill gas is formed during bacterial decomposition, volatilization, and chemical reactions. During bacterial decomposition, organic waste is broken down by bacteria naturally present in the soil (Parker et al., 2002). Volatilisation takes place when wastes change from a liquid or a solid into a vapour. Landfill gases, such as NMOCs are created when chemicals in the waste react. The rate and volume of landfill gas produced at a specific site is dependent on the characteristics of the waste and a multitude of environmental factors. Larger volumes of landfill gas containing carbon dioxide, methane, nitrogen and hydrogen sulphide, are produced when there is more organic material in the waste. The age of the waste also plays a role. Recently buried waste produces more landfill gas through bacterial decomposition, volatilisation and chemical reactions than older waste (Parker et al., 2002).

Numerous air pollutants identified as trace components in landfill gas from hazardous waste landfill sites are either known or suspected carcinogens. Benzene, toluene, ethylbenzene and xylene, collectively known as BTEX are classified as hazardous air pollutants (HAPs) and are common VOCs found in landfill gas. Landfill gas odours are produced by both bacterial and chemical processes and can be emitted by active and

closed landfills (Richardson et al., 2010). These odours can migrate to the surrounding communities. Landfill gas may migrate from the landfill above or below ground and exposure occurs at the site itself or in surrounding communities. Gases can move through the surface to the ambient air. Exposure pathways to landfill gas are depicted in Figure 2.2, which depicts the relationship between proximity to the landfill site, wind direction and dispersion of pollutants.

Compounds most likely to cause odour in landfill gas includes ethanol, butanoic acid, ethyl butyrate, propanethiol, ethanethiol and carbon disulphide (Parker et al., 2002). Carbon disulphide and hydrogen sulphide are the most odorous. Hydrogen sulphide is likely to be formed whenever sulphur compounds are subject to reducing conditions. Odours from landfill sites are often a source of complaint from communities and people tend to have concerns about health effects associated with the gases that cause these odours. Sense of smell varies from person to person and because of this variation there is no true odour threshold value, above which odours are unpleasant and below which odours are not detectable (Berger and Mann, 2001).

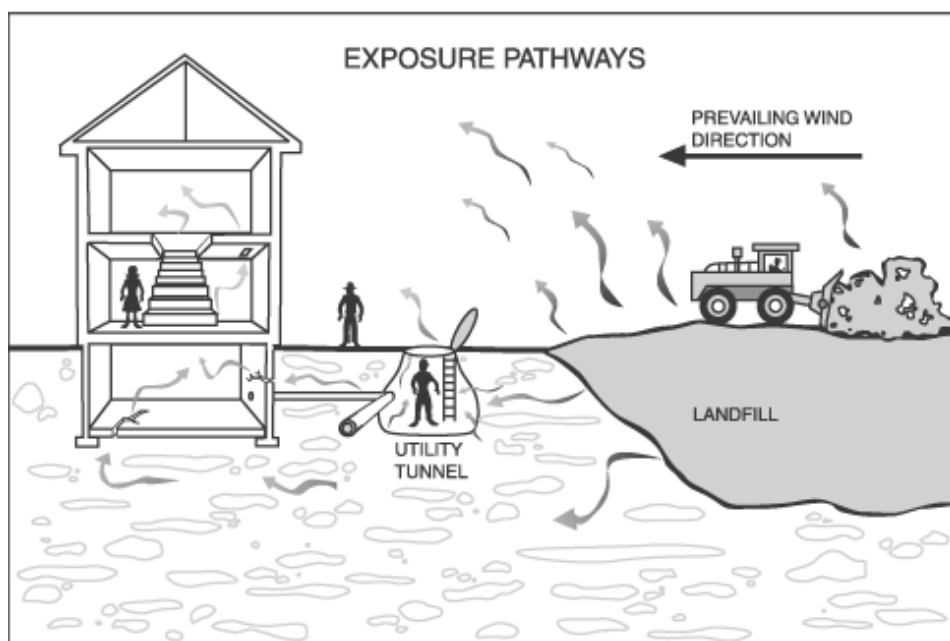


Figure 2-2 Exposure pathways to landfill gas (Berger and Mann, 2001)

Fallout dust

There are various activities that contribute to dust emission at a landfill site. These include but are not limited to the transportation of waste on and off site and the handling, storage and processing of waste (Jia et al. 2013). Dust is also generated through erosion of the surface of the landfill. Particulate matter deposits on surfaces and can become a nuisance for adjacent residents. Atmospheric particles often lead to a reduction in visibility and provide active surfaces for chemical reactions to occur. Health impacts occur because of inhalation through the respiratory tract (Manahan, 2005). The movement of airborne particulate matter from landfill sites is facilitated through a number of mechanisms (Jia et al. 2013). Deposition rates are influenced by meteorological factors such as wind velocity

and relative humidity, particle characteristics and surface characteristics (Amodio et al., 2014).

Atmospheric deposition is the transfer of pollutants, including dust to terrestrial and aquatic ecosystems (Amodio et al., 2014). The determination of heavy metal concentrations from the atmospheric bulk deposition provides a reliable indicator of possible contamination on a larger scale (Davis & Birch, 2011). There are many trace metals present in the atmosphere at low concentrations however, atmospheric deposition of metals, even at low levels, can contribute to the build-up of contaminants in terrestrial and aquatic ecosystems (WHO, 2007). This increases the potential risk to health of residents by prolonged exposure to them (Marrugo-Negrete et al., 2014). Acute exposure to high concentrations for short periods or chronic exposure to low concentrations over a long period may have adverse human health effects due to their tendency to accumulate in tissues and organs (Amodio et al., 2014).

Atmospheric emissions from landfill activities represent a pathway for input of heavy metals into the surface environment (Marrugo-Negrete et al., 2014). The WHO (2007) identifies cadmium, lead and mercury as the most common heavy metals that are air pollutants and they are also commonly associated with hazardous waste landfill sites. Other metals include beryllium, vanadium, nickel and arsenic. Lead ranks first in terms of toxicity because it is present in the greatest quantities while mercury ranks second. Chromium is a trace element that is essential to both humans and animals. Chromium compounds are toxic and carcinogenic across a wide range of potencies. Cancer primarily occurs during inhalation exposure. There is sufficient evidence of carcinogenicity in humans. Epidemiological studies have shown that different hexavalent chromium compounds have varying degrees of carcinogenic potency (WHO, 2000).

Both direct and indirect exposure to ambient lead can occur. Therefore the WHO (2000) recommends that ambient guidelines be accompanied by other preventative measures. These measures should specifically take the form of monitoring lead content of dust and soils. Atmospheric bulk deposition rates greater than 250 $\mu\text{g}/\text{m}^2/\text{day}$ has been associated with an increase in blood lead levels and poses a potential health risk (WHO, 2000). Cadmium in the ambient atmosphere is transferred to soil by wet or dry deposition and can enter the food chain. Cadmium is a human carcinogen. Whether absorbed by inhalation or via contaminated food which may give rise to various renal dysfunctions and lung cancer (WHO, 2000).

Emissions from decommissioned landfill sites

The emissions from a landfill that has been closed are toxic and potentially contribute to global warming. Landfill gas is a Greenhouse Gas (GHG) and when a landfill is capped this gas is typically produced under significant pressure (0.3-3 kPa). Lateral migration occurs unless it is controlled through gas extraction for power generation, flaring, venting or other means and compartmentalisation and variable saturation may make effective and uniform control of gas pressures difficult. Uncontrolled venting to the atmosphere is discouraged

by regulatory bodies like the US EPA (1995). Effective gas controls at a landfill reduce the release of hazardous gases. These include benzene, carbon tetrachloride, chloroform, ethylene dichloride, perchloroethylene, trichloroethylene, vinyl chloride and vinylidene chloride (US EPA, 1995).

Ambient monitoring

Monitoring data from landfill sites do not necessarily reflect the levels of contamination to which people may be exposed (Berger and Mann, 2001). However, these data usually offer some insight into general air quality, landfill gas migration, or possible health hazards. Monitoring of air emissions from landfills can fall into five categories; soil gas, near surface gas, emissions, ambient and indoor air monitoring. Ambient monitoring measures concentrations of pollutants in the air that people breathe and provide the best measure for exposure in the vicinity of landfill sites when they are compared to health based standards and guidelines (Gurjar et al., 2010). In this study the following contaminants were measured:

Trace components of landfill gas

- H₂S,
- BTEX
- 1, 3-Butadiene
- 1-Pentene,2,4,4-trimethyl-
- 1R-alpha.-Pinene
- 2,4-Dimethyl-1-heptene
- Benzene, 1,2,4-trimethyl-
- Benzene, (1-methylethyl)
- Benzene, 1,2,3-trimethyl-
- Benzene, 1-ethyl-2,3-dimethyl-
- Benzene, 1-ethyl-2-methyl
- Benzene, 1-ethyl-3,5-dimethyl-
- Benzene, 1-methyl-2-(1-methylethyl)
- Benzene, 2-ethyl-1,4-dimethyl-
- Benzene, -methyl-3-propyl
- Benzene,1,3,5-trimethyl-
- Benzene,1-ethyl-3-methyl-
- Benzene,1-ethyl-4-methyl
- Cyclohexane, methyl-
- Decane
- Dichlorodifluoromethane
- Dodecane
- Ethyl Acetate
- Ethyl Alcohol
- Heptane
- Hexane, 2-methyl-
- Hexane, 3-methyl-

- Methyl Isobutyl Ketone
- Napthalene
- n-Propyl acetate
- Octane
- Phenol
- Styrene
- Tetrachloroethylene
- Trichloroethylene
- Undecane

Fallout Dust:

- Iron
- Aluminium
- Zinc
- Manganese
- Lead
- Copper
- Nickel
- Chromium
- Copper
- Cadmium

2.3.Risk analysis

Environmental risk is defined as the potential for a detrimental outcome to an individual or group of individuals, as a result of the interaction between the natural and social components of the environment (Blaikie et al., 2014). Environmental risks range in complexity, geographic scale and impact. The capacity of an individual or a group of individuals to anticipate, cope with, resist and recover from the impacts of natural and human induced hazards is often referred to as resilience.

Vulnerability combines risk and resilience, and can be described as the degree to which individuals or groups are able to recover from stress (Blaikie et al., 2014). Vulnerability is influenced by a combination of factors. They can be discrete or continuous and are identified in both natural and social environments. Key variables to consider include class, race, gender and income. These varying levels of vulnerability influence the ability of individuals or groups to resist and recover from risks; this is defined as resilience (Blaikie et al., 2014).

The complex nature of environmental challenges makes it difficult to identify causal relationships between environmental risk and vulnerability (Forsyth, 2008). There are obvious characteristics of the social environment that need to be considered when assessing these connections. These include economic conditions, where people are forced to live in regions at a closer interface with environmental hazards. Less obvious aspects

are assets, income disparity and access to resources and distribution of these resources amongst different social groups (Véron, 2006). The natural and social components of the environment cannot be separated.

However, risk is typically measured in a technical and scientific manner that only considers biophysical change (Bickerstaff & Walker, 2001). The dominant perspective on vulnerability focuses on biophysical conditions. A considerable body of work on natural disasters focuses on the impacts of geophysical agents and is the dominant approach to vulnerability in climate change and other environmental risks, including air pollution. Biophysical factors are often more easily measured than social factors but a narrow biophysical focus neglects the social, economic and political factors that shapes the detailed tapestry of exposure to environmental threats (McLaughlin & Dietz, 2008). A technical approach can even increase vulnerability through an overreliance on expert knowledge and technological solutions and by disregarding political and socio-economic issues (McLaughlin & Dietz, 2008; Forsyth, 2004). Groups who are not part of the science process may have their views excluded (Forsyth, 2004). This perspective excludes the various role players involved in livelihoods of affected communities and the coping strategies individuals use to mitigate risk.

Air pollution has been identified by the WHO as a major environmental risk to human health (WHO, 2015). There are a wide range of adverse effects from ambient air pollution on human health. These range from respiratory diseases, cardiovascular issues to cancers and have been documented widely across the globe (WHO, 2012). Exposure to air pollution and the associated health risks is considerably unequal. This is attributed to the combination of air pollution with other social and physical factors that result in a disproportionate burden of disease amongst the economically less privileged (Véron, 2006).

2.4.Perceptions of air pollution

The study of public perceptions of air pollution developed in the United States and the United Kingdom in the 1950s (Bickerstaff & Walker, 2003). These studies were dominated by research approaches from quantitative psychology in the form of questionnaires and opinion polls. However, they failed to derive how people think and act towards air quality because they did not acknowledge that air pollution is influenced by socio-economic and political processes and not independent of society, history or culture (Véron, 2006). The next surge in work on perceptions of air pollution occurred in the late 1980s, following successful policy and legislation implementation that led to a reduction in particulate matter and sulphur dioxide. As a result of this lack of interest in perceptions of risk, air pollution research became the sole domain of natural sciences focused on understanding atmospheric processes and the links between air pollution and human health. However, the questions of how meaning is attributed to air pollution by the public remained unanswered (Bickerstaff & Walker, 2003). In the 1990s qualitative research began to provide detailed accounts of environmental problems and public concerns. These approaches recognised the role of discourse and politics and local contexts in influencing

the ways in which people approached and thought about environmental issues. The shift in approaches to air quality research is also linked to shifts in air quality management policy and legislation (Murray, 2013). Perspectives on global environmental risk have evolved to include the interpretation, judgement, sense making and different modes of perception linked to contextualising risk in a local space (Bickerstaff & Walker, 2001).

People's understandings of air pollution are localised within their immediate physical, social and cultural landscape (Bickerstaff & Walker, 2001). People understand air pollution through everyday experiences. Different social groups attribute different meanings to environmental processes (Forsyth, 2008). The ways in which stakeholders are involved in managing air pollution is influenced by varying levels of power in the decision making process (Bickerstaff & Walker, 2002). Therefore, the manner in which air pollution is perceived has implications for policy development and implementation (Véron, 2006). Therefore, there is a need to study public perceptions of air quality if policies and legislation are to be successfully implemented.

2.5. Historical background

Political ecology requires historical depth to illuminate contemporary situations (Leonard, 2012). Democratic rule brought changes to environmental governance that transformed the ways in which environmental issues like air pollution were addressed. International norms and best practice were adopted in lieu of ineffective apartheid policies (Naiker et al., 2012). The importance of air quality and its management is addressed in the South African Constitution (Act No. 108 of 1996). The National Environmental Management Act (NEMA) (Act No. 107 of 1998) reflected these constitutional requirements by providing a holistic framework for environmental management. A shift in air quality legislation and policy was needed because of the Air Pollution Prevention Act's (APPA) (Act No. 45 of 1965) failure to safeguard air quality and human health and led to the creation of air pollution hotspots across the country (Naiker et al., 2012). Black, Coloured and Indian communities were sited in or adjacent to industrial areas and waste disposal sites because of apartheid spatial planning policies and the repercussions continue to pose significant issues of environmental injustice and inequality (Bond & Desai, 2011; Scott & Barnett, 2009). While it is important that the current socio-economic and environmental issues are not habitually attributed to apartheid policies, the linkages between urban and environmental histories are very strong (Maylam, 2012; Patel, 2005).

Contemporary South Africa is a country of striking inequalities, and dramatic wealth polarisation (Mottiar & Bond, 2012). It is in cities like Johannesburg, Cape Town and Durban where intense socio-ecological struggles continue to play out across fractured urban landscapes (Bond & Desai, 2011; Maylam, 2012). Durban was the blueprint for **apartheid's spatial planning and ideals of racial segregation. Those patterns are beginning to erode but they have considerable influence on the current distribution of environmental risk in the region.** The city has a long history of environmental activism (Leonard & Pelling, 2010; Scott & Oelofse, 2005). Areas such as the South Durban Basin in the eThekweni Metropolitan Municipality, are products of inadequate, racially motivated environmental

legislation which has led to the creation of pollution hotspots that persist today (Naiker et al. 2012; Scott & Barnett, 2009). The state of air quality in South Africa was marked by urban air pollution and associated air quality issues from the 1960s to the late 1990s (Naiker et al., 2012). **During this period, industrial nodes led to the creation of 'air pollution hotspots'. This observation was supported by epidemiological and anecdotal evidence** (Scott and Barnett, 2009).

The potential impacts of air pollution on human health in the eThekweni Municipality have been emphasized for numerous years, particularly for the South Durban Basin, where an extensive epidemiological study has confirmed that residents are exposed to high levels of air pollution, particularly SO₂. There have been numerous interventions that have resulted in a decrease in ambient SO₂ concentrations (uMoya-NILU, 2015). However, knowledge of ambient air quality outside of this area, and potential impacts of air pollution on residents are limited.

There are strong linkages between waste management and environmental struggles in the municipality (Bond & Desai, 2011). The continued operation of the Bulbul Drive Landfill was a source of conflict amongst different stakeholder groups (Bond & Dada, 2007). The siting of a hazardous waste landfill in a community largely comprised of Indian, Black and Coloured residents was **a result of apartheid's racially biased** spatial planning policies (Brooks et al., 2010). The site was established in 1989 on extensive tracts of farmland that was used primarily for subsistence farming by the local inhabitants. Among the many crops farmed were ginger and banana plantations that thrived in the sub-tropical climate. Umlazi and Chatsworth are the communities in closest proximity to the waste disposal site. Located near a tributary of the Umlazi River, the surrounding area is currently urban residential. The Bulbul Drive Landfill is classified as a low hazard waste site, managed for the eThekweni Municipality by a private corporation, Wasteman.

Several of the environmental incidents that occurred at the Bulbul drive landfill site have been documented in the media. Hallowes and Munnik (2008) highlight an incident when **heavy rainfall led to the dump 'slipping', releasing toxic pollutants into the air and effluents** into the Mlazi River. In October 2009 approximately 170 children from the neighbouring Gitanjali Primary School had to be taken to hospital for medical treatment because they had difficulties breathing (Carnie, 2009). A National Environmental Compliance and Enforcement Report found the Bulbul Drive Site in substantial non-compliance to the waste management licence (DEA, 2011). This included a failure to comply with certain duties / obligations in the NEM: Waste Act and failure to comply with the duty of care in relation to, inter alia, leachate and storm water management; landfill gas management; co-disposal and cover material. A criminal investigation was initiated. Following the execution of a search warrant as part of the criminal process, a decision was taken that simultaneous administrative enforcement action was required in order to address the non-compliance resulting in harm to the environment.

Wasteman Pty (Ltd) is a private waste management company appointed by the municipality to manage the Bulbul Drive Landfill site. Wasteman sought to expand the site in 2009, however when faced with growing community opposition, the company announced that it was withdrawing its application in August 2010. The South Durban Community Environmental Alliance (SDCEA) is a local environmental justice organisation that campaigned with community members, for the Bulbul Drive Landfill to be shut down. Wasteman was required to submit a waste impact report in May 2011 and in November 2011, the Bulbul Drive Landfill officially closed. **Desmond D'Sa** of SDCEA received the Goldman Environmental Prize in 2014 for his efforts in bringing about the closure of the **Bulbul Drive landfill, which he terms Africa's most "toxic landfill". There has been little** work investigating the impacts of the Bulbul Drive Landfill on the health and well-being of residents from Umlazi and Chatsworth who live on its doorstep.

2.6. Summary

In this chapter the theoretical framework of political ecology has been explored, particularly the influence of political, social and economic processes on the distribution of environmental risk. Environmental risks like air pollution must be perceived within the broader patterns of society, to inform policies that will reduce disasters, mitigate hazards and improve quality of life (Forsyth, 2004). Apartheid planning led to the creation of air pollution hot-spots all characterised by the proximity of Black, Coloured and Indian communities to mines, industries and waste disposal sites (Naiker et al., 2012). The Bulbul Drive landfill was sited amidst the communities of Chatsworth and Umlazi because of these policies and the residents continued to negotiate these environmental risks well after the onset of democracy.

Chapter 3

3. Methodology

An assessment of air quality issues in the region of the Bulbul Drive landfill necessitated an interdisciplinary approach which engaged both natural and social science methods. Primary data was collected using air quality monitoring and household surveys. Local meteorological and climatic variables and topographical conditions informed the assessment of ambient air quality. These are introduced in this chapter as part of the description of the study area. The data collection and data analysis methods used, and the theories that informed them are also described.

3.1. Description of the study area

The study area is located in the eThekweni Metropolitan Municipality (Figure 3-1) on the east coast of South Africa in the Province of KwaZulu-Natal (KZN). According to the 2011 census, the eThekweni Municipality is home to 3 442 361 people, representing 33% of province's population and 7% of South Africa's total population. The seat of the municipality is the City of Durban, the largest city in KwaZulu-Natal and home the busiest port in Africa. It is a manufacturing hub and premier tourist destination.

The eThekweni Municipality is characterised by diverse topography, from steep escarpments in the west to a relatively flat coastal plain in the east. The majority of the municipality has been modified residential and economic land uses covering 122 641 ha or 53.5% of the land area (eThekweni, 2013). Natural land cover occurs mostly to the south and outer west, comprising 106 017 ha or 46.3% of the total area. The Bulbul Drive Landfill is located in the eThekweni Municipality near a tributary of the Umlazi River. The study area is categorised as urban residential and comprises the neighbourhoods of Bayview, Havenside and Silverglen in Chatsworth and Umlazi C and Umlazi E Sections. In South Africa, municipal wards are the geopolitical subdivisions of municipalities used for electoral purposes. The wards of interest in this study are wards 69 and 70 in Chatsworth() and Wards 80 and 81 in Umlazi (.).

3.2. Climate and meteorology

The eThekweni municipality has a subtropical climate (Cfa) according to the Köppen climate classification (Kottek et al., 2006). Meteorological data was sourced from the South African Weather Service (SAWS). The study area experiences hot and humid summers and warm relatively dry winters. Summer rainfall starts in late October to early April as seen in Figure 3-3. The average temperature in summer ranges from 21 °C to 25 °C. Daytime maximums can exceed 30 °C. During the summer the average humidity is in the region of 70%. In winter the average temperature is between 16 °C and 19 °C, with average maximum daytime temperatures reaching 23 °C. During the winter the average humidity is in the region of 55%. Two seasonal periods were characterised, a rainy season (wet) was from September to February and a dry season from August to June during 2011 and 2012 (Figure 3-3).

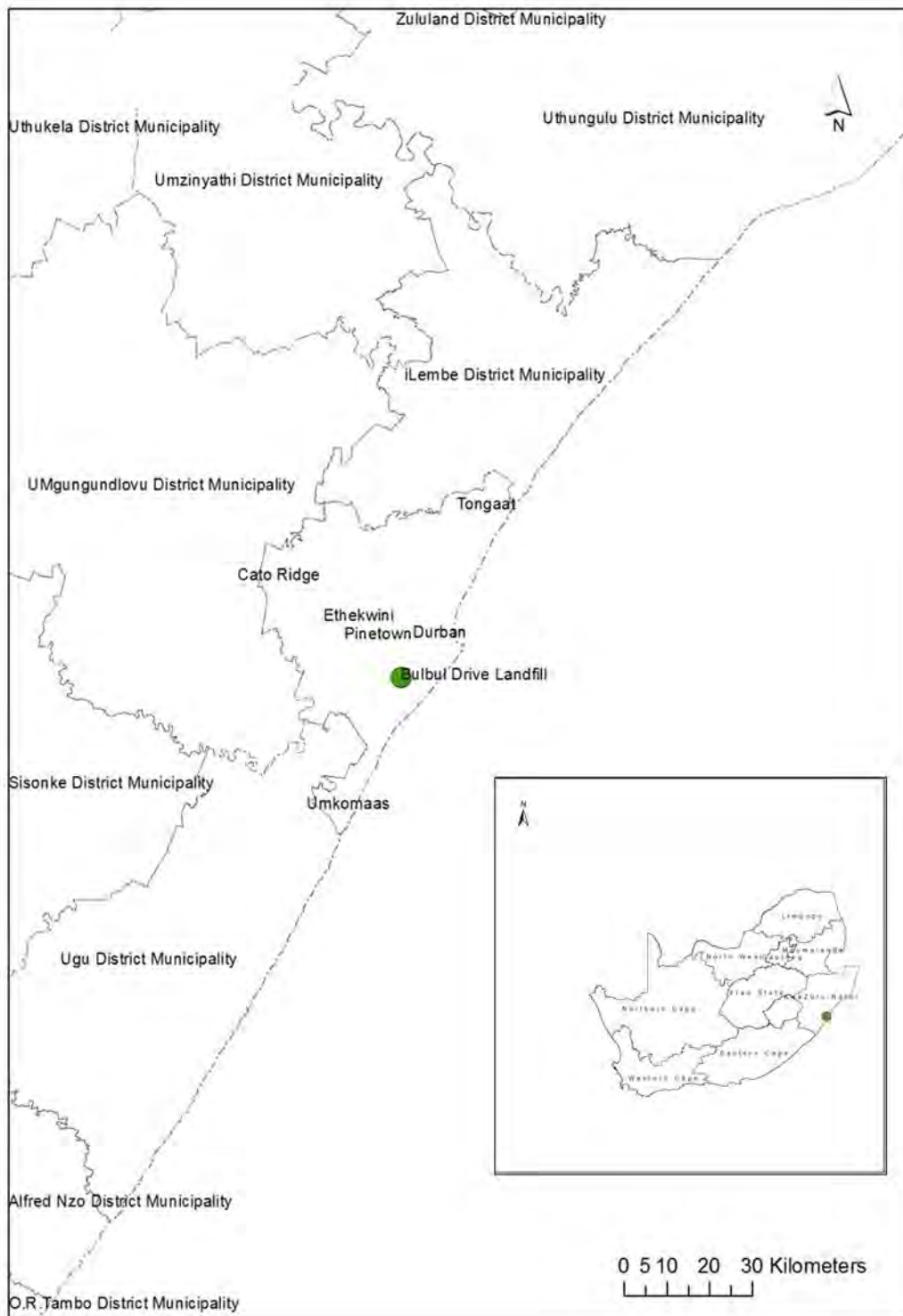


Figure 3-1 Map showing the study area

Any months with a rainfall above the highest dry season average rainfall was classified as wet, therefore March 2012 with similar rainfall patterns to November 2011, was classified as wet.

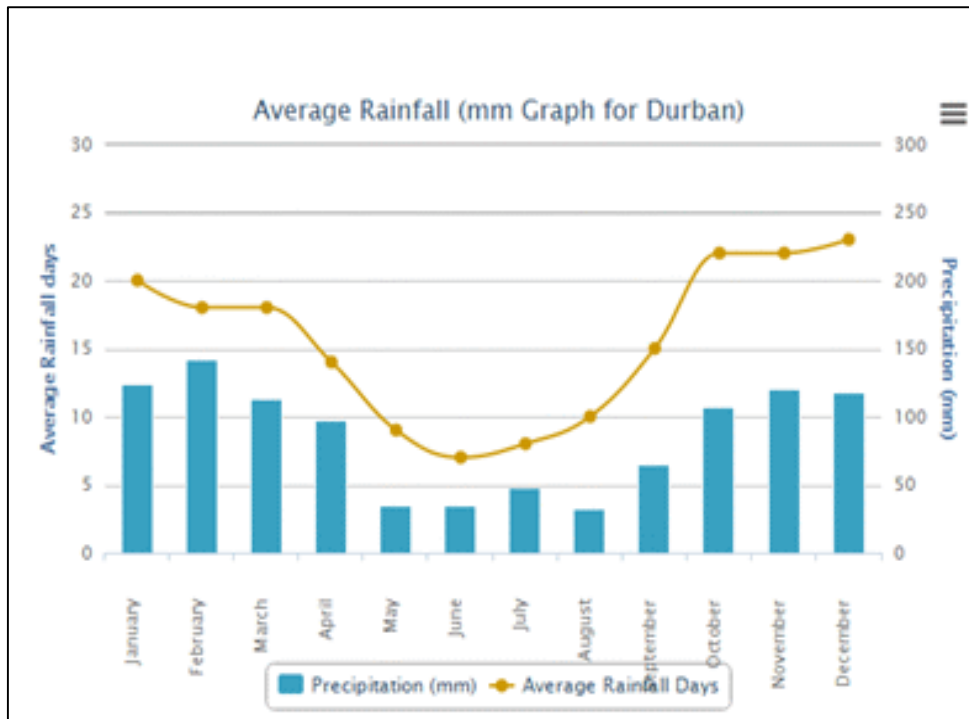


Figure 3-2 Rainfall (SAWS, 2000-2012)

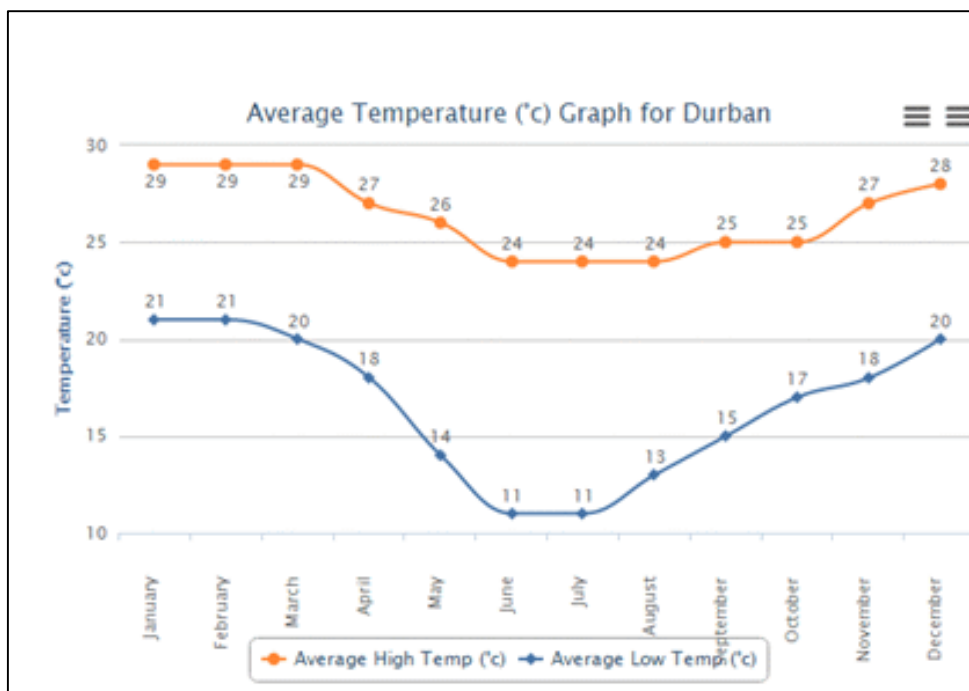


Figure 3-3 Temperature (SAWS, 2000-2012)

Windroses are graphs that simultaneously depict the frequency of occurrence of hourly winds from the 16 cardinal wind directions and in different wind speed classes. Wind direction is given as the direction from which the wind blows, i.e., southwesterly winds blow from the southwest. Wind speed is given in m/s, and each arc in the windrose represents a percentage frequency of occurrence. Wind patterns in eThekweni DM are

described by windroses for the 3-year period 2010 to 2012 at the old Durban International Airport (Figure 3-4). This monitoring station is suitably positioned to provide representative wind climatology for the study area. The dominant winds in eThekweni are from the north to north-northeast or from the south to southwest where the winds are typically light to moderate, but can exceed 11 m/s at times (Figure 3-4). Wind direction could also influence the dispersion of pollutants from other sources to the monitoring sites.

In addition to the Bulbul Drive Landfill, other sources of air pollution in the area are a brick manufacturing facility, a panel beating service and the Wasteman run truck stop and dust entrainment from heavy duty vehicles transporting waste to the site. The air pollution dispersion of an area refers to the ability of atmospheric processes, or meteorological mechanisms, to disperse and remove pollutants from the atmosphere. The eThekweni Municipality is generally well ventilated by a high frequency of moderate to strong winds that effectively disperse air pollutants as compared to inland urban centres (uMoya-NILU, 2015). In particular, the Bulbul Drive Landfill is located in a riverine valley between the communities of Umlazi and Chatsworth. Inversions in winter potentially inhibit the dispersion of pollutants which could result in higher concentrations of pollutants in the study area.

3.3. Pollutants monitored, ambient air quality standards and guidelines

Air quality monitoring entails the measurement of the concentration of air pollutants in the ambient atmosphere (Gurjar et al. 2010). These measurements are compared to health based ambient air quality guidelines or standards to ascertain the impact on human health or well-being. Air pollution concentrations above these guideline values and standards represent the likelihood of a significant health impact. This type of monitoring can be conducted for a wide range of pollutants near landfills. Regular ambient monitoring is often a condition imposed by regulatory authorities. This type of monitoring provides an accurate measure for air exposure concentrations in the vicinity of landfills. There is no ambient air quality monitoring station located in or near the Bulbul Drive landfill. To assess the ambient air quality in the region of the Bulbul Drive Landfill and evaluate potential impacts on residents in the surrounding areas:

- A passive monitoring campaign was carried out for one month in June 2010 to measure ambient concentrations of trace components of landfill gas.
- Bulk deposition samplers were deployed from August 2011 – June 2012 to measure fallout dust rates and metal composition. The location of the monitoring sites is depicted in Figure 3-4 below. Sites 1, 2, 3 and 5 were sampled for both gaseous pollutants and fallout dust while sites 6, 8, 9 and 10 were sampled only for fallout dust.

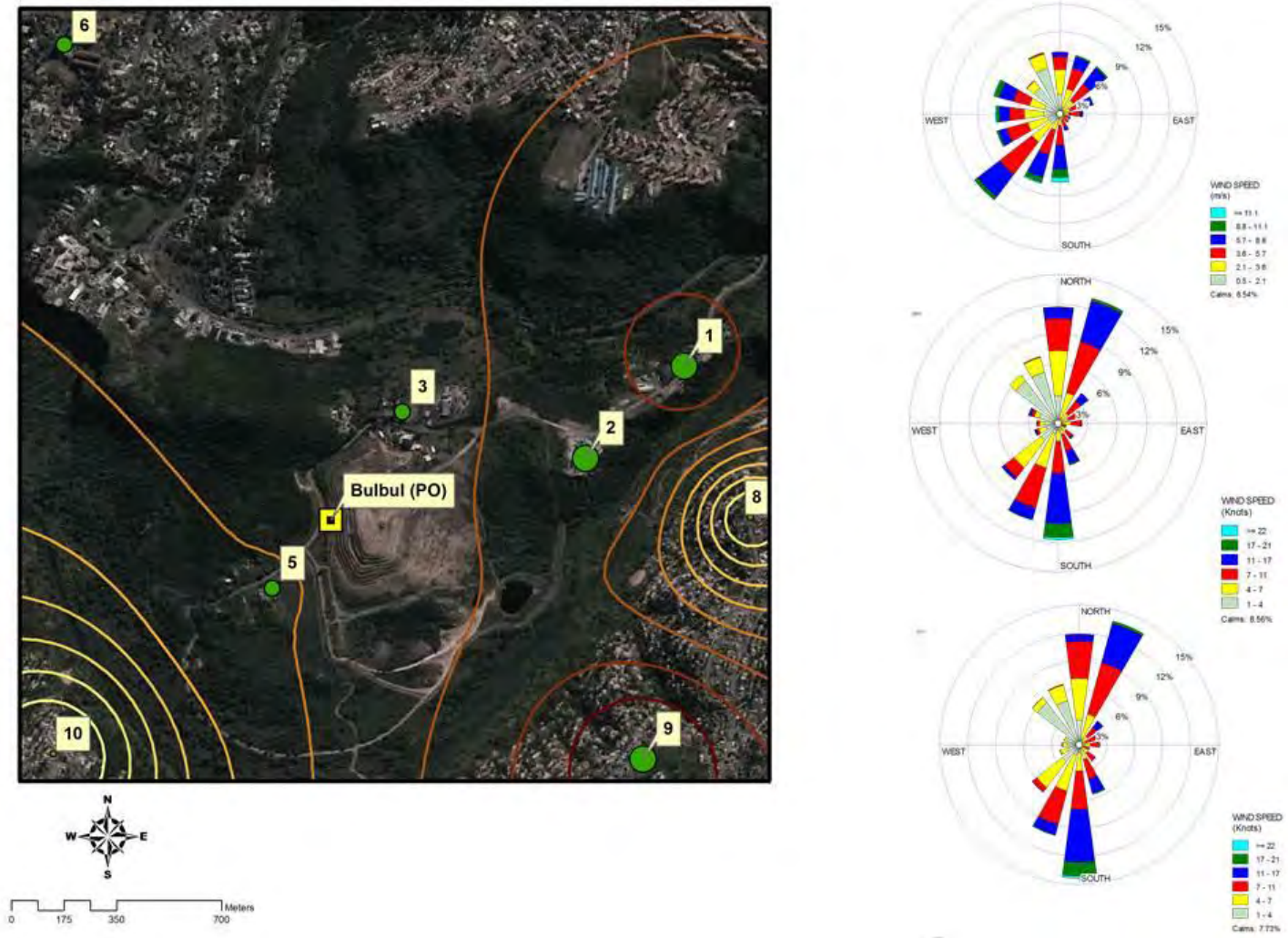


Figure 3-4 Location of monitoring sites and wind roses (SAWS, 2010-2012)

3.4. Passive monitoring of gases

Trace components identified as potentially odour causing or associated with health effects were measured in the ambient environment. Tenax/Unicard diffusion tubes were placed at four sites near the Bulbul Drive Landfill in June 2010, to monitor H₂S, BTEX and 1, 3-Butadiene and other VOCs. The passive monitors provide an average measurement for the period of exposure, i.e. 4 weeks. However, peaks as a result of emissions or meteorology are not shown by passive sampling because of the averaging periods. Diffusive bodies were placed on poles approximately 1.5 - 2m above the ground (Figure 3-5). The monitors were visible from households in unobstructed areas a few metres from the fence line of the Bulbul Drive Landfill. Residents were asked to provide information in the incidence of breakage or theft.

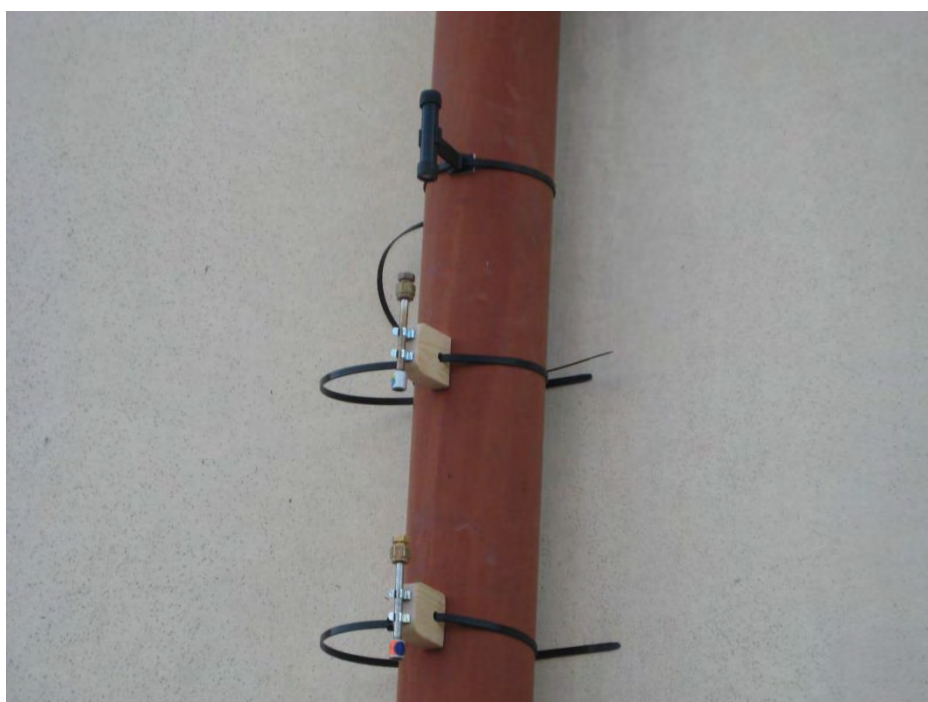


Figure 3-5 Diffusive bodies mounted on a mast at site 5

The H₂S samplers were exposed for a period of two weeks. The samples were removed and sent to Gradko Accredited Laboratories Pty (Ltd) for a quantitative analysis. The two week average H₂S concentration was then compared to the odour threshold of 7 µg/m³ which is an acute guideline of odour annoyance set by the WHO (1999) (Table 3-1). Exceedances of this threshold are indicative of a negative odour impact. There is no national ambient air quality standard for H₂S. The United States Department of Health and **Human Service's Agency for Toxic Substances and Disease Registry** (Berger and Mann, 2001) has set the acute minimum risk level (MRL) for acute exposure to H₂S at 105 µg/m³. This is an estimate of exposure on a daily basis and is based on respiratory irritation.

