The Amathole District Municipality Environmental Pollution Control Plan
Environmental Impact and Risk Assessment
Version 1.

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Health and Protection Service Unit
Pollution Control
January 2013
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1 PROJECT DESCRIPTION

1.1 Project Aim

The project seeks to develop an implementable Environmental Pollution Control Plan that will guide and assist Amathole District Municipality in controlling and addressing the pollution posed by the polluting agents within the District. The objective is to minimize the negative health impacts resulting from intentional and unintentional exposure of communities to environmental pollutants. This plan will lay down provisions for safe and effective management of Environmental Pollution Control Management Plan from Pollutants.

1.2 Project Background and Project Aim

The Amathole District Municipality (Figure 1-1: Map of amathole district municipality) is situated in the central coastal portion of the Eastern Cape, between the Mbashe River in the northeast and the Great Fish River in the southwest. It occupies the central coastal portion of the province, bordered by the Eastern Cape districts of Cacadu, Chris Hani and OR Tambo to the west, north and east, respectively. It extends for approximately 269 km along the coast, which accounts for 19.58% of the districts' jurisdictional boundary and roughly 34.14% of the Eastern Cape coastline. In total the district covers a geographical area of 23,577km² (ADM SoER, 2012).

FIGURE 1-1: MAP OF AMATHOLE DISTRICT MUNICIPALITY
Amathole DM is classified as a Category C2 municipality, indicating a largely rural character and low urbanisation rate, as well as limited municipal staff and budget capacity. This District Municipality consists of seven local municipalities, including Amahlathi Local Municipality (LM), Great Kei LM, Mbhashe LM, Mnquma LM, Ngqushwa LM, Nkonkobe LM and Nxuba LM. Mbhashe, Mnquma and Ngqushwa are classed as Category B4 (rural, mainly subsistence), and Great Kei, Amahlathi, Nkonkobe and Nxuba as B3 (small towns, agricultural) municipalities. About two-thirds of the district also includes the former Transkei and Ciskei homeland areas and former Cape provincial areas (ADM SoER, 2012).

### TABLE 1-1: CHARACTERISATION OF THE AMATHOLE DM AND ITS LOCAL MUNICIPALITIES (IINGCINGA, 2011)

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Category</th>
<th>Population density (per km²)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amahlathi LM</td>
<td>B3</td>
<td>32.2</td>
<td>Comprising towns of Stutterheim, Cathcart, Keiskammahoek and Kei Road. There are numerous peri-urban and rural settlements.</td>
</tr>
<tr>
<td>Great Kei LM</td>
<td>B3</td>
<td>27.7</td>
<td>Comprising the town of Komga, the small coastal town of Kei Mouth, Haga Haga, Morgan Bay and Chintsa and a number of rural settlements.</td>
</tr>
<tr>
<td>Mbhashe LM</td>
<td>B4</td>
<td>86.1</td>
<td>Comprising towns of Dutwya, Elliotdale and Willowvale, and numerous peri-urban and rural settlements.</td>
</tr>
<tr>
<td>Mnquma LM</td>
<td>B4</td>
<td>81.2</td>
<td>Comprising the main town of Butterworth, the small town of Ngqamakwe and Centani, numerous peri-urban and rural settlements.</td>
</tr>
<tr>
<td>Ngqushwa LM</td>
<td>B4</td>
<td>33.5</td>
<td>Comprising the town of Peddie, the coastal town of Hamburg, and numerous peri-urban and rural settlements.</td>
</tr>
</tbody>
</table>
| Nkonkobe LM    | B3       | 32.0                         | Comprising the towns of Alice, Fort Beaufort and Middledrift, the smaller towns of Hogsback and Seymour. The Municipality has numerous peri-
### Municipality Category Population density (per km²) Description

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Category</th>
<th>Population density (per km²)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nxuba LM</td>
<td>B3</td>
<td>9.0</td>
<td>Comprises of towns of Bedford and Adelaide and surrounding rural areas.</td>
</tr>
</tbody>
</table>

C2 municipalities are classified as: District Municipality, that is largely rural with a low urban rate

B3 municipalities are classified as: Local Municipality, with small towns with agricultural practices

B4 municipalities are classified as: Local Municipality, with mostly rural areas and subsistence farming

The area can generally be categorised as having limited institutional capacity and areas characterised by small centres, limited Small Medium Micro Enterprises (SMMEs) and market opportunities, dependence on public support and local Economic Development (LED) activities that are principally at the level of small projects (District Profile: Eastern Cape Amathole DM, Programme of Support to Local Economic Development in the Eastern Cape, 2005 cited in ADM SoER, 2012).
The Buffalo City Municipality (BCM) was recently upgraded to a Metropolitan Municipality (category A municipality), and therefore is no longer within the Amathole DM jurisdiction. Although BCM no longer forms part of the District, it is mentioned in some sections where projects and infrastructure forms an integral and dominant role in the region, and has the potential to provide positive spin-off effects for the District (ADM SoER, 2012). This may be noted particularly with regard to Air Quality analyses.

The District level Environmental Pollution Control Plan will assist in the sustainable management and control of environmental quality in the Amathole District Municipality in the Eastern Cape. The project seeks to develop an implementable ADM Environmental Pollution Control Plan that will guide and assist ADM in controlling and addressing the pollution posed by the polluting agents within the ADM. The objective is to minimize the negative health impacts resulting from intentional and unintentional exposure of communities to Environmental Pollutants. This Plan will lay down provisions for safe and effective management of Environmental Pollution Control Management Plan from Pollutants through:

- Identifying polluting agents and their sources i.e. water, land and air;
- Conducting environmental health impacts assessments of development related projects including those caused by Major Hazardous Installations;
- Identifying environmental health hazard and conducting risk assessment and mapping;
- Ensuring the registration, permitting, monitoring and auditing of all industries, activities, trade etcetera, which will involve the control of external impacts on the community;
- Develop good indicators appropriate for monitoring the effectiveness of Environmental Management Systems of Industries;
- Address the management of infrastructure integrity, including management of the infrastructure integrity management of pipelines and tanks at the clinics and institutions providing services to the public;
- Assist/advise on air quality monitoring and surveys where required;
- Control and prevent vibration and noise pollution;
- Give effect to best practice in Environmental Pollution Control;
- Develop the institutional framework for Pollution Control Management;
- Provide direction and clarification of roles and responsibilities for the Polluters;
- Develop risk mapping and identified pollutants must be presented in GIS format.
The Amathole District Municipality Environmental Pollution Control Plan – Risk Assessment

There exists the Community Safety Plan (CSP) which provides the framework to guide the ADM in its aim to ensure a safe and healthy environment for the communities within the district, through raising awareness and the implementation of community safety measures.

The Environmental Pollution Control Plan development process will comprise of three main deliverables:

**Phase 1:** Pre-Planning and Phase 1 Analysis leading to Output of Status Quo Study;

**Phase 2:** Setting out objectives, proposing strategies through a consultative and participatory process

**Phase 3:** Implementation and Operational Plan Development

In order to achieve this, several deliverables form part of the overall approach. These are:

- **Deliverable A** – Status Quo Assessment: Identification of Polluting Agents and key Indicators
- **Deliverable B** – Environmental Impact Assessment, Hazard and risk mapping
- **Deliverable C** - Improving the Regulatory systems
- **Deliverable D** - Air Quality Sampling and Surveys
- **Deliverable E** – Best Practice in Environmental Pollution Control

Presented in this report is **Deliverable B of the pollution control plan, Environmental Impact Assessment, Hazard and Risk Mapping.**

### 2 LEGISLATIVE IMPERATIVES

#### 2.1 Overarching National Acts and Strategies

- National Health Act (No 61 of 2003)
- National Environmental Management Act No 107 of 1998;
- National Environmental Management Air Quality Act 39 of 2004;
- The Municipal Systems Act 32 of 2000;
- The Municipal Structures Act 1 of 2003;
2.2 Roles and Functions as legislation stipulates

The Amathole district municipality, as any other within South Africa, has functions assigned according to sections 156 and 229 of the Constitution of South Africa. These functions are divided between the district and the locals which make up the district.

According to the Municipal Structures Act (1 of 2003) a district municipality must seek to achieve the integrated, sustainable and equitable social and economic development of its area as a whole by:

- ensuring integrated development planning for the district as a whole;
- promoting bulk infrastructural development and services for the district as a whole;
- building the capacity of local municipalities in its area to perform their functions and exercise their powers where such capacity is lacking; and
- promoting the equitable distribution of resources between the local municipalities in its area to ensure appropriate levels of municipal services within the area.

Division of functions and powers between district and local municipalities are as such:

- A district municipality has the following functions and powers:
  - Integrated development planning for the district municipality as a whole including a framework for integrated development plans for the local municipalities within the area of the district municipality, taking into account the integrated development plans of those local municipalities.
  - Bulk supply of water that affects a significant proportion of municipalities in the district.
  - Bulk supply of electricity that affects a significant proportion of municipalities in the district.
  - Bulk sewage purification works and main sewage disposal that affects a significant proportion of municipalities in the district.
  - Solid waste disposal sites serving the area of the district municipality as a whole.
  - Municipal roads which form an integral part of a road transport system for the area of the district municipality as a whole.
  - Regulation of passenger transport services.
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- Municipal airport/s serving the area of the district municipality as a whole.
- Municipal health services serving the area of the district municipality as a whole.
- Fire fighting services serving the area of the district municipality as a whole.
- The establishment, conduct, and control of fresh produce markets and abattoirs serving the area of the district municipality as a whole.
- The establishment, conduct, and control of cemeteries and crematoria serving the district as a whole.
- Promotion of local tourism for the area of the district municipality.
- Municipal public works relating to any of the above functions or any other functions assigned to the district municipality.
- The receipt, allocation and if applicable the distribution of grants made to the district municipality.
- The imposition and collection of taxes, levies and duties as related to the above functions or as may be assigned to the district municipality in terms of national legislation (Municipal Systems Act, 2003).

