WATER SAFETY AND SECURITY: EMERGENCY RESPONSE PLANS

TECHNICAL REPORT

Report to the
Water Research Commission

by

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This report forms part of a series of two reports. The other report is *Water Safety and Security: Emergency Response Plans. Guidance on Developing and Implementing Emergency Response Plans for Community Water Systems* (WRC Report No. TT 656/16)

EXECUTIVE SUMMARY

Although notable progress has been made in urban and/or more formal structured water supply systems, a challenge still exists in rural areas where there are no formal structured systems. Therefore there is a need for guidance in these areas to effectively manage water services in order to protect public health, safety and security of water services infrastructure and people involved. The most effective means of consistently ensuring functional and effective water system infrastructure is through the use of a comprehensive risk assessment and management approach that encompasses all components in the water system. Water Safety Plans (WSPs) have therefore been adopted as a tool to fulfil the objective of ensuring safe drinking water supply through the use of a comprehensive risk assessment and risk management approach. This was introduced by the Department of Water and Sanitation (DWS) in 2008 via introduction of Blue Drop Certification programme. Water Safety Planning is a risk management tool which encompasses the water management chain from catchment to consumer. The primary objectives of a WSP in ensuring good drinking water supply practice are as follows:

- minimization of contamination of source waters,
- reduction or removal of contamination through treatment processes and
- prevention of contamination during storage, distribution and handling of drinking water; seeking to identify hazards that the water resource and supply system are exposed to and the level of risk associated with each.

One of the WSP key elements is development of management procedures (including emergency response plans). The purpose of ERPs is to be prepared to manage anticipated incidents and emergencies in a structured and planned way. It is also a regulatory requirement (Disaster Management Act, 2002) that all water service systems, including CWS, irrespective of size, location, etc. have ERPs to guide them through emergencies as one way of managing risks in the water supply system. Simply put, an Emergency Response Plan specifies both how emergency response organizations will work together and what will actually happen during an emergency response operation.

Both managers and other technical staff need to understand what plans and budgets should be developed and implemented to operate and maintain successful water services. A wide variety of topics need to be planned for including, for example, the need to expand the water treatment works, a desire to improve the efficiency of the treatment process or to improve working conditions/ water safety. The plan needs clear aims and objectives, how to deal with changing circumstance (issues and risks arising) and what resources (people, money, time) will be needed to implement the plan. Finally, mechanisms should be established to periodically review and, where necessary, revise plans and budgets to reflect changing circumstances.

To assist Water Services Institutions (WSIs), this project aims to develop a generic ERP guide for Community Water Systems (CWS). CWS in this study were defined as areas where: (i) drinking water services provided to rural communities, (ii) municipal constraints exist and there is either “no supply” or water is provided up to a communal standpipe. The aim of the study is to assist communities to identify threats and vulnerabilities in the water supply system that may lead to emergencies. Emergencies considered in this study include (i) unavailability or over availability (e.g. flood) and (ii) water quality or pollution/contamination. Therefore the development of the guideline document with its associated templates will enable the municipalities and communities to be prepared to manage anticipated incidents and emergencies in a structured and planned way.

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ACRONYMS & ABBREVIATIONS

CWS	Community Water System
DM	District Municipality
DWS	Department of Water and Sanitation
EHP	Environmental Health Practitioner
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
LM	Local Municipality
WSA	Water Service Authority
WSI	Water Service Institution
WSP	Water Safety Plan

CHAPTER 1: BACKGROUND

1.1 INTRODUCTION

Although notable progress has been made in urban and/or more formal structured water supply systems, a challenge still exists at rural areas with no formal structured system. Therefore there is a need for guidance at these areas to effectively manage the water services in order to protect public health, safety and security of water services infrastructure and people involved. The most effective means of consistently ensuring functional and effective water system infrastructure is through the use of a comprehensive risk assessment and management approach that encompasses all components in the water system. Water Safety Plans (WSP) have been adopted as a tool to fulfil the objective of ensuring safe drinking water supply through the use of a comprehensive risk assessment and risk management approach. This was introduced by the Department of Water and Sanitation (DWS) in 2008 via introduction of the Blue Drop Certification programme. Water Safety Planning is a risk management tool which encompasses the water management chain from catchment to consumer. The primary objectives of a WSP in ensuring good drinking water supply practice are:

- the minimization of contamination of source waters,
- the reduction or removal of contamination through treatment processes and
- the prevention of contamination during storage, distribution and handling of drinking water; seeking to identify hazards that the water resource and supply system are exposed to and the level of risk associated with each.