Table 3-1 1-hour ambient air quality guidelines for H₂S in µg/m³

| Effect | Concentration | Reference |
|---------------------------------|----------------------|------------------|
| Odour annoyance | 7 | (WHO,1999) |
| Acute minimum risk level | 105 | (ASTDR,2015) |

The BTEX samplers were exposed for a period of four weeks. The samples were removed and sent to Gradko Accredited Laboratories Pty (Ltd) for quantitative analysis. The monthly concentration was then compared to an appropriate ambient air quality guideline or standard. There is a South African Ambient Air Quality Standard for Benzene. However, the WHO (2009) guideline values and Alberta Canada (2013) ambient air quality standards were used for Toluene, Ethylbenzene and Xylene respectively (Table 3-2).

Table 3-2 Ambient air quality guidelines and standards for BTEX

| Pollutant | Averaging period | Limit value (ug/m3) | Reference |
|---------------------|-------------------------|----------------------------|------------------|
| Benzene | 1 year | 5 | (DEA, 2009) |
| Toluene | 30 minute | 1000 | (WHO, 2009) |
| | 24 hour | 7500 | (Alberta,2013) |
| Ethylbenzene | 1 hour | 2000 | (Alberta,2013) |
| Xylene | 1 hour | 2300 | (Albeta,2013) |
| | 24 hour | 700 | (Alberta,2013) |

There is no South African Ambient Air Quality Standard for 1, 3-Butadiene. The DEFRA (2007) annual standard is applied. The samples were sent to Gradko Laboratories for a quantitative analysis. The measured 1, 3-Butadiene concentrations were then compared to the DEFRA ambient air quality standard (Table 3-3).

Table 3-3 Ambient air quality standard for 1, 3-Butadiene

| Pollutant | Averaging period | Limit value (ug/m3) | Reference |
|----------------------|-------------------------|----------------------------|------------------|
| 1,3-Butadiene | 1 year | 2.25 | (DEFRA, 2007) |

3.5.Fallout dust

Samplers used to assess atmospheric deposition are categorised based on the type of deposition that is collected. The atmospheric deposition of inorganic pollutants, ions and metals has to be estimated using suitable collectors. The sampler used in this study was based on the bottle and funnel combination as described by Amodio et al (2014) and is depicted in Figure 3-6 below. All collectors were of a sufficient height to avoid sampling

losses from splashing (Figure 3-6) Monitors were placed on level ground where possible, without obstructions from buildings or other obstacles that would interfere with dust deposition.

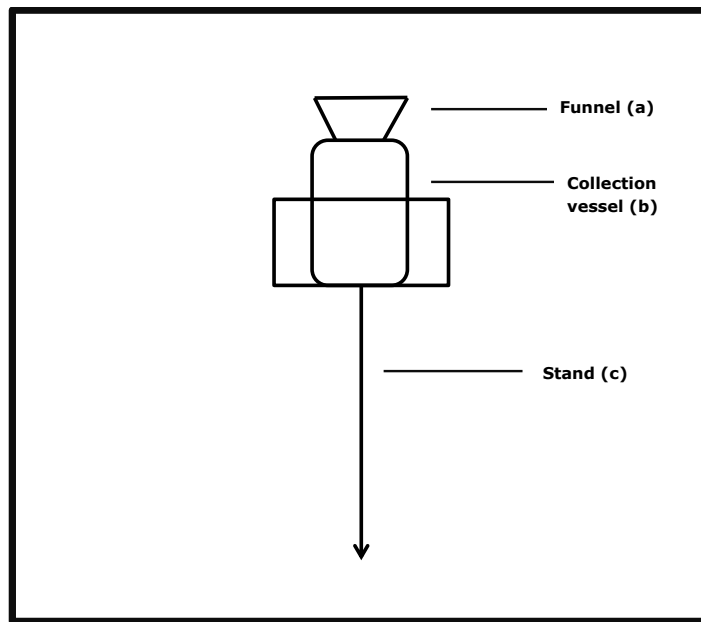


Figure 3-6 Dust deposition sampler (a) = 0.33m² (b) = 2 litres (c) =1.5m

Sampling vessels were replaced monthly on site with fresh sampling vessels. Upon sample collection, the vessels were sealed with polyethylene film and transported to the laboratory. The weight of each sample was then recorded and used to determine the amount of dust. Monitors were located in sensitive areas; in this case the residential boundaries closest to the Bulbul Drive Landfill. Eight passive monitoring sites were established on private properties in the neighbourhoods of Umlazi and Chatsworth. Representative sites were chosen in based on topography, wind direction, accessibility, safety and proximity to the Bulbul Drive Landfill. Monitoring of dust fallout was conducted from June 2011 to June 2012. Where possible a 30 day sampling period was adhered to. The dust fallout rate was calculated using the following calculation (Thöni et al., 1999):

(1)

$$X = \frac{G \times f}{A \times d}$$

Where:

- X= dust deposition in g/m²d or mg/m²d
- A= sample area in cm²
- f= 10000 cm²/m² (conversion factor)
- G= mass of the dry residue
- d= sample period (number of days).

On 1 November 2013 the Minister of Water and Environmental Affairs published the National Dust Control Regulations in terms of Section 53 of the NEM: AQA, prescribing general measures for the control of dust in all areas. The regulation provides standards for acceptable dust fall for residential and non-residential areas, as well as the requirements and method of monitoring and reporting. The permitted frequency of exceedance of the allowable dust fall rates at a monitoring site as two on an annual basis and not necessarily in consecutive months. The dust fallout regulation allows for 600 mg/m²/day in residential areas, with two exceedances allowed in one year but not in consecutive months (DEA, 2013). Exceedances of the standard are indicative of negative impacts from fallout dust.

Speciation of deposited particles provides an opportunity to study the mass balance of metals (Amodio et al., 2014). The elemental analysis of trace metals in fallout dust was done using an Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES). It is a commonly used analytical technique for the detection of trace metals (Hou and Jones 2000). With this technique, liquid samples are injected into radiofrequency induced argon plasma. The inductively coupled plasma is used to produce excited atoms and ions that emit electromagnetic radiation at wavelengths characteristic of a particular element. The intensity of this emission is indicative of the concentration of the element within the sample. The instrumentation associated with an ICP/OES system entails a lens or a concave mirror which collects a portion of the photons emitted by the ICP. This focusing optic forms an image of the ICP on the entrance aperture of a wavelength selection device such as a monochromator. The particular wavelength leaving the monochromator is converted to an electrical signal by a photodetector (Hou and Jones, 2000). The signal is **amplified and processed by the detector electronics, then displayed and stored by a personal computer** (Hou and Jones, 2000).

The Statistical Package for the Social Sciences (SPSS) software program (IBM, 2012) was used to analyse the data. A one sample Kolmogorov- Smirnov (KS) test was used to assess the normality of the heavy metal concentration data. The data satisfied the assumptions of normality. A One-Way Analysis of Variance (ANOVA) was run to compare mean metal deposition rates before and after the Bulbul Drive Landfill closed and across seasons. Differences in concentrations of heavy metals across seasons and before and after the Bulbul Drive Landfill closure were compared to determine whether the seasonality and the closure of the landfill affected concentrations of heavy metals. Fallout dust comprises coarse or settleable particulate matter (>30µg/m³) in diameter (Oguntoke et al., 2013).

Particle size of dust samples was established using a laser diffraction particle size analyser, the Malvern Mastersizer. The following size categories were used in this study:

- Total Suspended Particulates (TSP): all sizes of particles suspended within the air smaller than 100 micrometres
- PM₁₀: all particulate matter in the atmosphere with a diameter equal to or less than 10 µm

- PM_{2.5}: all particulate matter in the atmosphere with a diameter equal or less than 2.5 µm.

3.6. Collection of social data

To assess the community perceptions of environmental quality and to evaluate the broader socio economic context of communities in Umlazi and Chatsworth, household surveys were conducted. Questionnaires are widely used tools when primary data are required about people, their behaviour, attitude and opinions and awareness of specific issues (Flowerdew and Martin, 2005). There are three broad types of data that can be collected by a survey. The first being data that classifies people, their circumstances and environment. This includes information such as age, household size, locational variables, or state of health. **The second type is data relating to people's behaviour. The risk with this data is that** behaviour expressed in the survey can often differ from actual behaviour. The third is data that relates to attitudes, opinions and beliefs is the most difficult type of data to collect. The main stages of the survey process for this study were adapted from Flowerdew and Martin (2005) and are detailed below:

1. The initial research idea was refined and developed and the survey methodology was chosen.
2. A questionnaire was then drafted and piloted in households in Umlazi and Chatsworth. Following the post pilot review of the questionnaire, a sampling frame was devised.
3. The main fieldwork involved briefing interviewers and assessing response rates as the questionnaires were returned. The data was then processed, analysed and results were generated using appropriate methods.

It is impossible to sample every member of a population, hence the need for participant sampling (Kitchen and Tate, 2001). Depending on the nature of the study a choice of two participant sampling techniques can be employed. The choice of technique is dependent on the research question, nature of the sample population and access to said population (Kitchen and Tate, 2001; Flowerdew and Martin, 2005). Umlazi and Chatsworth were identified as the residential areas in closest proximity to the Bulbul Drive Landfill. Field assistants were carefully trained to follow a standardised procedure in selecting households.

A convenience sampling approach was used, households were chosen using a systematic method and a buffer area of 1.5 to 4km around the landfill was established.

Due to time and resource constraints only 200 surveys were carried out, of which 167 were deemed usable for analysis. An analysis of 163 questionnaires was done, with 52.5% of surveys from the Umlazi region and 47.3% of surveys from the Chatsworth region. The collection of a truly random sample was limited by several factors. Many households, particularly in Umlazi, did not have registered addresses and accessibility to home owner

information was limited. There were also issues of safety and surveys had to be carried out during the day. This is relevant because it biased the representation of respondents towards those who were home during the day i.e. retired, unemployed or spouses who stay at home.

Survey design, procedures and ethical considerations

The household surveys comprised closed and open ended questions. Field notes were documented after the surveys. All surveys, interviews and community meetings were documented with permission. The selected household was approached and the interviewer explained the purpose of the survey and requested an adult, or a parent or grandparent over the age of 18 to answer the questions. Zulu is spoken predominantly in the two Umlazi wards while English was largely spoken in Chatsworth. The fieldworkers were fluent in both Zulu and English and the respondents were given a choice of language.

No remuneration was given to the respondents and this was stated at the outset of the interview and on the information sheet. Participants were also made aware that they were not obligated to do the interview and could stop it at any point. The name and address of the interviewees were collected if the interviewee was willing to provide this information. These details were only collected for a possible follow-up interview, but were not included in the statistical analysis to ensure that the privacy of interviewees would be protected (Ramsay, 2010).

Analysis of social data

The true value of household survey data is only realised when the data set is analysed. Data analysis can range from very simple summary statistics to complex multivariate analyses (Kitchen and Tate 2001). The data from the household surveys were analysed using SPSS. Descriptive statistics, including frequency distributions and cross tabulations were used to derive findings and trends for raw data.

3.7. Summary

In this chapter the methodological approach used to collect the diverse data required to assess air pollution risks associated with the Bulbul Drive landfill is detailed. Approaches from both the social and natural sciences were applied to collect and analyse these data. Ambient monitoring of air pollution at various spatial scales is crucial for the development of appropriate management and abatement policies. This measurement of air quality is often viewed by practitioners as the best way to understand air pollution problems. The collection of reliable data helps scientists, policy makers and planners to make informed decisions and improve the overall quality of the environment (Gurjar et al., 2010). Where possible a continuous sampling period was adhered to.

A household survey was used to gather socio-economic and demographic data as well as data on perceptions of environmental quality and air pollution. A convenience sampling approach was used to collect the survey data. Demographic characteristics and health status information were collected using the survey. Demographics describe the population of a region and reflect political, economic and environmental influences. Respondents were

asked about their experiences of visibility, odour and other pollution sources and their opinions of the Bulbul drive landfill in the vicinity of their homes. Detailed open-ended questions focussed on perceptions and concerns of residents. The data from the survey were captured and coded for analysis.

Chapter 4

4. Results

This chapter comprises the ambient monitoring data collected during 2010-2012. These were compared to appropriate ambient air quality standards and guidelines to determine the likelihood of potential impacts on human health and well-being. The results of the assessment of community perceptions of environmental quality based on the household survey carried out in Chatsworth and Umlazi are also presented.

4.1. Ambient Air Quality Assessment

Trace components of landfill gas associated with odour or associated with health effects were measured in the ambient environment. Fallout dust was monitored in the region of the Bulbul Drive Landfill to determine potential nuisance and health impacts.

4.1.1. Passive monitoring of gases

The results of the passive monitoring of gaseous pollutants H₂S; BTEX; 1, 3-Butadiene and other VOCs commonly associated with landfill gas are presented in the figures and tables below.

H₂S

H₂S concentrations were found to be below threshold limits of detection and are therefore not reported in this section (Appendix A).

BTEX

Average monthly BTEX concentrations measured in the region of the Bulbul Drive Landfill are shown in Figure 4-1. Benzene concentrations measured near the landfill do not exceed the current NAAQS (DEA, 2015). This implies that ambient benzene concentrations in the region of the Bulbul Drive Landfill. Toluene does not exceed the WHO (1999) standard or the Alberta Canada Standard (2013). Ethylbenzene does not exceed the Alberta Canada standard (2013). Xylene does not exceed the Alberta Canada Standard (2013).

Compliance with these standards implies that BTEX concentrations in the region of the Bulbul Drive Landfill do not have a negative impact on human health and well-being. The highest concentrations of benzene, toluene, ethylbenzene and xylene were measured at site 2 and the lowest concentrations at site 4 (Figure 4-1).

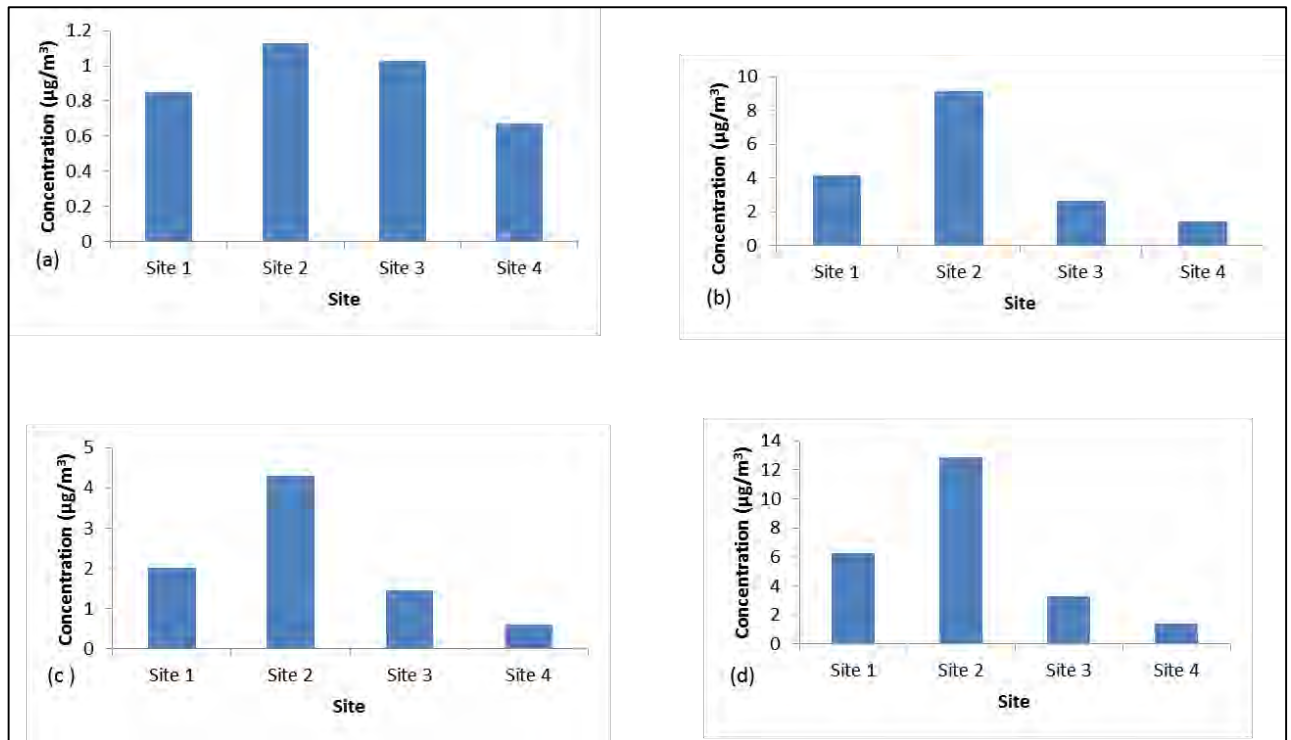


Figure 4-1 Average monthly concentrations of (a) benzene, toluene (b), ethylbenzene (c) and xylene (d) ($\mu\text{g}/\text{m}^3$)

1, 3-Butadiene

Average monthly 1, 3-Butadiene concentrations are depicted below in figure 4.2. These concentrations do not exceed the DEFRA (2007) standard implying that 1, 3-Butadiene concentrations in the region of the Bulbul Drive Landfill do not impact negatively on human health and well-being. Highest concentrations of 1, 3-Butadiene were measured at site 3.

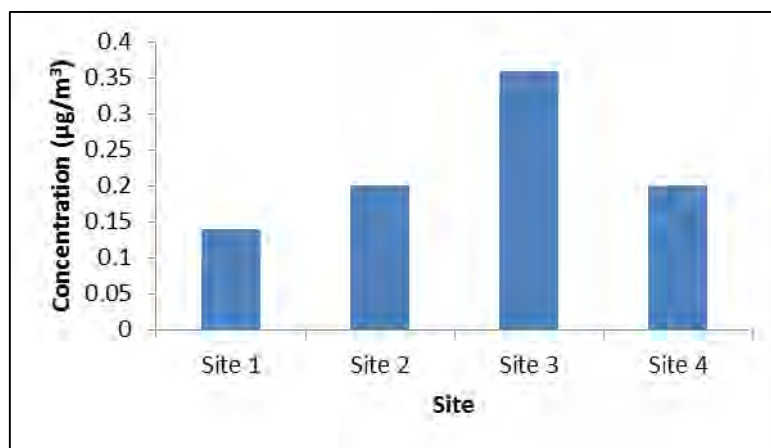


Figure 4-2 Average monthly concentration of 1,3-Butadiene ($\mu\text{g}/\text{m}^3$)

Additional VOCs monitored in the region of the Bulbul Drive landfill

The most abundant VOCs present as trace components in landfill gas are presented in Table 4-1 below. Benzene, 1, 2, 4-trimethyl-; benzene, 1-ethyl-2-methyl; decane;

heptane and tetrachloroethylene were present at all four monitoring sites. The highest concentration of benzene, 1, 2, and 4-trimethyl- was measured at site 2. Higher concentrations of all the other trace component VOC's were measured at this site as well, with the exception of benzene, 1, 3, and 5-trimethyl-. Some of the VOC's measured, were only present at this site.

Table 4-1 VOCs monitored in the region of the Bulbul Drive landfill

| VOC | Site 1 (ppb) | Site 2 (ppb) | Site 3 (ppb) | Site 4 (ppb) |
|---|--------------|--------------|--------------|--------------|
| 1-Pentene,2,4,4-trimethyl-1R-alpha.-Pinene | 0.08 | | | |
| 2,4-Dimethyl-1-heptene | | | 0.03 | |
| Benzene, 1,2,4-trimethyl- | 0.25 | 0.51 | 0.15 | 0.07 |
| Benzene, (1-methylethyl) | | | 0.02 | |
| Benzene, 1,2,3-trimethyl- | 0.08 | 0.19 | | |
| Benzene, 1-ethyl-2,3-dimethyl- | | | | 0.02 |
| Benzene, 1-ethyl-2-methyl | 0.09 | 0.21 | 0.07 | 0.03 |
| Benzene, 1-ethyl-3,5-dimethyl- | 0.07 | | 0.03 | |
| Benzene, 1-methyl-2-(1-methylethyl) | | 0.13 | | |
| Benzene, 2-ethyl-1,4-dimethyl- | | 0.17 | | |
| Benzene, -methyl-3-propyl | | 0.21 | | |
| Benzene,1,3,5-trimethyl- | 0.24 | 0.11 | 0.06 | |
| Benzene,1-ethyl-3-methyl- | | | | 0.03 |
| Benzene,1-ethyl-4-methyl | | | 0.05 | |
| Cyclohexane, methyl- | 0.13 | 0.17 | 0.1 | |
| Decane | 0.13 | 0.29 | 0.09 | 0.03 |
| Dichlorodifluoromethane | 0.14 | 0.16 | | |
| Dodecane | | 0.02 | | |
| Ethyl Acetate | 0.19 | 0.2 | | |
| Ethyl Alcohol | 0.06 | 0.09 | | |
| Heptane | 0.12 | 0.17 | 0.18 | 0.05 |
| Hexane, 2-methyl- | | 0.14 | | |
| Hexane, 3-methyl- | 0.19 | 0.23 | 0.13 | |
| Methyl Isobutyl Ketone | 0.14 | 0.2 | 0.1 | |
| Napthalene | 0.07 | | 0.04 | 0.01 |
| n-Propyl acetate | 0.25 | | 0.13 | |
| Octane | 0.13 | 0.24 | | 0.02 |
| Phenol | | 0.14 | | |
| Styrene | | | 0.08 | 0.02 |
| Tetrachloroethylene | 0.11 | 0.21 | 0.03 | 0.02 |
| Trichloroethylene | 0.16 | | | |
| Undecane | 0.12 | 0.24 | 0.05 | |

*Gases highlighted in red were present at all 4 sites

4.1.2. Fallout dust

The measured dust fallout rates at the eight sampling points are depicted in Table 4-2 below. The spatial and temporal patterns of dust dispersion are discussed further in this section.

Spatial trends

At Site 1 there were consecutive exceedances of the dust fall limit in August and September 2011, which triggers a non-compliance with the dust fall regulation. Site 1 is located adjacent to the unpaved road which would also contribute to elevated fallout dust rates. November 2011 was the only other month at site one with elevated dust fallout rates. Fallout dust rates decreased after September 2011, with the lowest rate measured

in September 2011. Fallout dust rates were higher in the dry months at Site 1 with the exception of May and June 2012.

At Site 2, fallout rates increased from August 2011 to November 2011, there were two exceedances of the limit value for dust fallout, in November 2011 and June 2012. The lowest dust fallout rate was recorded in April 2012. Fallout dust rates were higher during the wet period sampled when compared to dryer months, with the exception of June 2012.

At Site 3 there was an exceedance of the dust fall limit in September 2011. Higher fallout dust rates were measured during the wet period when compared to the dry months sampled. Elevated fallout dust rates were measured in November 2011 and February 2012.

The highest dust fallout rate of 1 505 mg/m²/day was measured at Site 5 in August 2011. However, there was a decline in fallout dust rates after this month, increasing in November 2011. The lowest fallout dust rate at site 5 was recorded in April 2012. Higher fallout dust rates were measured during the dry season at this site.

One exceedance was measured at Site 6 in August 2011 during the dry season and an elevated fallout dust rate was measured during March 2012 in the wet season. The lowest fallout dust rate was measured during September 2012.

No exceedances of the dust fall limit were measured at site 8. The highest fallout dust rate was measured during November 2011 and the lowest fallout dust rate was measured during October 2011. Fallout dust rates were higher during the dry season than during the wet.

At Site 9, exceedances of the dust fall limit occurred during September 2011, March 2012 and April 2012. The exceedance of the limit in consecutive months indicates a non-compliance with the dust fallout regulation. Elevated fallout dust rates were also measured during November 2011 with the lowest rate measured in August 2011.

An exceedance of the dust fall limit value also occurred at the neighbouring Site 10 in Umlazi. Site 1 and Site 9 were the only sites which experienced more than one exceedance during the sampling period.

Temporal trends

Windroses for each month monitored are depicted with dust fallout rates for each site in Figure 4-4 and Figure 4-5.

In August 2011 there were 3 exceedances of the dust fallout limit at sites 1, 5 and 6. The wind rose shows a predominantly northerly wind.

September 2011 was the only other month in which more than one exceedance was measured at sites 1, 3 and 10. The wind rose shows a predominantly northerly wind. In October 2011 there was an exceedance at Site 9. There was a change in the predominant wind direction to a southerly, south-westerly wind.

In November there was only one exceedance of the dust fallout limit in November 2011 but the DFO rates were considerable higher than those measured during the other months. The predominant wind direction was north-easterly to south-westerly.

In January 2012, no exceedances were measured and the predominant wind direction was north-easterly.

There were no exceedances were measured in February 2012 and the predominant wind direction was north easterly to southerly.

In March 2012, an exceedance was measured at site 9 and there was a predominant north-easterly, south westerly wind vector during this month. There was a consecutive exceedance at the same site in April 2012 with the same predominant wind vector.

In May 2012 no exceedances were recorded and this period was characterised by longer periods of calmer winds.

There was one exceedance at site 2 in June 2012. The period of calmer winds extended into this month, however the predominant wind vector was north-south.

Rainfall and average rainfall days during the sampling period are characterised in Figure 4-4. When dust fall rates across the seasons sampled are compared, the average dust fall rate was higher in the wet period than in the dry period sampled with the exception of the DFO rate in June 2012 (Table 4-2). There were six exceedances of the dust fall limit measured during the wet period sampled and 5 exceedances measured during the dry period.

The highest DFO rate occurred during August 2011, during the dry season and the lowest DFO rate occurred during the wet season (Figure 4-4 and Figure 4-5). Fallout dust rates declined after September 2011 but were elevated during November 2011. There was a decrease in average dust fallout concentrations following the closure of the Bulbul Drive Landfill in November 2011 with the exception of Site 2 and Site 9 (Table 4-2).

Table 4-2 Dust fallout rates measured in the region of the Bulbul Drive Landfill
(August 2011 –June 2012) (mg/m²/day)

| Site | Aug-11 | Sep-11 | Oct-11 | Nov-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 |
|------|--------------|--------------|------------|------------|--------|--------|------------|------------|--------|------------|
| 1 | 1 479 | 1 312 | 79 | 558 | 78 | 345 | 156 | 206. | 385 | 117 |
| 2 | 272 | 303 | 487 | 680 | 259 | 556 | 269 | 160 | 539 | 936 |
| 3 | 142 | 1 003 | 389 | 524 | 250 | 268 | 288 | 268 | 152 | 180 |
| 5 | 1 505 | 410 | 95 | 467 | 156 | 309 | 140 | 28 | 313 | 152 |
| 6 | 1 063 | 40 | 365 | 259 | 372 | 184 | 553 | | 135 | 107 |
| 8 | 264 | | 231 | 369 | | 400 | 151 | 242 | 339 | 185 |
| 9 | 59 | | 923 | 570 | | | 897 | 851 | 247 | |
| 10 | 23 | 913 | 15 | 332 | 125.68 | 175 | | 153 | 127 | 110 |

*exceedances highlighted in red

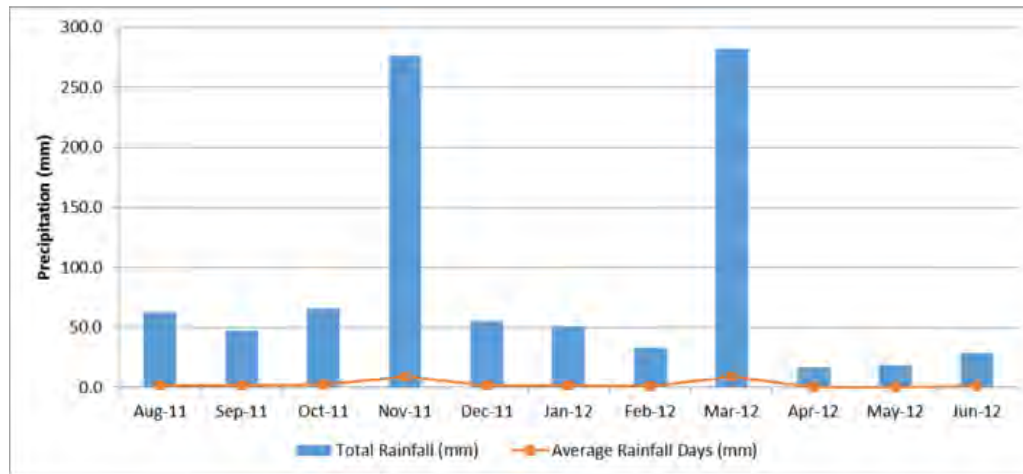


Figure 4-3 Monthly rainfall in mm from August 2011 to June 2012 and the number of rainfall days

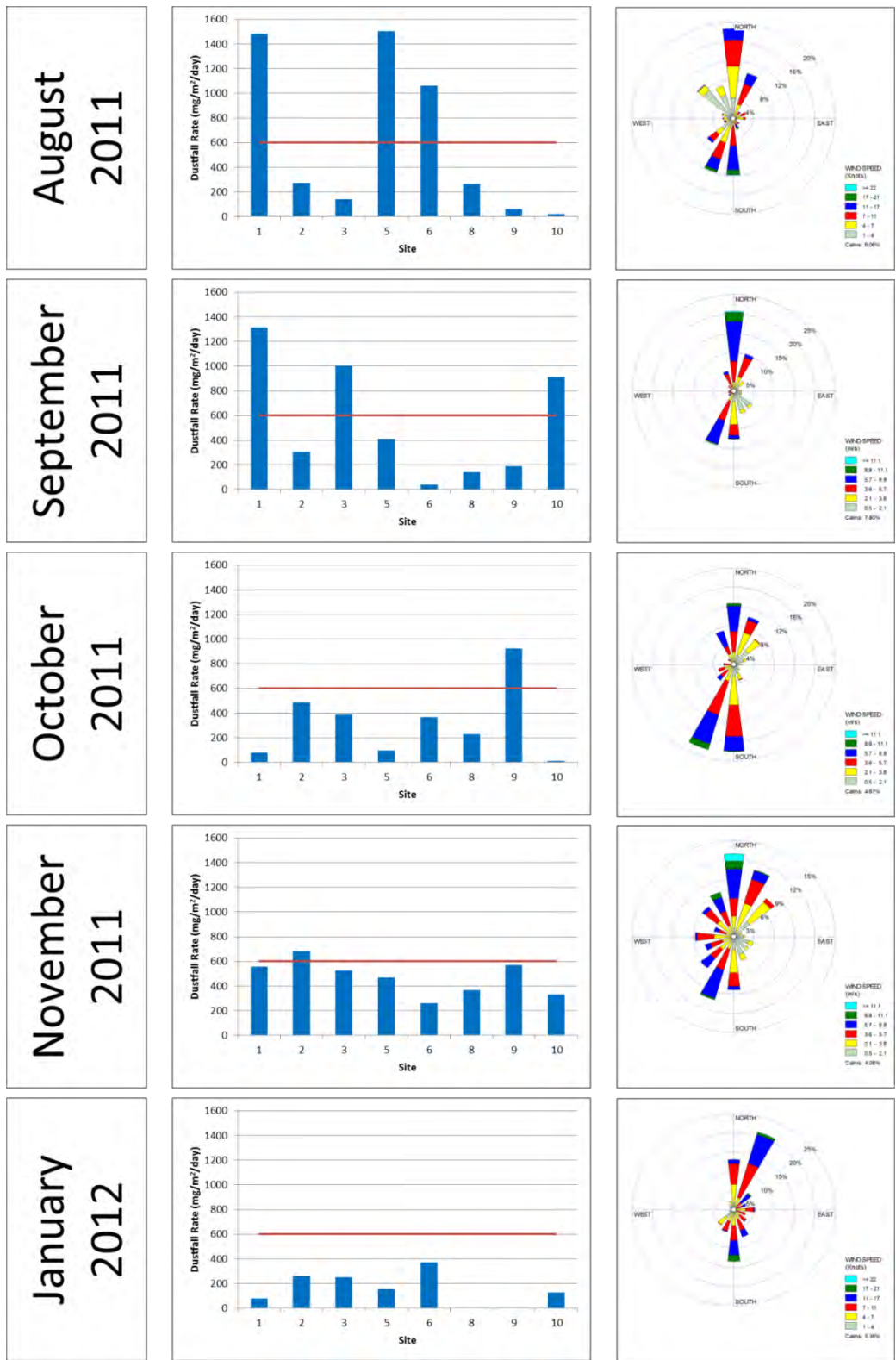


Figure 4-4 Monthly DFO rates measured on the fenceline of the Bulbul Drive Landfill (2011-2012)

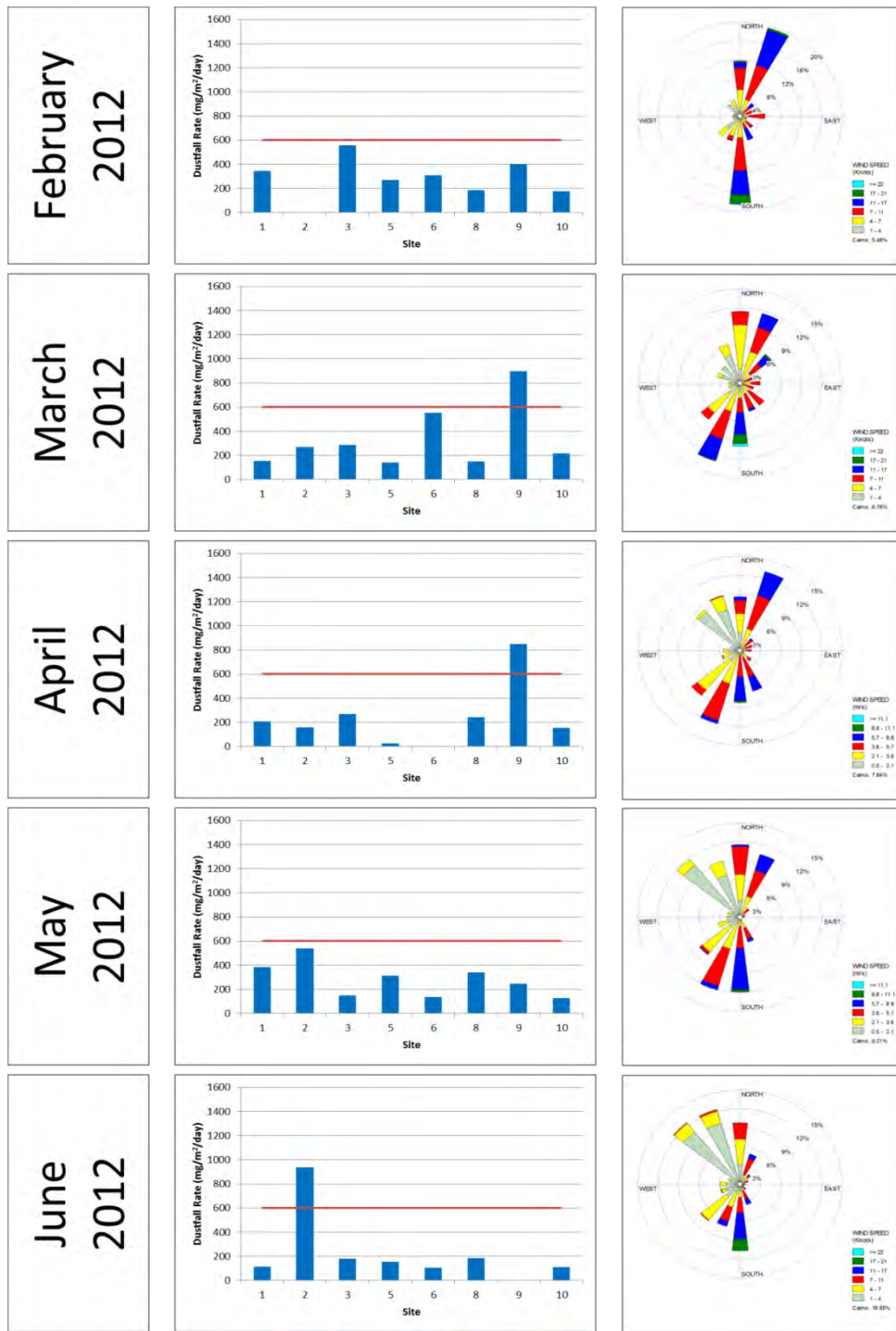


Figure 4-5 Monthly DFO rates measured on the fenceline of the Bulbul Drive Landfill (2012)

Elemental analysis

The results of the elemental analysis of trace metals in fallout dust are presented in this section. The average concentrations of all metals vary over five orders of magnitude, the most abundant heavy metal was Fe followed by Al (Table 4-3). Fe>Al > Zn> Mn> Pb> Cu> Pb> Ni> Cr> Co> Cd. Mean deposition fluxes are depicted in Figure 4.6. Average concentrations of Zn were highest at Site 10 and lowest at Site 2. Site 10 also had the

highest concentrations of Cr, Co and Ni. The highest concentrations of Pb were measured at Site 1 and Site 2. Higher concentrations of Al and Fe were measured at all sites, in comparison to the other metals measured. The highest concentration of Al was measured at site 10 and the lowest concentration at site 8. The highest concentration of Fe was measured at site 9 and the lowest concentration at site 2. The highest concentrations of Mn, Cd and Co were measured at site 2.

Table 4-3 Average metal concentrations in the region of the Bulbul Drive landfill

| Metal | Average metal concentrations per an individual site (mg/kg) | | | | | | | |
|-------|---|--------|--------|--------|--------|--------|--------|---------|
| | Site 1 | Site 2 | Site 3 | Site 5 | Site 6 | Site 8 | Site 9 | Site 10 |
| Zn | 1 942 | 197 | 1 442 | 1 798 | 1334 | 1 959 | 5 328 | 5 680 |
| Cr | 173 | 197 | 84 | 94 | 44 | 63 | 73 | 243 |
| Cu | 296 | 5 296 | 153 | 213 | 151 | 125 | 155 | 820 |
| Mn | 1 288 | 5 298 | 465 | 483 | 295 | 296 | 673 | 1 529 |
| Pb | 459 | 33 530 | 96 | 116 | 48 | 60 | 53 | 426 |
| Al | 26 646 | 33 531 | 12 413 | 13 749 | 8 860 | 9 737 | 19 474 | 48 257 |
| Fe | 41 442 | 146 | 22 184 | 10 825 | 13 615 | 8 892 | 78 087 | 37 554 |
| Ni | 140 | 146 | 138 | 106 | 94 | 79 | 75 | 328 |
| Cd | 9 | 29 | 4 | 1 | 1 | 1 | 14 | 6 |
| Co | 19 | 29 | 8 | 10 | 6 | 6 | 12 | 35 |

Figure 4-6 Mean deposition fluxes of metals in the region of the bulbul drive landfill

| Deposition fluxes (mg m ⁻² yr ⁻¹) | | | | | | | |
|--|--------|--------|--------|--------|--------|--------|---------|
| Site 1 | Site 2 | Site 3 | Site 5 | Site 6 | Site 8 | Site 9 | Site 10 |
| 7.05 | 0.71 | 5.23 | 6.53 | 4.84 | 7.11 | 19.34 | 20.62 |
| 0.63 | 0.71 | 0.30 | 0.34 | 0.16 | 0.23 | 0.26 | 0.88 |
| 1.07 | 19.23 | 0.56 | 0.77 | 0.55 | 0.45 | 0.56 | 2.98 |
| 4.68 | 19.23 | 1.69 | 1.75 | 1.07 | 1.08 | 2.44 | 5.55 |
| 1.67 | 121.72 | 0.35 | 0.42 | 0.17 | 0.22 | 0.19 | 1.54 |
| 96.73 | 121.72 | 45.06 | 49.91 | 32.16 | 35.35 | 70.69 | 175.17 |
| 150.43 | 0.53 | 80.53 | 39.29 | 49.42 | 32.28 | 283.46 | 136.32 |
| 0.51 | 0.53 | 0.50 | 0.39 | 0.34 | 0.29 | 0.27 | 1.19 |
| 0.03 | 0.11 | 0.01 | 0.01 | 0.00 | 0.00 | 0.05 | 0.02 |
| 0.07 | 0.11 | 0.03 | 0.04 | 0.02 | 0.02 | 0.04 | 0.13 |

The focus of this section is Cr, Cu, Pb, Cd, Co and Zn (Table 4-3 – Table 4-6). There was a variation in the concentration of these metals across the sites sampled from June 2011 to August 2012. During the wet season; the highest concentrations were attributed to Pb at Site 1. Pb concentrations were much higher in the wet season when compared to the dry season. During the dry season the highest concentration was attributed to Zn at site 3. Concentrations of metals prior to the Bulbul Drive Landfill closing were higher for most sites. Prior to landfill closure the highest concentration was attributed to Zn followed by

Pb at site 1. However, Zn concentrations did increase at the site following the closure of the Bulbul Drive Landfill for Sites 1, 2, 3 and 5.