- A local municipality has the functions and powers referred to in section 83(1); excluding those functions and powers vested in terms of subsection (1) of this section in the district municipality in whose area it falls.

3 METHODOLOGY

In deliverable A, the Status Quo Assessment: Identification of Polluting Agents and key Indicators, the DPSIR Framework was applied. For the purposes of the environmental impact assessment, the Risk Assessment will be applied.

3.1 Risk Assessment

The term Risk Assessment refers to the qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants. It is usually the first step in risk management process (UNISA, 2011). It can also be defined as the qualitative or quantitative evaluation of the environment or health risk resulting from exposure to a chemical or pollutant. It combines exposure assessment results with toxicity assessment results in order to estimate risks or to estimate the likelihood and magnitude of their consequences (UNISA, 2011). Risk assessment can be described as the determination of the probability that an adverse effect will result from a defined exposure (Links, 2006).

Risk assessment can also be described as the process of:

- identifying hazards,
- analyzing or evaluating the risk associated with that hazard, and
The United States Environmental Protection Agency (EPA) makes use of risk assessment for characterizing the nature and magnitude of health risks to human beings and ecological receptors from chemical contaminants which could be present in the natural environment. Ecological receptors refer to for example, birds or fish. This information is used in decision making for the protection of humans and the environment from contaminants. Risk assessments fall into two broad categories, these are human health and ecological. In South Africa, Ecological Risk Assessments are conducted as supporting assessments to larger tools such as Environmental Impact Assessments and Strategic Environmental Assessments and is explained in detail in the Department of Environmental Affairs and Tourism Series on Integrated Environmental Management (2002). The aim of a risk assessment process is to remove a hazard or reduce the level of its risk by adding precautions or control measures, as necessary. By doing so, you have created a safer and healthier environment. The latter therefore will be applied to the ADM Pollution Control Plan.

The traditional RA paradigm (Figure 3-1) consists of the following four steps (Glickman and Gough, 1990; ICME, 1995; National Research Council, 1994 cited in Wright and Welbourn, 2002):

1. Hazard identification: this refers to the process of determining whether exposure to an agent can cause an increase in the incidence of a health condition. It is the characterisation of the nature and strength of the evidence of causation and does not provide any information on the extent and magnitude of risk.

2. Dose response evaluation: this is exemplified by the phrase “All substances are poisons, there is none that is not poison. The right dose differentiates a poison and a remedy”

3. Exposure assessment: this quantifies the exposure to the agent of interest. It is often calculated for human and environmental exposures on the basis of predictive models, rather than measurements.

4. Risk characterisation: the final stage of RA, this summarises the information from 1, 2 and 3 and involves putting the expression or assessment of risk into a form that is useful for decision makers. The result is a qualitative or quantitative description of the potential hazards due to the particular exposure.
3.2 The dose-response

Dose-response relationships provide the basis for assessment of hazards and risks which chemicals present to the environment (Walker et al, 2006). Fundamental to toxicological investigations is the relationship between chemical exposure and toxicity. This relationship is characterised from the relationship between the two variables of dose and response, where dose is the measure of the amount of chemical taken up or ingested by the organism and may be quantified in different ways (Wright and Welbourn, 2002). This simple concept of the dose-response relationship raises questions about the definition of poisons, because everything depends on dose (Walker et al, 2006). According to Paracelsus (1493 – 1541) cited in Walker et al (2006) “the dose maketh the poison.” Dose may be precisely circumscribed by injecting an exact amount of chemical into an organism in toxicity bioassays involving terrestrial vertebrates, however, in many environmental toxicological studies; dose is implied from a measure of chemical concentration in the exposure medium and the total exposure time. Exposure mediums refer to air, water or sediment (Wright and Welbourn, 2002). The two parameters together provide a measure of exposure rather than dose, hence determining an exposure-response relationship (Wright and Welbourn, 2002).

3.3 Significance Ratings

In order to evaluate the significance of the identified hazards/pollution, the following characteristics of each potential hazard will be identified.

The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected shall be defined and described; where:

- The probability, which shall describe the likelihood of the hazard actually occurring, indicated as rare (once in five years), improbable (low likelihood or once a year), moderately probable (distinct possibility once a
month at least), highly probable (most likely occurring once a week), or definite (impact will occur regardless of any preventative measures as a permanent feature); (in the case of risk assessment, probability may refer to re-occurrence as in most cases, hazards that have already been identified will be evaluated as opposed to predicting the hazard. However, in some cases an identified hazard can lead to another, in which case a predictive approach will be taken).

- The **Intensity**: indicating whether the health hazard will be insignificant, minor, moderate, major or catastrophic.
- The **duration**, wherein it will be indicated whether the lifetime of the health hazard will be of a short duration (0–3 years), intermediate (3 – 5 years), medium-term (5–15 years), long term (> 15 years) or permanent;
- The **extent**, wherein it will be indicated whether the hazard will be local (limited to the immediate area or site of development) or regional/provincial/national.

**TABLE 3-1: RISK OR HAZARD RATINGS (ADAPTED FROM ADM W_2_RAP, 2011)**

<table>
<thead>
<tr>
<th>PROBABILITY</th>
<th>RATING</th>
<th>INTENSITY</th>
<th>RATING</th>
<th>DURATION</th>
<th>RATING</th>
<th>EXTENT</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definite occurrence (once a day or permanent feature)</td>
<td>5</td>
<td>Catastrophic</td>
<td>5</td>
<td>Permanent</td>
<td>5</td>
<td>Provincial/ National health hazard</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Death expected from exposure to hazard or pollution.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highly Probable (once per week)</td>
<td>4</td>
<td>Major</td>
<td>4</td>
<td>Long term &gt;15 years</td>
<td>4</td>
<td>Hazard extends throughout municipal level and to neighbouring municipalities</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Population exposed to significant illness or significant pollution) – i.e. major export crop loss, river downstream seriously polluted and requiring intervention etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### The Amathole District Municipality Environmental Pollution Control Plan – Risk Assessment

<table>
<thead>
<tr>
<th>PROBABILITY</th>
<th>RATING</th>
<th>INTENSITY</th>
<th>RATING</th>
<th>DURATION</th>
<th>RATING</th>
<th>EXTENT</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately probable</td>
<td>3</td>
<td>Moderate</td>
<td>3</td>
<td>Medium term</td>
<td>3</td>
<td>Within a radius of 2 km from the site</td>
<td>3</td>
</tr>
<tr>
<td>(once per month)</td>
<td></td>
<td>(Moderate health impact to large population).</td>
<td></td>
<td>5 - 15 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improbable</td>
<td>2</td>
<td>Minor</td>
<td>2</td>
<td>Intermediate</td>
<td>2</td>
<td>At site in question and surrounds</td>
<td>2</td>
</tr>
<tr>
<td>(once per year)</td>
<td></td>
<td>(minor impact to large population or minor health or pollution Impact)</td>
<td></td>
<td>3-5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rare</td>
<td>1</td>
<td>Insignificant</td>
<td>1</td>
<td>Short</td>
<td>1</td>
<td>In situ only (Hazard to employees or residents only)</td>
<td>1</td>
</tr>
<tr>
<td>(once in 5 years)</td>
<td></td>
<td>(No impact – or non serious health or pollution Impact) – i.e. system can re-establish itself in a relatively short time frame.</td>
<td></td>
<td>0 - 3 years</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Risk rating = Likelihood + Intensity + Duration + Extent**

The **significance (or risk profile)**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium, or high.
### TABLE 3-2: RISK PROFILE (ADAPTED FROM ADM W2RAP, 2011)

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 -8</td>
<td>LOW</td>
</tr>
<tr>
<td>8 - 13</td>
<td>MODERATE</td>
</tr>
<tr>
<td>14 -20</td>
<td>HIGH</td>
</tr>
</tbody>
</table>

- **LOW**
  - These are systems that operate with minor deficiency and usually meet the quality and legislative specifications set by the respective departments. It is unlikely that this level of risk is harmful to the health of people and the environment. Aesthetically and/or physical non-compliance can be expected for short periods.

- **MODERATE**
  - These are systems with deficiencies which individually or combined pose a high risk to the quality of health of the receiving environment. These systems would not generally require immediate action but the deficiencies should be rectified to avoid future problems and associated cost to rectify once in HIGH risk. Aesthetically and/or physically non-compliance can be expected over a medium term. Medium term impact on infrastructure and partial failure of the operation/institute/system and disinfection process is likely.

- **HIGH**
  - These are systems with deficiencies which individually or combined pose a high risk to the quality of the receiving environment and health, and may lead to potential health, safety and environmental concerns. Once a systems (or part of a system) are classified under this category, immediate corrective action is required to arrest or eliminate the deficiency. High impact on the health of people and the environment and/or significant damage to infrastructure can be expected. Total failure of the collector, treatment and disinfection facility are likely.

A holistic view shall then be taken on mitigation measures which are already in place, such as measures put in place in order to comply with quality and regulative standards and also specific measures taken pertinent to the unique hazard/site/operation. Thereafter the effectiveness of these measures should be evaluated and further mitigation measures or solutions offered in the form of a pollution control plan.

### 4 RISK ASSESSMENT

#### 4.1 Air Quality

##### 4.1.1 Informal Waste Combustion

Informal combustion of waste at landfills is a key environmental factor which has severe health implications and environmental concerns. Municipal refuse combustion generally has tall stacks/flares which are specifically designed as a high efficiency flue gas cleaning system that minimises the impact of emissions associated with waste combustion. The absence of municipal waste combustors (MWC) coupled with limited refuse removal systems, leads to informal waste combustion. Ground level open burning is characteristic of low temperatures which results in the release of particulate matter and the products of incomplete combustion to be emitted (Lemieu, et al 2000). Ground level open burning is influenced by numerous variables, such as ambient temperature, humidity, wind direction and wind speed, which could lead to the lack of dilution and dispersion.
In some instances temperatures may be high enough to release contaminants such as arsenic from treated wood timbers.

The burning of flammable organic compounds such as tyres and plastics breaks down the volatile organic compounds resulting in the emission of a dense black smoke known as soot. Soot is the impure carbon particles that arise as a result of incomplete combustion. Contaminants which are released include carcinogens such as polycyclic aromatic hydrocarbons (PAHs), dioxins, polychlorinated biphenyl (PCB) and volatised heavy metals. Due to the heavy metals based in tyres there is a potential risk of toxins leaching into groundwater when placed on wet soils.

4.1.1.1 Key Concerns

Polycyclic aromatic hydrocarbons (PAHs) are potent atmospheric pollutants that are characteristic of a fused aromatic ring. The most common PAHs are Naphthalene. It is often a component of Particulate matter suspended in air through the combustion or organic compounds. It consists of carcinogenic and teratogenic properties. Prenatal exposure to PAHs is associated with lower IQ and asthma in infants. Exposure during pregnancy has also been linked to cancer and DNA damage.

PCB compounds have low concentrations of dioxins. They enter the environment through PCB containing compounds in landfills, fires and incineration. These compounds are highly volatile and are dispersed over long distances by air leading to global distribution.

Dioxins are a persistent organic pollutant. Direct exposure results in respiratory, development and reproductive damage, damage to the immune system and is often associated with cancer. Dioxins are bioaccumulative. Bioaccumulative compounds are lipophilic in nature and have poor water solubility which enables them to move from the water environment to living organisms having a lipid cell structure. These toxins become more potent in concentration with each successive link in the food chain.

Informal combustion of organic compounds results in the release in dioxins. These pollutants settle on surrounding vegetation, which is consumed by livestock. The dioxin accumulates in fat; this in the form of milk is consumed by humans and ends up in mother’s breast milk which can be transmitted from mother to child, all the while increasing in concentration and health effects.

4.1.1.2 Assessment of Impact

Those immediately exposed and in the vicinity are particularly vulnerable. The release of PAHs and volatised heavy metals has minimum regional impacts. The release of particulate matter in the atmosphere has both local and regional implications. Dioxins due its bioaccumulative nature have the ability to spread from one ecosystem to another all the while increasing in concentration and impacting on both health and environment on a local and regional scale.
4.1.1.3 Informal Waste Combustion in Amathole

Informal waste combustion at Landfill sites was noted within the local municipality of Mnquma and Mbhashe (Figure 4-1).

FIGURE 4-1: INFORMAL WASTE COMBUSTION AT THE BUTTERWORTH LANDFILL SITE IN THE MNQUMA LOCAL MUNICIPALITY
Figure 4-2: Informal waste combustion at the Idutywa landfill site in Mbhashe Local Municipality

Figure 4-3 below illustrates the percentage of households without refuse disposal by the municipality. The Mbhashe and Mnquma Local Municipality has the highest percentages of household without proper disposal resources. The percentage of households receiving refuse removal is depicted in Figure 4-3. The percentage of households without refuse disposal is a good indication of the pollution problem that is prevalent in each local municipality. As an alternative, people resort to informal burning of their household waste which has dire impacts upon the environment and health.
FIGURE 4-3: NO REFUSE DISPOSAL IN EACH LOCAL MUNICIPALITY.

FIGURE 4-4: PERCENTAGE OF HOUSEHOLD RECEIVING REFUSE REMOVAL IN EACH LOCAL MUNICIPALITY.
4.1.2 Indoor Air Pollution

Indoor air pollution (IAP) is essentially the air quality within and around a building or structure especially as it relates to the health of the building occupants. The use of domestic fuel for cooking and/or space heating purposes is anticipated to occur more frequently in low income households. Household with limited electricity supply will resort to burning of domestic fuels as an energy source. Exposure to IAP from the combustion of solid fuels is an important cause of morbidity and mortality in many developing communities. Biomass and coal smoke contain a large number of pollutants and known health hazards, including Particulate matter (PM), Carbon monoxide (CO), Nitrogen dioxide (NO2), sulphur dioxide (SO2), formaldehyde and polycyclic organic matter, including carcinogens such as benzo[a]pyrene (Ezzati and Kammen 2002).

4.1.2.1 Key Concerns

Carbon monoxide (CO) is the colourless, odourless gas that is produced as the by-product from the incomplete combustion of fossil fuels. Sources of CO are from smoke, tobacco smoke, automobile exhausts and burning of fossil fuels for space heating. Exposure to high concentrations of CO leads to nausea, unconsciousness and death by depriving the brain of oxygen.

Due to the volatility and toxicity of formaldehyde, exposure to the organic pollutant is a known carcinogen. Formaldehyde is an intermediate in the combustion of methane and other carbon based compounds. Its production in the atmosphere, through the action of sunlight and oxygen on the atmospheric methane and other hydrocarbons, it becomes part of smog.

Exposure to indoor air pollution (IAP) from the combustion of solid fuels has been implicated, with varying degrees of evidence, as a causal agent of several diseases in developing countries, including acute respiratory infections (ARI) and otitis media (middle ear infection), chronic obstructive pulmonary disease (COPD), lung cancer (from coal smoke), asthma, cancer of the nasopharynx and larynx, tuberculosis, perinatal conditions and low birth weight, and diseases of the eye such as cataract and blindness (Ezzati and Kammen, 2002).

4.1.2.2 Assessment of Impact

Those that are directly exposed to the emission released from domestic fuel burning are particularly susceptible. The monitoring of indoor air pollution and the personal exposure from biomass burning in households has shown concentrations that have exceeded that of industrial countries. The level of exposure to the effects of domestic fuel burning will vary depending on the type of fuel used, the spatial and temporal variation of the household as well as the stove and housing type.
4.1.2.3 Indoor Air Pollution in Amathole

The usage of electricity for cooking and heating purposes within each local municipality is depicted in Figure 4-5 and Figure 4-6 below. The total percentage of household that utilise electricity for heating exceeds that of cooking. 2007 had the highest consumption of electricity for both cooking and heating purposes. The decrease in electricity usage from 2007 to 2011 can be attributed to the high electricity tariffs. The decline in electricity usage can be linked to the increased combustion of fossil fuels for cooking and space heating.

FIGURE 4-5: PERCENTAGE OF HOUSEHOLD USING ELECTRICITY FOR COOKING IN EACH LOCAL MUNICIPALITY
4.1.3 Waste Water Treatment Works

Waste water treatment works are located in each of the local municipalities within the Amathole district. Odour and stack emissions are the two most important impacts associated with a waste water treatment works; however aerosols may also be a cause of concern. It is also possible for other contaminants such as pathogens to become airborne in the process of treating water, especially at sites of gaseous release or mechanical agitation such as denitrification, aeration and mechanical oxidation. Bio-aerosols are defined as an airborne particle that is organic.

VOCs are emitted from the waste water collection, treatment and storage systems through volatisation of organic compounds at the liquid surface. Emissions can occur by diffusion or convection mechanism or by both mechanisms. Diffusion occurs when the organic concentration at the surface is higher than the ambient concentration. The organics volatise or diffuse from the high concentration into the air in order to achieve equilibrium between the aqueous and vapour phase. Convection occurs when air flows over the water surface, sweeping organic vapour from the surface water to the air. The rate at which volatisation occurs is directly proportionate to the rate of speed of air flow over the water surface.

Odour is the most common complaint received from the general public. Odour occurs during specific processes such as cleaning of screens or emptying of tanks. Odour can also arise when sewage sludge turns septic,
undergoes anaerobic processes or when it is stockpiled. The compounds that contribute to foul odour of waste water and their products arise from the original components within the sludge, the biochemical changes that takes place during the various steps and the chemical that may be added during the treatment stages. The inlet works of the waste water treatment works contribute the most hydrogen sulphide emissions whereas the consolidation tanks are expected to contribute the most to odours. Mitigation of odour is possible through changes to the plant equipment or processes.

4.1.3.1 Key Concerns

There is wide spectrum of inorganic and organic molecules that creates unpleasant odours. The most common are ammonia, amines, aldehydes, ketones, sulphur compounds, hydrogen sulphide and mercaptans.

Greenhouse gases are emitted from both domestic and industrial waste water treatment operations, when biological processes such as suspended growth and attached growth units operate in anaerobic conditions with a biological demand (BOD) loading, the dominant greenhouse gas emitted is methane (CH4), though less quantities of nitrous oxide (N2O) may also be emitted.

4.1.3.2 Assessment of Impact

Bioaerosols are more of a concern for operators and does not impact beyond the immediate vicinity of the processing units. The degree of transport and dilution of emitted air pollutants from the works depends on the dispersion potential. The dispersion potential is a function of atmospheric turbulence, which in turns is determined by wind speed and the ambient air temperature profile.

The operating conditions of the WWTW are important such as maintenance backlogs and failure could result in the deterioration of the quality of effluent which is released back into the environment.

4.1.3.3 WWTW in Amathole

The waste water treatment works in Butterworth (Figure 4-7) is fully operational. The chlorine treatment plant was discontinued and substituted with biological treatment. The Drying beds were damaged. This has some concerns and could lead to possible groundwater contamination.
FIGURE 4-7: WASTE WATER TREATMENT WORKS IN BUTTERWORTH, MNQUMA LOCAL MUNICIPALITY
FIGURE 4-8: WASTE WATER TREATMENT WORKS IN STUTTERHEIM, AMAHLAHI LOCAL MUNICIPALITY

Municipalities with poor or lack of sanitation systems pose a threat to the environment and health (Figure 4-9). Sanitation is a hygienic means of promoting health through prevention of human contact with the hazards of waste. Lack of proper sanitation causes diseases, and is related to poverty. In many rural areas within the Amathole district, household are not connected to sewers. A total of 65% of households within the Mbhashe local municipality has no access to the local sewage system.
Quarries are a type of open pit mine in which rocks and minerals are extracted. Quarries are generally used for extracting building material. There are several operating quarries located within the Amathole District municipality. Typical quarry operations involves not only extraction of materials (rock) but also crushing and screening that makes the material suitable for use in construction. In quarrying operations the major pollutant of concern are related to nuisance dust and particulate matter.