Table 4-4 Concentrations of metals during the wet season (mg/kg)

| Metal | Monitoring Sites | | | | | | | |
|-----------|------------------|--------|--------|--------|--------|--------|--------|---------|
| | Site 1 | Site 2 | Site 3 | Site 5 | Site 6 | Site 8 | Site 9 | Site 10 |
| Cr | 113 | 55 | 82 | 99 | 38 | 43 | 51 | 59 |
| Cu | | 95 | 164 | 216 | 100 | 110 | 79 | 88 |
| Pb | 8356 | 357 | 115 | 148 | 35 | 56 | 32 | 579 |
| Cd | 17 | 6 | 6 | 2 | 2 | 2 | 3 | 5 |
| Co | 27 | 58 | 8 | 11 | 7 | 6 | 6 | 35 |
| Zn | 1609 | 822 | 1339 | 1749 | 38 | 43 | 79 | 88 |

Table 4-5 Concentrations of metals during the dry season (mg/kg)

| Metal | Monitoring Sites | | | | | | | |
|-----------|------------------|--------|--------|--------|--------|--------|--------|---------|
| | Site 1 | Site 2 | Site 3 | Site 5 | Site 6 | Site 8 | Site 9 | Site 10 |
| Cr | 127 | 69 | 86 | 89 | 49 | 41 | 30 | 89 |
| Cu | 232 | 101 | 143 | 210 | 202 | 137 | 231 | 659 |
| Pb | 157 | 91 | 78 | 85 | 61 | 63 | 74 | 187 |
| Cd | 2 | 0.9 | 1 | 0.6 | 0.4 | 1 | 26 | 8 |
| Co | 13 | 6 | 8 | 9 | 6 | 6 | 18 | 27 |
| Zn | 2208 | 975 | 15445 | 2424 | 49 | 79 | 230 | 252 |

Table 4-6 Concentrations of metals pre landfill closure (mg/kg)

| Metal | Monitoring Sites | | | | | | | |
|-----------|------------------|--------|--------|--------|--------|--------|--------|---------|
| | Site 1 | Site 2 | Site 3 | Site 5 | Site 6 | Site 8 | Site 9 | Site 10 |
| Cr | 87 | 47 | 76. | 71 | 23 | 39 | 31 | 65 |
| Cu | 438 | 97 | 147 | 190 | 71 | 97 | 293 | 976 |
| Pb | 1064 | 348 | 102 | 128 | 30 | 101 | 100 | 1149 |
| Cd | 24 | 7 | 7 | 3 | 2 | 2 | 36 | 20 |
| Co | 32 | 58 | 8 | 8 | 6 | 6 | 25 | 86 |
| Zn | 1543 | 772 | 992 | 1807 | 23 | 39 | 294 | 72 |

Table 4-7 Concentrations of metals post landfill closure (mg/kg)

| Metal | Monitoring Sites | | | | | | | |
|-----------|------------------|--------|--------|--------|--------|--------|--------|---------|
| | Site 1 | Site 2 | Site 3 | Site 5 | Site 6 | Site 8 | Site 9 | Site 10 |
| Cr | 134 | 73 | 89 | 107 | 65 | 44 | 46 | 73 |
| Cu | 225 | 101 | 157 | 227 | 230 | 140 | 72 | 173 |
| Pb | 157 | 98 | 92 | 109 | 66 | 39 | 24 | 55 |
| Cd | 0.8 | 0.3 | 0.9 | 0.7 | 0.3 | 0.8 | 1 | 0.5 |
| Co | 13 | 6 | 8 | 11. | 7.4 | 6 | 4 | 8 |
| Zn | 2141 | 1005 | 1742 | 2130 | 64.6 | 81 | 65 | 195 |

A One-Way ANOVA revealed a significant difference in deposition of Pb, Cd and Co before the Bulbul Drive Landfill closed when compared to concentrations of these metals after the landfill closed (Table 4-7). There was a strong directional trend, deposition of these metals across all sites were significantly higher before the closure of the landfill in November 2011 (Table 4-5). There was no significant difference in deposition of metals across seasons but a directional trend was observed. Higher deposition of these metals occurred during the wet period sampled across all sites.

Table 4-8 ANOVA Results comparing values pre and post landfill closure (Pre-Post) and across seasons (Wet-Dry), where F= degrees of freedom and P= >0.05

| Metal | Sampling period | F | P | Significant difference | Directional trend |
|--------------|------------------------|----------|----------|-------------------------------|--------------------------|
| Zn | Wet-Dry | 0.008 | 0.929 | No | wet>dry |
| | Pre - Post | 4.134 | 0.046 | Yes | pre>post |
| Cr | Wet-Dry | 0.074 | 0.786 | No | wet>dry |
| | Pre - Post | 4.095 | 0.047 | Yes | pre>post |
| Cu | Wet-Dry | 0.282 | 0.597 | No | wet>dry |
| | Pre - Post | 4.865 | 0.031 | Yes | pre>post |
| Pb | Wet-Dry | 1.149 | 0.288 | No | wet>dry |
| | Pre - Post | 5.487 | 0.022 | Yes | pre>post |
| Cd | Wet-Dry | 0.158 | 0.692 | No | wet>dry |
| | Pre - Post | 11.456 | 0.001 | Yes | pre>post |
| Co | Wet-Dry | 0.244 | 0.623 | No | wet>dry |
| | Pre-Post | 6.972 | 0.01 | Yes | pre>post |

Particle size

The remaining portion of settleable dust consists of finer particulates. The concentration of particles below 10 µm does not exceed 25% of the sample volume. The concentration of particles below 2.5 µm does not exceed 10% of the sample volume (Appendix).

4.2. Community perceptions of ambient air quality

The results of the household survey carried out in the region of the Bulbul Drive Landfill are presented in the section below. Responses from residents in Umlazi and Chatsworth are documented.

4.2.1. Demographics of respondents

Demographics describe the population of a region and reflect political, economic and environmental influences. Several demographic variables were measured with the household survey. Respondents were requested to state their age, gender, race, educational level, employment status and monthly income category.

Demographic characteristics of the respondents interviewed in Umlazi are summarised in Table 4.2.1. The average age of respondents in Umlazi is 47.3. The majority of respondents have a secondary school education (78.4%). 43% of these respondents are unemployed. The majority of respondents did not disclose their income (69.3%). 92% of those surveyed were classified as Black in terms of historical racial categories. In terms of gender, 56.8 % of respondents were female.

Table 4.2-1 The demographic characteristics of the respondents interviewed in Umlazi (N=88)

| Categories of variable measured | % of respondents |
|-----------------------------------|------------------|
| Age | |
| Average age of respondents | 47.34 |
| Education | |
| Primary School | 5.7 |
| Secondary School | 78.4 |
| Tertiary Institution | 18.2 |
| Did not disclose | 2.3 |
| No formal education | 1 |
| Current activity | |
| Employed | 27.3 |
| Unemployed | 43.2 |
| Student | 3.4 |
| Pensioner | 20.5 |
| Did not disclose | 5.7 |
| Average monthly income | |
| <1000 | 11.4 |
| 1001-10 000 | 15.9 |
| 10 001 – 20 000 | 3.4 |
| Did not disclose | 69.3 |
| Race | |
| Black | 92 |
| White | |
| Coloured | |
| Indian | 3 |
| Gender | |
| Male | 37.5 |
| Female | 56.8 |

The demographic characteristics of the respondents interviewed in Chatsworth are summarised in Table 4.2.2. The average age of respondents in Chatsworth is 50.4. The majority of respondents have a primary school education (53.2%) as can be seen in Table 5-5. 42% of respondents were unemployed. The majority of respondents chose not to

disclose their average monthly income range (60%). In terms of historical racial categories the respondents in Chatsworth were Indian (86.3). In terms of gender 55.7% of those interviewed were female.

Table 4.2-2 The demographic characteristics of the respondents interviewed in Chatsworth (%; N=79).

| Categories of variable measured | Chatsworth |
|-----------------------------------|------------|
| Average age of respondents | 50.40 |
| Education | |
| Primary School | 7.6 |
| Secondary School | 53.2 |
| Tertiary Institution | 34.2 |
| Did not disclose | 5.1 |
| Occupation | |
| Employed | 36.7 |
| Unemployed | 41.8 |
| Student | 3.8 |
| Pensioner | 15.2 |
| Did not disclose | 1.3 |
| Average monthly income | |
| <1000 | 8.9 |
| 1001-10 000 | 20.3 |
| 10 001 – 20 000 | 6.3 |
| 20 001 | 2.5 |
| Did not disclose | 62 |
| Race | |
| Black | 12.7 |
| White | |
| Coloured | 1.3 |
| Indian | 86.3 |
| Gender | |
| Male | 44.3 |
| Female | 55.7 |

4.2.2. Neighbourhood attitudes

Respondents of the household survey were asked what they thought of their neighbourhood.

Most respondents have lived in Umlazi for more than 20 years (67%) and chose to live in the area because they were relocated during apartheid (21.6%); they had family ties to the area (20.5%), they were born in Umlazi (15.9%) or moved there for economic reasons (13.6%). When asked what they liked about living in their neighbourhood, most respondents highlighted the convenience of living in Umlazi (17%), the friendliness of

neighbours (12.5%) and that it was a good place to live (13.6%). Conversely, the most common dislike listed by respondents was the high crime levels (27.3%) and poor service delivery (15.9%). 7.9% of respondents listed the Bulbul Drive Landfill in the neighbourhood as a dislike. Almost all of the respondents knew their immediate neighbours and spoke to them regularly (93.2%) and 55 % of respondents have immediate family living in the neighbourhood. In terms of involvement in local community activities, most respondents are involved in religious activities (58%), or local sports clubs (17%). Only 44.3% of respondents spent time outdoors exercising and 43% enjoy spending time in their gardens. 62.5% of respondents felt safe in their neighbourhood, however 26% said that the crime rate was high when asked to justify their response and 34% said the area was a safe one. When asked if they were happy in their neighbourhoods, 82% of respondents were affirmative in their response. The most common validation was that **"everything is okay, I am happy"** and the **"friendly neighbourhood"** line of reasoning.

In Chatsworth, 55% of respondents have lived in their neighbourhood for greater than 20 years. The main reasons respondents chose to live in the area were because of relocation during apartheid, family ties to the neighbourhood, quietness and convenience of the neighbourhood and economic reasons. Most respondents had four people living in their house. When asked what they liked most about living in their neighbourhood, the most common response was the quietness of the area, friendly neighbours and convenience. Crime, poor service delivery and drug and alcohol abuse were cited as common dislikes while the presence of the Bulbul Drive Landfill in the neighbourhood was listed by 8% of respondents. 84 % of respondents talk regularly to their immediate neighbours and 47% of respondents have immediate family living in the neighbourhood. The most common community activity for residents is participation in local religious organisations (41.8%) while 66% said that they spent time outdoors exercising and 50% said that they enjoyed spending time outside in their gardens. 85% of respondents said that they were happy living in their neighbourhoods and the most common justification for this statement was that they are happy with the neighbourhood, the friendliness of neighbours and the quietness and convenience. 56% of respondents did not feel safe in the neighbourhood which 44% attributed to the high crime rate.

4.2.3. Access to health care facilities and health related issues

To understand access to health care facilities in the area, respondents were asked where they went when they were ill and were given four options of a private doctor, traditional healer, clinic and hospital. They were asked how they travelled there and how long it took them to get there from their homes. They were allowed to choose multiple options and their responses are summarised in Table 4.2.4 and Table 4.2.5 below.

The healthcare provider of choice for most respondents in Umlazi was the hospital (Table 4.2.4). The taxi was a favoured mode of transportation and the facility is between 31 – 40 minutes away from their homes. 73% of respondents interviewed in Umlazi were not smokers. 56% said they or family members suffered from illnesses and commonly listed illnesses were high blood pressure, asthma and tuberculosis.

The healthcare provider of choice for most respondents in Chatsworth is a private doctor and the preferred transport choice is a private vehicle (Table 4.2.5). Most respondents have private doctor that they can reach in 5 – 10 minutes. 76% of those interviewed in Chatsworth were not smokers and 55.7% said that they or their family members suffered from illnesses. Common illnesses listed were asthma (13.9%); high blood pressure (8.9%) heart problems (5.1%) and sinus allergies (6.3%).

Table 4.2-3 Access to healthcare facilities for respondents in Umlazi

| Where do you go when you are ill | Respondents (%) | How do you travel there | | | | | How much of time does it take you to travel there (min) | | | | | | |
|----------------------------------|-----------------|-------------------------|-----|------|---------|-----------|---|-----------------|---------------|---------------|---------------|---------------|--------------|
| | | Private vehicle | Bus | Taxi | Walking | Ambulance | 5 - 10 minutes | 11 - 20 minutes | 21-30 minutes | 31-40 minutes | 41-50 minutes | 51-60 minutes | > 60 minutes |
| Private doctor | 31.8 | 11.3 | 2.3 | 20.4 | | | 6.8 | 6.8 | 18.1 | 3.4 | | | |
| Clinic | 37.5 | 1.1 | 2.3 | 35.2 | 1.1 | 1.1 | | 4.5 | 25 | 4.5 | 1.1 | 1.1 | |
| Hospital | 60.2 | 9.1 | 2.3 | 35.2 | 6.8 | 3.4 | 5.7 | 10.2 | 35.2 | 9.1 | | 1.1 | |
| Traditional healer | 9.1 | | | 6.8 | 2.3 | | | | 6.8 | 1.1 | | | 1.1 |

Table 4.2-4 Access to healthcare facilities for respondents in Chatsworth

| Where do you go when you are ill | Respondents (%) | How do you travel there | | | | | How much of time does it take you to travel there (min) | | | | | | |
|----------------------------------|-----------------|-------------------------|-----|------|---------|-----------|---|-----------------|---------------|---------------|---------------|---------------|--------------|
| | | Private vehicle | Bus | Taxi | Walking | Ambulance | 5 - 10 minutes | 11 - 20 minutes | 21-30 minutes | 31-40 minutes | 41-50 minutes | 51-60 minutes | > 60 minutes |
| Private doctor | 78.5 | 67.1 | 1.3 | 7.6 | 3.8 | | 45.6 | 16.5 | 11.4 | 2.5 | | 1.3 | |
| Clinic | 7.6 | 1.3 | | 3.8 | 2.5 | | 2.5 | 1.3 | 3.8 | | | | |
| Hospital | 35.4 | 27.8 | | 2.5 | 3.8 | | 11.4 | 8.9 | 11.4 | | | 1.3 | |

4.2.4. Perceptions of air quality

Respondents were asked whether they had any concerns over odours, visibility and dust and then to add to the answer with an open-ended statement. Those who answered 'yes' were then asked what time of day the problem was worse, what time of year and the nature of the issue. The results are described under the categories of odour, visibility and dust.

Odour

77% of respondents in Umlazi said that they were currently aware of odours and that these odours were more prevalent in the mornings (31%) and the most common description of these odours was that they smelt like rotting or decomposing waste (29.5%). The odours were found to be the same all year round (51%) with 33% of respondents saying that the odours were worse in Summer. 72% of respondents were aware of odours in the past, and said that the smell remained unchanged and the same for all seasons and at all times of the day with 24% saying that it was worse in the mornings.

In Chatsworth 57% of respondents were currently aware of odours and of these, 24% said that the odours were the same all the time, only 12% said it was worse in the mornings and 16.5% described it as rotting or decomposing waste and 6.3 % attributed the smell **to the waste disposal site or as they often termed it the "dump"**. The respondents in Chatsworth (33%) felt that the smells were worse in summer. 58% of respondents said that they were aware of odours in the past and that these smelt like rotting waste (10.1%) or were the same as the present smell (20.0%) and 34.2% said that the smells were worse in summer.

Visibility

50% of respondents in Umlazi said that they experienced haziness, smog or poor visibility and said that it was the same all day and all year round. 14% did not know what caused it but 9% attributed it to the Bulbul Drive Landfill.

75% of respondents in Chatsworth did not experience haziness, smog or poor visibility and of the respondents that did experience it, they said that it was most prevalent in the morning and some said it was worse in summer while others said that it was the same all year round. The most common response when respondents were asked to identify a cause was the burning of fires at the Bulbul Drive Landfill (8.9%).

Dust

63% of respondents in Umlazi felt that dust was a problem in their neighbourhood and they felt that this was the same all day and the same all year round. 22% of respondents felt that the dust came from the Bulbul Drive Landfill.

67% of respondents in Chatsworth did not think that dust was a problem in their neighbourhood and of those that did think it was a problem, the majority thought that it

was the same all day long and that it was the same all year round. They thought most of this dust came from wind and soil, people's yards or traffic.

Defining air pollution

When asked to define the term air pollution the three most common answers from respondents in Umlazi were "dirty air", "causes illnesses" and that they "don't know".

The most common response of residents in Chatsworth was "dirty air" "contaminated air" or "don't know".

The effect on personal health and well-being

To determine whether air pollution in their neighbourhoods had an effect on their personal health and wellbeing, respondents were asked to what extent they agreed or disagreed with the following statement "Air pollution in my neighbourhood has an effect on my health and wellbeing".

49% of respondents in Umlazi strongly agreed and 44% thought that there were some groups in their community that were more affected by air pollution than others in their neighbourhood in Umlazi.

70 % of respondents in Chatsworth agreed. The majority felt that everyone was affected by air pollution in the same way.

Prioritising air pollution

55% strongly agreed that improving air quality should be a priority of local government in Umlazi but only 29 % were aware of air quality activities were and willing to participate. 96% of respondents in Umlazi would like to receive information on air quality in their neighbourhood. 36.4% of these respondents would like to receive this information on a weekly basis. 38.6% thought that the local authorities should be responsible for providing this information. 56% of respondents in Umlazi are aware of laws protecting their right to a healthy environment but most could not state what they were explicitly or did not know at all. 73% of respondents did not feel that the city addressed their concerns about air quality.

60% of respondents in Chatsworth agreed that improving air quality should be a priority of local government but only 22% said they would participate in activities to improve air quality. 87.3% of respondents in Chatsworth would like to receive information about air quality in their neighbourhood. 24% would like to receive this on a weekly basis and 28% on a monthly basis. They felt that local authorities should be responsible for this function. 30.4% were aware of laws protecting their right to a healthy environment but the majority were unable to specify further. 71% felt that the city did not address their environmental concerns.

4.2.5. Perceptions of the Bulbul Drive Landfill

93.7% of respondents in Umlazi were aware of the presence of the Bulbul Drive landfill and 30% were unhappy about its presence. 70% said that it had a negative impact on the

community which 28% attributed to sicknesses. 89.9% of respondents had no interactions with Wasteman. 75% had noticed no changes in the way that the Bulbul Drive Landfill was managed and 70% had noticed no changes in the natural environment surrounding the landfill in the last 5 years, except 11.4% who stated that vegetation growth was poor. 82% of respondents in Umlazi were happy that the Bulbul Drive Landfill was closing. **Respondents felt that the “health of people living near the landfill would improve” and that “we will be able to breathe fresh air”.**

99% of respondents in Chatsworth were aware of the existence of the Bulbul Drive Landfill and 48% of the respondents were unhappy about living near it. 86.4% said that the Bulbul Drive Landfill had a negative influence on the community because of health risks (38.6%). 87.5% of respondents in Umlazi had no interactions with the landfill management. 73% had not noticed any changes to the Bulbul Drive Landfill in the last 5 years and 58% had not noticed any changes to the natural environment. 34% did not answer the question but 17% said that there were problems with vegetation growth. 71% were happy that the Bulbul Drive Landfill was closing because **“the health of people would improve”; “the air quality would improve” and “the environment would be cleaner”.**

4.2.6. Cross tabulation between neighbourhood satisfaction and perceptions of environmental quality

A cross-tabulation revealed linkages between perceptions of air quality and neighbourhood satisfaction. Despite being aware of odours, the majority of respondents in Umlazi were happy living in their neighbourhood (Figure 4-2-1). A similar response was given by respondents in Chatsworth who stated that they were happy in the neighbourhood despite the presence of odours (Figure 4-2-2).

Despite experiencing poor visibility, the majority of respondents in Umlazi were happy living in their neighbourhood (Figure 4-2-3). A similar response was given by respondents in Chatsworth who stated that they were happy in the neighbourhood despite the experience of poor visibility (Figure 4-2-4).

Despite experiencing dust fallout as an issue, the majority of respondents in Umlazi were happy living in their neighbourhood (Figure 4-2-5). A similar response was given by respondents in Chatsworth although significantly fewer respondents deemed dust an issue in this neighbourhood. The respondents who did think it was a problem stated that they were happy in the neighbourhood despite the nuisance of dust fallout (Figure 4-2-6).

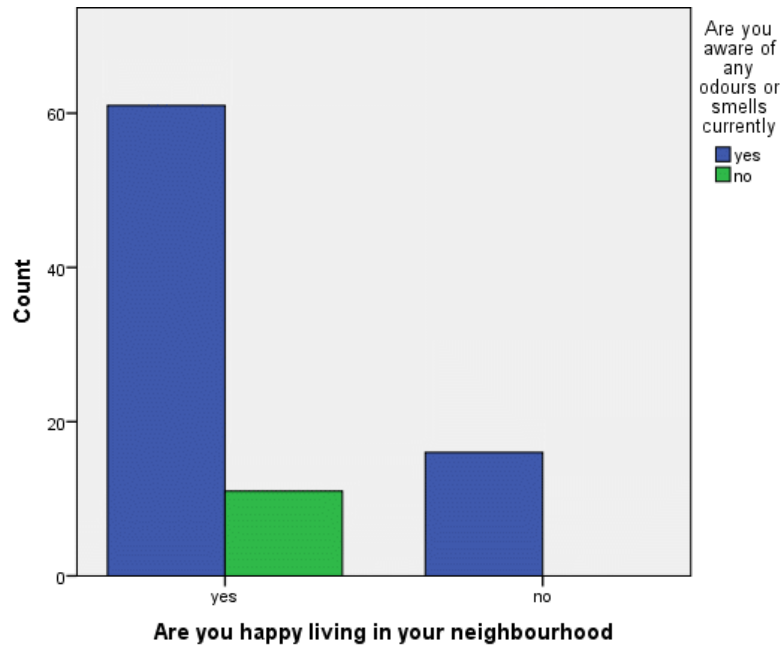


Figure 4.2-1 Cross-tabulation showing the relationship between neighbourhood satisfaction and perception of odour in Umlazi

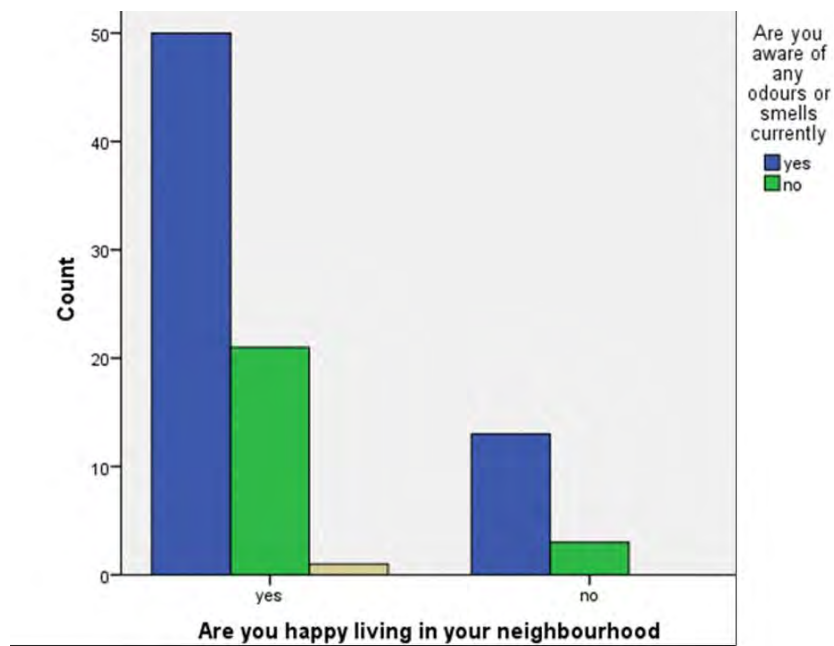


Figure 4.2-2 Cross-tabulation showing the relationship between neighbourhood satisfaction and perception of odour in Chatsworth

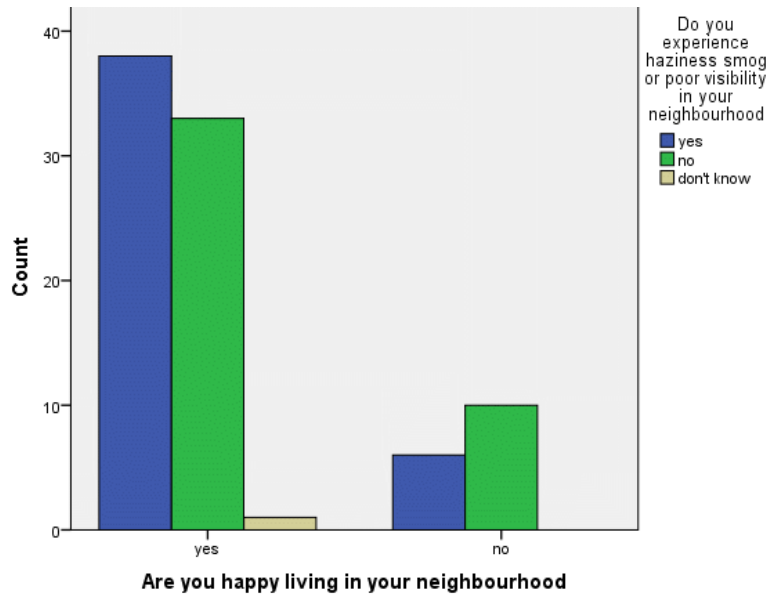


Figure 4.2-3 Cross-tabulation showing the relationship between neighbourhood satisfaction and experience of poor visibility in Umlazi

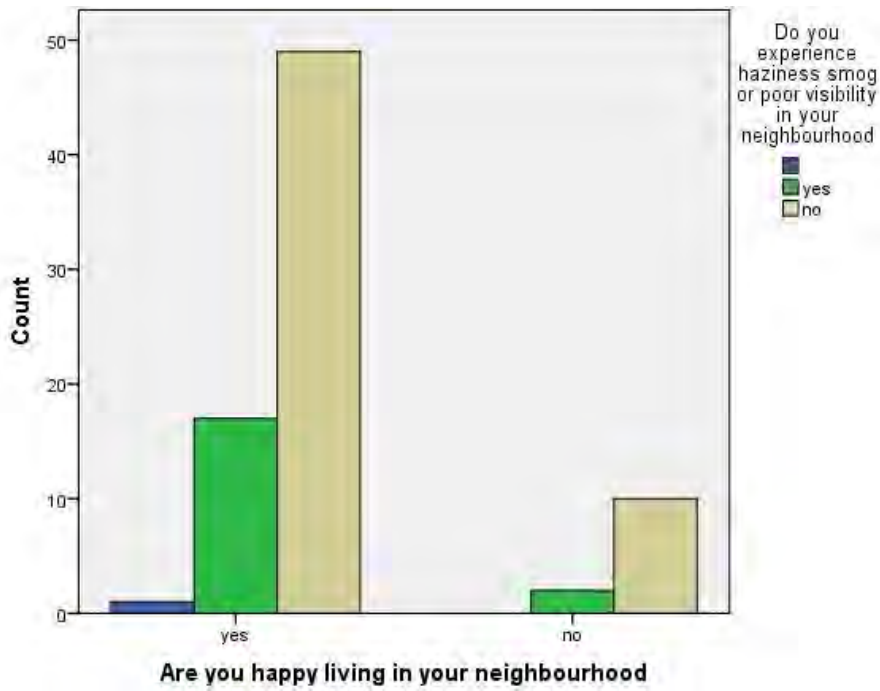


Figure 4.2-4 Cross-tabulation showing the relationship between neighbourhood satisfaction and experience of poor visibility in Chatsworth

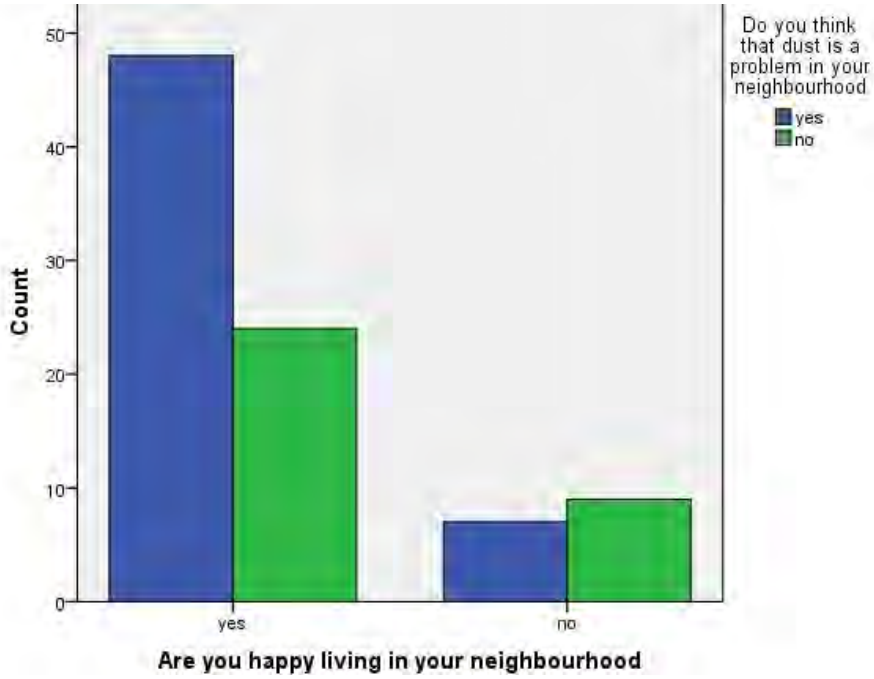


Figure 4.2-5 Cross-tabulation showing the relationship between neighbourhood satisfaction and dust fallout in Umlazi



Figure 4.2-6 Cross-tabulation showing the relationship between neighbourhood satisfaction and dust fallout in Chatsworth

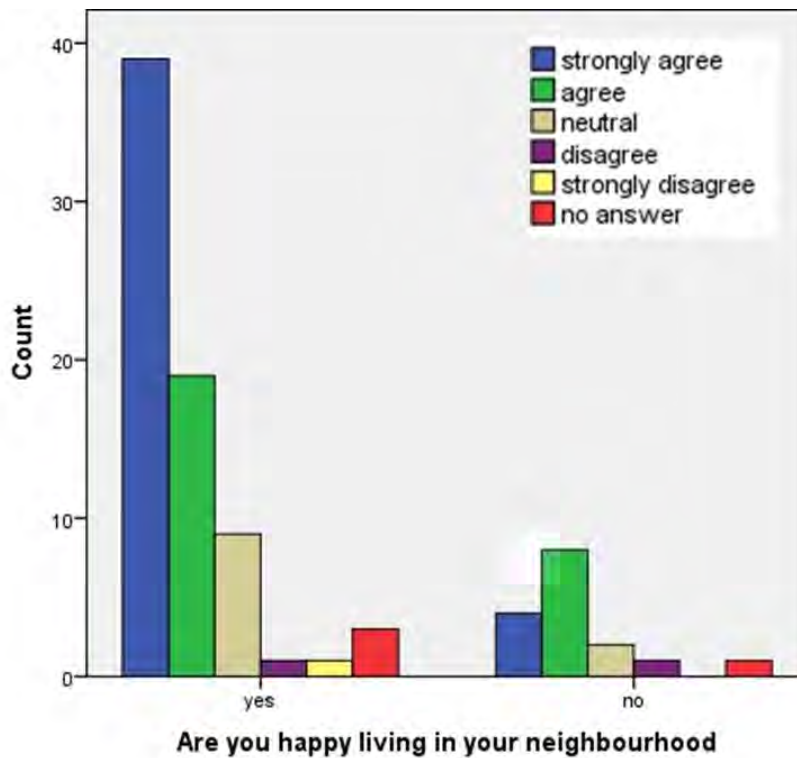


Figure 4.2-7 Cross-tabulation showing the relationship between neighbourhood satisfaction and the impact of air pollution on personal health and well-being of residents in Umlazi

The majority of respondents from Umlazi felt that air pollution had an impact on their health and well-being, yet these same respondents stated that they were happy in their neighbourhood.

A similar result was noted when responses from respondents in Chatsworth were cross-tabulated. Despite feeling that air pollution had an impact on their health and well-being neighbourhood satisfaction was high with these respondents.

A cross tabulation of neighbourhood satisfaction and feelings towards the Bulbul Drive Landfill revealed that despite feeling that the landfill had a negative impact, they were still happy in Umlazi (Figure 4-2-9).

A similar trend was observed in Chatsworth, however, there was a larger percentage of respondents when compared to Umlazi who seemed uncertain about the impact of the Bulbul Drive Landfill but were still happy in their neighbourhood (Figure 4-2-10)

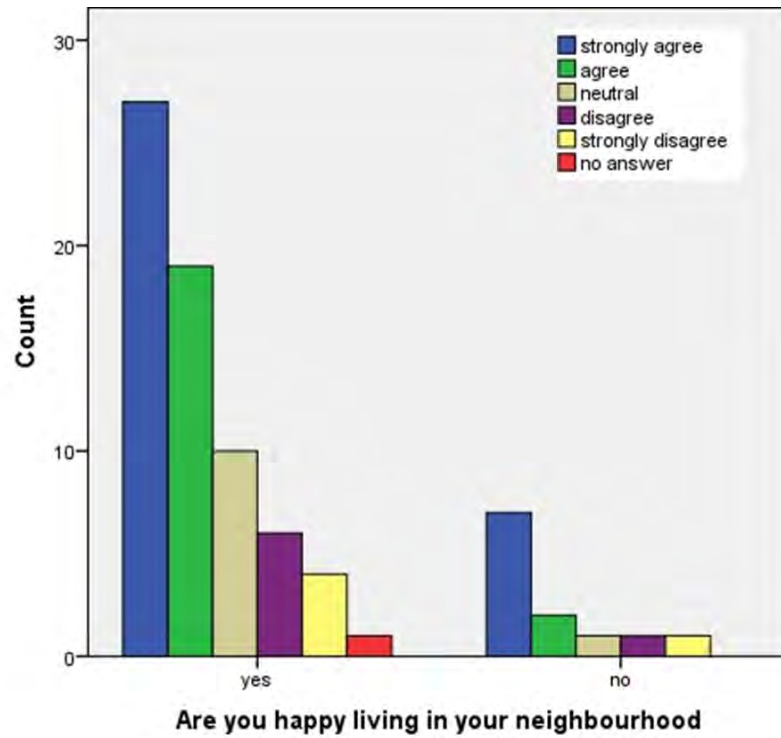


Figure 4.2-8 Cross-tabulation showing the relationship between neighbourhood satisfaction and the impact of air pollution on personal health and well-being of residents in Chatsworth Umlazi

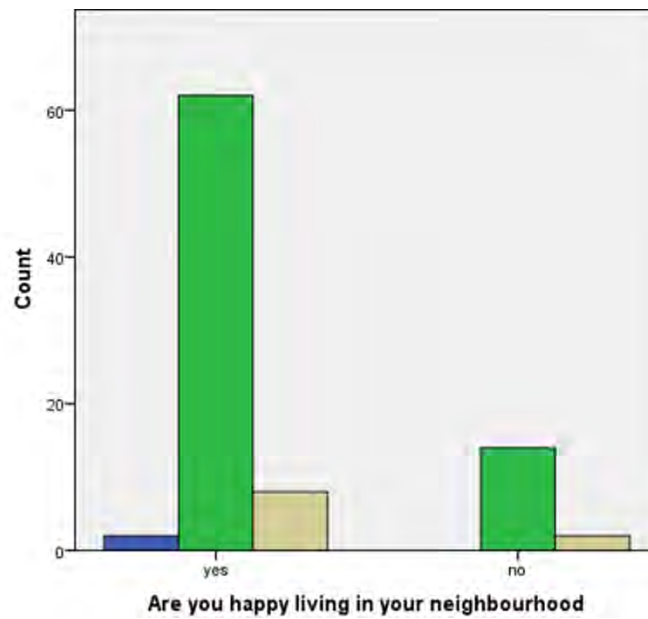


Figure 4.2-6 Cross-tabulation showing the relationship between neighbourhood satisfaction and perceptions of the impact of the Bulbul Drive Landfill in Umlazi

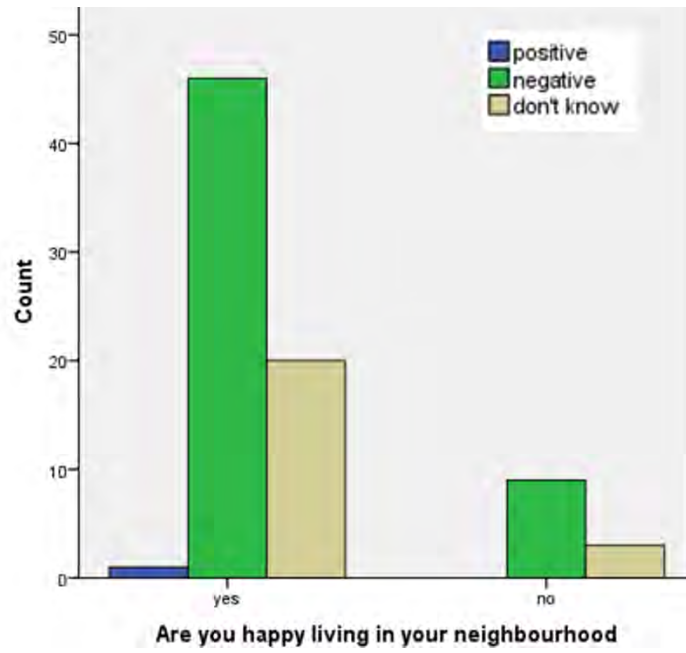


Figure 4.2-7 Cross-tabulation showing the relationship between neighbourhood satisfaction and perceptions of the impact of the Bulbul Drive Landfill in Chatsworth

4.3. Summary

The results of the passive monitoring in the region of the landfill provides an indication of the spatial dispersion of air emissions from the Bulbul Drive landfill site and the potential impacts on ambient air quality.

H₂S concentrations were below threshold limits of detection. BTEX concentrations were found to be in compliance with ambient air quality standards implying that concentrations of benzene, toluene, ethylbenzene and xylene do not have a negative impact on ambient air quality. 1, 3-Butadiene concentrations were found to be in compliance with ambient air quality standards implying that concentrations of 1, 3-Butadiene do not have a negative impact on ambient air quality. Fallout dust monitoring revealed incidents of non-compliance with the South African national dust regulation and implies a negative impact on ambient air quality in the region of the Bulbul Drive landfill. Elevated fallout dust rates were measured during the wet months sampled and at sites on the predominant wind vector.

Results of these analyses for residents in Umlazi and Chatsworth revealed a variety of responses in the way that environmental quality is perceived. Odours were perceived to be more of an issue in Umlazi than in Chatsworth. However, both communities described the odours in the same way, as rotting/decomposing waste. Visibility was a bigger issued in Chatsworth when compared to Umlazi, but a small percentage of respondents in both communities attributed poor visibility to activities at the Bulbul Drive Landfill. Dust was perceived to be a problem in both communities however it was in Umlazi that some respondents attributed the dust problem to activities at the Bulbul Drive Landfill.

Chapter 5

5. Discussion

The main aim of this study was to determine whether ambient air quality in the region of the Bulbul Drive Landfill is negatively impacted. In this chapter a discussion of the results of the ambient air quality assessment and the household survey is presented. In section 5.1 the results of the passive monitoring of gaseous pollutants and fallout dust are discussed in terms of potential nuisance and health implications. In section 5.2 the results of the household survey inform the discussion of community perceptions of air quality in the region of the Bulbul Drive Landfill. The ambient monitoring data and community perceptions are considered together in section 5.3, to propose a hybridised understanding of air pollution and environmental risk that extends beyond technical measurements. The extent to which the aim and objectives of the study have been achieved is evaluated. Limitations to the study are also discussed as well as the implications thereof.

5.1. Ambient air quality assessment

The ambient air quality assessment comprised passive monitoring of gases and fallout dust near the Bulbul Drive Landfill. Trace components of landfill gas commonly associated with hazardous waste disposal sites are not routinely monitored but have potential odour and health implications. As such, H₂S, BTEX and other NMOCs were monitored for one month near the fence-line of the Bulbul Drive Landfill and the results of the passive monitoring are discussed further in section 5.1.1.

Fallout dust was monitored using bulk deposition samplers for the period of one year, over wet and dry seasons. The sampling period also took into account the effects of the closure of the landfill on fugitive dust emission. Fallout dust and associated deposition of metals is discussed further in section 5.1.2.

5.1.1. Passive monitoring of gases

5.1.1.1. Odorous compounds

A health study at Fresh Kills Municipal landfill in New York revealed that odour producing chemicals in landfill gas are not likely to cause long term health effects at levels found in the ambient environment of landfills (Berger & Mann, 2001). Odours are however, associated with acute effects such as nausea and headaches. H₂S is a common compound found in landfill gas. It results from the decomposition of gypsum in landfill waste and is one of the most odorous components in landfill gas (Parker et al., 2002). Human exposure to H₂S is primarily through inhalation (WHO, 1998). Short term exposure to high concentrations of H₂S can cause serious health implications which include death, respiratory, ocular, neurological, cardiovascular, metabolic, and reproductive effects. H₂S was monitored as a proxy for odour. H₂S concentrations measured in the region of the Bulbul Drive Landfill were below odour threshold limits. They are also well below the WHO health based guideline. This indicates that H₂S is unlikely to have an impact of on human health in the vicinity of Bulbul Drive landfill, and it is unlikely to be detected as an odourant.

The low concentrations of H₂S are likely consequence of the lack of sulphate-bearing waste material and gypsum, as mostly industrial waste is disposed of at the site (Asakura, 2015).

Odour had been identified as an issue in the past by residents and low concentrations of H₂S does not imply that odour is not an issue. Odour in the region of the Bulbul Drive Landfill site can be attributed to other compounds present in landfill gas (Nagamori et al., 2013). VOCs associated with odour impacts include benzene, 1, 2, 4-trimethyl-1-ethyl-2-methyl; decane; heptane and tetrachloroethylene benzene, toluene, ethylbenzene, xylene, dichloroethylene, dichloromethane, trichloroethylene, tetrachloroethylene and vinyl chloride (Berger & Mann, 2001). These were present in the ambient environment the region of the landfill and it is likely that these compounds result in the odour that is detected by residents neighbouring the Bulbul Drive Landfill.

The highest concentrations of VOCs were measured at site 2, and may be attributed to its proximity to the leachate pond on the Bulbul Drive Landfill premises. In a study of Polish landfill sites odour was strongly influenced by landfilling processes such as the gas collection system, traffic of heavy duty vehicles and the compaction of waste. Elevated concentrations were also observed in close proximity to leachate ponds, biogas wells and recent waste layers (Sadowska-Rociek et al., 2009).

5.1.1.2. Volatile organic compounds

In addition to odour nuisance, compounds associated with health impacts were measured at all four sites. These compounds included Benzene,1,2,4-trimethyl-; benzene, 1-ethyl-2-methyl; decane; heptane; tetrachloroethylene and BTEX. These compounds are typically found in the ambient environment of hazardous waste landfills (US EPA, 1995). BTEX is pervasive in the atmospheric environment but proximity to a hazardous waste site increases the likelihood and frequency of exposure (Vrijheid, 2000). The most common VOCs in landfill gas are BTEX, classified as hazardous air pollutants. Concentrations of benzene, toluene, ethylbenzene and xylene were found to be below ambient air quality standards in the region of the Bulbul Drive Landfill, implying that there is no negative impact on human health or the ambient environment. Though singular compounds were below the ambient air quality standards they were compared to, their potential health impacts cannot be omitted. Where two or more substances are potentially dangerous to human health, the cumulative effects should be considered (Durmusoglu et al., 2010). Even at low exposure levels BTEX has been linked to reproductive, respiratory and heart problems and endocrine disruption (Dolk et al., 1998; Vrijheid, 2000). Benzene represents the greatest risk because it is a carcinogen (Vrijheid, 2000). Benzene is the only component of BTEX that is regulated in the ambient environment in South Africa (DEA, 2009).

Benzene, toluene, ethylbenzene and xylene in ambient concentrations at landfill sites in different locations around the world range from 5.6- 52.8; 23.4 – 528 ; 4.9 – 29.6 ; 7.9- 34 µg/m³, as reported by Durmusoglu et al. (2010). BTEX composition ratios are influenced by emission sources and each landfill has its own pattern, which is attributed

to variations in climate, topography, waste material and operational scenarios (Durmusoglu et al., 2010). The minimum concentrations of benzene, toluene, ethylbenzene and xylene were at the four monitoring sites at Bulbul Drive landfill were 0.67; 1.42; 0.6 and 1.4 $\mu\text{g}/\text{m}^3$ respectively. The maximum concentrations of benzene, toluene, ethylbenzene and xylene at these sites were 1.13; 9.15; 4.29; 12.86 $\mu\text{g}/\text{m}^3$ respectively. The values measured at the Bulbul Drive Landfill are relatively low in comparison to those reported by Durmusoglu et al. (2010). Landfill sites such as Bulbul Drive often show similar BTEX emission source characteristics with other industrial areas, but this requires further data to be understood.

1, 3-Butadiene concentrations measured at Bulbul Drive Landfill were below the DEFRA ambient air quality standard implying no negative impact on ambient air quality (DEFRA, 2007). Emission of 1, 3-Butadiene is largely attributed to motor vehicle combustion and results from industrial and manufacturing processes (Dollard et al., 2001). However, it is commonly monitored as a trace component of landfill gas (Parker et al., 2002). This is because emissions from industrial sites can elevate ambient concentrations of 1, 3-Butadiene to several tens of ppb (Dollard et al., 2001). When compared to 1, 3-Butadiene at other industrial sites the concentrations measured at Bulbul Drive Landfill is relatively low. Mean monthly 1, 3-Butadiene concentrations measured across the United Kingdom by Dollard et al. (2001) ranged from 0.1 – 0.4 ppb (where 1 ppb of 1, 3-Butadiene is equivalent to 2.25 $\mu\text{g}/\text{m}^3$ at 20°C).

Exposure to the gaseous pollutants measured in this study occurs if the Bulbul Drive Landfill produces harmful levels of gases and if these gases migrate to people living near the landfill (Parker et al., 2002). Acute effects associated with VOCs only occur at relatively high concentrations that are not likely to occur in the ambient environment. Landfill gas constituents are typically found at very low concentrations in the ambient environment and are unlikely to cause negative health impacts (Vrijheid, 2000). However, this is dependent on the nature of chemical concentrations and the duration of the exposure. Many of the residents in the region of the Bulbul Drive Landfill have lived their whole lives there. Potential cumulative effects of low levels of exposure to the trace components of landfill gas measured in this study should be evaluated further (Durmusoglu et al., 2010).

The time period for passive monitoring of trace components of landfill gas in the region of the Bulbul Drive site was limited to one month because of resource constraints. Fouche & Diab (1994) found that meteorology played a significant role in the patterns of odour distribution over Durban. Variations in temperature and wind have also been found to influence VOC concentrations (Durmusoglu et al., 2010). It is recommended that further studies consider seasonal variation (Bokowa, 2010). In addition, a longer period of monitoring would have allowed for a more meaningful comparison to health based ambient air quality standards. However, this passive monitoring campaign of gaseous pollutants provided a snapshot of ambient air quality and provides guidance for future work.

5.1.2. Fallout dust

It was predicted that fallout dust in the region of the Bulbul Drive Landfill site has a negative impact on ambient air quality. The results of the passive monitoring campaign carried out supported this prediction. There were two instances of non-compliance with the national dust fallout regulation and eleven measured exceedances of the dust fallout limit during the sampling campaign. This implies that fallout dust in the region of the Bulbul Drive Landfill has a negative impact on ambient air quality (DEA, 2013). Dust fallout rates reviewed by Amodio et al (2014) ranged from 0.05 g/m²/year to 138.9 g/m²/year. Mean dust fallout rate per a month was found to range from 23 mg/m²/day to 1 505 mg/m²/day and an annual dust fallout rate to range from 0.23 g/m²/year to 0.54 g/m²/year. There was variation in dust fallout rates amongst the selected monitoring sites, based on monthly dust fallout data from August 2011 to June 2012. There are a number of factors that influence dust pollution and dispersal. These include the influence of climatic factors and local scale meteorology. However, weather events have been identified as the predominant determinant factor. Wind speed, relative humidity and precipitation influence dust dispersion (Oguntoke et al., 2013).

There was seasonal variation in dust fallout rates observed during the months sampled. Higher dust fallout rates were measured in the wet months when compared to the dry months. This is attributed to precipitation removing both wet and dry deposition from the atmosphere (Amodio et al., 2014). Winds in the study area are typically from north to north-east or from south to south-west. Therefore, it was expected that sites situated on the predominant wind vector would have greater dust fallout rates than background sites (Richardson et al., 2010). However, dust fallout rates at these sites were not consistently higher than dust fallout rates at background sites, indicative of additional sources contributing to fugitive dust emission. Other factors influencing dust fallout rates are landfill activities (Jia et al., 2013). Site 1 is located adjacent to an unpaved road which is frequented by heavy-duty vehicles. Entrainment of dust from heavy-duty vehicles is a significant source of deposition at this site.

Dust fallout rates at some sites during specific months monitored showed no relationship to meteorological factors. Some sites experienced a reduction in average dust fallout rate after the Bulbul Drive Landfill closed in 2011.

All sites experienced elevated DFO rates in November 2011, which could be attributed to dust generated during closure activities. The study comprised an extensive period of fallout dust sampling which allowed for an analysis of seasonal variation in fugitive dust emission as well as spatial distribution of dust pollution. Whilst the methodology employed during this study is commonly used to sample fallout dust, there are limitations to its accuracy. When considering the location of the dust buckets in relation to dust generating sources, monitoring sites closer to the fence line on the Bulbul Drive Landfill Site in Umlazi particularly would have been ideal but was not possible due to accessibility of the area and safety issues. The capture efficiency of the system is largely wind dependent; as wind speed increases the efficiency of the sampler decreases. As such, the extent of the impact

of fugitive dust emission could be enhanced using methods that take variability in wind speeds into account (Oguntoke et al., 2013).

5.1.3 Atmospheric deposition of heavy metals

The deposition of heavy metals is governed by the ambient environment (Marrugo-Negrete et al., 2014). Atmospheric emissions from landfill activities represent a pathway for input of heavy metals into the surface environment (Marrugo-Negrete et al., 2014). The WHO (2007) identifies cadmium, lead and mercury as the most common heavy metals that are air pollutants and commonly associated with hazardous waste landfill sites such as the Bulbul Drive Landfill. The focus of this study was on Cr, Cu, Pb, Cd, Co and Zn because of their potential negative impacts on human and environmental health (WHO, 2012). Pb ranks first in terms of toxicity (WHO, 2007). Atmospheric bulk deposition rates greater than 250 $\mu\text{g}/\text{m}^2/\text{day}$ has been associated with an increase in blood lead levels and poses a potential health risk (WHO, 2000).

Passive sampling proved useful in providing information on the influence of the atmospheric content of heavy metals on the surface environment and an indicator of potential contamination on a larger scale. Average concentrations of all metals varied over five orders of magnitude. The most abundant heavy metal was Fe followed by Al. Some metals like Cu and Zn are essential nutrients but they can cause harmful effects depending on their concentrations in the atmosphere (Amodio et al., 2014). Elevated concentrations of Pb at site 1 and site 2 represent a cause for concern as Pb is linked with serious health effects. This was measured during November 2011, the month that the Bulbul Drive Landfill closed.

There was a significant difference in the concentrations of deposition of Zn, Pb, Cd, Co, Cr and Cu in dry deposition while the Bulbul Drive Landfill was still operational when compared to deposition after the landfill closed in November 2011. There was a directional trend with average concentrations of these metals higher at all sites before the closure of the Bulbul Drive Landfill. This could be attributed to increased activity while the landfill was operational.

There was also seasonal variation in the deposition of metals. Higher metal concentrations were measured during the wet months sampled when compared to the dry months. The result is similar to that of Soriano et al. (2012) in Castellano, Spain, where a high seasonal variability in atmospheric metal deposition was demonstrated. There was strong dependence on the rainfall in the study area and the maximum values of metals coincided with the periods of highest rainfall, while the lowest values were generally obtained during periods of low rainfall. Elevated concentrations during wet months could be attributed to the rain scavenging effect as described by (Amodio et al., 2014). However, Melaku et al. (2008) found a decrease in heavy metal concentrations during periods of higher rainfall. Evidently rainfall patterns are a major influence on the deposition of heavy metals in this region.

Direct sampling of atmospherically deposited particulates for determining heavy metal fluxes using passive bulk atmospheric deposition samplers has been conducted in contaminated areas in a number of studies. Mean deposition fluxes for Zn, Pb, Cd, Co, Cr and Co in mg/m²/yr measured at the Bulbul Drive Landfill range from (0.71 – 20.62); (121.72-0.17); (0.03-0.01); (0.02-0.13); (0.16-0.88); (0.45-19.23) at the four monitoring sites respectively. When compared to deposition fluxes of Cd, Cr, Cu, Pb, and in coastal regions as reported by Amodio et al. (2014); the fluxes measured in the region of the Bulbul Drive Landfill are similar to those in Tokyo Bay; Japan, River Seine; France and the Pearl River Delta, all highly industrialised areas. Proximity to industrialised sources was linked to higher mean deposition fluxes of trace metals because larger particles are expected to deposit closer to their source (Amodio et al., 2014). Another factor that influences deposition of metals in the ambient environment is diurnal variations, which was not taken into account in this study. These variations are attributed to vehicular traffic and wind speed variation, where typically higher fluxes occur during the day when compared to those measured at night (Fang et al., 2004).

5.1.3. Recommendations for future ambient monitoring assessments

The passive monitoring of gaseous pollutants and dust in the ambient environment provided a technical measurement of air quality in the region of the Bulbul Drive Landfill. Additional sources of ambient and indoor exposure to air pollution should also be considered should further monitoring be done in the region of Bulbul Drive Landfill. The informal settlements near the Bulbul Drive Landfill burn fuels such as paraffin and wood, which also pose risks to human health and present localised impacts on ambient air quality. A brick manufacturing facility and a panel beating facility could contribute to dust fall and VOC concentrations respectively. Monitoring of emissions and dispersion modelling following the closure of the landfill is recommended particularly because the emissions from a landfill that has been closed are toxic and potentially contribute to global warming (US EPA, 1995).

5.1.4 Summary

H₂S concentrations were measured as a proxy for odour but they were found to be below threshold levels and it is likely that odour issues are attributed to other components of landfill gas. These include benzene, 1, 2, 4-trimethyl-1-ethyl-2-methyl; decane; heptane and tetrachloroethylene benzene, toluene, ethylbenzene, xylene, dichloroethylene, dichloromethane, trichloroethylene, tetrachloroethylene and vinyl chloride (Berger & Mann, 2001). The concentrations of gaseous pollutants did not exceed the relevant ambient air quality standards but cumulative effects and the applicability of averaging times need to be considered further. There was an incidence of non-compliance with the South African National Dust Control Regulation implying that fallout dust in the region of the Bulbul Drive Landfill has a negative impact on ambient air quality. An elemental analysis of dust samples revealed that there is a potential for heavy metal contamination on a larger scale.

5.2. Community perceptions of air quality

The results of the household survey offer a community narrative of air pollution, which is discussed in the section below. This narrative is enhanced by an assessment of the socioeconomic context of the study area; neighbourhood attitudes and perceptions of the Bulbul Drive Landfill.

5.2.1. Demographics

Demographic characteristics in Umlazi and Chatsworth were explored using the household survey. Unemployment was highlighted as an issue in both Chatsworth and Umlazi. The eThekweni IDP (2015/2016) has also acknowledged elevated unemployment rates in the municipality. **The legacy of apartheid's racially based spatial planning policy is reflected in the contemporary racial composition of the two communities.** 92% of respondents surveyed in Umlazi were Black and 86.3% of those surveyed in Chatsworth were Indian. These trends correlate with Census 2011 (Stats SA, 2011).

5.2.2. Neighbourhood attitudes

The attitudes of respondents regarding their respective neighbourhoods shared several commonalities. Most respondents had lived in the region for more than 20 years because they had been relocated to either Umlazi or Chatsworth because of forced removals during the apartheid regime. Positive attributes of their neighbourhood that respondents in both Chatsworth and Umlazi highlighted include friendliness and convenience whilst negative attributes that were common to both communities include poor service delivery and crime. Concerns over air quality were mentioned by a few residents. The Bulbul Drive Landfill was mentioned by Umlazi residents more often than by residents in Chatsworth.

The ability to access healthcare has an influence on the vulnerability of affected communities to air pollution. Responses varied when comparing Umlazi and Chatsworth. Accessing a private doctor was more convenient for respondents in Chatsworth as this facility was only 5-10minutes away as opposed to the 30-40 minutes it took most respondents in Umlazi to reach a hospital of their choice via public transport. Of the respondents who chose to disclose ailments they experienced the most common in Umlazi were high blood pressure, asthma and tuberculosis. In Chatsworth the most common illnesses listed by respondents were asthma; high blood pressure heart problems and sinus allergies. Respiratory conditions such as asthma and tuberculosis are often associated with elevated concentrations of air pollution (WHO, 2015). Political, economic and social processes influence vulnerability of residents to environmental risks such as air pollution (Véron, 2006). Poor service delivery was highlighted as a negative aspect of living in both neighbourhoods. The majority of households in eThekweni Municipality have access to electricity and water and sanitation services. However, there are numerous households in the municipality that do not have access to these services, many of which are located in Umlazi on the borders of the Bulbul Drive landfill.

5.2.3. Perceptions of air pollution

The results of the household survey reveal diverse and complex local understandings of environmental quality in the region of the Bulbul Drive Landfill. It was predicted that odour and dust and poor visibility would be of concern to residents in the region of the Bulbul Drive Landfill. There are many factors that **influence a resident's perception of these facilities** but it appears that proximity plays a major role. The closer the resident is to the facility the more likely it is that they will fear being negatively impacted (Che et al., 2013). This is also related to the aspect of visibility of emission sources. The visibility of a stack from an industry, or a waste cell is often associated with an increase in anxiety and perceived risk to residents.

Residents living near municipal waste disposal sites are confronted with a variety of risk perceptions, the most obvious of which is odour. Odour annoyance is the most directly perceived response from residents living adjacent to landfill sites (Parker et. al, 2002). There is a direct association between proximity and odour annoyance. Most of the respondents surveyed live within a 4 km radius of the Bulbul Drive Landfill Site. Respondents from Umlazi were located in closer proximity to the south eastern edge of the site and somewhat downwind. The results of the survey show that more respondents in Umlazi described odour as an issue in their neighbourhood when compared to respondents in Chatsworth.

There was also a strong temporal difference in the perception of odours. Odours were described as more prevalent in the mornings in Umlazi and the same at all hours of the day in Chatsworth. The persistence of odour in the mornings could be attributed to a more stable atmosphere during this time. The spatial variation in odour perception can be attributed to topography and meteorology as well as seasonal variations in odour prevalence. The respondents in both Umlazi and Chatsworth found odours to be more prevalent in summer which correlates with the findings of Diab & Fouch (1994) during a study which assessed the effects of meteorology on odour prevalence in Durban. This is attributed to higher relative humidity in summer.

Human perception of odour is influenced by a number of factors; these include detectability, or odour threshold, intensity, acceptability and odour quality (Bokowa, 2010). Concentrations below the odour threshold can still be detected by some individuals. Others experience olfactory fatigue, where the individual is accustomed to the odour and is no longer capable of detection. There were several of the same descriptions of odour received from both communities, the most common being that of **"rotting or decomposing waste"**. Some respondents from Chatsworth linked this description to what they termed the **"dump site"**.

There are considerable differences in the perception of dust as an issue when the responses from the two communities are compared. The majority of respondents in Umlazi felt that dust was a problem in their neighbourhood whilst the majority of respondents from Chatsworth felt that dust was not an issue in their neighbourhood. This could be

attributed to additional sources of dust in Umlazi such as unpaved roads in the areas with informal settlements. Residents in Umlazi were also located in closer proximity to the landfill. Some of the respondents, who thought dust was an issue in Umlazi, felt that the dust came from the Bulbul Drive Landfill.

People understand air pollution through everyday experiences (Bickerstaff and Walker, 2003). In Umlazi, the three most common definitions of air pollution were **"dirty air", "causes illnesses" and that they "don't know"**. In Chatsworth, the three most common responses were **"dirty air" "contaminated air" or "don't know"**. The majority of respondents in both communities felt that air pollution had a personal impact on their lives. However, considerably more respondents in Umlazi as opposed to Chatsworth felt that air pollution had an impact on their personal health and wellbeing. In Umlazi, many respondents acknowledged that there were some groups who were more impacted on by air pollution than others whilst this was not the case in Chatsworth where most respondents felt that everyone experienced air pollution in the same way.

Perceptions of air pollution influence the ways in which people apportion blame and dictates their responses to the risk (Bickerstaff & Walker, 2002). The strong feelings around the negative impacts of air pollution did not necessarily translate into any inclination to participate in activities to reduce air pollution in either of the communities sampled. This was despite respondents suggesting that air quality should be a priority of local government. When considering the relationship between perceptions of environmental quality and neighbourhood satisfaction, it appears that air quality issues and the perceived impacts of the Bulbul Drive Landfill do not necessarily inhibit **respondents' satisfaction with their neighbourhood**. In both Chatsworth and Umlazi; respondents who experienced dust, odour and poor visibility as issues and thought that the landfill was a negative presence, also stated that they were happy living in their neighbourhood. As with other environmental risks, concerns over air pollution are weighted according to the seriousness of other risks (Wakefield et al., 2001). Respondents from Umlazi and Chatsworth identified some of these as a high crime rate, poor service delivery and a high unemployment rate.

The age of respondents and the length of time respondents have lived in the neighbourhood is another important factor that influences perceptions of air pollution. The average age of respondents in Umlazi was 47 years and the average age of respondents in Chatsworth is 50 years. Most of these respondents had lived in their respective neighbourhoods for more than twenty years. Older residents are more likely to say that there are improvements of air quality over time as they become more accepting of the status quo. Slum residents in Nairobi living adjacent to industries and waste sites rationalised the levels of environmental quality they experienced and expressed resignation to their condition (Muindi, 2014). Subsequently they also expressed a lack of agency to address air pollution in their communities. This was also reflected in the responses of residents in both Chatsworth and Umlazi.

5.2.4. Perceptions of the Bulbul Drive Landfill

Most respondents perceived the Bulbul Drive Landfill as a negative presence in the community. Almost all respondents were happy that it was closing and they associated the closure with improved health for residents and better air quality. This correlates with a study by Che et al. (2013) where it was found that public opposition to municipal waste disposal sites including landfills and incinerators appears to be growing due to perceived health risks associated with landfills. However, most respondents who felt that the Bulbul Drive Landfill was a negative presence because of health impacts also stated that they were happy living in their neighbourhood. As with concerns over air pollution, this could be attributed to the weighting of concern over the Bulbul Drive Landfill impacts in relation to other issues in the respondent's communities (Wakefield et al., 2001). In addition, a heavy reliance on the media to obtain information on environmental quality in the region may have amplified anxieties over the presence of the Bulbul Drive Landfill (Bickerstaff and Walker, 2001).

There was an awareness of the environmental degradation in the respective neighbourhoods of Umlazi and Chatsworth. However, concerns over environmental risks seemed to have been weighted according to the seriousness of other risks and an emphasis on a sense of belonging to their communities that is cemented by strong relationships with neighbours and family members and participation in community activities.

There were some limitations to conducting the household survey. It would have been useful to conduct the survey at different times of the day to get responses from residents who were in the neighbourhood only in the afternoon or evening due to work commitments. However, this was not possible due to logistics and safety issues. There was a limited response around health related questions as well as questions around income, this could be attributed to the sensitive nature of the topic. Further work should incorporate in depth interviews to explore health issues in the study area further. A study of perceptions of air pollution amongst different neighbourhoods across eThekweni would enable comparison amongst different socio-economic groups.

5.2.5 Summary

The results of the household survey showed that there were diverse and complex perceptions of air pollution amongst the residents of Chatsworth and Umlazi. These perceptions were contextualised within socio-economic and historical factors. The majority of residents surveyed had lived in their respective neighbourhoods for more than twenty years. Their perceptions of air pollution were therefore influenced by the time spent in the area. Most respondents experienced dust, odour and poor visibility but the nature of this experience varied from Chatsworth to Umlazi. The presence of the landfill was acknowledged as a negative aspect of both neighbourhoods and most respondents were happy that the landfill was closing.

5.3. A quantitative and community based analysis of air pollution

The technical measurement of air pollution revealed that ambient air quality in the region of the Bulbul Drive Landfill is negatively impacted by gaseous pollutants and fallout dust. Respondents from Umlazi and Chatsworth living adjacent to the Bulbul Drive Landfill stated that odours and dust were issues for them, which aligns with the ambient air quality assessment. In terms of perceptions of gaseous pollutants most respondents highlighted odour as a nuisance issue and attributed it to decomposing waste. Fallout dust is a nuisance impact in the region of the Bulbul Drive Landfill which the technical assessment confirmed and residents also perceived, particularly in Umlazi. However, knowledge of the potential toxicity associated with pollutants was limited. Environmental concern is often poorly correlated with physical measurements of environmental hazards (Muindi et al., 2014). Residents often weigh risks that are tangible, that they experience with their senses more highly than other risks that are insidious (Wakefield et al., 2001). This disconnect in knowledge might leave some residents vulnerable to impacts if they engage in behaviour that increases their risk of exposure to air pollution (Muindi et al., 2014).

A change in narrative from racially-based apartheid spatial planning to one of redress was associated with a shift in environmental governance (Naiker et al., 2012). However, despite progressive developments in environmental legislation and the eventual closure of the Bulbul Drive Landfill in 2011, the burden of impact in terms of ambient air quality is disproportionately placed on those who are vulnerable and on those who have not contributed directly to the creation of the waste or benefited from its disposal. As observed in Delhi by Véron (2006) and Leonard & Pelling (2010) in the case of the Bisassar Road Landfill which is also located in eThekweni; the burden of air pollution is placed on those who have not contributed to its production.

Most of this waste that was deposited at the Bulbul Drive Landfill was from the industrial and manufacturing sector, but the social and economic gains from this sector did not get channelled into these neighbourhoods. This is evident in the high unemployment rate, lack of service delivery and crime rates voiced by residents. Many of the respondents interviewed in Umlazi did not have formal housing structures, or access to clean sources of energy. A lack of basic services inherently increases their vulnerability to air pollution. Vulnerability to air pollution is closely linked to the socio-economic and political processes at play (Veron, 2006).

5.4. Summary

This chapter comprised a discussion of the results with regards to the aims and objectives of the study and relevant literature. Ambient air quality in the region of the Bulbul Drive Landfill is impacted by fugitive dust emissions, which was shown by a non-compliance with the National Dust Regulation. The presence of odorous compounds was also found to impact on ambient air quality. These compounds were not present in high enough concentrations to result in health impacts but cumulative effects over long periods should be investigated further. Residents in both Chatsworth and Umlazi perceive that the Bulbul Drive Landfill has an impact on their environment and their health and wellbeing. They also have complex experiences of odour, dust and poor visibility. When comparing the results of the ambient air quality assessment and the household survey, the disconnect between perceived risk and measurements was apparent. Most respondents in Chatsworth and Umlazi acknowledged odours and dust as an issue which correlated with the technical measurements. However, their understanding of less tangible types of air pollution such as the atmospheric deposition of metals was limited. This disconnect influences the manner in which residents negotiate environmental risks and could leave them vulnerable to its effects. The combination of data collected using technical scientific measurements of air pollution and a household survey to understand perceptions of air quality, demonstrate the benefits of an interdisciplinary approach.

Chapter 6

6. Conclusions

The aim of this study was to assess air quality in the region of the Bulbul Drive Landfill Site and to determine the potential impact on the neighbouring residential areas of Chatsworth and Umlazi.

Ambient air quality in the region of the Bulbul Drive Landfill is impacted by gaseous pollutants and fugitive dust emissions. Odour in the region of the Bulbul Drive Landfill site is likely to be attributed to compounds other than H₂S present in landfill gas (Nagamori et. al, 2013). VOCs associated with odour impacts include benzene, 1, 2, 4-trimethyl-ethyl-2-methyl; decane; heptane and tetrachloroethylene benzene, toluene, ethylbenzene, xylene, dichloroethylene, dichloromethane, trichloroethylene, tetrachloroethylene and vinyl chloride (Berger and Mann, 2001). These were present in the ambient environment the region of the Bulbul Drive Landfill. These chemicals are not likely to cause long term health effects at levels found in the ambient environment of landfills but they are associated with acute effects such as nausea and headaches.

Concentrations of benzene, toluene, ethylbenzene and xylene; and 1,3-Butadiene were found to be below ambient air quality standards in the region of the Bulbul Drive Landfill, implying that there is no negative impact on human health or the ambient environment. However, while singular compounds were below the ambient air quality standards they were compared to, their potential health impacts cannot be omitted. There were two instances of non-compliance with the national dust fallout regulation and eleven exceedances of the dust fallout limit measured. This implies that fallout dust in the region of the Bulbul Drive Landfill has a negative impact on ambient air quality. There was a significant difference in the concentrations of deposition of Zn, Pb, Cd, Co, Cr and Cu in atmospheric deposition while the Bulbul Drive Landfill was still operational when compared to deposition after the landfill closed in November 2011.

The passive monitoring of gaseous pollutants and dust in the ambient environment provided a technical measurement of air quality in the region of the Bulbul Drive Landfill. However, this provides a limited assessment as the impacts on neighbouring residents cannot be completely based on this data. A community narrative of air pollution, the potential impacts on communities and the health of individuals and the landscape are better understood. The household survey revealed that residents perceive that the Bulbul Drive Landfill has an impact on their environment and their health and wellbeing. Respondents also perceive that air pollution has a negative impact on their health and well-being. The major perceived issue in Umlazi being dust and the major issue in Chatsworth being odour.

A comparison of community perceptions of air quality and technical, scientific measurements of air pollution revealed a disconnect in between the perception of tangible

risks such as odour and dust and the presence of hazardous pollutants such as trace metals in the region of the Bulbul Drive Landfill. This disconnect might result in health impacts on adjacent communities if residents engage in activities that put them at a higher risk of exposure (Muindi et al., 2014).

This study attempted to explore the intersections between ambient air quality, waste management and community perceptions of environmental risk. It presents a departure from typical assessments of air quality, usually conducted by experts who use only technical scientific measurements of risk. For the residents of Chatsworth and Umlazi there is a potential for continued air quality impacts during the closure and rehabilitation processes. Emissions of pollutants from a landfill, be they solid or gaseous in nature, can be produced for 30 – 300 years after a landfill has closed (Ritzkowski et al., 2006). Awareness and education initiatives on air pollution and related health issues are necessary to reduce the impacts on affected residents.

Despite a shift in environmental governance in South Africa and the attempts to address the uneven distribution of environmental risk, air quality management remains a challenge. An interdisciplinary approach is required to address the underlying processes that influence the inequitable distribution of air pollution. There is a challenge to policy makers and practitioners alike, to augment technical measurements with an understanding of the social dimension of air pollution.

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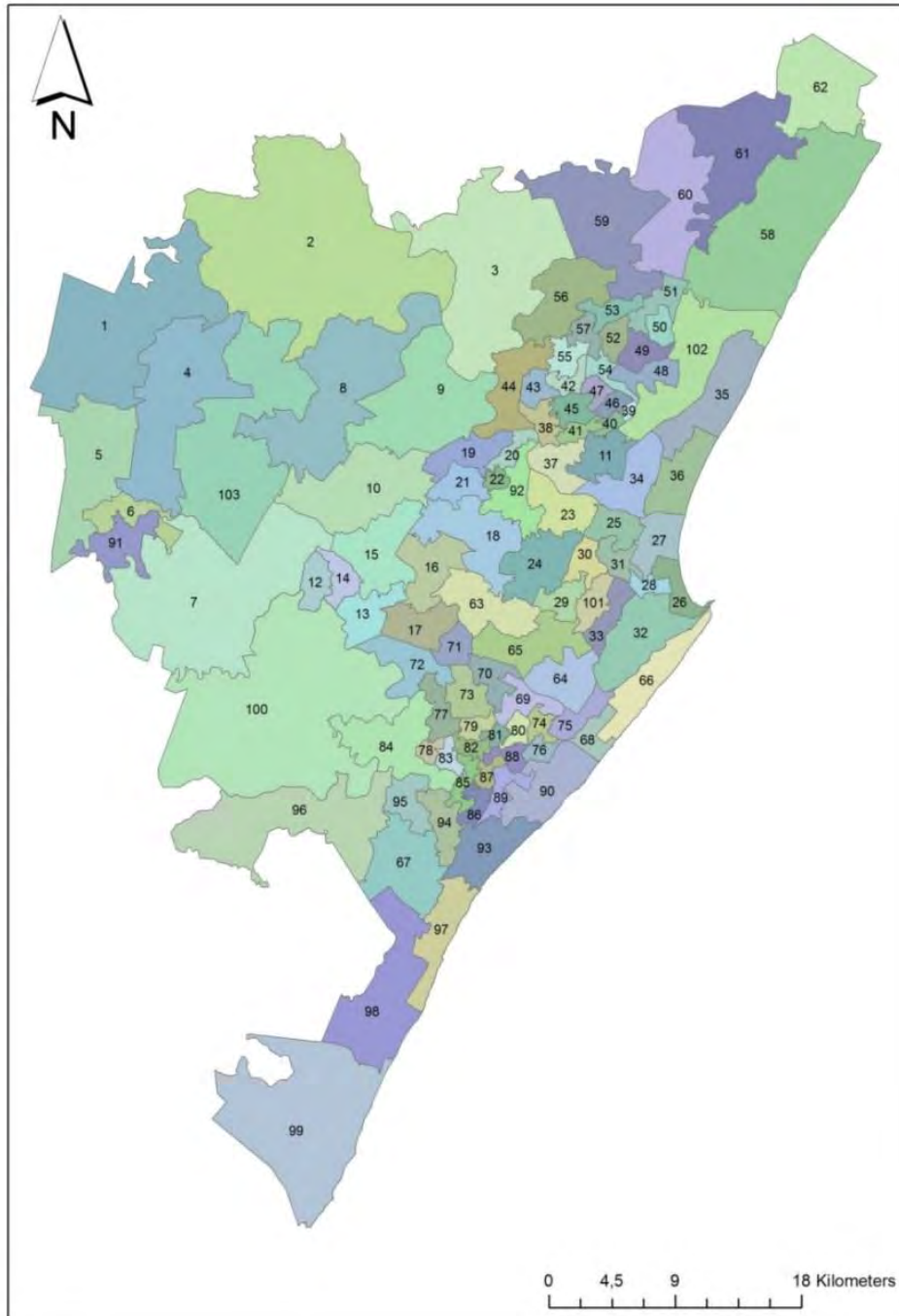
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Appendix



Map of wards in the eThekweni Municipality (eThekweni Corporate GIS, 2015)

A. Particle Size Data

Table A-1 Results of particle size analysis

| SITE | Result Below 10.000 μm | Result Below 2.500 μm | MONTH | ROUND |
|------|-----------------------------------|----------------------------------|--------|-------|
| 1 | 13.345 | 3.59 | May-11 | 1 |
| 2 | 5.871 | 1.308 | May-11 | 2 |
| 8 | 11.694 | 2.647 | May-11 | 1 |
| 9 | 18.022 | 3.813 | May-11 | 1 |
| 10 | 23.453 | 5.144 | May-11 | 1 |
| 3 | 20.378 | 3.836 | Jun-11 | 2 |
| 5 | 17.357 | 3.856 | Jun-11 | 2 |
| 5 | 13.991 | 2.936 | Jun-11 | 2 |
| 5 | 24.644 | 5.366 | Jun-11 | 2 |
| 6 | 13.355 | 3.831 | Jun-11 | 2 |
| 8 | 20.71 | 4.625 | Jun-11 | 2 |
| 9 | 21.304 | 4.587 | Jun-11 | 2 |
| 10 | 23.235 | 4.98 | Jun-11 | 2 |
| 2 | 8.548 | 2.003 | Jul-11 | 3 |
| 3 | 15.355 | 3.386 | Jul-11 | 3 |
| 6 | 21.712 | 4.864 | Jul-11 | 3 |
| 8 | 17.074 | 4.158 | Jul-11 | 3 |
| 9 | 12.387 | 3.193 | Jul-11 | 3 |
| 10 | 19.045 | 4.873 | Jul-11 | 3 |
| 1 | 5.527 | 1.484 | Aug-11 | 4 |
| 2 | 14.093 | 3.472 | Aug-11 | 4 |
| 5 | 14.714 | 3.554 | Aug-11 | 4 |
| 6 | 12.733 | 4.705 | Aug-11 | 4 |
| 6 | 7.238 | 1.999 | Aug-11 | 4 |
| 8 | 6.254 | 2.075 | Aug-11 | 4 |
| 8 | 16.18 | 4.228 | Aug-11 | 4 |
| 9 | 17.554 | 3.046 | Aug-11 | 4 |
| 10 | 20.962 | 4.523 | Aug-11 | 4 |
| 1 | 8.921 | 2.293 | Sep-11 | 5 |
| 2 | 7.879 | 1.667 | Sep-11 | 5 |
| 3 | 14.74 | 3.353 | Sep-11 | 5 |
| 5 | 7.074 | 1.628 | Sep-11 | 5 |
| 6 | 3.247 | 0.276 | Sep-11 | 5 |
| 8 | 6.446 | 1.632 | Sep-11 | 5 |
| 9 | 11.753 | 2.757 | Sep-11 | 5 |
| 10 | 9.897 | 2.238 | Sep-11 | 5 |

| SITE | Result Below 10.000 μm | Result Below 2.500 μm | MONTH | ROUND |
|------|-----------------------------------|----------------------------------|--------|-------|
| 1 | 12.296 | 3.28 | Oct-11 | 6 |
| 2 | 9.76 | 1.932 | Oct-11 | 6 |
| 3 | 12.296 | 2.68 | Oct-11 | 6 |
| 5 | 8.965 | 1.905 | Oct-11 | 6 |
| 6 | 11.495 | 2.299 | Oct-11 | 6 |
| 6 | 13.047 | 2.087 | Oct-11 | 6 |
| 8 | 9.171 | 1.471 | Oct-11 | 6 |
| 9 | 14.129 | 2.694 | Oct-11 | 6 |
| 10 | 14.93 | 2.673 | Oct-11 | 6 |
| 1 | 11.603 | 3.013 | Nov-11 | 7 |
| 2 | 13.07 | 2.296 | Nov-11 | 7 |
| 2 | 14.084 | 2.432 | Nov-11 | 7 |
| 2 | 13.238 | 2.26 | Nov-11 | 7 |
| 3 | 13.003 | 3.073 | Nov-11 | 7 |
| 5 | 8.889 | 1.971 | Nov-11 | 7 |
| 5 | 10.634 | 2.317 | Nov-11 | 7 |
| 5 | 12.924 | 2.789 | Nov-11 | 7 |
| 6 | 6.184 | 1.386 | Nov-11 | 7 |
| 8 | 11.176 | 3.399 | Nov-11 | 7 |
| 9 | 4.6 | 0.582 | Nov-11 | 7 |
| 9 | 6.808 | 1.278 | Nov-11 | 7 |
| 9 | 6.563 | 1.247 | Nov-11 | 7 |
| 10 | 14.642 | 3.592 | Nov-11 | 7 |
| 1 | 14.317 | 2.429 | Dec-11 | 8 |
| 2 | 10.023 | 2.062 | Dec-11 | 8 |
| 3 | 11.984 | 2.471 | Dec-11 | 8 |
| 3 | 8.413 | 1.941 | Dec-11 | 8 |
| 5 | 9.064 | 1.991 | Dec-11 | 8 |
| 5 | 16.473 | 3.901 | Dec-11 | 8 |
| 5 | 18.786 | 4.938 | Dec-11 | 8 |
| 6 | 9.536 | 2.481 | Dec-11 | 8 |
| 8 | 11.789 | 2.315 | Dec-11 | 8 |
| 8 | 12.687 | 2.313 | Dec-11 | 8 |
| 8 | 15.861 | 2.874 | Dec-11 | 8 |
| 9 | 8.165 | 1.774 | Dec-11 | 8 |
| 10 | 16.693 | 4.056 | Dec-11 | 8 |
| 1 | 21.284 | 3.482 | Jan-12 | 9 |
| 2 | 12.008 | 2.591 | Jan-12 | 9 |
| 3 | 6.345 | 1.319 | Jan-12 | 9 |

| SITE | Result Below 10.000 μm | Result Below 2.500 μm | MONTH | ROUND |
|------|-----------------------------------|----------------------------------|--------|-------|
| 5 | 13.407 | 3.682 | Jan-12 | 9 |
| 8 | 8.626 | 2.149 | Jan-12 | 9 |
| 9 | 18.238 | 4.279 | Jan-12 | 9 |
| 10 | 8.161 | 2.083 | Jan-12 | 9 |
| 10 | 16.272 | 4.133 | Jan-12 | 9 |
| 1 | 22.392 | 3.984 | Feb-12 | 10 |
| 2 | 13.687 | 3.308 | Feb-12 | 10 |
| 3 | 13.305 | 3.191 | Feb-12 | 10 |
| 5 | 13.739 | 3.395 | Feb-12 | 10 |
| 5 | 13.09 | 2.845 | Feb-12 | 10 |
| 5 | 3.977 | 0.659 | Feb-12 | 10 |
| 6 | 23.23 | 6.124 | Feb-12 | 10 |
| 8 | 12.306 | 2.954 | Feb-12 | 10 |
| 10 | 9.262 | 1.541 | Feb-12 | 10 |
| 1 | 10.569 | 1.929 | Mar-12 | 11 |
| 3 | 22.924 | 5.379 | Mar-12 | 11 |
| 5 | 15.513 | 3.498 | Mar-12 | 11 |
| 6 | 10.571 | 1.908 | Mar-12 | 11 |
| 6 | 11.146 | 3.254 | Mar-12 | 11 |
| 8 | 18.002 | 3.897 | Mar-12 | 11 |
| 9 | 22.136 | 5.788 | Mar-12 | 11 |
| 10 | 14.344 | 2.881 | Mar-12 | 11 |
| 1 | 12.697 | 3.327 | Apr-12 | 12 |
| 2 | 12.567 | 2.412 | Apr-12 | 12 |
| 3 | 10.442 | 2.655 | Apr-12 | 12 |
| 5 | 19.738 | 4.167 | Apr-12 | 12 |
| 8 | 12.008 | 2.716 | Apr-12 | 12 |
| 9 | 13.075 | 2.491 | Apr-12 | 12 |
| 10 | 13.216 | 3.298 | Apr-12 | 12 |
| 1 | 11.715 | 3.04 | May-12 | 13 |
| 2 | 23.417 | 4.977 | May-12 | 13 |
| 3 | 18.515 | 3.695 | May-12 | 13 |
| 5 | 16.869 | 3.977 | May-12 | 13 |
| 6 | 14.934 | 3.437 | May-12 | 13 |
| 8 | 11.057 | 2.471 | May-12 | 13 |
| 9 | 17.268 | 3.739 | May-12 | 13 |
| 10 | 8.052 | 1.713 | May-12 | 13 |
| 1 | 13.354 | 3.432 | Jun-12 | 14 |
| 2 | 21.133 | 4.836 | Jun-12 | 14 |

| SITE | Result Below 10.000 µm | Result Below 2.500 µm | MONTH | ROUND |
|-------------|-------------------------------|------------------------------|--------------|--------------|
| 3 | 15.895 | 3.544 | Jun-12 | 14 |
| 10 | 24.235 | 5.684 | Jun-12 | 14 |

B. Household survey

B.1. Household survey in English

Household Survey

Date.....