The apprehension regarding quarries is that it often results in a loss of habitat and the subsequent depletion of diversity is one of the most worrisome problems associated with the activity. Many municipalities regard quarries as an eyesore and most require abatement methods to counter the impacts of dust, noise and appearance. Once mining in a quarry is complete and it has reached its lifespan, the area can be used as a landfill.

Another factor to consider regarding quarries is fugitive dust emissions and particulate matter by unpaved roads. When mining vehicles travel on the unpaved roads, the force of the wheels on the road surface causes the pulverisation of surface material. Particles are lifted and dropped from the rolling wheels and the road is exposed to stronger air currents in turbulent shear with the surface.
4.1.4.1 Key concerns

Particulate matter is the collective term given for fine solid or liquid particles added to the atmosphere by processes at the earth’s surface. It includes dust, smoke, soot, pollen and soil particles (Kemp, 1998). PM has been linked to a diversity of serious respiratory illnesses and cardiovascular health problems. Exposure to particulate matter has been linked to premature mortality, aggravation of respiratory and cardiovascular disease, aggravated asthma, acute respiratory symptoms, chronic bronchitis, decreased lung function and an increased risk myocardial infarction (USEPA, 1996). The concentration of the particles in the air varies across space and time and is related to the source of the particles and the transformation that occur in the atmosphere (USEPA, 1996).

4.1.4.2 Assessment of impact

Depending on the wind patterns or surrounding cover, airborne dust and particulate matter can travel many kilometres from the point source and affect health of downwind residents, especially those with pre-existing lung issues. In Figure 10 below, the predominant wind direction arising from the Quarry operations is seen from the south-west and Western region. Residents residing in the towns of Mangweni and Toboshane are particularly vulnerable to wind blown pollutants.
FIGURE 4-10: WIND DEPICTING THE PREDOMINANT WIND DIRECTION FROM THE QUARRY OPERATIONS IN BUTTERWORTH.

4.1.4.3 Quarries in Amathole

Figure 4-10 illustrates the quarry operations in Butterworth. There are numerous operational quarries within the Amathole district. They are located within the towns of Butterworth, Stutterheim and Idutywa. The community located east of the quarry in Butterworth is particularly vulnerable to dust fallout from the quarry during the prevailing westerly winds.
FIGURE 4-11: QUARRY LOCATED IN BUTTERWORTH, MNQUMA LOCAL MUNICIPALITY
4.1.5 Industries

The Amathole District Municipality is home to a few industries operating within various local municipalities. Emissions generally associated with industrial processes are sulphur dioxide, carbon monoxide, oxides of nitrogen and particulate matter. Through the combustion of various fuels such as coal, paraffin and diesel, various levels of volatile organic compounds or heavy metals are also expected to be released to the atmosphere.

NewDen (Boardman Bros) located within the town of Stutterheim manufacturers paints and accessories, candles, hair products and household chemicals. The fuel combusted on site is coal, wood and off cut gum which is utilised in the boilers. The use of cut gum instead of coal has environmental benefits, such that the cost and emissions are lower and the heat benefits in comparison to coal is equivalent. The Utilisation of coal at NewDen is approximated at 24 kg of coal per hour (1344 kg of coal per week). The site however has mass storage of diesel, paraffin and turpentine. Mass storage of flammable products presents a hazard in the onset of a fire or spillage.

Stutterheim is home to the Poultry industry, namely Anca Chicks. The main pollutant of concern associated with Poultry farms is odour. Odour is brought about through the mixture of complex gases, with the principal odorants attributed to amines, sulfides, volatile fatty acids, indoles, phenols and mercaptans alcohols (Power 2003). Ammonia creates a strong unpleasant odour near manure storage areas and the surrounding poultry building. Ammonia is highly volatile and dispersers into the atmosphere efficiently when released.

There are brickworks operational in ADM. Emissions associated from the grinding process of raw materials are fugitive dust emissions. SOx, NOx, CO, CO2 are released during the firing process, organics such as VOC and methane are emitted from the dryers and kilns.

Amathole poles located in the Amahlathi local municipality currently have an operational Forestry industry. Deforestation represents approximately 15% of the worlds global greenhouse gases which also contributes to global climate change (WWF.2012). Poor forestation techniques results in Soil erosion, which increases surface runoff and decrease water retention. This impacts the state of vegetation and agriculture within the community.

4.1.5.1 Key Concerns

Nitrogen dioxide is a criteria pollutants emitted by many industries. It is an irritating gas that is readily absorbed into the mucous membranes of the respiratory tract. The most adverse health affects of NO2 occurs at the junction of the conducting airways and the gas exchange region of the lungs. The upper airways are less affected because NO2 is not very soluble in aqueous surfaces. Exposure to NO2 is linked with increasing susceptibility to respiratory infection, increased airway resistance and decreased pulmonary functions.
SO2 is an irritant criterion pollutant released from brickworks and many industrial processes. It is readily absorbed in the nose and aqueous surfaces of the upper respiratory tract and is associated with reduced lung functions and increased risk of mortality and morbidity. Adverse health effects of SO2 include coughing, phlegm, chest discomfort and bronchitis.

### 4.1.5.2 Assessment of Impact

The dispersion potential of NO2 and SO2 can be assessed using dispersion modelling in order to determine the distribution and impacts on surrounding communities.

### 4.1.5.3 Industries located within Amathole

Industries identified in Amathole DM which contribute to air quality are shown in the figures below.

![FIGURE 4-13: NEWDEN LOCATED IN STUTTERHEIM.](image-url)
FIGURE 4-14: WP TIMBERS IN STUTTERHEIM.
FIGURE 4-15: ANCA CHICKS IN STUTTERHEIM
### TABLE 4-1: AIR QUALITY RISK ASSESSMENT

<table>
<thead>
<tr>
<th>IDENTIFIED HAZARD</th>
<th>ASSOCIATED LIKELY IMPACTS</th>
<th>PROBABILITY RATING</th>
<th>INTENSITY RATING</th>
<th>DURATION RATING</th>
<th>EXTENT RATING</th>
<th>Risk Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1.1. Informal combustion of waste</td>
<td>Exposure to hazardous pollutants such as PAH, dioxins, VOC</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>10 MODERATE</td>
</tr>
<tr>
<td>4.1.2. Indoor Air pollution</td>
<td>Exposure to criteria pollutants such as PM, SO₂, CO and NO₂</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>12 MODERATE</td>
</tr>
<tr>
<td>4.1.3. Waste Water Treatment Works</td>
<td>Odour impact and associated pollutants (ammonia, hydrogen sulphide)</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>13 MODERATE</td>
</tr>
<tr>
<td>4.1.4. Quarries</td>
<td>Exposure to particulate matter and dust from quarrying operations and unpaved roads</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>11 MODERATE</td>
</tr>
<tr>
<td>4.1.5. Industrial activities</td>
<td>Exposure to criteria pollutants through the combustion of fossil fuels</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>14 HIGH</td>
</tr>
</tbody>
</table>
4.2 Waste Management

4.2.1 Summary of priority waste issues

4.2.1.1 Continued growth in waste generation

There is continual growth in the amount of waste generated by both households and businesses within the Amathole District Municipality (as with other municipalities within South Africa). The generation and disposal of waste is an increasing and on-going problem within ADM.

4.2.1.2 Unlicensed landfill sites

Many of the landfill sites within the ADM are operating illegally; they are not licensed and are not correctly designed to prevent leachate and odours.

4.2.1.3 Burning of waste

The burning of waste in some municipalities within ADM is a concern from a health and air emissions perspective. This waste may contain harmful chemicals and gases which are then emitted into the atmosphere and can impact on human health and surrounding sensitive receptors.

4.2.1.4 Leachate Management

Leachate from unlined and mis-managed landfill sites can seep into the groundwater and/or surrounding surface water resources.
4.2.1.5 Health Care Risk Waste Management

Health Care Risk Waste refers to primarily medical waste and needs to be disposed of separately to general waste. In the ADM Integrated Waste Management Plan (IWMP) 2001 it was discussed that some medical waste is being disposed of at landfill sites. It was also reported that medical waste from clinics and rural institutions is often burnt or illegally dumped.

4.2.1.6 Industrial Waste

Industries generate effluents and hazardous waste which needs to be disposed of. Very little information is available about what industries exist within ADM and how they dispose of their waste.

4.2.2 Elaboration of significant issues and key concerns

4.2.2.1 Continued growth in waste generation

This increase can be attributed to numerous factors including population growth, consumerism and the packaging of various everyday items. Countrywide, our population increases every year and as such, so too does the amount of waste generated by households and businesses. The number of landfill sites and the space available within the ADM for such landfill sites will never increase and there will be a time when there is no longer space available for the amount of waste which requires disposal.

As a society we are continually buying more items which ultimately require disposal. These may be items used on a daily basis such as food or it may be larger items which will be replaced in the future such as radios, televisions or furniture. Consumerism has increased at a rapid rate in the last 20 years and most of these items will end up at a landfill site. Businesses also generate a large amount of waste such as papers and plastics, which all require disposal.

The packaging which we use has changed considerably and includes more plastics which take hundreds of years to biodegrade. The type of waste disposed to landfill is therefore a greater concern than a number of years ago.
4.2.2.2 Unlicensed landfill sites

The conventional end-of-pipe option of disposing of waste to a landfill site is still the most common form of waste disposal. Many of the landfill sites within ADM are operating illegally and do not have a Waste Management License, as required in terms of the National Environmental Management Waste Act (No. 59 of 2008) (NEMWA). These unlicensed landfill sites very often do not follow best practice in terms of landfill design and management and therefore do not contain mitigation measures to prevent leachate and odours. There is also a lack of funds for machinery and vehicles which aid in solid waste management e.g compaction of waste to reduce volume and air.

4.2.2.3 Burning of waste

Not all areas within ADM receive adequate and reliable waste collection services. A large percentage of households, particularly in the rural areas, do not receive waste removal services from the municipality. They have their own refuse dumps and then burn the waste in order to reduce the volume. According to the Draft Provincial Situational Analysis Report (Nov 2009) as much as 50% of households within the ADM do not have
waste collection services. Burning of waste as a disposal method emits potentially harmful chemicals and gases into the atmosphere. These can impact on the ambient air quality within an area and have health impacts on the lives of the surrounding communities and living organisms.

FIGURE 4-17: PERCENTAGE OF HOUSEHOLDS RECEIVING WASTE REMOVAL SERVICES WITHIN EACH LOCAL MUNICIPALITY

FIGURE 4-18: PERCENTAGE OF HOUSEHOLDS RECEIVING NO WASTE REMOVAL SERVICES WITHIN EACH LOCAL MUNICIPALITY
4.2.2.4 Leachate Management

Leachate is the liquid that drains from the stockpiled waste material and contains significantly elevated concentrations of undesirable solutes and organics which have the potential to pollute ground and surface water resources. The type of leachate varies depending on the age of the landfill, the type of waste disposed there, the degree of decomposition that has taken place and physical modification of the waste (e.g., shredding or compaction). Should this leachate end up in the groundwater or surrounding surface water resources, it can have serious consequences including depleting the oxygen supply within water for fish and other living organisms. Heavy metals in the leachate may be toxic to fishes, animals, and humans who live in or drink the water. Harmful chemicals in the leachate can cause diseases such as cancer and birth defects in both humans and other living organisms. Leachate from landfills which is allowed to end up in ground and surface water can have severe and long term consequences for both humans and other living organisms.

4.2.2.5 Health Care Risk Waste Management

The collection and disposal of Health Care Risk Waste Management is a function of the Department of Health. Collection and transportation from clinics is undertaken by a contractor who transports the waste to the closest hospital. Compass waste is contracted to collect and dispose of all Health Care Waste, both general and hazardous, within the Eastern Cape (per communication Compass Waste). They collect the waste from hospitals and dispose of it using what is called the Bondtech Autoclave system.

The ADM IWMP states that medical waste is however still being illegally disposed of at landfill sites. This poses a serious risk to the reclaimers who collect recyclables at these dump sites. Leachate from these landfill sites will also contain the harmful chemicals, bacteria’s and viruses from medical waste and this can have serious consequences should the leachate seep into the groundwater or surrounding surface water resources.

The AMD IWMP also reports that medical waste from clinics and rural institutions is often burnt or dumped illegally. An audit of healthcare waste generations in ADM conducted by the Municipal Health Services Unit revealed that approximately 45% of healthcare waste generated cannot be accounted for. The burning of such waste will release harmful toxins into the air which will have negative impacts on human health and other living organisms. Should this waste be illegally dumped, it can impact on human health, animals and organisms who come into contact with it and it has the potential to pollute ground and surface water resources, should leachate emanating from the waste enter any water resources.
4.2.2.6 Industrial Waste

Industries are obligated to treat their waste to certain standards before disposal into municipal sewer systems or landfill waste sites. There is no available literature as to the kind of industries which exist within ADM, how much waste is generated or how this waste is treated or disposed of. This waste could potentially be hazardous and may not currently be disposed of appropriately. Without any specific assessments done on industries or quantitative information, it is difficult to assess the potential pollution risks or whether these industries are disposing of their waste correctly.

4.2.3 The receiving environment and scale of impact

The receiving environment is primarily the areas of land where waste is disposed of, whether a legal landfill site or illegal dumping in a veld. Surrounding communities, flora and fauna are affected by poor waste management practices. The implications include nuisances such as odours to more serious health consequences, diseases and even death in severe cases. The negative impacts resulting from waste disposal will also affect air and water, so the effect may be perceived as an air or water problem but it stems from the mis-management of various forms of waste. The impact can therefore be classified as high, due to the resultant health implications for both humans
and other organisms as well as the fact that the impact affects other resources such as air and water which are imperative for survival.

4.2.4 Risk Assessment

This section applies the risk assessment matrix as elaborated on in section 3.1. The objective of the risk assessment is to determine the significance of the impact and to prioritise key impacts which require resolution. This assessment will, together with the outcomes of the solutions focused workshop, provide the pollution control plan for the Amathole District Municipality.
### TABLE 4-2: WASTE RISK ASSESSMENT

<table>
<thead>
<tr>
<th>IDENTIFIED HAZARD</th>
<th>ASSOCIATED LIKELY IMPACTS</th>
<th>PROBABILITY RATING</th>
<th>INTENSITY RATING</th>
<th>DURATION RATING</th>
<th>EXTENT RATING</th>
<th>TOTAL RISK SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2.1. <strong>Continued growth in waste generation</strong></td>
<td>Existing landfill sites to reach their capacity in a shorter time therefore necessitating the need to find alternative sites for waste disposal. An increase in the disposal of non-biodegradable wastes such as plastics which require hundreds of years to bio-degrade.</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>16 High</td>
</tr>
<tr>
<td>4.2.2. <strong>Unlicensed landfill sites</strong></td>
<td>Unlicensed landfill sites are often poorly designed with no mitigation measures for the negative impacts associated with landfill sites. They are also underfunded and lack appropriate vehicles and machinery to efficiently operate a waste disposal site.</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>13 Moderate</td>
</tr>
<tr>
<td>4.2.3. <strong>Burning of waste</strong></td>
<td>The burning of waste emits harmful chemicals and gases into the atmosphere. These are likely to have health impacts for surrounding sensitive</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>14 High</td>
</tr>
<tr>
<td>IDENTIFIED HAZARD</td>
<td>ASSOCIATED LIKELY IMPACTS</td>
<td>PROBABILITY RATING</td>
<td>INTENSITY RATING</td>
<td>DURATION RATING</td>
<td>EXTENT RATING</td>
<td>TOTAL RISK SIGNIFICANCE</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>4.2.4. Leachate Management</td>
<td>Many landfills, especially those without licenses, operate without any leachate management facilities. Leachate seeps into the groundwater or nearby surface water resources causing pollution, loss of aquatic life and a potential health hazard to humans and animals who consume the water.</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>16 (High)</td>
</tr>
<tr>
<td>4.2.5. Health Care Risk Waste Management (HCRWM)</td>
<td>Disposal of HCRWM to landfill sites or burning of such waste poses a great risk to both water resources and ambient air quality. It also poses a risk to reclaimers at the landfill sites as this waste can contain dangerous chemicals and hazardous substances.</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>13 (Moderate)</td>
</tr>
</tbody>
</table>
### Identified Hazard: Industrial Waste

No information is available regarding the type, amount or disposal practices of industries within the AMD. This could potentially be a pollution risk if this waste is not adequately treated and disposed of.

<table>
<thead>
<tr>
<th>IDENTIFIED HAZARD</th>
<th>ASSOCIATED LIKELY IMPACTS</th>
<th>PROBABILITY RATING</th>
<th>INTENSITY RATING</th>
<th>DURATION RATING</th>
<th>EXTENT RATING</th>
<th>TOTAL RISK SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2.5 Industrial Waste</td>
<td>No information is available regarding the type, amount or disposal practices of industries within the AMD. This could potentially be a pollution risk if this waste is not adequately treated and disposed of.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>11</td>
</tr>
</tbody>
</table>
4.2.6 Strategies to implement

Strategies to implement will include actions and management measures which need to be undertaken in order to reduce the risks and current pollution sources which occur within the ADM. These strategies will be incorporated into the pollution control plan and need to be implemented in order to decrease the likelihood of a risk occurring. Where pollution is already known to occur, identified steps should be undertaken to at a minimum decrease the severity of a risk.

4.3 Water Management

4.3.1 Review on the information and key concerns associated with each impact

4.3.1.1 Use of Blue Storage tanks for drinking water

The use of the discarded industrial drums for the storage of water in many rural areas presents a cause for concern as there may be residual chemicals lacing the drums (Chetty, pers.comm., 2012).

4.3.1.2 Poor Blue and Green Drop scores

The quality of available water resources is an important factor which determines its fitness for use. This is therefore monitored at all available sources in the form of Blue and Green Drop reporting. The Blue Drop report specifically monitors river systems, and grades the system based on a number of criteria. The Green Drop report specifically monitors waste water treatment works, to measure the quality of treatment of water and associated levels of fitness for use. Together, these two reports present a clear indication of the availability of quality water resources and areas for improvement. Ecological health, and therefore the overall health of the river systems, is measured through different methods but the most consistent and recognised systems are the South African Scoring System or SASS and River Health system.

Overall, both the Blue and Green Drop reports indicate that the Amathole DM has numerous areas within which attention is required. Although, it is also noted that in many of these cases no monitoring or inconsistent monitoring takes place and this is majority of the problem as a clear understanding of the problems cannot be formed. The 2011 assessments of Blue and Green drop status in the ADM showed that the ADM is performing below average. No certificates were awarded in the region; however, the now independent Buffalo City and King Williams Town did receive Blue and Green Drop certificates (Blue Drop Report, 2011).
4.3.1.3 Poor quality water in the ADM

It was found that the ADM is below the regional average in terms of water quality, the regional average being 77.3%. This indicates problems with the purification of water, and the ill-management of waste water treatment works and water reticulation systems. Water quality results have been assessed and elaborated on in the Situational Assessment – deliverable A of the Amathole District Municipality, Environmental Pollution Control Plan.