Time:.....

Code:

Dear Resident

I am conducting a household survey in your area as part of a research project at the University of KwaZulu-Natal. My research aims to provide me with a better understanding of resident's concerns in the Silverglen, Umlazi, Bayview, Havenside neighbourhoods. It would be appreciated if you would contribute to my research by answering the following questions. It will not take more than 30 minutes of your time. The information you give will be kept confidential, and where necessary, please feel free to answer 'don't know' or 'not applicable'. If you do not want to participate in the survey, there will be no repercussions for you. Thank you for your participation. Should you have any queries, please feel free to contact me.

Contact details:

Sarisha Perumal 0741210386
Email: sarishaperumal@hotmail.com

Alternative Contact details:

Dr. Lisa Frost Ramsay (Supervisor)
School of Environmental Sciences
University of KwaZulu-Natal
Tel: +27-31-2608140
Fax: +27-31-2607317

I hereby confirm that I understand the contents of this document. I consent to participating in this survey voluntarily. I understand that I can withdraw from the survey at any time.

.....
SIGNATURE OF PARTICIPANT

.....
DATE

SECTION A

1. Residential Area:

- (a) Silverglen (b) Havenside (c) Bayview
(d) Umlazi C- Section (e) Umlazi E- Section

2. Road Name & House number:

3. Number of years you have lived in your home:

- (a) < 1 (b) 1 - 5 (c) 6 - 10 (d) 11 - 20 (e) 20 +

3.1 How many people live in this house? ____

3.1.1 Number of adults ____

3.1.2 Number of children ____

4. What were your reasons for choosing to live in this area?

SECTION B

5. Please list three things that you like about living in your neighbourhood:

- (a) _____
- (b) _____
- (c) _____

6. Please list three things that you dislike about living in your neighbourhood:

- (a) _____
- (b) _____
- (c) _____

7. What is your relationship with your immediate neighbours?

- (a) You talk to them regularly
- (b) You know them but do not talk often
- (c) You haven't met them
- (d) No immediate neighbours
- (e) Other (specify) _____

8. Do you have immediate family (parents, children or grandparents) living in your neighbourhood (other than those living in this household)?

- (a) Yes (b) No

**9. Please tick if you are involved in any of the following community activities:
(You may tick more than one option)**

- (a) Local sports clubs
- (b) Local religious organisations (e.g. churches)
- (c) Local political organisations (e.g. a ratepayer's society)

(d) Local environmental organisations

(f) Not involved in any activities

(f) Other (please specify) _____

10. Do you spend time outdoors exercising?

(a) Yes

(b) No

**11. How would you describe your relationship with the natural environment around you?
(You may tick more than one option)**

(a) I enjoy spending time outside in my garden

(b) I enjoy visiting parks in my neighbourhood

(c) I enjoy the natural scenery of my neighbourhood

(d) I spend most of my time indoors

(e) I don't think about the natural environment much

(f) Other (Please explain) _____

SECTION C

11. Are you happy living in your neighbourhood?

- (a) Yes (b) No

11.1. Please explain why you feel this way.

12. Are you aware of any odours or smells in your neighbourhood currently?

- (a) Yes (b) No

**** If no please skip to question 12.4****

12.1. If yes, at which particular times of the day are these odours/smells stronger or more prevalent?

(You may tick more than one option)

- (a) Morning (b) Afternoon (c) Evening
(d) Night (e) Its the same all the time (f) Don't know

12.2. If yes, describe these odours or smells?

12.3. If yes, what time of year are the odours or smells at their worst?

(You may tick more than one option)

- (a) Spring (b) Summer (c) Autumn
(d) Winter (e) The same all year round (f) Don't know

12.4 Have you been aware of any odours or smells in your neighbourhood in the past?

- (a) Yes (b) No

12.4.1 If yes, describe these odours or smells?

**12.4.2 If yes, what time of the year were these odours or smells at their worst?
(You may tick more than one option)**

- (a) Spring (b) Summer (c) Autumn
(d) Winter (e) The same all year round (f) Don't know

**12.4.3 If yes, at which particular times of the day were these odours or smells stronger or more prevalent?
(You may tick more than one option)**

- (a) Morning (b) Afternoon (c) Evening
(d) Night (e) Its the same all the time (f) Don't know

13. Do you experience haziness, smog or poor visibility in your neighbourhood?

- (a) Yes (b) No

**** If no please skip to question 14****

13.1. If yes, please describe this.

13.2. If yes, are there any particular times in the day do you feel that this haziness, smog or poor visibility is at its worst? (You make tick more than one)

- (a) Morning (b) Afternoon (c) Evening
(d) Night (e) Its the same all day (f) Don't know

13.3. If yes, what time of year is this haziness, smog or poor visibility at its worst? (You may tick more than one)

- (a) Spring (b) Summer (c) Autumn
(d) Winter (e) The same all year round (f) Don't know

13.4. If yes, what do you think causes this haziness, smog or poor visibility?

14. Do you think that dust is a problem in your neighbourhood?

- (a) Yes (b) No

**** If no please skip to question 15****

14.1. If yes, are there any particular times in the day do you feel that dust is at its worst? (you make tick more than one)

- (a) Morning (b) Afternoon (c) Evening (d) Night
(e) Its the same all day (f) Don't know

14.2. If yes, what time of year is dust at its worst ? (you may tick more than one)

- (a) Spring (b) Summer (c) Autumn
(d) Winter (e) The same all year round (f) Don't know

14.3. If yes, where do you think this dust comes from?

15. What does the term ‘Air Pollution’ mean to you?

16. Please indicate the extent to which you agree or disagree with the following statement:

“Air pollution in my neighbourhood has an impact on my health and wellbeing.”

(a) Strongly agree (b) Agree (c) Neutral (d) Disagree

(e) Strongly Disagree

17. Do you feel that there is a group in the community (e.g. a race, gender or age group) that is affected by air pollution more than others in your neighbourhood?

(a) Yes (b) No

17.1. Please explain why you feel this way.

18. Do you think that improving air quality should be a priority of local government in your area?

(a) Strongly agree (b) Agree (c) Neutral (d) Disagree

(e) Strongly Disagree

19. Do you know of any activities to improve air quality in your neighbourhood?

(a) Yes (b) No

20. Would you be interested in participating in any activities to improve air quality in your neighbourhood?

(a) Yes (b) No

SECTION D

21. Do you know that there is a landfill located on Bulbul Drive in Silverglen, Chatsworth?

- (a) Yes (b) No

22. Describe how you feel about living near a landfill.

23. What type of influence do you think the Bulbul drive landfill has on your community?

- (a) Positive (b) Negative (c) Don't know

23.1. Please explain why you feel this way.

24. Do you feel safe in your neighbourhood?

- (a) Yes (b) No (c) Don't know

24.1. Please explain why you feel this way.

25. What is your relationship (if any) with the landfill management (Wasteman)?

- (a) I interact at least once a year with Wasteman personnel
- (b) I interact infrequently (less than once a year) with Wasteman personnel
- (c) I have had no interaction with Wasteman personnel

(d) I have had no interaction with the Wasteman personnel but I know who they are

(e) Other _____

26. If you have interacted with landfill management, these interactions have been:

(a) Positive (b) Negative (c) Sometimes negative, other time's positive

26.1. Please explain why you feel this way.

27. Have you noticed any changes in the way the landfill has been managed in the last five years?

(a) Yes (b) No

27.1. Please explain why you feel this way.

28. Have you noticed any changes to the natural environment surrounding the landfill since you have lived here?

(a) Yes (b) No

28.1. Please explain why you feel this way.

SECTION E

29. Would you like to receive information about air quality in your neighbourhood?

- (a) Yes (b) No

29.1. If yes, please tick how often:

- (a) Only if the air quality will affect my health (b) Everyday (c) Weekly
(d) Other (specify) _____

**30. In your opinion, who is responsible for providing you with air quality information?
(You may tick more than one option)**

- (a) Local authorities (b) Local GP (c) Local hospital (d) Central government
(e) Non Governmental Organizations (f) Industries in your area (g) Don't know (h)
Other (specify) _____

**31. In your opinion which of the following organizations provides you with reliable information?
(You may tick more than one option)**

- (a) Industries (b) Environmental Non Governmental Organizations
(c) Community Groups (d) Government Officials (e) Don't known
(f) None (g) Other (specify) _____

32. Are you aware of any laws protecting your right to a healthy environment?

- (a) Yes (b) No

32.1. If yes, please specify

33. In your opinion do you feel the city addresses your concerns about the environment in your area?

- (a) Yes (b) No

34. How do you feel about the Bulbul Drive landfill closing in the near future?

- (a) I am happy that the landfill is closing
- (b) I am unhappy that the landfill is closing
- (c) It does not really affect my life whether the landfill closes or remains open
- (d) I don't know how I feel about the landfill closure

34.1. Please explain why you feel this way.

SECTION F

35. What is your occupation? _____

36. * Please tick the income category you fall under (on average):**

- (a) = < R1000 (b) R1001 - R10 000 (c) R10 001 - 20 000 (d) R20 001+
- (e) Did not disclose

37. Please state the occupation of your household's main breadwinner _____

38. * Please tick the income category he or she falls under (on average):**

- (a) = < R1000 (b) R1001 - R10 000 (c) R10 001 - 20 000 (d) R20 001+
- (e) Did not disclose

39. Please tick your highest education level achieved:

- (a) Primary school (b) Secondary school
- (c) Tertiary Institution (university, technikon etc) (d) Other (specify) _____

40. Please tick the highest education level achieved of the main breadwinner in your household: (a) Primary

- school (b) Secondary school (c) Tertiary Institution (university, technikon etc) (d) Other (specify) _____

SECTION G

**41. Where do you go when you or someone in your family is ill?
(You may tick more than one option)**

(a) Private Doctor

(b) Clinic

(c) Hospital

(d) Traditional healer

41.1. How do you travel there?

(a) Private Vehicle Bus Taxi Walking Other (specify) _____

(b) Private Vehicle Bus Taxi Walking Other (specify) _____

(c) Private Vehicle Bus Taxi Walking Other (specify) _____

(d) Private Vehicle Bus Taxi Walking Other (specify) _____

41.2. How much of time does it take for you to travel there?

(a) 5- 10 min 11-20 min 21-30 min 31-40 min 41-50 51-60 min > 60 min

(b) 5- 10 min 11-20 min 21-30 min 31-40 min 41-50 51-60 min > 60 min

(c) 5- 10 min 11-20 min 21-30 min 31-40 min 41-50 51-60 min > 60 min

(d) 5- 10 min 11-20 min 21-30 min 31-40 min 41-50 51-60 min > 60 min

42. Please fill in the table below: *** Household member 1 must be interviewee***

| 42.1.1. <i>Household members</i> <i>Mother, father, child etc</i> | 42.1.2. <i>Age</i> | 42.1.3. <i>Sex (M/ F)</i> | 42.1.4. <i>Race</i> | 42.1.5. <i>Smoker? (Y/N)</i> | 42.1.6. <i>Current activity</i> <i>employed/ in school/ retired/ unemployed/ too young for school/ other (specify)</i> |
|---|-----------------------|------------------------------|------------------------|---------------------------------|--|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| | | | | | |

43. Do you or any members of your household suffer from any of these illnesses:

List of health issues: Please fill in the codes of the illnesses in table that follows, and if it is 'other', then specify the illness.

Respiratory illnesses: Asthma (A) Emphysema (B) Tuberculosis (C)

Cardiovascular problems: High Blood Pressure (HBP) (D) Angina (E)

Allergies: Watery eyes (F) Rashes (G) **Chronic illnesses:** example: Cancer (H)

Other (specify) Did not disclose (DND) Not applicable (NA)

*** Household member 1 must be interviewee***

| 43.1. Household member number | 43.2. Illness | 43.3. Is this diagnosed by a doctor? (Y/N) | 43.4. What do you think causes this? | 43.5. How long have you or they experienced these symptoms? (In months or years) | 43.6. Do symptoms of this illness occur Regularly (at least once a month) (Y/N) | 14.2.7. Do symptoms occur Intermittently (at least a couple times a year) (Y/N) |
|--|--------------------------|---|---|--|--|--|
| 1 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 2 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 3 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | | | | | | |
| | | | | | | |
| | d | | | | | |
| 43.1. Household member number | 43.2. Illness | 43.3. Is this diagnosed by a doctor? (Y/N) | 43.4. What do you think causes this? | 43.5. How long have you or they experienced these symptoms? (In months or years) | 43.6. Do symptoms of this illness occur Regularly (at least once a month) (Y/N) | 14.2.7. Do symptoms occur Intermittently (at least a couple times a year) (Y/N) |

| | | | | | | |
|--|--------------------------------|---|---|--|--|--|
| 4 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| 5 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 6 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 7 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 43.1. <i>Household member number</i> | 43.2. <i>Illness</i> | 43.3. <i>Is this diagnosed by a doctor? (Y/N)</i> | 43.4. <i>What do you think causes this?</i> | 43.5. <i>How long have you or they experienced these symptoms? (In months or years)</i> | 43.6. <i>Do symptoms of this illness occur Regularly (at least once a month) (Y/N)</i> | 14.2.7. <i>Do symptoms occur Intermittently (at least a couple times a year) (Y/N)</i> |
| 8 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| 9 | a | | | | | |
| | b | | | | | |

| | | | | | | |
|----|---|--|--|--|--|--|
| | c | | | | | |
| | d | | | | | |
| 10 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |

43. Would you be willing to participate in any follow up surveys/interviews or discussions? (a) Yes (b) No

Contact details: _____

Thank you for your participation!

B.2. Household survey in Zulu

Ucwaningo Ngemizi

Usuku.....

Isikhathi:.....

Ikhodi (Code):

Sawubona Mhlali

Ngenza ucwaningo ngemizi endaweni yangakini njengengxenywe yocwaningo lwe-projekthi yami eUniversity of KwaZulu-Natal. Ucwaningo lwami luhlose lungozisiza ekwazini kangcono izimo zabahlali e-Silverglen, Umlazi, Bayview naseHavenside. Kuyobongeka uma ungase unikele kulolu cwano ngokuthi uphendule le mibuzo elandelayo. Ngeke kukuthathe ngisho imizuzu engu-30 ukwenza lokhu. Ulwazi ozolunikeza luzogcinwa luyimfihlo, uma kunesidingo, unaphendula ngokuthi ‘angazi’ noma ‘okungenzeki’. Uma ungathandi ukubamba iqhaza kulolu cwano, ngeke kube namphumela omubi kuwena. Siyabonga ngokubamba kwakho iqhaza. Ungangithinta uma unemibuzo.

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Ngियाqinisekisa ukuthi ngiyakuqonda okuqukethwe yilo mbhalo. Ngiyavuma ukubamba iqhaza ngaphandle kokubheka inkokhelo. Ngियाqonda ukuthi ngingahoxa noma inini kulolu cwano

Isiginesha Yombambiqhaza

.....

Usuku

.....

ISIGABA A

1. Indawo ohlala kuyona:

- (a) Silverglen (b) Havenside (c) Bayview
(d) Umlazi C- Section (e) Umlazi E- Section

2. Igama lomgwaqo:

3. Iminyaka osuyihlalile kini:

- (a) < 1 (b) 1 - 5 (c) 6 - 10 (d) 11 - 20 (e) 20 +

4. Eziphi izizathu ezenze wakhetha ukuhlala kule ndawo?

ISIGABA B

5. Sicela ubale izinto ezintathu ezenza uthande ukuhlala kule ndawo yangakini:

- (a) _____
- (b) _____
- (c) _____

6. Sicela ubale izinto ezintathu ezenza ungathandi ukuhlala kule ndawo yangakini:

- (a) _____
- (b) _____
- (c) _____ bakho _____

7. Bunjani ubudlelwano nomakhelwano ?

- (a) Uyaxoxa nabo njalo
- (b) Uyabazi kodwa awujwayele ukuxoxa nabo
- (c) Awukaze uhlangane nabo
- (d) Abekho omakhelwane oncikene nabo
- (e) Okunye (chaza) _____

8. Bakhona abomndeni wakho (abazali, izingane noma omkhlu nogogo) abahlala endaweni yangakini (ngaphandle nje kwalaba ohlala nabo ekhaya)?

- (a) Yebo
- (b) Cha

**9. Sicela ubeke uphawu uma uzibandakanya kwezinye zalezi zinto zomphakathi:
(Ungalubeka uphawu ezindaweni ezingaphezu kweyodwa**

- (a) Local sports clubs

(b) Izinhlango zamasono zasendaweni (e.g. amasono)

(c) Izinhlango zombusazwe zasendaweni (e.g. inhlango yabakhokhi bama-rates)

(d) Izinhlango zemvelo zasendaweni

(e) Okunye (sicela uchaze) _____

10. Sikhona isikhathi osisebenzisa ngokujima ngaphandle?

(a) Yebo

(b) Cha

**11. Ungabuchaza kanjani ubudlelwano bakho nemvelo osondelana nayo?
(Ungabeka uphawu ezindaweni ezingaphezu kweyodwa)**

(a) Ngiyathanda ukuhlala engadini yami

(b) Ngiyathanda ukuvakashela amapaki endaweni engihlala kuyona

(c) Ngiyabuthanda ubuhle bemvelo endaweni engihlala kuyo

(d) Isikhathi esiningi ngiba sendlini

(e) Angicabangi kakhulu ngemvelo

(f) Okunye (Sicela uchaze) _____

ISIGABA C

11. Uyajabula ukuhlala kule ndawo ohlala kuyona ?

- (a) Yebo (b) Cha

23.1. Chaza ukuthi yingani usho kanje.

12. Kungabe likhona iphunga endaweni ohlala kuyo?

- (a) Yebo (b) Cha

**12.1. Uma impendulo kungu-yebo, liba likhulu ngaziphi isikhathi leli phunga?
(Ungabeka uphawu ezindaweni ezingaphezu kweyodwa)**

- (a) Ekuseni (b) Ntambama (c) Sekuhlwile (d) Ebusuku
(e) Liyafana zonke isikhathi (f) Angazi

12.2. Uma impendulo yakho kungu-yebo, lichaze leli phunga

13. Kungabe kuye kwenzeke ungaboni kahle ngenxa yokungcola komoya endaweni yangakini ?

- (a) Yebo (b) Cha

13.1. Uma impendulo yakho kungu-yebo, kuchaze lokhu

13.2. Uma impendulo yakho kungu-yebo, kungabe kukhona izikhathi ezithile osukwini lapho lokungaboni kahle ngenxa yokungcola komoya kuba kubi kakhulu? (Ungafaka uphawu ezindaweni ezingaphezu kweyodwa)

- (a) Ekuseni (b) Ntambama (c) Sekuhlwile

(d) Ebusuku

(e) Kuyafana lonke usuku

(f) Angazi

**13.3. Uma impendulo yakho kungu-yebo, esiphi isikhathi sonyaka lapho lokungaboni kahle ngenxa yokungcola komoya kuba kubi kakhulu?
(Ungabeka uphawu ezindaweni ezingaphezu kweyodwa)**

(a) Entwasahlobo

(b) Ehlobo

(c) Ekwindla

(d) Ebusika

(e) Kuyafana wonke unyaka

(f) Angazi

13.4. Uma impendulo yakho kungu-yebo, ucabanga ukuthi kudalwa yini lokungaboni kahle?

14. Kungabe uthuli luyinkinga endaweni ohlala kuyona?

(a) Yebo (b) Cha

**14.1. Uma impendulo yakho kungu-yebo, kungabe sikhona isikhathi lapho ucabanga ukuthi lolu thuli luningi kakhulu?
(Ungabeka uphawu ezindaweni ezingaphezu kweyodwa)**

(a) Ekuseni

(b) Ntambama

(c) Sekuhlwile

(d) Ebusuku

(e) Kuyafana lonke usuku

(f) Angazi

**14.2. Uma impendulo yakho kungu-yebo, esiphi isikhathi sonyaka lapho lusuke ludlange kakhulu ?
(Ungabeka uphawu ezindaweni ezingaphezu kweyodwa)**

(a) Entwasahlobo

(b) Ehlobo

(c) Ekwindla

(d) Ebusika

(e) Kuyafana wonke unyaka

(f) Angazi

14.3. Uma impendulo yakho kungu-yebo, ucabanga ukuthi yini edala lolu thuli?

**15. Ungalichaza kanjani izinga lomoya kulezi zindawo ezibhalwe ngezansi?
Faka uphawu olufanele endaweni ngayinye.**

| Indawo | Kubi kakhulu | Kubi | Kungeconywa | Kuhle | Kuhle kakhulu | Angazi |
|----------------------------------|--------------|------|-------------|-------|---------------|--------|
| Indawo yakho (ohlala Kuyona) | | | | | | |
| Endaweni yangakini | | | | | | |
| I-Ningizimu yonkana yeTheku | | | | | | |
| ITheku njengedolobha | | | | | | |
| I-KwaZulu-Natal njengesifundazwe | | | | | | |
| I-Ningizimu Africa njengeZwe | | | | | | |

16. Beka uphawu uveze ukuthi uvuma noma awuvumi kangakanani kulokhu okungezansi:

Ukungcola komoya endaweni yangakithi kunomthelela empilweni yami.

(a) Ngivuma kakhulu (b) Ngiyavuma (c) Ngiphakathi nendawo

(d) Angivumi (e) Angivumi kakhulu

17. Kungabe ukholwa ukuthi ingxenye yomphakathi (isibonelo, ngokwebala, ngokobulili noma ngokobudala) abathinteka kakhulu ngokungcola komoya endaweni yangakini?

(a) Yebo (b) Cha

17.1. Sicela uchaze ukuthi kungani ubona noma uphendula kanje.

18. Ucabanga ukuthi ukuhlaza umoya kufanele kube yinto ephambili kuhulumeni basekhaya endaweni yangakini?

(a) Ngivuma kakhulu (b) Ngiyavuma (c) Ngiphakathi nendawo

(d) Angivumi (e) Angivumi kakhulu

19. Kungabe ikhona imizamo yokwenza ngcono izinga lomoya endaweni yangakini?

(a) Yebo

(b) Cha

20. Ungathanda ukuzibandakanya nemizamo yokwenza ngcono izinga lomoya endaweni yangakini?

(a) Yebo

(b) Cha

ISIGABA D

21. Kungabe uyazi ngendawo yokulahla imfucuzwa eku-Bulbul Drive eSilverglen, eChatsworth?

(a) Yebo (b) Cha

22. Chaza ukuthi kukuphatha kanjani ukuhlala eduze kwendawo elahla imfucuzwa.

23. Ucabanga ukuthi inomthelela onjani emphakathini wakho le ndawo yemfucuzwa esemgwaqweni uBulbul ?

(a) Umthelela omuhle (b) Umthelela ongemuhle (c) Angazi

23.1. Sicela uchaze ukuthi kungani usho kanje.

24. Uma ubuka, kungabe le ndawo yemfucuzwa inomthelela ekuphepheni kwakho?

(a) Yebo (b) Cha (c) Angazi

24.1. Uma impendulo yakho kungu-yebo, sicela uchaze ukuthi ibe nomthelela onjani ekuphepheni kwakho.

25. Bunjani ubudlelwano bakho (uma bukhona) nabaphethe indawo yokulahla imfucuzwa?

(a) Ngiyaxhumana cishe kanye ngonyaka nezisebenzi zakwa-Wasteman

(b) Ngixhumana kancane kakhulu nezisebenzi zakwa-Wasteman

(c) Angixhumani nezisebenzi zakwa-Wasteman

26. Uma usuke waxhumana nabaphathi bendawo yokulahla imfucuzo, lokhu kuxhumana kube:

(a) Kube kuhle

(b) Akubanga kuhle

(c) Kwesinye isikhathi bekungekuhle,

kwesinye isikhathi kukuhle

26.1. Sicela uchaze ukuthi kungani usho kanje.

27 Usuke waluqaphela ushintsho endleleni okuphethwe ngayo indawo yokulahla imfucuzo kule minyaka embalwa edlulile?

(a) Yebo

(b) Cha

27.1. Sicela uchaze ukuthi kungani usho kanje.

28 Usuke waluqaphela ushintsho kwimvelo eseduze nalapho kulahlwa khona imfucuzo kule minyaka embalwa edlulile?

(a) Yebo

(b) Cha

28.1 Sicela uchaze ukuthi kungani usho kanje.

ISIGABA E

29. Ungathanda ukuthunyelelwa ulwazi mayelana nezinga (ukuhlanzeka /ukungahlanzeki) komoya endaweni yangakini?

- (a) Yebo (b) Cha

29.1. Uma impendulo yakho kungu-yebo, beka uphawu ukuthi kwenzeka nini:

- (a) Uma-nje izinga lokuhlanzeka/lokungahlanzeki komoya lizothikameza impilo yami (b) Nsukuzonke
(c) Masonto onke (d) Okunye (chaza) _____

30. Ngowakho umbono, ubani okufanele aninikeze ngolwazi mayelana nezinga lokuhlanzeka/lokungahlanzeki komoya?

(Ungabeka uphawu ezindaweni ezingaphezu kweyodwa)

- (a) Ohulumeni basekhaya (b) Udokotela wendawo (c) Isibhedlela sendawo (d) Uhulumeni kazwelonke
(e) Izinhlango ezingekho ngaphansi kwahulumeni (f) Izimboni ezisendaweni
(g) Angazi (h) Okunye (chaza) _____

31. Ngowakho umbono, eziphi kulezi zihlangano ezingezansi ezikunikeza ulwazi oluthembekile?

(Ungabeka uphawu ezindaweni ezingaphezu kweyodwa)

- (a) Izimboni (b) Izinhlango zemvelo ezingekho ngaphansi kwahulumeni
(c) Ama-Groups omphakathi (d) Izikhulu zikahulumeni (e) Angazi
(f) Akukho neyodwa (g) Okunye (chaza) _____

32. Kungabe uyazi ngemithetho evikele ilungelo lakho lokuphila endaweni enempilo?

- (a) Yebo (b) Cha

32.1. . Uma impendulo yakho kungu-yebo, sicela uchaze.

33. Ngowakho umbono, ucabanga ukuthi idolobha liyabhekana nezinkinga zakho eziqondene nemvelo endaweni yangakini?

- (a) Yebo (b) Cha

34. Uzizwa unjani njengoba indawo yokulahla imfucuzwa eku-Bulbul Drive izovalwa esikhathini esincane esizayo ?

- (a) Ngiyajabula ukuthi le ndawo yokulahla imfucuzwa izovalwa
- (b)) Angijabuli ukuthi le ndawo yokulahla imfucuzwa izovalwa
- (c) Akunamthelela empilweni yami noma ngabe le ndawo iyavalwa noma iyekwa isebenza
- (d) Angizazi ukuthi ngiphatheke kanjani ngokuvalwa kwayo

34.1. Sicela uchaze ukuthi kungani uphatheke kanje.

ISIGABA F

35. Usebeznaphi? _____

36. * Beka uphawu ngezanga lomholo wakho :**

- (a) = < R1000 (b) R1001 - R10 000 (c) R10 001 - 20 000 (d) R20 001+
- (e) Akadalulanga

37. Usebenzaphi owondlayo ekhaya _____

38. *Beka uphawu ngezanga lomholo wakhe :**

- (a) = < R1000 (b) R1001 - R10 000 (c) R10 001 - 20 000 (d) R20 001+
- (e) Akadalulanga

39. Beka uphawu ezingeni lemfundo ofinyelele kulona:

- (a) Isikole sebanga eliphansi (b) Isikole sezinga eliphezulu
(c) Isikhungo semfundo ephakeme (university, technikon etc) (d) Okunye (chaza) _____

- 40. Ufinyelele kweliphi izinga lemfundo owondlayo ekhaya:** (a)) Isikole sebanga eliphansi (b) Isikole sezinga eliphezulu (c)) Isikhungo semfundo ephakeme (university, technikon etc) (d) Okunye (chaza) _____

ISIGABA G

41. Uma wena noma omunye emndenini egula niya kuphi? (Ungabeka uphawu ezindaweni ezingaphezu kweyodwa)

(a) Kudokotela ozimele

(b) Eklinikhi

(c) Esibhedlela

(d) Kolapha ngamakhambi esintu

41.1 Niya kanjani lapho?

(a) Imoto encane Ibhasi Itekisi Nihamba ngezinyawo Okunye (chaza) _____

(b) Imoto encane Ibhasi Itekisi Nihamba ngezinyawo Okunye (chaza) _____

(c) Imoto encane Ibhasi Itekisi Nihamba ngezinyawo Okunye (chaza) _____

(d) Imoto encane Ibhasi Itekisi Nihamba ngezinyawo Okunye (chaza) _____

41.2. Kunithatha isikhathi esingakanani ukufika khona?

(a) 5- 10 min 11-20 min 21-30 min 31-40 min 41-50 51-60 min > 60 min

(b) 5- 10 min 11-20 min 21-30 min 31-40 min 41-50 51-60 min > 60 min

(c) 5- 10 min 11-20 min 21-30 min 31-40 min 41-50 51-60 min > 60 min

(d) 5- 10 min 11-20 min 21-30 min 31-40 min 41-50 51-60 min > 60 min

42.Sicela ugcwalise lokhu okungezansi :

| 14.1.1. <i>Amalunga omndeni</i> <i>Umama,ubaba, ingane etc</i> | 14.1.2. <i>Ubudala</i> | 14.1.3. <i>Ubulili (M/ F)</i> | 14.1.4. <i>Ibala</i> | 14.1.5. <i>Uyabhema? (Yebo/Cha)</i> | 14.1.6. <i>Okwenzayo njengamanje uyasebenza/ usesikoleni/ uthathe umhlalaphansi/awusebenzi/usemncane kakhulu ukuthi ungaya esikoleni/okunye (chaza)</i> |
|--|---------------------------|----------------------------------|-------------------------|--|--|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |

Kufanele kuxoxwe nelunga lomndeni eliwu nombolo 1

Uhlu lwezifo: Sicela ugcwalise ngokwamakhodi (code) izifo kuleli shadi elilandelayo, uma ‘kungesinye isfo’, kufanele uchaze isifo.

Izinkinga ngokuphefumula: Isifuba somoya(A) I-Emphysema (B) Isifuba sephepha (C)

Izinkinga zenhliziyo: I-High Blood Pressure (HBP) (D) I-Angina (E)

Izinto ezikuphatha kabi: Amehlo akhala izinyembezi (F) Isihlungu / Ukuqubuka (G)

Izifo ezingalapheki: isibonelo: umdlavuza (H)

Okunye (chaza) Akadalulanga (DND) Okungenzeki (NA)

42.1 *** Kufanele uxoxwe nelunga lomndeni eliwu nombolo 1 ***

| 14.2.1. Inamba ngokwelunga lomndeni | 14.2.2. Uhlobo lwesifo | 14.2.3. Kungabe le sifo sihlolwe ngudokotela? (Yebo/Cha) | 14.2.4. Ucabnga ukuthi sibangwa yini lesi sifo? | 14.2.5. Singakanani isikhathi ubone noma bebone lezi zimpawu? (Izinyanga noma iminyaka) | 14.2.6. Kungabe izimpawu zalo kugula ziba khona njalo (cishe kanye ngonyaka (Yebo/Cha) | 14.2.7. Kungabe lezi zimpawu ziba khona kaningana (mhlawumbe kuba izikhashana onyakeni (Yebo/Cha) |
|--|-----------------------------------|---|--|--|---|--|
| 1 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 2 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 3 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 4 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 5 | a | | | | | |
| | b | | | | | |
| | c | | | | | |

| | | | | | | |
|----|---|--|--|--|--|--|
| | d | | | | | |
| 6 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 7 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 8 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 9 | a | | | | | |
| | b | | | | | |
| | c | | | | | |
| | d | | | | | |
| 10 | a | | | | | |
| | b | | | | | |

43. Usengathanda ukubamba iqhaza kolunye ucwaningo / ingxoxo engalandela lena? (a) Yebo

(b) Cha

Ezokuxhumana: _____ Siyabonga ngokubamba kwakho
iqhaza

B.3. Results of the household survey: Frequency Tables

B.3.1. Demographics

Umlazi

Please tick the income category you fall under (on average)^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------------|-----------|---------|---------------|--------------------|
| Valid = < R1000 | 10 | 11.4 | 11.4 | 11.4 |
| R1001 - R10 000 | 14 | 15.9 | 15.9 | 27.3 |
| R10 001 - R 20 000 | 3 | 3.4 | 3.4 | 30.7 |
| did not disclose | 61 | 69.3 | 69.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Please tick your highest education level achieved^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid primary school | 5 | 5.7 | 5.7 | 5.7 |
| secondary school | 64 | 72.7 | 72.7 | 78.4 |
| tertiary institution (university,technikon etc) | 16 | 18.2 | 18.2 | 96.6 |
| no answer | 2 | 2.3 | 2.3 | 98.9 |
| no education at all | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Sex of household member 1^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------|-----------|---------|---------------|--------------------|
| Valid | 5 | 5.7 | 5.7 | 5.7 |
| female | 50 | 56.8 | 56.8 | 62.5 |
| male | 33 | 37.5 | 37.5 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Race of household member 1^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------|-----------|---------|---------------|--------------------|
| Valid | 4 | 4.5 | 4.5 | 4.5 |
| black | 81 | 92.0 | 92.0 | 96.6 |
| indian | 3 | 3.4 | 3.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Current activity of household member 1^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|-----------|---------|---------------|--------------------|
| Valid employed | 24 | 27.3 | 27.3 | 27.3 |
| unemployed | 38 | 43.2 | 43.2 | 70.5 |
| student | 3 | 3.4 | 3.4 | 73.9 |
| pensioner | 18 | 20.5 | 20.5 | 94.3 |
| did not disclose | 5 | 5.7 | 5.7 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Chatsworth

Please tick the income category you fall under (on average)^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------------|-----------|---------|---------------|--------------------|
| Valid = < R1000 | 7 | 8.9 | 8.9 | 8.9 |
| R1001 - R10 000 | 16 | 20.3 | 20.3 | 29.1 |
| R10 001 - R 20 000 | 5 | 6.3 | 6.3 | 35.4 |
| R20 000+ | 2 | 2.5 | 2.5 | 38.0 |
| did not disclose | 49 | 62.0 | 62.0 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

Please tick your highest education level achieved^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--|-----------|---------|---------------|--------------------|
| Valid | primary school | 6 | 7.6 | 7.6 | 7.6 |
| | secondary school | 42 | 53.2 | 53.2 | 60.8 |
| | tertiary institution (university,technikon etc) | 27 | 34.2 | 34.2 | 94.9 |
| | no answer | 4 | 5.1 | 5.1 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

Sex of household member 1^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--------|-----------|---------|---------------|--------------------|
| Valid | female | 35 | 44.3 | 44.3 | 44.3 |
| | male | 44 | 55.7 | 55.7 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

Race of household member 1^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|------------------|-----------|---------|---------------|--------------------|
| Valid | black | 10 | 12.7 | 12.7 | 12.7 |
| | indian | 63 | 79.7 | 79.7 | 92.4 |
| | did not disclose | 5 | 6.3 | 6.3 | 98.7 |
| | asian | 1 | 1.3 | 1.3 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

Current activity of household member 1^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|-----------|---------|---------------|--------------------|
| Valid employed | 22 | 27.8 | 27.8 | 27.8 |
| unemployed | 24 | 30.4 | 30.4 | 58.2 |
| student | 1 | 1.3 | 1.3 | 59.5 |
| pensioner | 10 | 12.7 | 12.7 | 72.2 |
| did not disclose | 1 | 1.3 | 1.3 | 73.4 |
| employed | 7 | 8.9 | 8.9 | 82.3 |
| pensioner | 2 | 2.5 | 2.5 | 84.8 |
| retired | 1 | 1.3 | 1.3 | 86.1 |
| student | 2 | 2.5 | 2.5 | 88.6 |
| unemployed | 9 | 11.4 | 11.4 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

B.3.2. Neighbourhood Attitudes

Umlazi

Number of years you have lived in your home^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid <1 | 1 | 1.1 | 1.1 | 1.1 |
| 1-5 | 11 | 12.5 | 12.5 | 13.6 |
| 6-10 | 8 | 9.1 | 9.1 | 22.7 |
| 11-20 | 9 | 10.2 | 10.2 | 33.0 |
| 20+ | 59 | 67.0 | 67.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

How many people live in this house^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | 2 | 10 | 11.4 | 11.4 | 11.4 |
| | 3 | 5 | 5.7 | 5.7 | 17.0 |
| | 4 | 7 | 8.0 | 8.0 | 25.0 |
| | 5 | 16 | 18.2 | 18.2 | 43.2 |
| | 6 | 12 | 13.6 | 13.6 | 56.8 |
| | 7 | 10 | 11.4 | 11.4 | 68.2 |
| | 8 | 12 | 13.6 | 13.6 | 81.8 |
| | 9 | 5 | 5.7 | 5.7 | 87.5 |
| | 10 | 3 | 3.4 | 3.4 | 90.9 |
| | 11 | 2 | 2.3 | 2.3 | 93.2 |
| | 12 | 2 | 2.3 | 2.3 | 95.5 |
| | 14 | 1 | 1.1 | 1.1 | 96.6 |
| | 16 | 1 | 1.1 | 1.1 | 97.7 |
| | 24 | 1 | 1.1 | 1.1 | 98.9 |
| | 30 | 1 | 1.1 | 1.1 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

Number of adults^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | 1 | 8 | 9.1 | 9.1 | 9.1 |
| | 2 | 27 | 30.7 | 30.7 | 39.8 |
| | 3 | 13 | 14.8 | 14.8 | 54.5 |
| | 4 | 15 | 17.0 | 17.0 | 71.6 |
| | 5 | 15 | 17.0 | 17.0 | 88.6 |
| | 6 | 6 | 6.8 | 6.8 | 95.5 |
| | 7 | 1 | 1.1 | 1.1 | 96.6 |
| | 9 | 1 | 1.1 | 1.1 | 97.7 |
| | 10 | 1 | 1.1 | 1.1 | 98.9 |
| | 12 | 1 | 1.1 | 1.1 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

Number of children^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | 0 | 18 | 20.5 | 20.5 | 20.5 |
| | 1 | 10 | 11.4 | 11.4 | 31.8 |
| | 2 | 14 | 15.9 | 15.9 | 47.7 |
| | 3 | 14 | 15.9 | 15.9 | 63.6 |
| | 4 | 14 | 15.9 | 15.9 | 79.5 |
| | 5 | 6 | 6.8 | 6.8 | 86.4 |
| | 6 | 5 | 5.7 | 5.7 | 92.0 |
| | 7 | 4 | 4.5 | 4.5 | 96.6 |
| | 9 | 1 | 1.1 | 1.1 | 97.7 |
| | 13 | 1 | 1.1 | 1.1 | 98.9 |
| | 24 | 1 | 1.1 | 1.1 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

Reasons for choosing to live in this area^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--|-----------|---------|---------------|--------------------|
| Valid | no answer | 4 | 4.5 | 4.5 | 4.5 |
| | born here | 14 | 15.9 | 15.9 | 20.5 |
| | family ties to the area | 18 | 20.5 | 20.5 | 40.9 |
| | inherited the property | 1 | 1.1 | 1.1 | 42.0 |
| | at home here | 1 | 1.1 | 1.1 | 43.2 |
| | we are looking for another place to live | 1 | 1.1 | 1.1 | 44.3 |
| | don't know | 5 | 5.7 | 5.7 | 50.0 |
| | relocated because of apartheid | 19 | 21.6 | 21.6 | 71.6 |
| | no specific reason | 1 | 1.1 | 1.1 | 72.7 |
| | economic reasons | 12 | 13.6 | 13.6 | 86.4 |
| | no other choice | 5 | 5.7 | 5.7 | 92.0 |
| | convenient location | 7 | 8.0 | 8.0 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

Three things you like about living in this area^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|---------------------------|-----------|---------|---------------|-----------------------|
| Valid | no answer | 12 | 13.6 | 13.6 | 13.6 |
| | near hospitals | 2 | 2.3 | 2.3 | 15.9 |
| | convenient | 15 | 17.0 | 17.0 | 33.0 |
| | religious community | 1 | 1.1 | 1.1 | 34.1 |
| | water | 1 | 1.1 | 1.1 | 35.2 |
| | born here | 2 | 2.3 | 2.3 | 37.5 |
| | easier to find a job here | 1 | 1.1 | 1.1 | 38.6 |
| | nothing | 9 | 10.2 | 10.2 | 48.9 |
| | it is home | 2 | 2.3 | 2.3 | 51.1 |
| | don't know | 4 | 4.5 | 4.5 | 55.7 |
| | friendly neighbourhood | 11 | 12.5 | 12.5 | 68.2 |
| | quiet area | 8 | 9.1 | 9.1 | 77.3 |
| | safe area | 4 | 4.5 | 4.5 | 81.8 |
| | good place to live | 12 | 13.6 | 13.6 | 95.5 |
| | near schools | 4 | 4.5 | 4.5 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

Three things you like about living in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------------|-----------|---------|---------------|--------------------|
| Valid | 1 | 1.1 | 1.1 | 1.1 |
| no answer | 44 | 50.0 | 50.0 | 51.1 |
| service provision | 4 | 4.5 | 4.5 | 55.7 |
| near hospitals | 1 | 1.1 | 1.1 | 56.8 |
| convenient | 6 | 6.8 | 6.8 | 63.6 |
| electricity | 2 | 2.3 | 2.3 | 65.9 |
| easier to find a job here | 1 | 1.1 | 1.1 | 67.0 |
| nothing | 2 | 2.3 | 2.3 | 69.3 |
| don't know | 3 | 3.4 | 3.4 | 72.7 |
| friendly neighbourhood | 6 | 6.8 | 6.8 | 79.5 |
| quiet area | 3 | 3.4 | 3.4 | 83.0 |
| safe area | 6 | 6.8 | 6.8 | 89.8 |
| near schools | 5 | 5.7 | 5.7 | 95.5 |
| near shops | 4 | 4.5 | 4.5 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Three things you like about living in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------|-----------|---------|---------------|--------------------|
| Valid | | | | |
| no answer | 60 | 68.2 | 68.2 | 68.2 |
| service provision | 2 | 2.3 | 2.3 | 70.5 |
| convenient | 5 | 5.7 | 5.7 | 76.1 |
| water | 1 | 1.1 | 1.1 | 77.3 |
| government housing | 1 | 1.1 | 1.1 | 78.4 |
| nothing | 2 | 2.3 | 2.3 | 80.7 |
| don't know | 7 | 8.0 | 8.0 | 88.6 |
| friendly neighbourhood | 3 | 3.4 | 3.4 | 92.0 |
| quiet area | 2 | 2.3 | 2.3 | 94.3 |
| near schools | 2 | 2.3 | 2.3 | 96.6 |
| near shops | 3 | 3.4 | 3.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Three things you dislike about living in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid no answer | 16 | 18.2 | 18.2 | 18.2 |
| landfill near neighbourhood | 4 | 4.5 | 4.5 | 22.7 |
| water pollution | 1 | 1.1 | 1.1 | 23.9 |
| problems with neighbours | 1 | 1.1 | 1.1 | 25.0 |
| poverty and unemployment | 1 | 1.1 | 1.1 | 26.1 |
| no water | 1 | 1.1 | 1.1 | 27.3 |
| noisy | 3 | 3.4 | 3.4 | 30.7 |
| the area smells | 1 | 1.1 | 1.1 | 31.8 |
| rubbish is not collected, waste is left strewn in the streets | 1 | 1.1 | 1.1 | 33.0 |
| no RDP houses | 2 | 2.3 | 2.3 | 35.2 |
| the area smells because of the landfill | 4 | 4.5 | 4.5 | 39.8 |
| don't know | 3 | 3.4 | 3.4 | 43.2 |
| nothing | 9 | 10.2 | 10.2 | 53.4 |
| crime | 24 | 27.3 | 27.3 | 80.7 |
| drug and alcohol abuse | 3 | 3.4 | 3.4 | 84.1 |
| poor service delivery | 14 | 15.9 | 15.9 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Three things you dislike about living in this area^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--|-----------|---------|---------------|-----------------------|
| Valid | no answer | 53 | 60.2 | 60.2 | 60.2 |
| | landfill near neighbourhood | 2 | 2.3 | 2.3 | 62.5 |
| | water pollution | 1 | 1.1 | 1.1 | 63.6 |
| | problems with neighbours | 2 | 2.3 | 2.3 | 65.9 |
| | poverty and unemployment | 3 | 3.4 | 3.4 | 69.3 |
| | lack of government housing | 1 | 1.1 | 1.1 | 70.5 |
| | no sanitation | 2 | 2.3 | 2.3 | 72.7 |
| | noisy | 4 | 4.5 | 4.5 | 77.3 |
| | nearbye forests are being destroyed by people | 1 | 1.1 | 1.1 | 78.4 |
| | the area smells | 2 | 2.3 | 2.3 | 80.7 |
| | don't know | 3 | 3.4 | 3.4 | 84.1 |
| | nothing | 1 | 1.1 | 1.1 | 85.2 |
| | problems with local authorities | 1 | 1.1 | 1.1 | 86.4 |
| | crime | 5 | 5.7 | 5.7 | 92.0 |
| | drug and alcohol abuse | 2 | 2.3 | 2.3 | 94.3 |
| | lack of public transport | 1 | 1.1 | 1.1 | 95.5 |
| | poor service delivery | 4 | 4.5 | 4.5 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

Three things you dislike about living in this area^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|---|-----------|---------|---------------|--------------------|
| Valid | no answer | 66 | 75.0 | 75.0 | 75.0 |
| | landfill near neighbourhood | 1 | 1.1 | 1.1 | 76.1 |
| | air pollution | 1 | 1.1 | 1.1 | 77.3 |
| | lack of government housing | 1 | 1.1 | 1.1 | 78.4 |
| | noisy | 2 | 2.3 | 2.3 | 80.7 |
| | the area smells | 2 | 2.3 | 2.3 | 83.0 |
| | rubbish is not collected, waste is left strewn in the streets | 2 | 2.3 | 2.3 | 85.2 |
| | no RDP houses | 1 | 1.1 | 1.1 | 86.4 |
| | don't know | 5 | 5.7 | 5.7 | 92.0 |
| | nothing | 1 | 1.1 | 1.1 | 93.2 |
| | crime | 1 | 1.1 | 1.1 | 94.3 |
| | far away from schools and amenities etc | 2 | 2.3 | 2.3 | 96.6 |
| | poor service delivery | 3 | 3.4 | 3.4 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

What is your relationship with your immediate neighbours^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--|-----------|---------|---------------|--------------------|
| Valid | you talk to them regularly | 82 | 93.2 | 93.2 | 93.2 |
| | you know them but do not talk often | 6 | 6.8 | 6.8 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

Do you have immediate family living in your neighbourhood^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | yes | 48 | 54.5 | 54.5 | 54.5 |
| | no | 40 | 45.5 | 45.5 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

Are you involved in any community activities^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------------------------------|-----------|---------|---------------|--------------------|
| Valid | local sports club | 12 | 13.6 | 13.6 | 13.6 |
| | local religious organisations | 51 | 58.0 | 58.0 | 71.6 |
| | local political organisations | 7 | 8.0 | 8.0 | 79.5 |
| | local environmental organisations | 1 | 1.1 | 1.1 | 80.7 |
| | not involved in any activities | 15 | 17.0 | 17.0 | 97.7 |
| | scrap yard | 1 | 1.1 | 1.1 | 98.9 |
| | educational activities | 1 | 1.1 | 1.1 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

Do you spend time outdoors exercising^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | yes | 39 | 44.3 | 44.3 | 44.3 |
| | no | 49 | 55.7 | 55.7 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

How would you describe your relationship with your natural environment around you^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--|-----------|---------|---------------|--------------------|
| Valid | I enjoy spending time outside in my garden | 38 | 43.2 | 43.2 | 43.2 |
| | I enjoy visiting parks in my neighbourhood | 4 | 4.5 | 4.5 | 47.7 |
| | I enjoy the natural scenery of my neighbourhood | 8 | 9.1 | 9.1 | 56.8 |
| | I spend most of my time indoors | 28 | 31.8 | 31.8 | 88.6 |
| | I don't think about the natural environment much | 8 | 9.1 | 9.1 | 97.7 |
| | I spend most of my time outside | 1 | 1.1 | 1.1 | 98.9 |
| | construction of buildings | 1 | 1.1 | 1.1 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

How would you describe your relationship with your natural environment around you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid | 82 | 93.2 | 93.2 | 93.2 |
| I enjoy visiting parks in my neighbourhood | 3 | 3.4 | 3.4 | 96.6 |
| I enjoy the natural scenery of my neighbourhood | 2 | 2.3 | 2.3 | 98.9 |
| I spend most of my time outside | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Are you happy living in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid yes | 72 | 81.8 | 81.8 | 81.8 |
| no | 16 | 18.2 | 18.2 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid no answer | 17 | 19.3 | 19.3 | 19.3 |
| andry, disgusted or just unhappy | 2 | 2.3 | 2.3 | 21.6 |
| happy with fascilities in the area | 4 | 4.5 | 4.5 | 26.1 |
| unhappy with service delivery in the area | 6 | 6.8 | 6.8 | 33.0 |
| safe area | 3 | 3.4 | 3.4 | 36.4 |
| bad relationship with neighbours | 1 | 1.1 | 1.1 | 37.5 |
| transport is available | 1 | 1.1 | 1.1 | 38.6 |
| close to nearby towns and cities | 1 | 1.1 | 1.1 | 39.8 |
| freedom | 1 | 1.1 | 1.1 | 40.9 |
| I just love this area | 1 | 1.1 | 1.1 | 42.0 |
| bad smell from the landfill | 1 | 1.1 | 1.1 | 43.2 |
| good relationship with neighbours | 17 | 19.3 | 19.3 | 62.5 |
| quite and peaceful area | 5 | 5.7 | 5.7 | 68.2 |
| family ties to the area: inheritance/marriage/born | 1 | 1.1 | 1.1 | 69.3 |
| crime | 4 | 4.5 | 4.5 | 73.9 |
| everything is okay, I am happy | 21 | 23.9 | 23.9 | 97.7 |
| no choice but to live here because I ahve nowhere else to go | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 72 | 81.8 | 81.8 | 81.8 |
| angry, disgusted or just unhappy | 1 | 1.1 | 1.1 | 83.0 |
| unhappy with service delivery in the area | 1 | 1.1 | 1.1 | 84.1 |
| safe area | 1 | 1.1 | 1.1 | 85.2 |
| religious community | 1 | 1.1 | 1.1 | 86.4 |
| close to nearby towns and cities | 1 | 1.1 | 1.1 | 87.5 |
| bad smell from the landfill | 3 | 3.4 | 3.4 | 90.9 |
| good relationship with neighbours | 4 | 4.5 | 4.5 | 95.5 |
| quiet and peaceful area | 1 | 1.1 | 1.1 | 96.6 |
| crime | 1 | 1.1 | 1.1 | 97.7 |
| everything is okay, I am happy | 1 | 1.1 | 1.1 | 98.9 |
| no choice but to live here because I have nowhere else to go | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

Chatsworth

Number of years you have lived in your home^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Valid <1 | 6 | 7.6 | 7.7 | 7.7 |
| 1-5 | 8 | 10.1 | 10.3 | 17.9 |
| 6-10 | 5 | 6.3 | 6.4 | 24.4 |
| 11-20 | 16 | 20.3 | 20.5 | 44.9 |
| 20+ | 43 | 54.4 | 55.1 | 100.0 |
| Total | 78 | 98.7 | 100.0 | |
| Missing System | 1 | 1.3 | | |
| Total | 79 | 100.0 | | |

How many people live in this house^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | 1 | 3 | 3.8 | 3.8 | 3.8 |
| | 2 | 10 | 12.7 | 12.7 | 16.5 |
| | 3 | 12 | 15.2 | 15.2 | 31.6 |
| | 4 | 20 | 25.3 | 25.3 | 57.0 |
| | 5 | 14 | 17.7 | 17.7 | 74.7 |
| | 6 | 6 | 7.6 | 7.6 | 82.3 |
| | 7 | 6 | 7.6 | 7.6 | 89.9 |
| | 8 | 5 | 6.3 | 6.3 | 96.2 |
| | 9 | 2 | 2.5 | 2.5 | 98.7 |
| | 10 | 1 | 1.3 | 1.3 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

Number of adults^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | 1 | 3 | 3.8 | 3.8 | 3.8 |
| | 2 | 31 | 39.2 | 39.2 | 43.0 |
| | 3 | 11 | 13.9 | 13.9 | 57.0 |
| | 4 | 18 | 22.8 | 22.8 | 79.7 |
| | 5 | 11 | 13.9 | 13.9 | 93.7 |
| | 6 | 1 | 1.3 | 1.3 | 94.9 |
| | 7 | 4 | 5.1 | 5.1 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | 0 | 30 | 38.0 | 38.0 | 38.0 |
| | 1 | 20 | 25.3 | 25.3 | 63.3 |
| | 2 | 16 | 20.3 | 20.3 | 83.5 |
| | 3 | 9 | 11.4 | 11.4 | 94.9 |
| | 4 | 3 | 3.8 | 3.8 | 98.7 |
| | 5 | 1 | 1.3 | 1.3 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

Reasons for choosing to live in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|-----------------------|
| Valid no answer | 3 | 3.8 | 3.8 | 3.8 |
| born here | 7 | 8.9 | 8.9 | 12.7 |
| family ties to the area | 16 | 20.3 | 20.3 | 32.9 |
| allocated government housing here | 1 | 1.3 | 1.3 | 34.2 |
| quiet area | 12 | 15.2 | 15.2 | 49.4 |
| at home here | 2 | 2.5 | 2.5 | 51.9 |
| pollution in merebank forced us to move | 1 | 1.3 | 1.3 | 53.2 |
| don't know | 3 | 3.8 | 3.8 | 57.0 |
| relocated because of apartheid | 7 | 8.9 | 8.9 | 65.8 |
| no specific reason | 2 | 2.5 | 2.5 | 68.4 |
| economic reasons | 10 | 12.7 | 12.7 | 81.0 |
| no other choice | 6 | 7.6 | 7.6 | 88.6 |
| convenient location | 9 | 11.4 | 11.4 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Three things you like about living in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------|-----------|---------|---------------|-----------------------|
| Valid no answer | 9 | 11.4 | 11.4 | 11.4 |
| service provision | 2 | 2.5 | 2.5 | 13.9 |
| close to family | 1 | 1.3 | 1.3 | 15.2 |
| convenient | 8 | 10.1 | 10.1 | 25.3 |
| religious community | 4 | 5.1 | 5.1 | 30.4 |
| does not apply | 4 | 5.1 | 5.1 | 35.4 |
| don't know | 1 | 1.3 | 1.3 | 36.7 |
| friendly neighbourhood | 10 | 12.7 | 12.7 | 49.4 |
| quiet area | 19 | 24.1 | 24.1 | 73.4 |
| safe area | 7 | 8.9 | 8.9 | 82.3 |
| good place to live | 5 | 6.3 | 6.3 | 88.6 |
| near schools | 7 | 8.9 | 8.9 | 97.5 |
| near shops | 2 | 2.5 | 2.5 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Three things you like about living in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------|-----------|---------|---------------|--------------------|
| Valid no answer | 29 | 36.7 | 36.7 | 36.7 |
| service provision | 3 | 3.8 | 3.8 | 40.5 |
| close to family | 1 | 1.3 | 1.3 | 41.8 |
| near hospitals | 2 | 2.5 | 2.5 | 44.3 |
| convenient | 8 | 10.1 | 10.1 | 54.4 |
| religious community | 1 | 1.3 | 1.3 | 55.7 |
| nature reserve | 1 | 1.3 | 1.3 | 57.0 |
| don't know | 1 | 1.3 | 1.3 | 58.2 |
| friendly neighbourhood | 9 | 11.4 | 11.4 | 69.6 |
| quiet area | 4 | 5.1 | 5.1 | 74.7 |
| safe area | 6 | 7.6 | 7.6 | 82.3 |
| good place to live | 8 | 10.1 | 10.1 | 92.4 |
| near schools | 5 | 6.3 | 6.3 | 98.7 |
| near shops | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Three things you like about living in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------|-----------|---------|---------------|--------------------|
| Valid | 2 | 2.5 | 2.5 | 2.5 |
| no answer | 54 | 68.4 | 68.4 | 70.9 |
| service provision | 1 | 1.3 | 1.3 | 72.2 |
| close to family | 2 | 2.5 | 2.5 | 74.7 |
| convenient | 2 | 2.5 | 2.5 | 77.2 |
| religious community | 1 | 1.3 | 1.3 | 78.5 |
| cheap place to live | 1 | 1.3 | 1.3 | 79.7 |
| does not apply | 1 | 1.3 | 1.3 | 81.0 |
| don't know | 1 | 1.3 | 1.3 | 82.3 |
| friendly neighbourhood | 3 | 3.8 | 3.8 | 86.1 |
| quiet area | 3 | 3.8 | 3.8 | 89.9 |
| safe area | 2 | 2.5 | 2.5 | 92.4 |
| good place to live | 1 | 1.3 | 1.3 | 93.7 |
| near schools | 3 | 3.8 | 3.8 | 97.5 |
| near shops | 2 | 2.5 | 2.5 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Three things you dislike about living in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid no answer | 9 | 11.4 | 11.4 | 11.4 |
| landfill near neighbourhood | 4 | 5.1 | 5.1 | 16.5 |
| air pollution | 2 | 2.5 | 2.5 | 19.0 |
| problems with neighbours | 4 | 5.1 | 5.1 | 24.1 |
| does not apply | 1 | 1.3 | 1.3 | 25.3 |
| the area smells because of the landfill | 1 | 1.3 | 1.3 | 26.6 |
| don't know | 1 | 1.3 | 1.3 | 27.8 |
| nothing | 2 | 2.5 | 2.5 | 30.4 |
| crime | 33 | 41.8 | 41.8 | 72.2 |
| drug and alcohol abuse | 7 | 8.9 | 8.9 | 81.0 |
| lack of public transport | 5 | 6.3 | 6.3 | 87.3 |
| far away from schools and amenities etc | 3 | 3.8 | 3.8 | 91.1 |
| near informal settlements | 1 | 1.3 | 1.3 | 92.4 |
| poor service delivery | 6 | 7.6 | 7.6 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Three things you dislike about living in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid no answer | 46 | 58.2 | 58.2 | 58.2 |
| overpopulation of monkeys | 1 | 1.3 | 1.3 | 59.5 |
| landfill near neighbourhood | 3 | 3.8 | 3.8 | 63.3 |
| near industrial areas | 1 | 1.3 | 1.3 | 64.6 |
| air pollution | 1 | 1.3 | 1.3 | 65.8 |
| water pollution | 1 | 1.3 | 1.3 | 67.1 |
| problems with neighbours | 1 | 1.3 | 1.3 | 68.4 |
| poverty and unemployment | 1 | 1.3 | 1.3 | 69.6 |
| does not apply | 1 | 1.3 | 1.3 | 70.9 |
| noisy | 1 | 1.3 | 1.3 | 72.2 |
| the area smells because of the landfill | 1 | 1.3 | 1.3 | 73.4 |
| crime | 6 | 7.6 | 7.6 | 81.0 |
| drug and alcohol abuse | 5 | 6.3 | 6.3 | 87.3 |
| lack of public transport | 6 | 7.6 | 7.6 | 94.9 |
| near informal settlements | 3 | 3.8 | 3.8 | 98.7 |
| poor service delivery | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Three things you dislike about living in this area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid no answer | 61 | 77.2 | 77.2 | 77.2 |
| overpopulation of monkeys | 1 | 1.3 | 1.3 | 78.5 |
| near industrial areas | 1 | 1.3 | 1.3 | 79.7 |
| problems with neighbours | 3 | 3.8 | 3.8 | 83.5 |
| does not apply | 1 | 1.3 | 1.3 | 84.8 |
| crime | 6 | 7.6 | 7.6 | 92.4 |
| far away from schools and amenities etc | 2 | 2.5 | 2.5 | 94.9 |
| near informal settlements | 1 | 1.3 | 1.3 | 96.2 |
| poor service delivery | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

What is your relationship with your immediate neighbours^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------------------|-----------|---------|---------------|--------------------|
| Valid you talk to them regularly | 66 | 83.5 | 83.5 | 83.5 |
| you know them but do not talk often | 12 | 15.2 | 15.2 | 98.7 |
| you haven't met them | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Do you have immediate family living in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid yes | 37 | 46.8 | 46.8 | 46.8 |
| no | 42 | 53.2 | 53.2 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Are you involved in any community activities^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------------------------------|-----------|---------|---------------|--------------------|
| Valid | local sports club | 10 | 12.7 | 12.7 | 12.7 |
| | local religious organisations | 33 | 41.8 | 41.8 | 54.4 |
| | local environmental organisations | 2 | 2.5 | 2.5 | 57.0 |
| | not involved in any activities | 32 | 40.5 | 40.5 | 97.5 |
| | anti drugs community | 1 | 1.3 | 1.3 | 98.7 |
| | neighbourhood watch | 1 | 1.3 | 1.3 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Do you spend time outdoors exercising^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | yes | 51 | 64.6 | 64.6 | 64.6 |
| | no | 28 | 35.4 | 35.4 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

How would you describe your relationship with your natural environment around you^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--|-----------|---------|---------------|--------------------|
| Valid | I enjoy spending time outside in my garden | 39 | 49.4 | 49.4 | 49.4 |
| | I enjoy visiting parks in my neighbourhood | 11 | 13.9 | 13.9 | 63.3 |
| | I spend most of my time indoors | 26 | 32.9 | 32.9 | 96.2 |
| | I don't think about the natural environment much | 2 | 2.5 | 2.5 | 98.7 |
| | i like being all over the place | 1 | 1.3 | 1.3 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

How would you describe your relationship with your natural environment around you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid | 65 | 82.3 | 82.3 | 82.3 |
| I enjoy visiting parks in my neighbourhood | 6 | 7.6 | 7.6 | 89.9 |
| I enjoy the natural scenery of my neighbourhood | 3 | 3.8 | 3.8 | 93.7 |
| I spend most of my time indoors | 3 | 3.8 | 3.8 | 97.5 |
| i like being all over the place | 1 | 1.3 | 1.3 | 98.7 |
| I spend most of my time outside | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Are you happy living in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid yes | 67 | 84.8 | 84.8 | 84.8 |
| no | 12 | 15.2 | 15.2 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid no answer | 7 | 8.9 | 8.9 | 8.9 |
| I used to like it but not anymore | 4 | 5.1 | 5.1 | 13.9 |
| happy with fascilities in the area | 9 | 11.4 | 11.4 | 25.3 |
| unhappy with service delivery in the area | 1 | 1.3 | 1.3 | 26.6 |
| safe area | 7 | 8.9 | 8.9 | 35.4 |
| bad relationship with neighbours | 1 | 1.3 | 1.3 | 36.7 |
| religous community | 2 | 2.5 | 2.5 | 39.2 |
| I just love this area | 1 | 1.3 | 1.3 | 40.5 |
| don't know | 1 | 1.3 | 1.3 | 41.8 |
| good relationship with neighbours | 10 | 12.7 | 12.7 | 54.4 |
| quite and peaceful area | 10 | 12.7 | 12.7 | 67.1 |
| family ties to the area: inheritance/marriage/born | 3 | 3.8 | 3.8 | 70.9 |
| crime | 8 | 10.1 | 10.1 | 81.0 |
| everything is okay, I am happy | 12 | 15.2 | 15.2 | 96.2 |
| no choice but to live here because I ahve nowhere else to go | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 71 | 89.9 | 89.9 | 89.9 |
| safe area | 3 | 3.8 | 3.8 | 93.7 |
| good relationship with neighbours | 3 | 3.8 | 3.8 | 97.5 |
| family ties to the area: inheritance/marriage/born | 1 | 1.3 | 1.3 | 98.7 |
| crime | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

B.3.3. Access to health care facilities and health related issues

Umlazi

Is household member 1 a smoker^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 4 | 4.5 | 4.5 | 4.5 |
| yes | 20 | 22.7 | 22.7 | 27.3 |
| no | 64 | 72.7 | 72.7 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Do you or any of you family members suffer from any illnesses^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|-----------|---------|---------------|--------------------|
| Valid yes | 52 | 59.1 | 59.1 | 59.1 |
| no illnesses | 28 | 31.8 | 31.8 | 90.9 |
| did not disclose | 8 | 9.1 | 9.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Illness^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|---------------------|-----------|---------|---------------|--------------------|
| Valid | asthma | 7 | 8.0 | 8.0 | 8.0 |
| | tuberculosis | 4 | 4.5 | 4.5 | 12.5 |
| | high blood pressure | 9 | 10.2 | 10.2 | 22.7 |
| | heart problems | 1 | 1.1 | 1.1 | 23.9 |
| | cancer | 1 | 1.1 | 1.1 | 25.0 |
| | not applicable | 35 | 39.8 | 39.8 | 64.8 |
| | did not disclose | 23 | 26.1 | 26.1 | 90.9 |
| | diabetes | 3 | 3.4 | 3.4 | 94.3 |
| | sinus allergies | 2 | 2.3 | 2.3 | 96.6 |
| | chronic illness | 2 | 2.3 | 2.3 | 98.9 |
| | HIV+ | 1 | 1.1 | 1.1 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Illness^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 88 | 100.0 | 100.0 | 100.0 |

a. Sampling region = Umlazi

What do you think causes this^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| Valid | 57 | 64.8 | 64.8 | 64.8 |
| air | 1 | 1.1 | 1.1 | 65.9 |
| air pollution | 1 | 1.1 | 1.1 | 67.0 |
| bad diet | 1 | 1.1 | 1.1 | 68.2 |
| born with it | 2 | 2.3 | 2.3 | 70.5 |
| confidential | 1 | 1.1 | 1.1 | 71.6 |
| don't know | 9 | 10.2 | 10.2 | 81.8 |
| it's in the blood | 1 | 1.1 | 1.1 | 83.0 |
| landfill | 1 | 1.1 | 1.1 | 84.1 |
| natural | 1 | 1.1 | 1.1 | 85.2 |
| natural causes | 2 | 2.3 | 2.3 | 87.5 |
| no answer | 3 | 3.4 | 3.4 | 90.9 |
| no response | 1 | 1.1 | 1.1 | 92.0 |
| old age | 1 | 1.1 | 1.1 | 93.2 |
| poor air quality | 1 | 1.1 | 1.1 | 94.3 |
| smell | 1 | 1.1 | 1.1 | 95.5 |
| smoking | 1 | 1.1 | 1.1 | 96.6 |
| stress | 3 | 3.4 | 3.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How long have you experienced these symptoms^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------|-----------|---------|---------------|--------------------|
| Valid | | | | |
| 0-6 months | 4 | 4.5 | 14.3 | 14.3 |
| 6months- 1 year | 6 | 6.8 | 21.4 | 35.7 |
| 1year-5years | 11 | 12.5 | 39.3 | 75.0 |
| 5years-10 years | 5 | 5.7 | 17.9 | 92.9 |
| 15 years to 20 years | 1 | 1.1 | 3.6 | 96.4 |
| < 20 years | 1 | 1.1 | 3.6 | 100.0 |
| Total | 28 | 31.8 | 100.0 | |
| Missing | | | | |
| System | 60 | 68.2 | | |
| Total | 88 | 100.0 | | |

a. Sampling region = Umlazi

**Do these symptoms occur regularly (at least once a month) or intermittently
(at least a couple times a year)^a**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid | 69 | 78.4 | 78.4 | 78.4 |
| regularly | 19 | 21.6 | 21.6 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Statistics^a

| | Where do you go when you are ill | Where do you go when you are ill | Where do you go when you are ill | Where do you go when you are ill | How do you travel there |
|---------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|-------------------------|
| N Valid | 88 | 88 | 88 | 88 | 88 |
| Missing | 0 | 0 | 0 | 0 | 0 |

Statistics^a

| | How do you travel there | How do you travel there | How do you travel there | How do you travel there | How much of time does it take for you to travel there |
|---------|-------------------------|-------------------------|-------------------------|-------------------------|---|
| N Valid | 88 | 88 | 88 | 88 | 88 |
| Missing | 0 | 0 | 0 | 0 | 0 |

Statistics^a

| | How much of time does it take for you to travel there | How much of time does it take for you to travel there | How much of time does it take for you to travel there | How much of time does it take for you to travel there |
|---------|---|---|---|---|
| N Valid | 88 | 88 | 88 | 88 |
| Missing | 0 | 0 | 0 | 0 |

a. Sampling region = Umlazi

Frequency Table

Where do you go when you are ill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Valid | 61 | 69.3 | 69.3 | 69.3 |
| private doctor | 27 | 30.7 | 30.7 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Where do you go when you are ill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------|-----------|---------|---------------|--------------------|
| Valid | 55 | 62.5 | 62.5 | 62.5 |
| clinic | 33 | 37.5 | 37.5 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Where do you go when you are ill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Valid | 34 | 38.6 | 38.6 | 38.6 |
| private doctor | 1 | 1.1 | 1.1 | 39.8 |
| hospital | 53 | 60.2 | 60.2 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Where do you go when you are ill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------------|-----------|---------|---------------|--------------------|
| Valid | 79 | 89.8 | 89.8 | 89.8 |
| hospital | 1 | 1.1 | 1.1 | 90.9 |
| traditional healer | 8 | 9.1 | 9.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid | 62 | 70.5 | 70.5 | 70.5 |
| private vehicle | 9 | 10.2 | 10.2 | 80.7 |
| bus | 2 | 2.3 | 2.3 | 83.0 |
| taxi | 15 | 17.0 | 17.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid | 84 | 95.5 | 95.5 | 95.5 |
| private vehicle | 1 | 1.1 | 1.1 | 96.6 |
| taxi | 3 | 3.4 | 3.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid | 52 | 59.1 | 59.1 | 59.1 |
| private vehicle | 1 | 1.1 | 1.1 | 60.2 |
| bus | 2 | 2.3 | 2.3 | 62.5 |
| taxi | 31 | 35.2 | 35.2 | 97.7 |
| walking | 1 | 1.1 | 1.1 | 98.9 |
| ambulance | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid | 38 | 43.2 | 43.2 | 43.2 |
| private vehicle | 8 | 9.1 | 9.1 | 52.3 |
| bus | 2 | 2.3 | 2.3 | 54.5 |
| taxi | 31 | 35.2 | 35.2 | 89.8 |
| walking | 6 | 6.8 | 6.8 | 96.6 |
| ambulance | 3 | 3.4 | 3.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------|-----------|---------|---------------|--------------------|
| Valid | 80 | 90.9 | 90.9 | 90.9 |
| taxi | 6 | 6.8 | 6.8 | 97.7 |
| walking | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid | 59 | 67.0 | 67.0 | 67.0 |
| 5-10min | 6 | 6.8 | 6.8 | 73.9 |
| 11-20min | 5 | 5.7 | 5.7 | 79.5 |
| 31-40min | 3 | 3.4 | 3.4 | 83.0 |
| 21-30min | 15 | 17.0 | 17.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid | 86 | 97.7 | 97.7 | 97.7 |
| 11-20min | 1 | 1.1 | 1.1 | 98.9 |
| 21-30min | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid | 56 | 63.6 | 63.6 | 63.6 |
| 11-20min | 4 | 4.5 | 4.5 | 68.2 |
| 31-40min | 4 | 4.5 | 4.5 | 72.7 |
| 21-30min | 22 | 25.0 | 25.0 | 97.7 |
| 41-50min | 1 | 1.1 | 1.1 | 98.9 |
| 51-60min | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid | 34 | 38.6 | 38.6 | 38.6 |
| 5-10min | 5 | 5.7 | 5.7 | 44.3 |
| 11-20min | 9 | 10.2 | 10.2 | 54.5 |
| 31-40min | 8 | 9.1 | 9.1 | 63.6 |
| 21-30min | 31 | 35.2 | 35.2 | 98.9 |
| 51-60min | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

. Sampling region = Umlazi

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid | 80 | 90.9 | 90.9 | 90.9 |
| 31-40min | 1 | 1.1 | 1.1 | 92.0 |
| 21-30min | 6 | 6.8 | 6.8 | 98.9 |
| >60min | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Chatsworth

Is household member 1 a smoker^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 1 | 1.3 | 1.3 | 1.3 |
| yes | 18 | 22.8 | 22.8 | 24.1 |
| no | 60 | 75.9 | 75.9 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Do you or any of you family members suffer from any illnesses^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|-----------|---------|---------------|--------------------|
| Valid yes | 44 | 55.7 | 55.7 | 55.7 |
| no illnesses | 29 | 36.7 | 36.7 | 92.4 |
| did not disclose | 6 | 7.6 | 7.6 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Illness^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|----------------------|-----------|---------|---------------|--------------------|
| Valid | asthma | 11 | 13.9 | 13.9 | 13.9 |
| | emphysema | 1 | 1.3 | 1.3 | 15.2 |
| | high blood pressure | 7 | 8.9 | 8.9 | 24.1 |
| | heart problems | 4 | 5.1 | 5.1 | 29.1 |
| | watering eyes | 1 | 1.3 | 1.3 | 30.4 |
| | skin rashes | 1 | 1.3 | 1.3 | 31.6 |
| | respiratory problems | 1 | 1.3 | 1.3 | 32.9 |
| | not applicable | 31 | 39.2 | 39.2 | 72.2 |
| | did not disclose | 12 | 15.2 | 15.2 | 87.3 |
| | diabetes | 3 | 3.8 | 3.8 | 91.1 |
| | sinus allergies | 5 | 6.3 | 6.3 | 97.5 |
| | chronic illness | 1 | 1.3 | 1.3 | 98.7 |
| | toxic hepatitis | 1 | 1.3 | 1.3 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Illness^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 79 | 100.0 | 100.0 | 100.0 |

a. Sampling region = Chatsworth

What do you think causes this^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------------|-----------|---------|---------------|-----------------------|
| Valid | 43 | 54.4 | 54.4 | 54.4 |
| age | 2 | 2.5 | 2.5 | 57.0 |
| air pollution | 1 | 1.3 | 1.3 | 58.2 |
| bad smell | 2 | 2.5 | 2.5 | 60.8 |
| born with it | 1 | 1.3 | 1.3 | 62.0 |
| climate and dust | 1 | 1.3 | 1.3 | 63.3 |
| cold weather | 1 | 1.3 | 1.3 | 64.6 |
| diabetic | 1 | 1.3 | 1.3 | 65.8 |
| don't kn | 1 | 1.3 | 1.3 | 67.1 |
| don't know | 2 | 2.5 | 2.5 | 69.6 |
| don't know maybe the air | 1 | 1.3 | 1.3 | 70.9 |
| dust | 2 | 2.5 | 2.5 | 73.4 |
| eating habits | 1 | 1.3 | 1.3 | 74.7 |
| genetic | 2 | 2.5 | 2.5 | 77.2 |
| hereditary, smoke, dust | 1 | 1.3 | 1.3 | 78.5 |
| inherited from father | 1 | 1.3 | 1.3 | 79.7 |
| just happened | 1 | 1.3 | 1.3 | 81.0 |
| lifestyle | 2 | 2.5 | 2.5 | 83.5 |
| no answe | 1 | 1.3 | 1.3 | 84.8 |
| no answer | 3 | 3.8 | 3.8 | 88.6 |
| old age | 2 | 2.5 | 2.5 | 91.1 |
| old age and stress | 1 | 1.3 | 1.3 | 92.4 |
| pollution | 1 | 1.3 | 1.3 | 93.7 |
| since birth | 1 | 1.3 | 1.3 | 94.9 |
| stress and dust | 1 | 1.3 | 1.3 | 96.2 |
| the air in the area | 1 | 1.3 | 1.3 | 97.5 |
| wind | 1 | 1.3 | 1.3 | 98.7 |
| work in a chemical environ | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