4.3.1.4 Licences and schedule trade permits

The enforcement and management of permits and licences is lacking in the region. This brings to the forefront, the issues of monitoring and management, which need to be greater enforced in the region. An example of such a case is elaborated on in section 4.3.2.

4.3.1.5 Illegal sand mining

Workshops held at the earlier stages of the project highlighted illegal mining as a problem in the ADM. The effects of illegal mining are far reaching as this causes downstream effects and alteration of the river banks. Where management of such operations is non-existent, significant impacts can take place on the water course (Jack, pers comm., 2012)

4.3.1.6 Access to basic services and infrastructure

Providing a higher level of service to the residents within ADM is a huge challenge especially within peri-urban and rural areas due to the huge backlogs still to be eradicated and the increase in the water demand these higher level of services will result in. Residents want to move from access to communal stand tap water supply to individual erf or yard connection and from a VIP to smallborne system to waterborne sewage system. This same challenge applies where communities want to extend the water supply infrastructure into their area by connecting into nearby reticulation.

4.3.1.7 The state of estuaries and beaches

The state of estuaries and beaches are found to be compromised due to activities such as over-exploitation during fishing, sewer leakages, informal housing and accompanying toilet facilities within flood plains, which often flood into the estuaries. This poses a significant problem as the estuaries form many livelihoods. No beaches in
the ADM have received blue flag status, indicative of the fact that the beaches are not meeting satisfactory standards (Stakeholders, pers.comm., Stakeholder Workshop, 2012).

4.3.1.8 Timber operations

Timber operations were identified as possible sources of pollution due to the use of chemicals such as creosote in the treatment of the wood. The fate of the chemicals is in many cases unknown and could result in residual chemicals in storm water run off (Chetty, pers.comm., 2012)

4.3.1.9 Drought conditions

The ADM was declared a drought stricken area in 2009. This drought brought with it the health concerns of cholera and other infectious diseases.

4.3.2 Elaboration of significant issues and key concerns

4.3.2.1 Use of Blue Storage tanks for drinking water

The use of discarded chemical storage tanks from industrial and other operations in the area was prevalently evident during site visits, in Butterworth and Stutterheim, in rural areas where the only water available are those from Jo-Jo tanks (Figure 4-20). The discarded tanks (Figure 4-21), which are blue in colour pose high hazards to those who consume water from them, as they may contain residues of chemicals.
Discarded chemical storage tanks used to store water for consumption.

FIGURE 4-20: JO-JO TANKS IN THE ADM

FIGURE 4-21: SITINGS OF THE BLUE INDUSTRIAL DRUMS IN BUTTERWORTH
Many people are unaware of the benefits of the collection and re-processing of industrial packaging, which presents itself as an opportunity to rectify this problem in the ADM.

4.3.2.2 Poor Blue and Green Drop scores

Overall, both the Blue and Green Drop reports indicate that the Amathole DM has numerous areas within which attention is required. Although, it is also noted that in many of these cases no monitoring or inconsistent monitoring takes place and this is majority of the problem as a clear understanding of the problems cannot be formed.

Amathole performance statistics from the recent Blue Drop Report (June 2011) indicate that the drinking water quality compares slightly below the regional averages (77.3%) with a municipal score of 65.21%. The respective drinking water system varied significantly from 19 to 85%, with Masincendane on the higher performance end and Amathlathi on the lower performance end. ADM is taking 6th place (out of 17) on the Eastern Cape Performance Barometer. A Water Safety Plan Process is in process to raise the performance of drinking water quality in the ADM.

Performance statistics from the Green Drop Report (June 2011) indicate that the wastewater systems also compare below its regional counterparts (67.2% provincial average), with ADM receiving a Green Drop Score of 56.0%. This places the ADM in the 3rd position (out of 17) on the Eastern Cape Wastewater Services Performance Barometer. A Wastewater Risk Abatement Plan and Green Drop Improvement Plan are pursued as tools to raise the performance of wastewater services in the ADM.

The Amathole DM had a blue drop score of 65.2% in 2011 with most of the poor scores at municipal works and boreholes due to non-compliant monitoring. This implies a potential improvement of the blue drop score should the monitoring of water quality improve. The most common monitoring non-compliance is for microbiological health monitoring.
The state of water resources in the Amathole DM is yet to be fully determined in the context of sustainable yield, ecological requirements and accurate present ecological status. The River Health Programme (RHP) is currently implementing various water resource state determination initiatives together with national and local government water quality programmes, conservancies, parastatals (CSIR) and university institutions to provide an estimate of ecological health related to the water resource status of rivers in the Eastern Cape and the Amathole DM.

A municipal score of about 56% for the Green Drop Assessment might not be what is being set as the target, but there remains sufficient reason to sustain optimism about the wastewater service management performance of Amathole District Municipality. Except for Alice there seems to be a commitment to employ adequately skilled process controllers to operate their wastewater treatment facilities. There are various sub-criterion adherence that impressed the assessing team however it is of great concern that not one of the 16 wastewater treatment works are fully complying with the set effluent quality limits. Amabele treatment facility came closest with 100% microbiological and 83% chemical compliance however; due to inconsistent monitoring practice a potential promising situation is compromised. A concerted effort is required to improve as a matter of urgency.
The municipality is encouraged to prioritise the implementation of a credible monitoring programme for both operational (including flow volumes) and compliance monitoring. This information is used to inform effective management decisions and practice.

**Amathole DM Performance Chart**

![Amathole DM Performance Chart](chart.png)

**FIGURE 4-23: THE ADM GREEN DROP PERFORMANCE CHART.**

4.3.2.3 Poor quality water in the ADM

In most hard hit areas the remaining shallow water ponds are shared with livestock as a source of drinking water, thus increasing the risk of contracting waterborne diseases, which are exacerbated by poor hygiene practices.

The analyses of water quality results in the local communities of the ADM are reported on below.

For Nxuba, the physical analysis shows water quality to be mostly ideal, with only turbidity bordering between good and marginal. However, turbidity does not pose a significant health hazard itself but can be used as an indication of microbiological water quality and inefficient water treatment. Depending on the nature of the suspended matter, there may be associated health effects. Suspended clay particles provide a large surface area for colonisation by bacteria and other micro-organisms. Proper disinfection is required and suspended matter must be removed. With regard to bacteriological analyses, Nxuba shows variance. Free chlorine yielded cases of
poor quality and completely unacceptable. This can potentially lead to irritation due to mucous membranes and nausea and vomiting. Completely unacceptable cases were also found with the presence of E.Coli, which leads to a myriad of health issues, including diarrhoea and infections.

Nkonkobe Municipality yielded ideal and good conditions for the physical analyses, which of course result in no health effects. However, the bacteriological analyses show poor and completely unacceptable levels of free chlorine, total coliforms and heterotrophic. Free available (residual) chlorine is the concentration of chlorine remaining thirty minutes after breakpoint disinfection of the water with chlorine. The available chlorine indicates how effective the disinfection process was, hence indicating the probable microbiological safety or otherwise of the treated water. Health effects may be prevalent if there is no free available chlorine after treatment as this implies that either the water was not treated with chlorine or that an insufficient amount of chlorine was used to successfully disinfect the water. Microbiological infection may occur if the untreated water contains pathogenic micro-organisms. On the other hand, if the concentration of chlorine is too high, irritation of the mucous membranes, nausea and vomiting may occur. The chlorine residual also protects against secondary contamination in the distribution system. Higher concentrations of free available chlorine cause a disinfectant like taste and smell to the water. There is no truly “ideal” free available chlorine level from an aesthetic viewpoint which will still be acceptable from a health viewpoint. It is, therefore, not possible to obtain Blue water which has been treated with chlorine. Faecal coliforms indicate indicates recent faecal pollution and the potential risk for contracting infectious diseases. Presence of E.Coli was also evident.

Ngqushwa Local Municipality shows relatively pleasing water quality, particularly ratings of ideal and good in the physical analyses. However, the poor rating of free chlorine exists. Free chlorine however, does not pose a significant high health hazard. Sample number 99940 however, showed a result of 66 E.Coli. This is extremely dangerous and poses a significant health risk.

Mbashe Local Municipality shows ideal, good and marginal results for the physical analyses. The marginal results for turbidity do not pose significant health risks unless combined with other factors. Turbidity is a measure of the cloudiness or muddiness of water. Clear water has low turbidity and muddy water has a high turbidity. Turbidity is caused by the presence of suspended solid matter consisting of a mixture of inorganic matter and organic matter. Turbidity itself does not have direct health effects. However, it can be used as an indication of microbiological water quality and inefficient water treatment. Depending on the nature of the suspended matter, there may be associated health effects. Suspended clay particles provide a large surface area for colonisation by bacteria and other micro-organisms. Proper disinfection is required and suspended matter must be removed. Free Chlorine and total heterotrophic yielded some cases of poor and completely unacceptable.

The Great Kei shows ideal, good and marginal results for physical analyses. The marginal rating for turbidity as mentioned in above cases does not pose a significant health risk, unless combined with other factors. The bacteriological results show at worst, cases of poor ratings for free chlorine and total heterotrophic. Once again, this does not pose significant cases of health risks, but none the less should be rectified.
Amahlathi Local Municipality showed overall ideal, good and marginal results in the physical analyses, but showed cases of poor and completely unacceptable ratings for free chlorine, total coliforms and total heterotrophic. While such indicators may not pose significant health hazards, these conditions must be rectified. Total coliforms can result in cases of diarrhoea and infectious diseases.