How long have you experienced these symptoms^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------|----------------------|-----------|---------|---------------|--------------------|
| Valid | 6months- 1 year | 2 | 2.5 | 7.4 | 7.4 |
| | 1year-5years | 6 | 7.6 | 22.2 | 29.6 |
| | 5years-10 years | 6 | 7.6 | 22.2 | 51.9 |
| | 10years-15years | 6 | 7.6 | 22.2 | 74.1 |
| | 15 years to 20 years | 2 | 2.5 | 7.4 | 81.5 |
| | < 20 years | 5 | 6.3 | 18.5 | 100.0 |
| | Total | 27 | 34.2 | 100.0 | |
| Missing | System | 52 | 65.8 | | |
| Total | | 79 | 100.0 | | |

a. Sampling region = Chatsworth

Do these symptoms occur regularly (at least once a month) or intermittently (at least a couple times a year)^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|----------------|-----------|---------|---------------|--------------------|
| Valid | | 59 | 74.7 | 74.7 | 74.7 |
| | regularly | 19 | 24.1 | 24.1 | 98.7 |
| | intermittently | 1 | 1.3 | 1.3 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Statistics^a

| | | Where do you go when you are ill | Where do you go when you are ill | Where do you go when you are ill | Where do you go when you are ill | How do you travel there |
|---|---------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|-------------------------|
| N | Valid | 79 | 79 | 79 | 79 | 79 |
| | Missing | 0 | 0 | 0 | 0 | 0 |

Statistics^a

| | | How do you travel there | How do you travel there | How do you travel there | How do you travel there | How much of time does it take for you to travel there |
|---|---------|-------------------------|-------------------------|-------------------------|-------------------------|---|
| N | Valid | 79 | 79 | 79 | 79 | 79 |
| | Missing | 0 | 0 | 0 | 0 | 0 |

Statistics^a

| | | How much of time does it take for you to travel there | How much of time does it take for you to travel there | How much of time does it take for you to travel there | How much of time does it take for you to travel there |
|---|---------|---|---|---|---|
| N | Valid | 79 | 79 | 79 | 79 |
| | Missing | 0 | 0 | 0 | 0 |

a. Sampling region = Chatsworth

Frequency Table

Where do you go when you are ill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Valid | 17 | 21.5 | 21.5 | 21.5 |
| private doctor | 62 | 78.5 | 78.5 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Where do you go when you are ill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------|-----------|---------|---------------|--------------------|
| Valid | 73 | 92.4 | 92.4 | 92.4 |
| clinic | 6 | 7.6 | 7.6 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Where do you go when you are ill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid | 51 | 64.6 | 64.6 | 64.6 |
| hospital | 28 | 35.4 | 35.4 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Where do you go when you are ill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 79 | 100.0 | 100.0 | 100.0 |

a. Sampling region = Chatsworth

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid | 16 | 20.3 | 20.3 | 20.3 |
| private vehicle | 53 | 67.1 | 67.1 | 87.3 |
| bus | 1 | 1.3 | 1.3 | 88.6 |
| taxi | 6 | 7.6 | 7.6 | 96.2 |
| walking | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 79 | 100.0 | 100.0 | 100.0 |

a. Sampling region = Chatsworth

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid | 73 | 92.4 | 92.4 | 92.4 |
| private vehicle | 1 | 1.3 | 1.3 | 93.7 |
| taxi | 3 | 3.8 | 3.8 | 97.5 |
| walking | 2 | 2.5 | 2.5 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid | 52 | 65.8 | 65.8 | 65.8 |
| private vehicle | 22 | 27.8 | 27.8 | 93.7 |
| taxi | 2 | 2.5 | 2.5 | 96.2 |
| walking | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

How do you travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 79 | 100.0 | 100.0 | 100.0 |

a. Sampling region = Chatsworth

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid | 15 | 19.0 | 19.0 | 19.0 |
| 1 | 1 | 1.3 | 1.3 | 20.3 |
| 2 | 1 | 1.3 | 1.3 | 21.5 |
| 4 | 1 | 1.3 | 1.3 | 22.8 |
| 5-10min | 36 | 45.6 | 45.6 | 68.4 |
| 11-20min | 13 | 16.5 | 16.5 | 84.8 |
| 31-40min | 2 | 2.5 | 2.5 | 87.3 |
| 21-30min | 9 | 11.4 | 11.4 | 98.7 |
| 51-60min | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 79 | 100.0 | 100.0 | 100.0 |

a. Sampling region = Chatsworth

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid | 73 | 92.4 | 92.4 | 92.4 |
| 5-10min | 2 | 2.5 | 2.5 | 94.9 |
| 11-20min | 1 | 1.3 | 1.3 | 96.2 |
| 21-30min | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid | 53 | 67.1 | 67.1 | 67.1 |
| 5-10min | 9 | 11.4 | 11.4 | 78.5 |
| 11-20min | 7 | 8.9 | 8.9 | 87.3 |
| 21-30min | 9 | 11.4 | 11.4 | 98.7 |
| 51-60min | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

How much of time does it take for you to travel there^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 79 | 100.0 | 100.0 | 100.0 |

a. Sampling region = Chatsworth

B.3.4. Perceptions of air quality

Umlazi

Do you experience haziness smog or poor visibility in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-----------|---------|---------------|--------------------|
| Valid yes | 44 | 50.0 | 50.0 | 50.0 |
| no | 43 | 48.9 | 48.9 | 98.9 |
| don't know | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Do you experience haziness, smog or poor visibility in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------------------------|-----------|---------|---------------|--------------------|
| Valid | 39 | 44.3 | 44.3 | 44.3 |
| no answer | 4 | 4.5 | 4.5 | 48.9 |
| poor visibility | 14 | 15.9 | 15.9 | 64.8 |
| dust from the landfill | 2 | 2.3 | 2.3 | 67.0 |
| causes illnesses | 2 | 2.3 | 2.3 | 69.3 |
| from the soil | 1 | 1.1 | 1.1 | 70.5 |
| disturbing or upsetting | 1 | 1.1 | 1.1 | 71.6 |
| intense | 1 | 1.1 | 1.1 | 72.7 |
| don't know | 4 | 4.5 | 4.5 | 77.3 |
| biomass/burning on peoples properties | 3 | 3.4 | 3.4 | 80.7 |
| burning waste at the landfill | 4 | 4.5 | 4.5 | 85.2 |
| smog/mist | 6 | 6.8 | 6.8 | 92.0 |
| health issues eg. eye problems | 6 | 6.8 | 6.8 | 98.9 |
| bad smell | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes are there any particular times in the day you feel that this haziness, smog or poor visibility is at its worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------------|-----------|---------|---------------|--------------------|
| Valid | 41 | 46.6 | 46.6 | 46.6 |
| morning | 13 | 14.8 | 14.8 | 61.4 |
| afternoon | 4 | 4.5 | 4.5 | 65.9 |
| evening | 3 | 3.4 | 3.4 | 69.3 |
| it's the same all day | 20 | 22.7 | 22.7 | 92.0 |
| don't know | 5 | 5.7 | 5.7 | 97.7 |
| midday | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, what time of year is this haziness, smog or poor visibility at it's worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid | 42 | 47.7 | 47.7 | 47.7 |
| spring | 1 | 1.1 | 1.1 | 48.9 |
| summer | 9 | 10.2 | 10.2 | 59.1 |
| winter | 6 | 6.8 | 6.8 | 65.9 |
| the same all year round | 23 | 26.1 | 26.1 | 92.0 |
| don't know | 7 | 8.0 | 8.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, what do you think causes this haziness smog or poor visibility^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------------------|-----------|---------|---------------|--------------------|
| Valid | 41 | 46.6 | 46.6 | 46.6 |
| no answer | 2 | 2.3 | 2.3 | 48.9 |
| burning tyres | 2 | 2.3 | 2.3 | 51.1 |
| burnin fires at the landfill | 5 | 5.7 | 5.7 | 56.8 |
| chemicals from the landfill | 2 | 2.3 | 2.3 | 59.1 |
| the landfill | 8 | 9.1 | 9.1 | 68.2 |
| chemicals that are burnt | 2 | 2.3 | 2.3 | 70.5 |
| trucks/vehicles | 2 | 2.3 | 2.3 | 72.7 |
| does not apply | 1 | 1.1 | 1.1 | 73.9 |
| don't know | 12 | 13.6 | 13.6 | 87.5 |
| mist | 5 | 5.7 | 5.7 | 93.2 |
| smoke from fires and burning | 3 | 3.4 | 3.4 | 96.6 |
| industrial pollution | 1 | 1.1 | 1.1 | 97.7 |
| dumping dirty soil | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Do you think that dust is a problem in your neighbourhood^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | yes | 55 | 62.5 | 62.5 | 62.5 |
| | no | 33 | 37.5 | 37.5 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes,are there any particular times of day when dust is at it's worst^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|------------------------|-----------|---------|---------------|--------------------|
| Valid | | 33 | 37.5 | 37.5 | 37.5 |
| | morning | 9 | 10.2 | 10.2 | 47.7 |
| | afternoon | 16 | 18.2 | 18.2 | 65.9 |
| | night | 1 | 1.1 | 1.1 | 67.0 |
| | it's the same all day | 21 | 23.9 | 23.9 | 90.9 |
| | don't know | 7 | 8.0 | 8.0 | 98.9 |
| | depends on the weather | 1 | 1.1 | 1.1 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes,are there any particular times of day when dust is at it's worst^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|-----------|---------|---------------|--------------------|
| Valid | | 86 | 97.7 | 97.7 | 97.7 |
| | afternoon | 2 | 2.3 | 2.3 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, what time of the year is dust at it's worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid | 33 | 37.5 | 37.5 | 37.5 |
| spring | 1 | 1.1 | 1.1 | 38.6 |
| summer | 7 | 8.0 | 8.0 | 46.6 |
| autumn | 1 | 1.1 | 1.1 | 47.7 |
| winter | 17 | 19.3 | 19.3 | 67.0 |
| the same all year round | 25 | 28.4 | 28.4 | 95.5 |
| don't know | 4 | 4.5 | 4.5 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, where do you think this dust comes from^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid | 33 | 37.5 | 37.5 | 37.5 |
| no answer | 3 | 3.4 | 3.4 | 40.9 |
| from the landfill | 20 | 22.7 | 22.7 | 63.6 |
| from trucks going to the landfill | 3 | 3.4 | 3.4 | 67.0 |
| from the soil covering the landfill | 3 | 3.4 | 3.4 | 70.5 |
| don't know | 4 | 4.5 | 4.5 | 75.0 |
| wind and soil | 14 | 15.9 | 15.9 | 90.9 |
| natural processes | 4 | 4.5 | 4.5 | 95.5 |
| from peoples yards in the neighbourhood | 3 | 3.4 | 3.4 | 98.9 |
| roads and traffic | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Are you aware of any odours or smells currently^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid yes | 77 | 87.5 | 87.5 | 87.5 |
| no | 11 | 12.5 | 12.5 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, at which particular times of the day are these odours or smells stronger or more prevalent^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| Valid | 10 | 11.4 | 11.4 | 11.4 |
| morning | 27 | 30.7 | 30.7 | 42.0 |
| afternoon | 19 | 21.6 | 21.6 | 63.6 |
| evening | 3 | 3.4 | 3.4 | 67.0 |
| night | 2 | 2.3 | 2.3 | 69.3 |
| same all the time | 25 | 28.4 | 28.4 | 97.7 |
| don't know | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, at which particular times of the day are these odours or smells stronger or more prevalent^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid | 78 | 88.6 | 88.6 | 88.6 |
| afternoon | 4 | 4.5 | 4.5 | 93.2 |
| evening | 4 | 4.5 | 4.5 | 97.7 |
| night | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, please describe these odours or smells^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 10 | 11.4 | 11.4 | 11.4 |
| no answer | 4 | 4.5 | 4.5 | 15.9 |
| terrible smell from the dump | 4 | 4.5 | 4.5 | 20.5 |
| irritating sometimes | 3 | 3.4 | 3.4 | 23.9 |
| smells liek gas | 1 | 1.1 | 1.1 | 25.0 |
| dangerous | 1 | 1.1 | 1.1 | 26.1 |
| sour smell | 1 | 1.1 | 1.1 | 27.3 |
| affects kids health | 1 | 1.1 | 1.1 | 28.4 |
| affects those with asthma | 1 | 1.1 | 1.1 | 29.5 |
| don't know | 3 | 3.4 | 3.4 | 33.0 |
| smells like sewage | 4 | 4.5 | 4.5 | 37.5 |
| terrible or bad smell | 10 | 11.4 | 11.4 | 48.9 |
| smells like rotting or decomposing waste | 26 | 29.5 | 29.5 | 78.4 |
| chemical smell | 14 | 15.9 | 15.9 | 94.3 |
| smells like the burning of copper and plastics | 1 | 1.1 | 1.1 | 95.5 |
| smells like the burning of chemicals | 4 | 4.5 | 4.5 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

f yes, please describe these odours or smells^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 71 | 80.7 | 80.7 | 80.7 |
| no answer | 1 | 1.1 | 1.1 | 81.8 |
| terrible smell from the dump | 1 | 1.1 | 1.1 | 83.0 |
| smells liek gas | 1 | 1.1 | 1.1 | 84.1 |
| dangerous | 1 | 1.1 | 1.1 | 85.2 |
| affects pregnant women | 1 | 1.1 | 1.1 | 86.4 |
| weird smell | 1 | 1.1 | 1.1 | 87.5 |
| terrible or bad smell | 2 | 2.3 | 2.3 | 89.8 |
| smells like rotting or decomposing waste | 4 | 4.5 | 4.5 | 94.3 |
| chemical smell | 4 | 4.5 | 4.5 | 98.9 |
| smells like the burning of copper and plastics | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes,at what time of year are the odours or smells at their worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid | 10 | 11.4 | 11.4 | 11.4 |
| summer | 29 | 33.0 | 33.0 | 44.3 |
| winter | 1 | 1.1 | 1.1 | 45.5 |
| the same all year round | 45 | 51.1 | 51.1 | 96.6 |
| don't know | 3 | 3.4 | 3.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Have you been aware of any odours or smells in the past^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Valid yes | 63 | 71.6 | 71.6 | 71.6 |
| no | 24 | 27.3 | 27.3 | 98.9 |
| does not apply | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, describe these odours or smells^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 18 | 20.5 | 20.5 | 20.5 |
| no answer | 8 | 9.1 | 9.1 | 29.5 |
| chemical smell | 2 | 2.3 | 2.3 | 31.8 |
| rotten eggs | 1 | 1.1 | 1.1 | 33.0 |
| burning waste | 11 | 12.5 | 12.5 | 45.5 |
| irritating smell | 3 | 3.4 | 3.4 | 48.9 |
| the smell/odour was better in the past | 3 | 3.4 | 3.4 | 52.3 |
| smells like rotting waste | 5 | 5.7 | 5.7 | 58.0 |
| dirty terrible smell | 2 | 2.3 | 2.3 | 60.2 |
| same smell as the present | 35 | 39.8 | 39.8 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, what time of year were these odours or smells at their worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid | 20 | 22.7 | 22.7 | 22.7 |
| spring | 1 | 1.1 | 1.1 | 23.9 |
| summer | 24 | 27.3 | 27.3 | 51.1 |
| the same all year round | 37 | 42.0 | 42.0 | 93.2 |
| don't know | 6 | 6.8 | 6.8 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, what time of year were these odours or smells at their worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-----------|---------|---------------|--------------------|
| Valid | 85 | 96.6 | 96.6 | 96.6 |
| winter | 1 | 1.1 | 1.1 | 97.7 |
| don't know | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, at which particular times of day were these odours or smells stronger or more prevalent^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------------|-----------|---------|---------------|--------------------|
| Valid | 19 | 21.6 | 21.6 | 21.6 |
| morning | 21 | 23.9 | 23.9 | 45.5 |
| afternoon | 10 | 11.4 | 11.4 | 56.8 |
| evening | 5 | 5.7 | 5.7 | 62.5 |
| night | 4 | 4.5 | 4.5 | 67.0 |
| it's the same all the time | 22 | 25.0 | 25.0 | 92.0 |
| don't know | 7 | 8.0 | 8.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If yes, at which particular times of day were these odours or smells stronger or more prevalent^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid | 79 | 89.8 | 89.8 | 89.8 |
| morning | 1 | 1.1 | 1.1 | 90.9 |
| afternoon | 5 | 5.7 | 5.7 | 96.6 |
| evening | 2 | 2.3 | 2.3 | 98.9 |
| night | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

What does the term 'Air Pollution' mean to you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------------|-----------|---------|---------------|--------------------|
| Valid no answer | 8 | 9.1 | 9.1 | 9.1 |
| toxic chemicals | 3 | 3.4 | 3.4 | 12.5 |
| from factories or industries | 2 | 2.3 | 2.3 | 14.8 |
| from the dump site/landfill | 2 | 2.3 | 2.3 | 17.0 |
| bad smell | 3 | 3.4 | 3.4 | 20.5 |
| dust | 6 | 6.8 | 6.8 | 27.3 |
| contaminated air | 3 | 3.4 | 3.4 | 30.7 |
| nothing | 3 | 3.4 | 3.4 | 34.1 |
| it's about nature | 2 | 2.3 | 2.3 | 36.4 |
| don't know | 15 | 17.0 | 17.0 | 53.4 |
| bad for the environment | 1 | 1.1 | 1.1 | 54.5 |
| dirty air | 21 | 23.9 | 23.9 | 78.4 |
| causes illnesses | 12 | 13.6 | 13.6 | 92.0 |
| burning | 7 | 8.0 | 8.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

What does the term 'Air Pollution' mean to you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------------|-----------|---------|---------------|--------------------|
| Valid | 57 | 64.8 | 64.8 | 64.8 |
| no answer | 1 | 1.1 | 1.1 | 65.9 |
| toxic chemicals | 1 | 1.1 | 1.1 | 67.0 |
| from factories or industries | 1 | 1.1 | 1.1 | 68.2 |
| bad smell | 2 | 2.3 | 2.3 | 70.5 |
| dust | 2 | 2.3 | 2.3 | 72.7 |
| contaminated air | 8 | 9.1 | 9.1 | 81.8 |
| rotting stuff | 1 | 1.1 | 1.1 | 83.0 |
| don't know | 1 | 1.1 | 1.1 | 84.1 |
| dirty air | 8 | 9.1 | 9.1 | 93.2 |
| pollution | 1 | 1.1 | 1.1 | 94.3 |
| causes illnesses | 2 | 2.3 | 2.3 | 96.6 |
| burning | 3 | 3.4 | 3.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

What does the term 'Air Pollution' mean to you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|-----------|---------|---------------|--------------------|
| Valid | 83 | 94.3 | 94.3 | 94.3 |
| fumes or gasses | 1 | 1.1 | 1.1 | 95.5 |
| dirty air | 1 | 1.1 | 1.1 | 96.6 |
| pollution | 1 | 1.1 | 1.1 | 97.7 |
| causes illnesses | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

What does the term 'Air Pollution' mean to you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid | 86 | 97.7 | 97.7 | 97.7 |
| toxic chemicals | 1 | 1.1 | 1.1 | 98.9 |
| pollution | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please indicate the extent to which you agree or disagree with the following statement^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------|-----------|---------|---------------|--------------------|
| Valid strongly agree | 43 | 48.9 | 48.9 | 48.9 |
| agree | 27 | 30.7 | 30.7 | 79.5 |
| neutral | 11 | 12.5 | 12.5 | 92.0 |
| disagree | 2 | 2.3 | 2.3 | 94.3 |
| strongly disagree | 1 | 1.1 | 1.1 | 95.5 |
| no answer | 4 | 4.5 | 4.5 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Do you think that there is a group in the community that is more affected by air pollution than others in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-----------|---------|---------------|--------------------|
| Valid yes | 39 | 44.3 | 44.3 | 44.3 |
| no | 44 | 50.0 | 50.0 | 94.3 |
| don't know | 4 | 4.5 | 4.5 | 98.9 |
| no answer | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------------------------|-----------|---------|---------------|--------------------|
| Valid no answer | 24 | 27.3 | 27.3 | 27.3 |
| it depends on which area you live in | 4 | 4.5 | 4.5 | 31.8 |
| can't happen to white people | 1 | 1.1 | 1.1 | 33.0 |
| don't know | 5 | 5.7 | 5.7 | 38.6 |
| people who have respiratory illnesses | 1 | 1.1 | 1.1 | 39.8 |
| it affects all people in the same way | 29 | 33.0 | 33.0 | 72.7 |
| children | 15 | 17.0 | 17.0 | 89.8 |
| elderly people | 6 | 6.8 | 6.8 | 96.6 |
| black people are affected | 3 | 3.4 | 3.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------------------------|-----------|---------|---------------|--------------------|
| Valid | 84 | 95.5 | 95.5 | 95.5 |
| indian people are affected | 1 | 1.1 | 1.1 | 96.6 |
| it depends on which area you live in | 1 | 1.1 | 1.1 | 97.7 |
| it affects all people in the same way | 1 | 1.1 | 1.1 | 98.9 |
| elderly people | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Do you think that improving air quality should be a priority of local government in your area^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|----------------|-----------|---------|---------------|--------------------|
| Valid | strongly agree | 48 | 54.5 | 54.5 | 54.5 |
| | agree | 27 | 30.7 | 30.7 | 85.2 |
| | neutral | 6 | 6.8 | 6.8 | 92.0 |
| | disagree | 2 | 2.3 | 2.3 | 94.3 |
| | no answer | 5 | 5.7 | 5.7 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Do you know of activities to improve air quality in your neighbourhood^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | yes | 18 | 20.5 | 20.5 | 20.5 |
| | no | 70 | 79.5 | 79.5 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Would you be interested in participatin in any activities to improve air quality in your neighbourhood^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | yes | 75 | 85.2 | 85.2 | 85.2 |
| | no | 13 | 14.8 | 14.8 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Chatsworth

Do you experience haziness smog or poor visibility in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 1 | 1.3 | 1.3 | 1.3 |
| yes | 19 | 24.1 | 24.1 | 25.3 |
| no | 59 | 74.7 | 74.7 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Do you experience haziness, smog or poor visibility in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------------------------|-----------|---------|---------------|--------------------|
| Valid | 60 | 75.9 | 75.9 | 75.9 |
| no answer | 6 | 7.6 | 7.6 | 83.5 |
| poor visibiloty | 4 | 5.1 | 5.1 | 88.6 |
| burning of tyres | 1 | 1.3 | 1.3 | 89.9 |
| disturbing or upsetting | 1 | 1.3 | 1.3 | 91.1 |
| biomass/burning on peoples properties | 3 | 3.8 | 3.8 | 94.9 |
| burning waste at the landfill | 2 | 2.5 | 2.5 | 97.5 |
| smog/mist | 1 | 1.3 | 1.3 | 98.7 |
| people smoking | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes are there any particular times in the day you feel that this haziness,smog or poor visibility is at its worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------------|-----------|---------|---------------|--------------------|
| Valid | 60 | 75.9 | 75.9 | 75.9 |
| morning | 7 | 8.9 | 8.9 | 84.8 |
| afternoon | 3 | 3.8 | 3.8 | 88.6 |
| evening | 4 | 5.1 | 5.1 | 93.7 |
| night | 1 | 1.3 | 1.3 | 94.9 |
| it's the same all day | 2 | 2.5 | 2.5 | 97.5 |
| don't know | 2 | 2.5 | 2.5 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, what time of year is this haziness,smog or poor visibility at it's worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid | 60 | 75.9 | 75.9 | 75.9 |
| summer | 5 | 6.3 | 6.3 | 82.3 |
| winter | 6 | 7.6 | 7.6 | 89.9 |
| the same all year round | 5 | 6.3 | 6.3 | 96.2 |
| don't know | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, what do you think causes this haziness smog or poor visibility^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------------|-----------|---------|---------------|--------------------|
| Valid | 60 | 75.9 | 75.9 | 75.9 |
| burning tyres | 1 | 1.3 | 1.3 | 77.2 |
| burnin fires at the landfill | 7 | 8.9 | 8.9 | 86.1 |
| chemicals from the landfill | 1 | 1.3 | 1.3 | 87.3 |
| don't know | 3 | 3.8 | 3.8 | 91.1 |
| mist | 2 | 2.5 | 2.5 | 93.7 |
| smoke from fires and burning | 3 | 3.8 | 3.8 | 97.5 |
| industrial pollution | 1 | 1.3 | 1.3 | 98.7 |
| smoking | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Do you think that dust is a problem in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-----------|---------|---------------|--------------------|
| Valid yes | 25 | 31.6 | 31.6 | 31.6 |
| no | 53 | 67.1 | 67.1 | 98.7 |
| don't know | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes,are there any particular times of day when dust is at it's worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------------|-----------|---------|---------------|--------------------|
| Valid | 53 | 67.1 | 67.1 | 67.1 |
| morning | 5 | 6.3 | 6.3 | 73.4 |
| afternoon | 6 | 7.6 | 7.6 | 81.0 |
| it's the same all day | 11 | 13.9 | 13.9 | 94.9 |
| don't know | 4 | 5.1 | 5.1 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes,are there any particular times of day when dust is at it's worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid | 78 | 98.7 | 98.7 | 98.7 |
| afternoon | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes,what time of the year is dust at it's worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid | 53 | 67.1 | 67.1 | 67.1 |
| spring | 2 | 2.5 | 2.5 | 69.6 |
| summer | 3 | 3.8 | 3.8 | 73.4 |
| winter | 5 | 6.3 | 6.3 | 79.7 |
| the same all year round | 11 | 13.9 | 13.9 | 93.7 |
| don't know | 5 | 6.3 | 6.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, where do you think this dust comes from^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid | 53 | 67.1 | 67.1 | 67.1 |
| from the landfill | 1 | 1.3 | 1.3 | 68.4 |
| from the soil covering the landfill | 1 | 1.3 | 1.3 | 69.6 |
| refinery in wentworth | 1 | 1.3 | 1.3 | 70.9 |
| fires | 1 | 1.3 | 1.3 | 72.2 |
| don't know | 1 | 1.3 | 1.3 | 73.4 |
| wind and soil | 9 | 11.4 | 11.4 | 84.8 |
| natural processes | 1 | 1.3 | 1.3 | 86.1 |
| industry | 1 | 1.3 | 1.3 | 87.3 |
| from peoples yards in the neighbourhood | 4 | 5.1 | 5.1 | 92.4 |
| roads and traffic | 4 | 5.1 | 5.1 | 97.5 |
| burning tyres | 2 | 2.5 | 2.5 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Are you aware of any odours or smells currently^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid yes | 45 | 57.0 | 57.0 | 57.0 |
| no | 34 | 43.0 | 43.0 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, at which particular times of the day are these odours or smells stronger or more prevalent^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| Valid | 34 | 43.0 | 43.0 | 43.0 |
| morning | 10 | 12.7 | 12.7 | 55.7 |
| when it rains | 1 | 1.3 | 1.3 | 57.0 |
| afternoon | 7 | 8.9 | 8.9 | 65.8 |
| evening | 3 | 3.8 | 3.8 | 69.6 |
| night | 2 | 2.5 | 2.5 | 72.2 |
| same all the time | 19 | 24.1 | 24.1 | 96.2 |
| don't know | 1 | 1.3 | 1.3 | 97.5 |
| during the day | 1 | 1.3 | 1.3 | 98.7 |
| midday | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, at which particular times of the day are these odours or smells stronger or more prevalent^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------|-----------|---------|---------------|--------------------|
| Valid | 77 | 97.5 | 97.5 | 97.5 |
| when it rains | 1 | 1.3 | 1.3 | 98.7 |
| evening | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, please describe these odours or smells^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 34 | 43.0 | 43.0 | 43.0 |
| no answer | 1 | 1.3 | 1.3 | 44.3 |
| oily smells | 1 | 1.3 | 1.3 | 45.6 |
| terrible smell from the dump | 5 | 6.3 | 6.3 | 51.9 |
| burning smell | 1 | 1.3 | 1.3 | 53.2 |
| smells like sewage | 7 | 8.9 | 8.9 | 62.0 |
| terrible or bad smell | 10 | 12.7 | 12.7 | 74.7 |
| smells like rotting or decomposing waste | 13 | 16.5 | 16.5 | 91.1 |
| chemical smell | 6 | 7.6 | 7.6 | 98.7 |
| smells like the burning of copper and plastics | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, please describe these odours or smells^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-----------|---------|---------------|--------------------|
| Valid | 78 | 98.7 | 98.7 | 98.7 |
| don't know | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, at what time of year are the odours or smells at their worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid | 34 | 43.0 | 43.0 | 43.0 |
| summer | 26 | 32.9 | 32.9 | 75.9 |
| winter | 2 | 2.5 | 2.5 | 78.5 |
| the same all year round | 13 | 16.5 | 16.5 | 94.9 |
| don't know | 4 | 5.1 | 5.1 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Have you been aware of any odours or smells in the past^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Valid yes | 46 | 58.2 | 58.2 | 58.2 |
| no | 31 | 39.2 | 39.2 | 97.5 |
| does not apply | 2 | 2.5 | 2.5 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, describe these odours or smells^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------------------|-----------|---------|---------------|--------------------|
| Valid | 33 | 41.8 | 41.8 | 41.8 |
| no answer | 1 | 1.3 | 1.3 | 43.0 |
| death like smell | 1 | 1.3 | 1.3 | 44.3 |
| chemical smell | 3 | 3.8 | 3.8 | 48.1 |
| sewage | 7 | 8.9 | 8.9 | 57.0 |
| terrible dump smell | 2 | 2.5 | 2.5 | 59.5 |
| burning chemicals | 1 | 1.3 | 1.3 | 60.8 |
| don't know | 1 | 1.3 | 1.3 | 62.0 |
| smells toxic | 1 | 1.3 | 1.3 | 63.3 |
| smells like rotting waste | 8 | 10.1 | 10.1 | 73.4 |
| much stronger odour in the past | 1 | 1.3 | 1.3 | 74.7 |
| oily smell | 1 | 1.3 | 1.3 | 75.9 |
| dirty terrible smell | 4 | 5.1 | 5.1 | 81.0 |
| same smell as the present | 15 | 19.0 | 19.0 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, what time of year were these odours or smells at their worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid | 33 | 41.8 | 41.8 | 41.8 |
| spring | 1 | 1.3 | 1.3 | 43.0 |
| summer | 27 | 34.2 | 34.2 | 77.2 |
| winter | 2 | 2.5 | 2.5 | 79.7 |
| the same all year round | 13 | 16.5 | 16.5 | 96.2 |
| don't know | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, what time of year were these odours or smells at their worst^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid | 77 | 97.5 | 97.5 | 97.5 |
| autumn | 1 | 1.3 | 1.3 | 98.7 |
| the same all year round | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, at which particular times of day were these odours or smells stronger or more prevalent^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------------|-----------|---------|---------------|--------------------|
| Valid | 33 | 41.8 | 41.8 | 41.8 |
| morning | 9 | 11.4 | 11.4 | 53.2 |
| afternoon | 12 | 15.2 | 15.2 | 68.4 |
| night | 1 | 1.3 | 1.3 | 69.6 |
| it's the same all the time | 18 | 22.8 | 22.8 | 92.4 |
| don't know | 5 | 6.3 | 6.3 | 98.7 |
| during the day | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If yes, at which particular times of day were these odours or smells stronger or more prevalent^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid | 78 | 98.7 | 98.7 | 98.7 |
| afternoon | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

What does the term 'Air Pollution' mean to you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------------|-----------|---------|---------------|--------------------|
| Valid | 3 | 3.8 | 3.8 | 3.8 |
| no answer | 1 | 1.3 | 1.3 | 5.1 |
| toxic chemicals | 4 | 5.1 | 5.1 | 10.1 |
| from vehicles | 5 | 6.3 | 6.3 | 16.5 |
| from factories or industries | 2 | 2.5 | 2.5 | 19.0 |
| from the dump site/landfill | 2 | 2.5 | 2.5 | 21.5 |
| bad smell | 7 | 8.9 | 8.9 | 30.4 |
| dust | 5 | 6.3 | 6.3 | 36.7 |
| contaminated air | 8 | 10.1 | 10.1 | 46.8 |
| fumes or gasses | 4 | 5.1 | 5.1 | 51.9 |
| ozone layer | 1 | 1.3 | 1.3 | 53.2 |
| fires | 1 | 1.3 | 1.3 | 54.4 |
| carbon emissions | 1 | 1.3 | 1.3 | 55.7 |
| don't know | 11 | 13.9 | 13.9 | 69.6 |
| clean air | 2 | 2.5 | 2.5 | 72.2 |
| bad for the environment | 1 | 1.3 | 1.3 | 73.4 |
| dirty air | 9 | 11.4 | 11.4 | 84.8 |
| pollution | 3 | 3.8 | 3.8 | 88.6 |
| causes illnesses | 3 | 3.8 | 3.8 | 92.4 |
| burning | 6 | 7.6 | 7.6 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

What does the term 'Air Pollution' mean to you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------------|-----------|---------|---------------|--------------------|
| Valid | 40 | 50.6 | 50.6 | 50.6 |
| no answer | 2 | 2.5 | 2.5 | 53.2 |
| toxic chemicals | 1 | 1.3 | 1.3 | 54.4 |
| from vehicles | 2 | 2.5 | 2.5 | 57.0 |
| from factories or industries | 1 | 1.3 | 1.3 | 58.2 |
| from the dump site/landfill | 3 | 3.8 | 3.8 | 62.0 |
| bad smell | 1 | 1.3 | 1.3 | 63.3 |
| dust | 3 | 3.8 | 3.8 | 67.1 |
| contaminated air | 8 | 10.1 | 10.1 | 77.2 |
| fumes or gasses | 4 | 5.1 | 5.1 | 82.3 |
| motor vehicles | 2 | 2.5 | 2.5 | 84.8 |
| dirty air | 4 | 5.1 | 5.1 | 89.9 |
| causes illnesses | 2 | 2.5 | 2.5 | 92.4 |
| burning | 6 | 7.6 | 7.6 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

What does the term 'Air Pollution' mean to you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|-----------|---------|---------------|--------------------|
| Valid | 66 | 83.5 | 83.5 | 83.5 |
| toxic chemicals | 1 | 1.3 | 1.3 | 84.8 |
| bad smell | 1 | 1.3 | 1.3 | 86.1 |
| contaminated air | 4 | 5.1 | 5.1 | 91.1 |
| fumes or gasses | 1 | 1.3 | 1.3 | 92.4 |
| motor vehicles | 1 | 1.3 | 1.3 | 93.7 |
| causes illnesses | 2 | 2.5 | 2.5 | 96.2 |
| burning | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

What does the term 'Air Pollution' mean to you^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|-----------|---------|---------------|--------------------|
| Valid | 76 | 96.2 | 96.2 | 96.2 |
| toxic chemicals | 1 | 1.3 | 1.3 | 97.5 |
| contaminated air | 1 | 1.3 | 1.3 | 98.7 |
| fires | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please indicate the extent to which you agree or disagree with the following statement^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------|-----------|---------|---------------|--------------------|
| Valid strongly agree | 34 | 43.0 | 43.0 | 43.0 |
| agree | 21 | 26.6 | 26.6 | 69.6 |
| neutral | 11 | 13.9 | 13.9 | 83.5 |
| disagree | 7 | 8.9 | 8.9 | 92.4 |
| strongly disagree | 5 | 6.3 | 6.3 | 98.7 |
| no answer | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Do you think that there is a group in the community that is more affected by air pollution than others in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-----------|---------|---------------|--------------------|
| Valid yes | 23 | 29.1 | 29.1 | 29.1 |
| no | 50 | 63.3 | 63.3 | 92.4 |
| don't know | 3 | 3.8 | 3.8 | 96.2 |
| no answer | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|-----------------------|
| Valid | 1 | 1.3 | 1.3 | 1.3 |
| no answer | 22 | 27.8 | 27.8 | 29.1 |
| indian people are affected | 1 | 1.3 | 1.3 | 30.4 |
| it depends on which area you live in | 2 | 2.5 | 2.5 | 32.9 |
| because we don't have much air pollution | 1 | 1.3 | 1.3 | 34.2 |
| don't know | 4 | 5.1 | 5.1 | 39.2 |
| people who have respiratory illnesses | 2 | 2.5 | 2.5 | 41.8 |
| it affects all people in the same way | 28 | 35.4 | 35.4 | 77.2 |
| children | 10 | 12.7 | 12.7 | 89.9 |
| people who are sickly or have chronic illnesses | 2 | 2.5 | 2.5 | 92.4 |
| elderly people | 5 | 6.3 | 6.3 | 98.7 |
| black people are affected | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 74 | 93.7 | 93.7 | 93.7 |
| smokers | 1 | 1.3 | 1.3 | 94.9 |
| don't know | 1 | 1.3 | 1.3 | 96.2 |
| children | 2 | 2.5 | 2.5 | 98.7 |
| people who are sickly or have chronic illnesses | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Do you think that improving air quality should be a priority of local government in your area^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------|-----------|---------|---------------|--------------------|
| Valid strongly agree | 47 | 59.5 | 59.5 | 59.5 |
| agree | 18 | 22.8 | 22.8 | 82.3 |
| neutral | 11 | 13.9 | 13.9 | 96.2 |
| disagree | 2 | 2.5 | 2.5 | 98.7 |
| strongly disagree | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Do you know of activites to improve air quality in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid yes | 17 | 21.5 | 21.5 | 21.5 |
| no | 62 | 78.5 | 78.5 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Would you be interested in participatin in any activities to improve air quality in your neighbourhood^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | yes | 57 | 72.2 | 72.2 | 72.2 |
| | no | 22 | 27.8 | 27.8 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

B.3.5. Perceptions of the Bulbul Drive Landfill

Umlazi

Statistics^a

| | | Do you know that there is a landfill located on Bulbul Drive in | Describe how you feel about living near a landfill | Describe how you feel about living near a landfill | What type of influence do you think the Bulbul Drive landfill has on your community | Please explain why you feel this way |
|---|---------|---|--|--|---|--------------------------------------|
| N | Valid | 88 | 88 | 88 | 88 | 88 |
| | Missing | 0 | 0 | 0 | 0 | 0 |

Statistics^a

| | | Please explain why you feel this way | Do you feel safe in your neighbourhood | Please explain why you feel this way | Please explain why you feel this way | What is your relationship (if any) with the landfill management (Wasteman) |
|---|---------|--------------------------------------|--|--------------------------------------|--------------------------------------|--|
| N | Valid | 88 | 88 | 88 | 88 | 88 |
| | Missing | 0 | 0 | 0 | 0 | 0 |

Statistics^a

| | | | | | | |
|---|---------|---|--------------------------------------|--|--------------------------------------|--|
| | | If you have interacted with landfill management, these interactions have been | Please explain why you feel this way | Have you noticed any changes to the way the landfill has been managed in the last five years | Please explain why you feel this way | Have you noticed any changes to the natural environment surrounding the landfill since you have lived here |
| N | Valid | 88 | 88 | 88 | 88 | 88 |
| | Missing | 0 | 0 | 0 | 0 | 0 |