4.3.2.4 Licences and schedule trade permits

The situation within the ADM in the field of operation and maintenance of water services infrastructure reflects that of the rest of the province in that it requires urgent attention. Much of the infrastructure that has been taken over by the ADM has reached its useful life and is in a dilapidated condition. Steel pipes that were installed over 50 years ago have become badly corroded and old asbestos water and sewer networks burst continuously. Owing to limited financial resources and the need to address backlogs, refurbishment and asset replacement needs to be carefully planned and implemented in order to maximise the use of limited resources. In this regard the ADM has embarked on an asset verification project as well as a “Master Planning” initiative which will seek to inform the refurbishment and asset replacement programme. Due to the extent of the Water and Sanitation assets, the lack of “As built” plans and limited funding, this process is likely to take a number of years. Actual refurbishment implementation will depend on financial resources, but will be prioritized according to a risk and benefit analysis.

Other issues affecting the quality of service delivery is the quality and state of water and sanitation services infrastructure handed over to the ADM from Local Municipalities and the Provincial Housing Department – especially Water Treatment Works and Wastewater Treatment Works which generally are in dire need of repairs. Poor workmanship and inferior quality materials are sometimes used on low cost housing developments and is making it challenging for the Operations and Maintenance Division to provide a sustainable service due to failing water and sanitation services infrastructure particularly in low income housing developments.

Another significant issue is in with regard to poor monitoring occurs in Stutterheim with the Abattoir, the ANCA operation which has an inadequate waste water management system, which then results in the Stutterheim waste water treatment works (Figure 4-24) receiving feathers and fats from ANCA.
With regard to permits and licensing of fisheries, this is also mis-managed as illegal fishing is rife in rural coastal areas like Dwesa and Khobonqaba and abalone in Ngquishwa.

An example of an operation which is not guided in obtaining the necessary permits and licences is Newden Candles, in Stutterheim. The operation which mainly produces candles, paints and cosmetic products, operates well and has a sound sustainable procedure. Newden Candles operated its own irrigation process, facilitated by separation ponds, shown in Figure 4-25. This water is then used to irrigate the greenery on the property.
4.3.2.5 Illegal sand mining

While the effect and impacts associated with poorly managed mining sites, which are often the case with illegal sand mining operations, none were observed during ground-truthing. Furthermore, officials from the ADM are currently not able to pin-point these operations.

4.3.2.6 Access to basic services and infrastructure

The urban areas of the ADM WSA function are generally in need of upgrading in terms of capacity of bulk infrastructure, refurbishment of dilapidated infrastructure and access to raw water supply as well as unreliable groundwater resources. This need is growing rapidly as the continued process of urbanization, coastal developments and pressure is placed on local municipalities to provide housing and basic services. An example of a project being investigated to try and address this need of sustainable water supply is the Great Kei River Basin Scheme (currently completed the technical & preliminary design stage) where water would be abstracted from the under-utilised Wriggleswade Dam, purified at Kei Road WTW and supplied to the Komga Town, Mooiplaas, Kwelera and to East Coast Resorts (ADM IDP, 2011/2012).
Despite urbanization and the rural development that is taking place recently, an approximately 80% of the ADM water services backlog is located in the rural areas, especially in the local municipalities of Mnguma and Mbhashe. The ADM, OR Tambo DM and Chris Hani DM are jointly planning and implementing water service delivery to communities that share a boundary between the municipalities i.e. Intsika Yethu LM (CHDM) and Amahlati LM (ADM) and (or) (Mbhashe –King Dalindyebo Sabata next to Elliotdale, Xhora Regional Water Supply Scheme) through a Memorandum of Agreement that will be signed between the two District Municipalities (ADM IDP, 2011/2012).

Several wastewater treatment facilities exist within the Amathole DM. However, the poor operational state and inadequate maintenance (e.g. design weaknesses, overloaded capacity, faulty equipment and machinery) of most of these wastewater treatment works has been of huge concern. Overflows, spills and inadequately treated effluent that contaminate freshwater systems are the main cause for degraded water systems with fish kills, disease outbreaks and eutrophication.

Another issue encountered during ground-truthing were make-shift or community made sanitation facilities. Indigent rural areas not supplied with any form of sanitation services make use of their own facilities as shown in Figure 4-26.

**FIGURE 4-26: RURAL AREA IN BUTTERWORTH, NON-SERVICED WITH SANITATION FACILITIES**
Of the total population of 980 125, 108 479 people (11%) do not yet receive water services (as at September 2011). Thereby, 871 646 people or 217 912 households (89%) receive water services. Of these households, only 38 905 are registered ervens as per the Service Coverage. The balance of 179 007 (82% of population) are households located in villages in the former homelands. These households receive a basic level of supply of 25 litres per person per day from communal standpipes (W2RAP, 2011).

Figure 4-28 through to Figure 4-20 depict the census 2011 data on sanitation service delivery or lack therefore in the ADM.

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![Figure 4-27: Percentage of Houses with Access to Piped Water (Census 2001 and 2011 Where Available)](image_url)

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1 While Buffalo City is included in the graph, the service provider is aware of the exclusion of the Buffalo City Municipality from the Amathole District Municipality.
FIGURE 4-28: PERCENTAGE OF HOUSEHOLDS WITH NO TOILETS (SOURCE: CENSUS 2011).

FIGURE 4-29: PERCENTAGE OF HOUSES WITH PIT LATRINES (CENSUS 2011).
The World Health Organisation stated that “Sanitation is a cornerstone of public health, improved sanitation contributes enormously to human health and well-being, especially for girls and women. Simple, achievable interventions can reduce the risk of contracting diarrhoeal disease by a third.” Using proper toilets and hand washing - preferably with soap - prevents the transfer of bacteria, viruses and parasites found in human excreta which otherwise contaminate water resources, soil and food. This contamination is a major cause of diarrhoea, the second biggest killer of children in developing countries, and leads to other major diseases such as cholera, schistosomiasis, and trachoma (WHO, 2013).

A pit toilet is a dry toilet system which collects human excrement in a large container and range from a simple slit trench to more elaborate systems with ventilation. They are more often used in rural and wilderness areas as well as in much of the developing world. The waste pit, in some cases, will be large enough that the reduction in mass of the contained waste products by the ongoing process of decomposition allows the pit to be more or less permanent. In other cases, when the pit becomes too full, it may be emptied or the hole made be covered with soil and the associated structure moved or rebuilt over a new pit.

The ventilated improved pit latrine, or VIP, is a pit toilet with a black pipe (vent pipe) fitted to the pit, and a screen (fly screen) at the top outlet of the pipe. VIP latrines are an improvement to overcome the disadvantages of simple pit latrines, i.e. fly and mosquito nuisance and unpleasant odours. The smell is carried upwards by the chimney effect and flies are prevented from leaving the pit and spreading disease.
Bucket toilets are buckets which are used to collect human excrement; a bucket composting toilet consists of a receptacle bucket, a removable toilet seat that slips into the top, and a bucket of sawdust for covering after each use. When the toilet is full the seat is switched to the empty sawdust bucket. The toilet is emptied, cleaned and sanitized and then becomes the sawdust bucket after filling with clean sawdust.

4.3.2.7 The state of estuaries and beaches

Pollution of the ADM estuaries and beaches occurs through over exploitation of invertebrate animals on certain areas of the coastline (e.g. abalone, limpets, mussels) in certain estuaries, over exploitation of offshore, inshore and estuarine fish species. Some populations have collapsed, (e.g. Red Stumpnose), organic pollution of estuaries and beaches due to poor sanitation in certain resort and coastal developments, poor sanitation in townships and informal settlements and inadequate water treatment, organic or inorganic chemical pollution of estuaries due to industrial and storm water run-off, pollution of ocean from outfall pipes, silting up of rivers and estuary mouths due to water flow restrictions, destruction of coastal forests due to uncontrolled removal of wood by subsistence gatherers and blow-outs in sand dunes due to uncontrolled beach access, poorly planned developments and sand mining activities.

4.3.2.8 Timber operations

There are water, waste and air pollution issues related to the forestry sector in AMD in terms of organic and chemical loading from the processing centres. Pollutants include organic timber residues including sawdust, litter, petroleum products, paints, solvents, coolants, degreasing agents, sediments, rubber particles and detergents. Sawdust and off-cuts should be collected and disposed of. Waste from treated timber products, like creosote, permazine, must be segregated from untreated timber waste products, which may then be recycled. When spray painting or lacquering will often be carried out in association with wood processing works, refer to the Environmental Assessment Guide for Planners, Surface Coating (Spray painting and powder coating). The recommended separation distance for air quality purposes between the spray-booth and the nearest residential (or other sensitive) shall be at a safe distance.
The Amabele Poles in Stutterheim was observed to be in poor conditions, with no one on site who was able to explain their processes or operation to us. Figure 4-32 shows the conditions at Amabele Poles. We were unable to determine whether Creosote is used to treat the poles. If it is used, this could pose a significant problem as standing water was observed and no information was obtained on the methods of disposal of chemicals used.
4.3.2.9 Drought conditions

The severe drought conditions that have prevailed across in some parts of the District over the past three years have also placed a heavy burden on the ADM’s recourses. Although the ADM, along with a number of other municipalities in the province, was declared a ‘Drought Disaster Area’ in July 2009, limited support has been forthcoming from National Treasury and the ADM has had to carry the full financial burden of providing alternative emergency water supply solutions to the affected areas. The drought situation will continue to place a strain on the ADM’s financial resources until the weather patterns return to normal or National Treasury provides financial assistance. The drought conditions have also highlighted the need to fast track plans for further water resource development (ADM IDP, 2011/2012).

At present the main challenge experienced by ADM which has a major impact on the availability of an adequate quantities of water necessary to maintain health and the quality of available drinking water, is the prevailing drought. The effect varies according to vulnerability. This prolonged, abnormally dry period has resulted in shortage of water for communities’ normal needs. It has also reduced the quality of water because the low water flows have reduced capacity for the dilution of pollutants, with resultant increased contamination of remaining water sources.
4.3.3 The receiving environment and scale of impact

The receiving environment is ultimately the communities which consume the drinking water provided by the ADM, the scale of the impacts of ingesting water which is of poor quality is significant. Particularly considering the fact that the ADM is performing below the regional average with regard to water quality, this indicates that the scale of impact is high enough to warrant immediate actions of resolution. In some cases, the impacts are of a lower scale, but with water services being paramount to the welfare of the ADM community, any impact is viewed as in need of attention, for the purposes of this assessment, and the environmental pollution control plan.