Statistics^a

| | | |
|---|---------|--------------------------------------|
| | | Please explain why you feel this way |
| N | Valid | 88 |
| | Missing | 0 |

a. Sampling region = Umlazi

Frequency Table

Do you know that there is a landfill located on Bulbul Drive in^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------|-----------|---------|---------------|--------------------|
| Valid | yes | 87 | 98.9 | 98.9 | 98.9 |
| | no | 1 | 1.1 | 1.1 | 100.0 |
| | Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Describe how you feel about living near a landfill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid no answer | 1 | 1.1 | 1.1 | 1.1 |
| it provides jobs | 1 | 1.1 | 1.1 | 2.3 |
| pollution spreads to our area | 1 | 1.1 | 1.1 | 3.4 |
| can't do anything about it | 1 | 1.1 | 1.1 | 4.5 |
| I don't care as long as I don't get sick | 1 | 1.1 | 1.1 | 5.7 |
| embarrassment | 1 | 1.1 | 1.1 | 6.8 |
| kids scavenge from the landfill | 1 | 1.1 | 1.1 | 8.0 |
| normal, like everyone else | 1 | 1.1 | 1.1 | 9.1 |
| angry | 1 | 1.1 | 1.1 | 10.2 |
| i feel that it is not good | 3 | 3.4 | 3.4 | 13.6 |
| it should be relocated | 2 | 2.3 | 2.3 | 15.9 |
| got used to it | 1 | 1.1 | 1.1 | 17.0 |
| it is better now | 1 | 1.1 | 1.1 | 18.2 |
| feel ashamed because we die | 1 | 1.1 | 1.1 | 19.3 |
| not in my backyard | 1 | 1.1 | 1.1 | 20.5 |
| it does not affect me | 11 | 12.5 | 12.5 | 33.0 |
| not happy because it causes illnesses | 9 | 10.2 | 10.2 | 43.2 |
| unhappy | 42 | 47.7 | 47.7 | 90.9 |
| bad smell | 8 | 9.1 | 9.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Describe how you feel about living near a landfill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 49 | 55.7 | 55.7 | 55.7 |
| it provides jobs | 1 | 1.1 | 1.1 | 56.8 |
| pollution spreads to our area | 1 | 1.1 | 1.1 | 58.0 |
| can't do anything about it | 2 | 2.3 | 2.3 | 60.2 |
| embarrassment | 4 | 4.5 | 4.5 | 64.8 |
| people from chatsworth throw waste in our place | 1 | 1.1 | 1.1 | 65.9 |
| they burn waste | 2 | 2.3 | 2.3 | 68.2 |
| i feel that it is not good | 1 | 1.1 | 1.1 | 69.3 |
| I hate it | 1 | 1.1 | 1.1 | 70.5 |
| it should be relocated | 4 | 4.5 | 4.5 | 75.0 |
| government should do something | 1 | 1.1 | 1.1 | 76.1 |
| disturbs our breathing | 2 | 2.3 | 2.3 | 78.4 |
| sometimes I go there to scavenge from the landfill | 1 | 1.1 | 1.1 | 79.5 |
| hard to cope with it | 1 | 1.1 | 1.1 | 80.7 |
| not in my backyard | 1 | 1.1 | 1.1 | 81.8 |
| it does not affect me | 1 | 1.1 | 1.1 | 83.0 |
| not happy because it causes illnesses | 3 | 3.4 | 3.4 | 86.4 |
| unhappy | 4 | 4.5 | 4.5 | 90.9 |
| it needs to be managed properly | 1 | 1.1 | 1.1 | 92.0 |
| bad smell | 7 | 8.0 | 8.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

What type of influence do you think the Bulbul Drive landfill has on your community^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Valid positive | 2 | 2.3 | 2.3 | 2.3 |
| negative | 76 | 86.4 | 86.4 | 88.6 |
| don't know | 10 | 11.4 | 11.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 1 | 1.1 | 1.1 | 1.1 |
| no answer | 13 | 14.8 | 14.8 | 15.9 |
| dangerous area | 1 | 1.1 | 1.1 | 17.0 |
| unsure of the risks | 6 | 6.8 | 6.8 | 23.9 |
| complaints in the newspaper by the community | 1 | 1.1 | 1.1 | 25.0 |
| Some people rely on the landfill for scavengeing | 6 | 6.8 | 6.8 | 31.8 |
| if it is controlled then it is okay | 1 | 1.1 | 1.1 | 33.0 |
| people living near the landfill are be affected | 4 | 4.5 | 4.5 | 37.5 |
| weak people are affected and can easily get diseases from the landfill | 1 | 1.1 | 1.1 | 38.6 |
| it is the place that we use to dump our rubbish | 2 | 2.3 | 2.3 | 40.9 |
| dirty | 1 | 1.1 | 1.1 | 42.0 |
| our community is suffering | 2 | 2.3 | 2.3 | 44.3 |
| because it affects other people, not me specifically | 2 | 2.3 | 2.3 | 46.6 |
| don't know | 3 | 3.4 | 3.4 | 50.0 |
| bad smell | 10 | 11.4 | 11.4 | 61.4 |
| sicknesses | 34 | 38.6 | 38.6 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid | 75 | 85.2 | 85.2 | 85.2 |
| dangerous area | 2 | 2.3 | 2.3 | 87.5 |
| people living near the landfill are be affected | 6 | 6.8 | 6.8 | 94.3 |
| we are no longer allowed to go there to "collect stuff" from the landfill | 1 | 1.1 | 1.1 | 95.5 |
| bad smell | 1 | 1.1 | 1.1 | 96.6 |
| sicknesses | 2 | 2.3 | 2.3 | 98.9 |
| air pollution | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Do you feel safe in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-----------|---------|---------------|--------------------|
| Valid yes | 55 | 62.5 | 62.5 | 62.5 |
| no | 26 | 29.5 | 29.5 | 92.0 |
| don't know | 7 | 8.0 | 8.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid no answer | 12 | 13.6 | 13.6 | 13.6 |
| safe environment | 30 | 34.1 | 34.1 | 47.7 |
| I am used to the area | 1 | 1.1 | 1.1 | 48.9 |
| I have a lot of security | 1 | 1.1 | 1.1 | 50.0 |
| in certain situations I do feel unsafe | 7 | 8.0 | 8.0 | 58.0 |
| people socialise here | 3 | 3.4 | 3.4 | 61.4 |
| people are free here | 1 | 1.1 | 1.1 | 62.5 |
| yes there is crime, but when it comes to health,we are not safe at all | 4 | 4.5 | 4.5 | 67.0 |
| we can get diseases from the air we inhale from the landfill | 2 | 2.3 | 2.3 | 69.3 |
| kids like to play at the landfill and eat rotten food | 1 | 1.1 | 1.1 | 70.5 |
| gangsters around | 1 | 1.1 | 1.1 | 71.6 |
| we are not affected by air pollution all the time | 1 | 1.1 | 1.1 | 72.7 |
| don't know | 1 | 1.1 | 1.1 | 73.9 |
| high crime rate | 23 | 26.1 | 26.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid | 75 | 85.2 | 85.2 | 85.2 |
| safe environment | 3 | 3.4 | 3.4 | 88.6 |
| I have a lot of security | 2 | 2.3 | 2.3 | 90.9 |
| in certain situations I do feel unsafe | 3 | 3.4 | 3.4 | 94.3 |
| people socialise here | 1 | 1.1 | 1.1 | 95.5 |
| yes there is crime, but when it comes to health, we are not safe at all | 2 | 2.3 | 2.3 | 97.7 |
| we can get diseases from the air we inhale from the landfill | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

What is your relationship (if any) with the landfill management (Wasteman)^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid I interact at least once a year with Wasteman personnel | 5 | 5.7 | 5.7 | 5.7 |
| I interact infrequently with wasteman personnel | 3 | 3.4 | 3.4 | 9.1 |
| I have had no interaction with Wasteman personnel | 77 | 87.5 | 87.5 | 96.6 |
| I have had no interaction with Wasteman personnel but I know who they are | 1 | 1.1 | 1.1 | 97.7 |
| don't know | 1 | 1.1 | 1.1 | 98.9 |
| I have interacted at least once with wasteman | 1 | 1.1 | 1.1 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

If you have interacted with landfill management, these interactions have been^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 82 | 93.2 | 93.2 | 93.2 |
| positive | 1 | 1.1 | 1.1 | 94.3 |
| negative | 2 | 2.3 | 2.3 | 96.6 |
| sometimes negative and other times positive | 3 | 3.4 | 3.4 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------------------------|-----------|---------|---------------|--------------------|
| Valid | 82 | 93.2 | 93.2 | 93.2 |
| no answer | 1 | 1.1 | 1.1 | 94.3 |
| they are part of the community | 1 | 1.1 | 1.1 | 95.5 |
| wasteman does not care at all | 2 | 2.3 | 2.3 | 97.7 |
| we argue with them about the smell | 2 | 2.3 | 2.3 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

**Have you noticed any changes to the way the landfill has been managed in
the last five years^a**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid yes | 24 | 27.3 | 27.3 | 27.3 |
| no | 64 | 72.7 | 72.7 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid no answer | 31 | 35.2 | 35.2 | 35.2 |
| I don't go near the landfill | 2 | 2.3 | 2.3 | 37.5 |
| Children have died scavenging from the landfill | 1 | 1.1 | 1.1 | 38.6 |
| they are managing the landfill better now | 4 | 4.5 | 4.5 | 43.2 |
| they are closing the dump | 3 | 3.4 | 3.4 | 46.6 |
| they are covering the waste now | 1 | 1.1 | 1.1 | 47.7 |
| it's gotten worse | 3 | 3.4 | 3.4 | 51.1 |
| does not apply | 2 | 2.3 | 2.3 | 53.4 |
| bad smell and odour | 2 | 2.3 | 2.3 | 55.7 |
| still using chemicals | 1 | 1.1 | 1.1 | 56.8 |
| when its full they use the space next to it | 1 | 1.1 | 1.1 | 58.0 |
| kids are no longer scavenging from the landfill | 1 | 1.1 | 1.1 | 59.1 |
| we have been trying to talk to the municipality but there responses are negative | 1 | 1.1 | 1.1 | 60.2 |
| don't know | 3 | 3.4 | 3.4 | 63.6 |
| the management changed | 1 | 1.1 | 1.1 | 64.8 |
| the landfill only started a few years ago | 1 | 1.1 | 1.1 | 65.9 |
| improvement in the smell | 8 | 9.1 | 9.1 | 75.0 |
| nothing that I can do | 1 | 1.1 | 1.1 | 76.1 |
| still the same, no changes | 21 | 23.9 | 23.9 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Have you noticed any changes to the natural environment surrounding the landfill since you have lived here^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid yes | 37 | 42.0 | 42.0 | 42.0 |
| no | 51 | 58.0 | 58.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid no answer | 30 | 34.1 | 34.1 | 34.1 |
| the environment is cleaner | 7 | 8.0 | 8.0 | 42.0 |
| no changes | 8 | 9.1 | 9.1 | 51.1 |
| getting worse | 1 | 1.1 | 1.1 | 52.3 |
| does not affect me | 2 | 2.3 | 2.3 | 54.5 |
| trees planted around the landfill | 3 | 3.4 | 3.4 | 58.0 |
| lots of construction | 1 | 1.1 | 1.1 | 59.1 |
| our area is very clean | 3 | 3.4 | 3.4 | 62.5 |
| people will die scavenging | 1 | 1.1 | 1.1 | 63.6 |
| the landfill is closing | 1 | 1.1 | 1.1 | 64.8 |
| does not apply | 1 | 1.1 | 1.1 | 65.9 |
| the river is no longer flooding as it did before | 1 | 1.1 | 1.1 | 67.0 |
| water has been polluted | 2 | 2.3 | 2.3 | 69.3 |
| don't know | 10 | 11.4 | 11.4 | 80.7 |
| rubbish on the streets | 2 | 2.3 | 2.3 | 83.0 |
| problems with vegetation growing | 15 | 17.0 | 17.0 | 100.0 |
| Total | 88 | 100.0 | 100.0 | |

a. Sampling region = Umlazi

Chatsworth

Do you know that there is a landfill located on Bulbul Drive in^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|-----------|---------|---------------|--------------------|
| Valid yes | 74 | 93.7 | 93.7 | 93.7 |
| no | 5 | 6.3 | 6.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Describe how you feel about living near a landfill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid no answer | 5 | 6.3 | 6.3 | 6.3 |
| it provides jobs | 1 | 1.3 | 1.3 | 7.6 |
| robbery affects us | 1 | 1.3 | 1.3 | 8.9 |
| pollution spreads to our area | 3 | 3.8 | 3.8 | 12.7 |
| i don't live near it so it does not affect me | 1 | 1.3 | 1.3 | 13.9 |
| i feel that it is not good | 2 | 2.5 | 2.5 | 16.5 |
| it should be relocated | 1 | 1.3 | 1.3 | 17.7 |
| got used to it | 1 | 1.3 | 1.3 | 19.0 |
| don't know | 8 | 10.1 | 10.1 | 29.1 |
| the landfill is closed but sometimes there are illegal dumpers | 1 | 1.3 | 1.3 | 30.4 |
| they should "purify" the dump and people can relocate there, it would be no problem at all | 1 | 1.3 | 1.3 | 31.6 |
| the bacteria affects our health | 1 | 1.3 | 1.3 | 32.9 |
| not in my backyard | 7 | 8.9 | 8.9 | 41.8 |
| it does not affect me | 9 | 11.4 | 11.4 | 53.2 |
| not happy because it causes illnesses | 8 | 10.1 | 10.1 | 63.3 |
| unhappy | 23 | 29.1 | 29.1 | 92.4 |
| it needs to be managed properly | 3 | 3.8 | 3.8 | 96.2 |
| bad smell | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Describe how you feel about living near a landfill^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------------------------|-----------|---------|---------------|--------------------|
| Valid | 62 | 78.5 | 78.5 | 78.5 |
| no answer | 2 | 2.5 | 2.5 | 81.0 |
| it should be relocated | 1 | 1.3 | 1.3 | 82.3 |
| don't know | 1 | 1.3 | 1.3 | 83.5 |
| hard to cope with it | 1 | 1.3 | 1.3 | 84.8 |
| dangerous area | 1 | 1.3 | 1.3 | 86.1 |
| not in my backyard | 2 | 2.5 | 2.5 | 88.6 |
| not happy because it causes illnesses | 3 | 3.8 | 3.8 | 92.4 |
| unhappy | 1 | 1.3 | 1.3 | 93.7 |
| it needs to be managed properly | 1 | 1.3 | 1.3 | 94.9 |
| bad smell | 4 | 5.1 | 5.1 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

What type of influence do you think the Bulbul Drive landfill has on your community^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Valid positive | 1 | 1.3 | 1.3 | 1.3 |
| negative | 55 | 69.6 | 69.6 | 70.9 |
| don't know | 23 | 29.1 | 29.1 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|--|-----------|---------|---------------|--------------------|
| Valid | no answer | 18 | 22.8 | 22.8 | 22.8 |
| | dangerous area | 3 | 3.8 | 3.8 | 26.6 |
| | unsure of the risks | 5 | 6.3 | 6.3 | 32.9 |
| | reduction in property prices | 1 | 1.3 | 1.3 | 34.2 |
| | don't think it has any risks | 1 | 1.3 | 1.3 | 35.4 |
| | people living near the landfill are be affected | 2 | 2.5 | 2.5 | 38.0 |
| | dirty | 1 | 1.3 | 1.3 | 39.2 |
| | because it affects other people, not me specifically | 4 | 5.1 | 5.1 | 44.3 |
| | it affects us | 1 | 1.3 | 1.3 | 45.6 |
| | don't know | 2 | 2.5 | 2.5 | 48.1 |
| | smoke from the burning of tyres | 1 | 1.3 | 1.3 | 49.4 |
| | bad smell | 8 | 10.1 | 10.1 | 59.5 |
| | sicknesses | 22 | 27.8 | 27.8 | 87.3 |
| | air pollution | 6 | 7.6 | 7.6 | 94.9 |
| | does not affect me | 1 | 1.3 | 1.3 | 96.2 |
| | people dump illegally in our neighbourhood | 3 | 3.8 | 3.8 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid | 65 | 82.3 | 82.3 | 82.3 |
| ? | 1 | 1.3 | 1.3 | 83.5 |
| dangerous area | 1 | 1.3 | 1.3 | 84.8 |
| reduction in property prices | 3 | 3.8 | 3.8 | 88.6 |
| complaints in the newspaper by the community | 1 | 1.3 | 1.3 | 89.9 |
| truck spillages | 1 | 1.3 | 1.3 | 91.1 |
| sicknesses | 3 | 3.8 | 3.8 | 94.9 |
| air pollution | 3 | 3.8 | 3.8 | 98.7 |
| does not affect me | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Do you feel safe in your neighbourhood^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-----------|---------|---------------|--------------------|
| Valid yes | 28 | 35.4 | 35.4 | 35.4 |
| no | 44 | 55.7 | 55.7 | 91.1 |
| don't know | 7 | 8.9 | 8.9 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid no answer | 7 | 8.9 | 8.9 | 8.9 |
| safe environment | 10 | 12.7 | 12.7 | 21.5 |
| I am used to the area | 3 | 3.8 | 3.8 | 25.3 |
| I have a lot of security | 3 | 3.8 | 3.8 | 29.1 |
| in certain situations I do feel unsafe | 4 | 5.1 | 5.1 | 34.2 |
| does not apply | 1 | 1.3 | 1.3 | 35.4 |
| robberies | 5 | 6.3 | 6.3 | 41.8 |
| hijackings | 4 | 5.1 | 5.1 | 46.8 |
| high crime rate | 35 | 44.3 | 44.3 | 91.1 |
| informal settlement | 3 | 3.8 | 3.8 | 94.9 |
| certain religious groups | 1 | 1.3 | 1.3 | 96.2 |
| drug and alcohol abuse | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 71 | 89.9 | 89.9 | 89.9 |
| safe environment | 2 | 2.5 | 2.5 | 92.4 |
| in certain situations I do feel unsafe | 3 | 3.8 | 3.8 | 96.2 |
| we can get diseases from the air we inhale from the landfill | 1 | 1.3 | 1.3 | 97.5 |
| hijackings | 1 | 1.3 | 1.3 | 98.7 |
| high crime rate | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

What is your relationship (if any) with the landfill management (Wasteman)^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|---|-----------|---------|---------------|--------------------|
| Valid | I interact at least once a year with Wasteman personnel | 3 | 3.8 | 3.8 | 3.8 |
| | I interact infrequently with wasteman personnel | 2 | 2.5 | 2.5 | 6.3 |
| | I have had no interaction with Wasteman personnel | 71 | 89.9 | 89.9 | 96.2 |
| | I have had no interaction with Wasteman personnel but I know who they are | 2 | 2.5 | 2.5 | 98.7 |
| | no answer | 1 | 1.3 | 1.3 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

If you have interacted with landfill management, these interactions have been^a

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|---|-----------|---------|---------------|--------------------|
| Valid | | 73 | 92.4 | 92.4 | 92.4 |
| | positive | 2 | 2.5 | 2.5 | 94.9 |
| | negative | 2 | 2.5 | 2.5 | 97.5 |
| | sometimes negative and other times positive | 2 | 2.5 | 2.5 | 100.0 |
| | Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid | 72 | 91.1 | 91.1 | 91.1 |
| we are trying to close the landfill | 1 | 1.3 | 1.3 | 92.4 |
| fires at the landfill | 1 | 1.3 | 1.3 | 93.7 |
| restricted dumping | 1 | 1.3 | 1.3 | 94.9 |
| don't know | 1 | 1.3 | 1.3 | 96.2 |
| wasteman does not care at all | 1 | 1.3 | 1.3 | 97.5 |
| wasteman management was sympathetic | 1 | 1.3 | 1.3 | 98.7 |
| we are fighting to relocate the landfill | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Have you noticed any changes to the way the landfill has been managed in the last five years^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Valid | 1 | 1.3 | 1.3 | 1.3 |
| yes | 16 | 20.3 | 20.3 | 21.5 |
| no | 59 | 74.7 | 74.7 | 96.2 |
| does not apply | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid no answer | 27 | 34.2 | 34.2 | 34.2 |
| it's already closed now | 1 | 1.3 | 1.3 | 35.4 |
| I don't go near the landfill | 2 | 2.5 | 2.5 | 38.0 |
| I don't go near the landfill because of crime | 2 | 2.5 | 2.5 | 40.5 |
| they are managing the landfill better now | 1 | 1.3 | 1.3 | 41.8 |
| less waste than in the past | 1 | 1.3 | 1.3 | 43.0 |
| they are covering the waste now | 1 | 1.3 | 1.3 | 44.3 |
| it's gotten worse | 4 | 5.1 | 5.1 | 49.4 |
| does not apply | 4 | 5.1 | 5.1 | 54.4 |
| i didn't know the landfill was there | 3 | 3.8 | 3.8 | 58.2 |
| the landfill is surrounded by fencing and police | 1 | 1.3 | 1.3 | 59.5 |
| not as much landfill action in the past few months | 2 | 2.5 | 2.5 | 62.0 |
| the landfill is surrounded by lots of vegetation | 1 | 1.3 | 1.3 | 63.3 |
| don't know | 9 | 11.4 | 11.4 | 74.7 |
| improvement in the smell | 4 | 5.1 | 5.1 | 79.7 |
| still the same, no changes | 13 | 16.5 | 16.5 | 96.2 |
| smell improved | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

**Have you noticed any changes to the natural environment surrounding the landfill
since you have lived here^a**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|-----------------------|
| Valid yes | 21 | 26.6 | 26.6 | 26.6 |
| no | 55 | 69.6 | 69.6 | 96.2 |
| does not apply | 3 | 3.8 | 3.8 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

Please explain why you feel this way^a

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------------------------|-----------|---------|---------------|-----------------------|
| Valid no answer | 32 | 40.5 | 40.5 | 40.5 |
| the environment is cleaner | 3 | 3.8 | 3.8 | 44.3 |
| no changes | 6 | 7.6 | 7.6 | 51.9 |
| getting worse | 2 | 2.5 | 2.5 | 54.4 |
| does not affect me | 2 | 2.5 | 2.5 | 57.0 |
| air pollution | 3 | 3.8 | 3.8 | 60.8 |
| our area is very clean | 1 | 1.3 | 1.3 | 62.0 |
| does not apply | 6 | 7.6 | 7.6 | 69.6 |
| the smell affects us when it rains | 1 | 1.3 | 1.3 | 70.9 |
| water has been polluted | 1 | 1.3 | 1.3 | 72.2 |
| medical waste | 1 | 1.3 | 1.3 | 73.4 |
| don't know | 8 | 10.1 | 10.1 | 83.5 |
| bad smell or odour | 1 | 1.3 | 1.3 | 84.8 |
| rubbish on the streets | 2 | 2.5 | 2.5 | 87.3 |
| problems with vegetation growing | 9 | 11.4 | 11.4 | 98.7 |
| the landfill is already closed | 1 | 1.3 | 1.3 | 100.0 |
| Total | 79 | 100.0 | 100.0 | |

a. Sampling region = Chatsworth

B.3.6. Cross tabulations between neighbourhood satisfaction and perceptions of environmental quality.

Umlazi

Case Processing Summary^a

| | Cases | | | | | |
|--|-------|---------|---------|---------|-------|---------|
| | Valid | | Missing | | Total | |
| | N | Percent | N | Percent | N | Percent |
| Are you happy living in your neighbourhood * Describe how you feel about living near a landfill | 88 | 100.0% | 0 | 0.0% | 88 | 100.0% |
| Are you happy living in your neighbourhood * What type of influence do you think the Bulbul Drive landfill has on your community | 88 | 100.0% | 0 | 0.0% | 88 | 100.0% |
| Are you happy living in your neighbourhood * How do you feel about the Bulbul Drive landfill closing in the future | 88 | 100.0% | 0 | 0.0% | 88 | 100.0% |

a. Sampling region = Umlazi

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|---|--|------------------|
| | | | no answer | it provides jobs |
| Are you happy living in your neighbourhood | yes | Count | 1 | 1 |
| | | % within Are you happy living in your neighbourhood | 1.4% | 1.4% |
| | no | Count | 0 | 0 |
| | | % within Are you happy living in your neighbourhood | 0.0% | 0.0% |
| Total | | Count | 1 | 1 |
| | | % within Are you happy living in your neighbourhood | 1.1% | 1.1% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|--|--|----------------------------|
| | | | pollution spreads to our area | can't do anything about it |
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 1 1.4% | 1 1.4% |
| | no | Count % within Are you happy living in your neighbourhood | 0 0.0% | 0 0.0% |
| Total | | Count % within Are you happy living in your neighbourhood | 1 1.1% | 1 1.1% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|--|--|---------------|
| | | | I don't care as long as I don't get sick | embarrassment |
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 1 1.4% | 0 0.0% |
| | no | Count % within Are you happy living in your neighbourhood | 0 0.0% | 1 6.3% |
| Total | | Count % within Are you happy living in your neighbourhood | 1 1.1% | 1 1.1% |

Are you happy living in your neighbour

ood * Describe how you feel about living near a landfill Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|--|--|----------------------------|
| | | | kids scavenge from the landfill | normal, like everyone else |
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 1 1.4% | 1 1.4% |
| | no | Count % within Are you happy living in your neighbourhood | 0 0.0% | 0 0.0% |
| Total | | Count % within Are you happy living in your neighbourhood | 1 1.1% | 1 1.1% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|--|--|----------------------------|
| | | | angry | i feel that it is not good |
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 1 1.4% | 3 4.2% |
| | no | Count % within Are you happy living in your neighbourhood | 0 0.0% | 0 0.0% |
| Total | | Count % within Are you happy living in your neighbourhood | 1 1.1% | 3 3.4% |

Are you happy living in your neighbour

hood * Describe how you feel about living near a landfill Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|--|--|----------------|
| | | | it should be relocated | got used to it |
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 2 2.8% | 1 1.4% |
| | no | Count % within Are you happy living in your neighbourhood | 0 0.0% | 0 0.0% |
| Total | | Count % within Are you happy living in your neighbourhood | 2 2.3% | 1 1.1% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|--|--|-----------------------------|
| | | | it is better now | feel ashamed because we die |
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 1 1.4% | 0 0.0% |
| | no | Count % within Are you happy living in your neighbourhood | 0 0.0% | 1 6.3% |
| Total | | Count | 1 | 1 |

| | | |
|--|------|------|
| % within Are you happy living in your neighbourhood | 1.1% | 1.1% |
|--|------|------|

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|--|--|-----------------------|
| | | | not in my backyard | it does not affect me |
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 1 1.4% | 9 12.5% |
| | no | Count % within Are you happy living in your neighbourhood | 0 0.0% | 2 12.5% |
| Total | | Count % within Are you happy living in your neighbourhood | 1 1.1% | 11 12.5% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|--|--|-------------|
| | | | not happy because it causes illnesses | unhappy |
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 8 11.1% | 34 47.2% |
| | no | Count % within Are you happy living in your neighbourhood | 1 6.3% | 8 50.0% |

| | | | |
|-------|---|-------|-------|
| Total | Count | 9 | 42 |
| | % within Are you happy living in your neighbourhood | 10.2% | 47.7% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|---|--|--------|
| | | | bad smell | Total |
| Are you happy living in your neighbourhood | yes | Count | 5 | 72 |
| | | % within Are you happy living in your neighbourhood | 6.9% | 100.0% |
| | no | Count | 3 | 16 |
| | | % within Are you happy living in your neighbourhood | 18.8% | 100.0% |
| Total | | Count | 8 | 88 |
| | | % within Are you happy living in your neighbourhood | 9.1% | 100.0% |

a. Sampling region = Umlazi

Are you happy living in your neighbourhood * What type of influence do you think the Bulbul Drive landfill has on your community Crosstabulation^a

| | | What type of influence do you think the Bulbul Drive landfill has on your community | |
|------------------------------|-----|---|----------|
| | | positive | negative |
| Are you happy living in your | yes | Count | 2 |
| | | | 62 |

| | | | | |
|---------------|----|---|------|-------|
| neighbourhood | | % within Are you happy living in your neighbourhood | 2.8% | 86.1% |
| | no | Count | 0 | 14 |
| | | % within Are you happy living in your neighbourhood | 0.0% | 87.5% |
| Total | | Count | 2 | 76 |
| | | % within Are you happy living in your neighbourhood | 2.3% | 86.4% |

Are you happy living in your neighbourhood * What type of influence do you think the Bulbul Drive landfill has on your community Crosstabulation^a

| | | | What type of influence do you think the Bulbul Drive landfill has on your community | |
|--|-----|---|---|--------|
| | | | don't know | Total |
| Are you happy living in your neighbourhood | yes | Count | 8 | 72 |
| | | % within Are you happy living in your neighbourhood | 11.1% | 100.0% |
| | no | Count | 2 | 16 |
| | | % within Are you happy living in your neighbourhood | 12.5% | 100.0% |
| Total | | Count | 10 | 88 |
| | | % within Are you happy living in your neighbourhood | 11.4% | 100.0% |

a. Sampling region = Umlazi

Are you happy living in your neighbourhood * How do you feel about the Bulbul Drive landfill closing in the future Crosstabulation^a

| | |
|--|---|
| | How do you feel about the Bulbul Drive landfill closing in the future |
|--|---|

| | | | i am happy that the landfill is closing | i am unhappy that the landfill is closing |
|--|-----|---|---|---|
| Are you happy living in your neighbourhood | yes | Count | 58 | 5 |
| | | % within Are you happy living in your neighbourhood | 80.6% | 6.9% |
| | no | Count | 14 | 1 |
| | | % within Are you happy living in your neighbourhood | 87.5% | 6.3% |
| Total | | Count | 72 | 6 |
| | | % within Are you happy living in your neighbourhood | 81.8% | 6.8% |

Are you happy living in your neighbourhood * How do you feel about the Bulbul Drive landfill closing in the future Crosstabulation^a

| | | | How do you feel about the Bulbul Drive landfill closing in the future | |
|--|-----|---|---|--|
| | | | it does not really affect my life whether the landfill closes or remains open | i don't know how i feel about the landfill closure |
| Are you happy living in your neighbourhood | yes | Count | 5 | 4 |
| | | % within Are you happy living in your neighbourhood | 6.9% | 5.6% |
| | no | Count | 0 | 1 |
| | | % within Are you happy living in your neighbourhood | 0.0% | 6.3% |
| Total | | Count | 5 | 5 |
| | | % within Are you happy living in your neighbourhood | 5.7% | 5.7% |

Are you happy living in your neighbourhood * How do you feel about the Bulbul Drive landfill closing in the future Crosstabulation^a

| | | | Total |
|--|-----|---|--------|
| Are you happy living in your neighbourhood | yes | Count | 72 |
| | | % within Are you happy living in your neighbourhood | 100.0% |

| | | | |
|-------|----|---|--------|
| | no | Count | 16 |
| | | % within Are you happy living in your neighbourhood | 100.0% |
| Total | | Count | 88 |
| | | % within Are you happy living in your neighbourhood | 100.0% |

a. Sampling region = Umlazi

Chatsworth

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|---|--|------------------|
| | | | no answer | it provides jobs |
| Are you happy living in your neighbourhood | yes | Count | 5 | 1 |
| | | % within Are you happy living in your neighbourhood | 7.5% | 1.5% |
| | no | Count | 0 | 0 |
| | | % within Are you happy living in your neighbourhood | 0.0% | 0.0% |
| Total | | Count | 5 | 1 |
| | | % within Are you happy living in your neighbourhood | 6.3% | 1.3% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|------------------------------|-----|-------|--|-------------------------------|
| | | | robbery affects us | pollution spreads to our area |
| Are you happy living in your | yes | Count | 1 | 2 |

| | | | |
|---------------|---|------|------|
| neighbourhood | % within Are you happy living in your neighbourhood | 1.5% | 3.0% |
| | no Count | 0 | 1 |
| | % within Are you happy living in your neighbourhood | 0.0% | 8.3% |
| Total | Count | 1 | 3 |
| | % within Are you happy living in your neighbourhood | 1.3% | 3.8% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|---|--|----------------------------|
| | | | i don't live near it so it does not affect me | i feel that it is not good |
| Are you happy living in your neighbourhood | yes | Count | 1 | 2 |
| | | % within Are you happy living in your neighbourhood | 1.5% | 3.0% |
| | no | Count | 0 | 0 |
| | | % within Are you happy living in your neighbourhood | 0.0% | 0.0% |
| Total | | Count | 1 | 2 |
| | | % within Are you happy living in your neighbourhood | 1.3% | 2.5% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|--|--|--|--|
| | | | | |

| | | | it should be relocated | got used to it |
|---|-----|--|---------------------------|----------------|
| Are you happy living in your neighbourhood | yes | Count | 1 | 1 |
| | | % within Are you happy living in your neighbourhood | 1.5% | 1.5% |
| | no | Count | 0 | 0 |
| | | % within Are you happy living in your neighbourhood | 0.0% | 0.0% |
| Total | | Count | 1 | 1 |
| | | % within Are you happy living in your neighbourhood | 1.3% | 1.3% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|---|-----|--|---|--|
| | | | don't know | the landfill is closed but sometimes there are illegal dumpers |
| Are you happy living in your neighbourhood | yes | Count | 7 | 1 |
| | | % within Are you happy living in your neighbourhood | 10.4% | 1.5% |
| | no | Count | 1 | 0 |
| | | % within Are you happy living in your neighbourhood | 8.3% | 0.0% |
| Total | | Count | 8 | 1 |
| | | % within Are you happy living in your neighbourhood | 10.1% | 1.3% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill |
|--|--|--|---|
| | | | |

| | | | | |
|--|-----|---|--|---------------------------------|
| | | | they should "purify" the dump and people can relocate there, it would be no problem at all | the bacteria affects our health |
| Are you happy living in your neighbourhood | yes | Count | 1 | 0 |
| | | % within Are you happy living in your neighbourhood | 1.5% | 0.0% |
| | no | Count | 0 | 1 |
| | | % within Are you happy living in your neighbourhood | 0.0% | 8.3% |
| Total | | Count | 1 | 1 |
| | | % within Are you happy living in your neighbourhood | 1.3% | 1.3% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|---|--|-----------------------|
| | | | not in my backyard | it does not affect me |
| Are you happy living in your neighbourhood | yes | Count | 6 | 6 |
| | | % within Are you happy living in your neighbourhood | 9.0% | 9.0% |
| | no | Count | 1 | 3 |
| | | % within Are you happy living in your neighbourhood | 8.3% | 25.0% |
| Total | | Count | 7 | 9 |
| | | % within Are you happy living in your neighbourhood | 8.9% | 11.4% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|--|--|--|--|
| | | | | |

| | | | not happy because it causes illnesses | unhappy |
|--|-----|--|---|-------------|
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 7 10.4% | 20 29.9% |
| | no | Count % within Are you happy living in your neighbourhood | 1 8.3% | 3 25.0% |
| Total | | Count % within Are you happy living in your neighbourhood | 8 10.1% | 23 29.1% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Describe how you feel about living near a landfill | |
|--|-----|--|---|-----------|
| | | | it needs to be managed properly | bad smell |
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 2 3.0% | 3 4.5% |
| | no | Count % within Are you happy living in your neighbourhood | 1 8.3% | 0 0.0% |
| Total | | Count % within Are you happy living in your neighbourhood | 3 3.8% | 3 3.8% |

Are you happy living in your neighbourhood * Describe how you feel about living near a landfill

Crosstabulation^a

| | | | Total |
|--|-----|--|--------------|
| Are you happy living in your neighbourhood | yes | Count % within Are you happy living in your neighbourhood | 67 100.0% |
| | no | Count | 12 |

| | | |
|-------|---|--------|
| | % within Are you happy living in your neighbourhood | 100.0% |
| Total | Count | 79 |
| | % within Are you happy living in your neighbourhood | 100.0% |

a. Sampling region = Chatsworth

Are you happy living in your neighbourhood * What type of influence do you think the Bulbul Drive landfill has on your community Crosstabulation^a

| | | | What type of influence do you think the Bulbul Drive landfill has on your community | |
|--|-----|---|---|----------|
| | | | positive | negative |
| Are you happy living in your neighbourhood | yes | Count | 1 | 46 |
| | | % within Are you happy living in your neighbourhood | 1.5% | 68.7% |
| | no | Count | 0 | 9 |
| | | % within Are you happy living in your neighbourhood | 0.0% | 75.0% |
| Total | | Count | 1 | 55 |
| | | % within Are you happy living in your neighbourhood | 1.3% | 69.6% |

Are you happy living in your neighbourhood * What type of influence do you think the Bulbul Drive landfill has on your community Crosstabulation^a

| | | | What type of influence do you think the Bulbul Drive landfill has on your community | |
|--|-----|---|---|--------|
| | | | don't know | Total |
| Are you happy living in your neighbourhood | yes | Count | 20 | 67 |
| | | % within Are you happy living in your neighbourhood | 29.9% | 100.0% |

| | | | | |
|-------|----|---|-------|--------|
| | no | Count | 3 | 12 |
| | | % within Are you happy living in your neighbourhood | 25.0% | 100.0% |
| Total | | Count | 23 | 79 |
| | | % within Are you happy living in your neighbourhood | 29.1% | 100.0% |

. Sampling region = Chatsworth

Are you happy living in your neighbourhood * How do you feel about the Bulbul Drive landfill closing in the future Crosstabulation^a

| | | | How do you feel about the Bulbul Drive landfill closing in the future | |
|--|-----|---|---|--|
| | | | it does not really affect my life whether the landfill closes or remains open | i don't know how i feel about the landfill closure |
| Are you happy living in your neighbourhood | yes | Count | 8 | 7 |
| | | % within Are you happy living in your neighbourhood | 11.9% | 10.4% |
| | no | Count | 1 | 1 |
| | | % within Are you happy living in your neighbourhood | 8.3% | 8.3% |
| Total | | Count | 9 | 8 |
| | | % within Are you happy living in your neighbourhood | 11.4% | 10.1% |

Are you happy living in your neighbourhood * How do you feel about the Bulbul Drive landfill closing in the future Crosstabulation^a

| | | | Total |
|--|-----|---|--------|
| Are you happy living in your neighbourhood | yes | Count | 67 |
| | | % within Are you happy living in your neighbourhood | 100.0% |
| | no | Count | 12 |

| | | |
|-------|---|--------|
| | % within Are you happy living in your neighbourhood | 100.0% |
| Total | Count | 79 |
| | % within Are you happy living in your neighbourhood | 100.0% |

a. Sampling region = Chatsworth

C. Gradko report for hydrogen sulphide



St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
 tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

LABORATORY ANALYSIS REPORT HYDROGEN SULPHIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

Report number **40802**
 Booking in reference no **D 4108**
 Customer **Sarisha Perumal, Uni. Of Kwa-Zulu-Africa, Kwa-Zulu Natal, S.A.**
 Date samples received **09/08/2010**

| | Location | Date exposed | Date finished | Exposure hours | µg H ₂ S Total | µg H ₂ S - Blank | H ₂ S µg/m ³ * | H ₂ S ppb* |
|---|------------------|--------------|---------------|----------------|---------------------------|-----------------------------|--------------------------------------|-----------------------|
| 1 | 209 Bulbul Drive | 14/07/2010 | 28/07/2010 | 334.07 | <L.O.D. | <L.O.D. | <L.O.D. | <L.O.D. |
| 2 | 164 Bulbul Drive | 14/07/2010 | 28/07/2010 | 333.63 | <L.O.D. | <L.O.D. | <L.O.D. | <L.O.D. |
| 3 | 57 Bulbul Drive | 14/07/2010 | 28/07/2010 | 333.13 | <L.O.D. | <L.O.D. | <L.O.D. | <L.O.D. |
| 4 | 2 Bulbul Drive | 14/07/2010 | 28/07/2010 | 332.92 | <L.O.D. | <L.O.D. | <L.O.D. | <L.O.D. |

Lab Blank 0.010

Results are blank subtracted

<L.O.D. means below the limit of detection.

The L.O.D. is 0.132ppb based on 0.05µg including blank result at 334.07 hours.

| | | | |
|-------------------|------------|--------------------|------------|
| Overall M.O.U. | 9.06% +/- | Limit of detection | 0.05µg |
| Analyst signature | | Analyst name | J. Roberts |
| Date of analysis | 19/08/2010 | Date of report | 23/08/2010 |

Analysis carried out in accordance with documented in-house Laboratory Method GLM5

The Diffusion Tubes have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures calculations and assessments involving the exposure procedures and periods provided by the client are not within the scope of our UKAS accreditation. Those results obtained using exposure data shall be indicated by an asterisk. Any queries concerning the data in this report should be directed to the Laboratory Manager Gradko International Ltd.

Form LQF32 Issue 2

Report Number 40802

Page 1 of 1



Gradko International Ltd
 This signature confirms the authenticity of these results
 Signed.....*L. Gates*.....
 L. Gates, Laboratory Supervisor