4.3.4 Risk Assessment

This section applies the risk assessment matrix as elaborated on in section 3.1. The objective of the risk assessment is to determine the significance of the impact and to prioritise key impacts which require resolution. This assessment will, together with the outcomes of the solutions focused workshop, provide the pollution control plan for the Amathole District Municipality.
### TABLE 4-3: WATER RISK ASSESSMENT

<table>
<thead>
<tr>
<th>IDENTIFIED HAZARD</th>
<th>ASSOCIATED LIKELY IMPACTS</th>
<th>PROBABILITY RATING</th>
<th>INTENSITY RATING</th>
<th>DURATION RATING</th>
<th>EXTENT RATING</th>
<th>TOTAL RISK SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4.3.1.</strong> Potable water quality – low residual chlorine in some supply lines.</td>
<td>Indicates low levels of water purification which ultimately leads to the consumption of poor quality water and the generation of health impacts. The quality of drinking water in the ADM is below the regional average of 77.3%</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>11 Moderate</td>
</tr>
<tr>
<td><strong>4.3.2.</strong> Rural area water supply - Containment in blue plastic drums</td>
<td>Potential release of contaminants into the water stored in the drums for consumption and the associated health impacts with consuming the residual chemicals.</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>11 Moderate</td>
</tr>
<tr>
<td><strong>4.3.3.</strong> Bacterial contamination in rural water supply</td>
<td>Bacterial contamination in water could lead to susceptibility to infectious diseases.</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>12 Moderate</td>
</tr>
<tr>
<td><strong>4.3.4.</strong> Poor Blue and Green Drop assessments results throughout ADM</td>
<td>Indicates poor quality water which ultimately leads to the generation of health impacts. The quality of drinking water in the ADM is below the regional</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>15 High</td>
</tr>
<tr>
<td>IDENTIFIED HAZARD</td>
<td>ASSOCIATED LIKELY IMPACTS</td>
<td>PROBABILITY RATING</td>
<td>INTENSITY RATING</td>
<td>DURATION RATING</td>
<td>EXTENT RATING</td>
<td>TOTAL RISK SIGNIFICANCE</td>
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<tr>
<td>4.3.5.</td>
<td>Washing of vehicles alongside rivers will result in certain chemical and greases entering</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>8</td>
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<tr>
<td>There is concern across ADM with</td>
<td>the water. This could cause potential for the ingestion of polluted organisms within the</td>
<td></td>
<td></td>
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<td></td>
<td>Low</td>
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<td>regards to the washing of vehicles</td>
<td>river.</td>
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<td>using river water in situ. Particularly</td>
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<td>along the eastern portion of the</td>
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<td>region</td>
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<tr>
<td>4.3.5</td>
<td>Illegal sand mining indicates that there are no standards or Environmental Management</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Illegal sand mining along the Mbashe</td>
<td>Plans by which the miner needs to abide, which could result in damages to the watercourse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td>River.</td>
<td>and pollution of the water, this will subsequently have downstream health effects.</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>4.3.7.</td>
<td>Ill management of crucial operations such as water purification leads to poor quality</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Lack of implementation of the ADM Waste Water Risk Abatement Plan.</td>
<td>water and the diseases associated with ingestion thereof.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>IDENTIFIED HAZARD</td>
<td>ASSOCIATED LIKELY IMPACTS</td>
<td>PROBABILITY RATING</td>
<td>INTENSITY RATING</td>
<td>DURATION RATING</td>
<td>EXTENT RATING</td>
<td>TOTAL RISK SIGNIFICANCE</td>
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<tr>
<td>4.3.8. Frequent sewer spills in Indutwa Town and Fort. Beaufort at the raw sewage pump station.</td>
<td>Sewer spills arise from ill-management and can directly enter water sources, which in turn can cause diarrhoea a host of other infectious diseases.</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>14 High</td>
</tr>
<tr>
<td>4.3.9. Informal housing and accompanying sanitation facilities occurring in flood plains.</td>
<td>The informal housing and toilet facilities are often damaged during floods, allowing sewage to seep directly into groundwater.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>11 Moderate</td>
</tr>
<tr>
<td>4.3.10. Pollution of estuaries due to industrial and storm water run-off.</td>
<td>Seepage of industrial wastes and chemicals into the estuary which forms the livelihoods of many communities.</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>14 High</td>
</tr>
<tr>
<td>4.3.11. Lack of enforcement of schedule trade permits and licences.</td>
<td>Ill-management of the practices of industries and the subsequent pollution of surface and ground water.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>12 Moderate</td>
</tr>
<tr>
<td>4.3.12. No beaches in the ADM have blue flag status</td>
<td>This is indicative of the fact that conditions on the ADM beaches are satisfactory or to the compliant standard, which in itself highlights safety and health impacts.</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>16 High</td>
</tr>
</tbody>
</table>
## The Amathole District Municipality Environmental Pollution Control Plan – Risk Assessment

<table>
<thead>
<tr>
<th>IDENTIFIED HAZARD</th>
<th>ASSOCIATED LIKELY IMPACTS</th>
<th>PROBABILITY RATING</th>
<th>INTENSITY RATING</th>
<th>DURATION RATING</th>
<th>EXTENT RATING</th>
<th>TOTAL RISK SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3.13. Unsustainable fishing.</td>
<td>This is rife in the Ngqushwa Municipality, particularly of Abolone. Fishing occurs for recreational, subsistence and commercial reasons and the over-exploitation has resulted in the population collapse of the Red Stumpnose.</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>13 Moderate</td>
</tr>
<tr>
<td>4.3.14. Groundwater pollution caused by quarries.</td>
<td>Pollution of groundwater and the consumption of this water without required purification could lead to various illnesses.</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>10 Moderate</td>
</tr>
<tr>
<td>4.3.15. The residual effects of the Kind Williams Town Foundary.</td>
<td>The residual chemicals (such as Manganese) which could be found in the groundwater are unknown in terms of how far the extent goes.</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>9 Moderate</td>
</tr>
<tr>
<td>4.3.16. Poor sanitation facilities and mis-management pollute estuaries and the beaches.</td>
<td>Seepage of sewage wastes into the estuary which forms the livelihoods of many communities.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>13 Moderate</td>
</tr>
<tr>
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</tr>
<tr>
<td>4.3.17. Drought conditions</td>
<td>Prevalence of water bourne diseases such as cholera.</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>15 High</td>
</tr>
<tr>
<td>4.3.18. Chemicals used at timber industries.</td>
<td>Some chemicals such as Creosote that are used to treat the wood could end up in storm water run-off and thereby reach unsuspecting consumers in soil.</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>10 Moderate</td>
</tr>
<tr>
<td>4.3.19. The use of herbicides and pesticides.</td>
<td>These substances could reach water bodies and be consumed by communities.</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>11 Moderate</td>
</tr>
<tr>
<td>4.3.20. Lack of infrastructure – 50 year old, dilapidated steel pipes.</td>
<td>These pipes are corroded and repeatedly burst.</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>16 High</td>
</tr>
<tr>
<td>4.3.21. Residual wastes from ANCA Abattoir being received by the Stutterheim WWTW.</td>
<td>Feathers and fats from the ANCA Abattoir are still received by the Stutterheim WWTW.</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>17 High</td>
</tr>
<tr>
<td>4.3.22. Leachate pollution from landfill sites and</td>
<td>Should leachate reach ground water and surface water this would lead to serious contamination and the cause of</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>12 Moderate</td>
</tr>
<tr>
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</tr>
<tr>
<td>informal land filling.</td>
<td>infectious diseases once consumed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.3.23. Air pollutants associated with wastewater treatment.</td>
<td>These air pollutants include VOCs, hydrogen sulphide, mercaptans, ammonia, acetone, toluene and ethyl benzene. Some of the pollutants are odorants (H2S, ammonia and mercaptans). Odour impacts may also be a serious source of nuisance to the local communities located close to the wastewater treatment works</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>13 Moderate</td>
</tr>
</tbody>
</table>
4.3.6 Strategies to implement

The strategies to implement will give rise to the overall pollution control plan and will include the actions to be taken which are pertinent to certain hazardous impacts. These actions will be accompanied by a plan on how to best implement the pollution control, and will be informed by the solutions focused workshop.

5 CONCLUSION

The risk assessment covering water pollution issues in the Amathole District Municipality provides a good basis to move towards developing a coherent pollution control plan for the District.

With regard to air quality, while all impacts or hazards identified had a significance rating of moderate, industrial impacts were rated high.

The waste risk assessment found continued growth in waste generation, leachate management and the burning of waste to pose a significantly high hazard to the health of the communities in the Amathole District Municipality.

The water risk assessment found the following to be of a significantly high hazard to human health:

- Poor Blue and Green Drop assessments results throughout ADM;
- Lack of implementation of the ADM Waste Water Risk Abatement Plan;
- Frequent sewer spills in Indutwa Town and Fort. Beaufort at the raw sewage pump station;
- Pollution of estuaries due to industrial and storm water run-off;
- No beaches in the ADM have blue flag status;
- Drought conditions;
- Lack of infrastructure – 50 year old, dilapidated steel pipes; and
- Residual wastes from ANCA Abattoir being received by the Stutterheim WWTW.

These are systems with deficiencies which individually or combined pose a high risk to the quality of the receiving environment and health, and may lead to potential health, safety and environmental concerns. Once a systems (or part of a system) are classified under this category, immediate corrective action is required to arrest or eliminate the deficiency. High impact on the health of people and the environment and/or significant damage to infrastructure can be expected. Total failure of the collector, treatment and disinfection facility are likely.