Key components of Water Safety Planning (WHO, 2009; Thompson et. Al, 2009) include:

- System assessment – determine whether the supply system (i) can deliver safe water, and (ii) is meeting SANS 241 targets.
- Identifying control measures – conduct a risk assessment to collectively control identified risks and hazardous events and ensure that SANS 241 targets are met. For each control measure identified, an appropriate means of operational monitoring should be defined that will ensure that any deviation from required performance is rapidly detected in a timely manner.
- Management plans and risk management – to develop plans describing actions to be taken during normal operation or incident conditions and documenting the system assessment, monitoring and communication plans and supporting programmes.

One of the WSP key elements is development of management procedures (including emergency response plans). The purpose of ERPs is to be prepared to manage anticipated incidents and emergencies in a structured and planned way. Simply put, an Emergency Response Plan specifies both how emergency response organizations will work together and what will actually happen during an emergency response operation. Emergencies are likely to require the resources of organisations beyond the drinking water supplier, particularly the public health authorities.

1.2 PROJECT AIMS

The project aims to:

- Survey what exists currently in terms of Emergency Response Plans and identify international practices.

- Assist Community Water Services to identify water services and water services infrastructure threats, vulnerabilities and risks.
- Assist Community Water Services to identify management supporting plans and/or documents required in support of risk and asset management focusing on water services emergencies.
- Develop a draft water safety and security Emergency Response Plan (ERP) guideline with useful templates with reference to international ERP practices.
- Workshop the draft guide at selected communities/municipalities.
- Workshop the guide at local, provincial and national meetings and/or conferences.
- Develop a final ERP guide with inputs and amendments from the pilot and workshops with useful templates.

1.3 PROJECT METHODOLOGY

1.3.1 Project initiation

- Conduct a literature review to:
  - Ascertain current status of such communities.
  - Review legislation related to Community Water Services.
  - Review international guides or practices in developing and implementing ERPs.

1.3.2 Conduct site visits to:

- Establish current status of the Community Water Services.
  - Ascertaining who owns and who is responsible for water services (e.g. if these communities are serviced by municipalities or local chiefs and/or trusts).
  - Identifying water service delivery, methods and possible shared threats/vulnerabilities and risks.
  - Identifying if the CWS has been documented and the availability of information about the system.
  - Investigating if the systems have been documented and evaluated.

- Establish current status of water safety and security emergency response planning, including:
  - Determining the emergency response plan status.
  - Identifying water services challenges experienced at these communities.
  - Determining community involvement options / method.

1.3.3 Develop Draft guideline Emergency Response Plans that include:

- Conditions identified as emergencies.
- Communication procedures/protocol/chain of command.
- Procedures on how to attend to the specified emergencies.

1.3.4 Workshop the draft framework with identified CWS to:

- Identify if there are any requirements that have not been developed.
- Gather inputs for the developed draft ERPs for amendments.
- Review and finalise draft framework.

1.3.5 Final Guideline Document

- Following feedback, update and finalize guideline document.

CHAPTER 2: WATER SAFETY AND SECURITY EMERGENCY RESPONSE PLANNING: A REVIEW

2.1 INTRODUCTION

This section provides feedback on the literature reviewed in developing and implementing emergency response plans. Literature review was conducted to:

- Ascertain current status of community water systems.
- Review legislation related to community water systems and water services.
- Review international guides or practices in developing and implementing ERPs.
- Benchmark the international guides or practices with South African practices.

This section presents literature review according to the objectives of the project. Therefore elements considered for the literature review included:

1. Emergency background (definition of terms)
2. Definition of Community Water System (CWS)
3. International guides and practices in developing Emergency Response Plans
4. Water safety planning in South Africa
5. Benchmarking South African practices to International practices

Key aspects of these elements are discussed in the sections that follow.

2.2 DEFINITION OF TERMS

The following defined terms will be regularly used in this project and associated documents. The definitions have been adopted from previous Water Research Commission (WRC) projects (Projects K5/ 1893 and K5/1993).

Emergency – For the purposes of this guide, an emergency may be considered as an indication that water is contaminated; or is unavailable for consumption; or is in excess (in the case of floods).

Threat – a threat is an indication or warning of probable trouble (e.g. drought).

Hazard – a hazard is a situation that poses a level of threat to life, health or environment (e.g. poor water quality).

Vulnerability – vulnerability is an exploitable security weakness or deficiency at a facility (e.g. non controlled access to a drinking water reservoir).

Risk – risk is probability/likelihood of a threat happening X consequence/impact should the threat happen

Community – Community is defined as a social group of any size whose members reside in a specific locality, share government, and often have a common cultural and historical heritage (www.oxforddictionaries.com).

Community water system – The Environmental Protection Agency (EPA) defines a Community Water System (CWS) as small and medium sized community drinking water systems serving between 3 300 to 99 999 (EPA, 2005). The EPA definition also includes Public Water Systems (PWS) which are defined as systems for the provision of piped water for human consumption, which has at least 15 service connections, or regularly serves an average of at least 25 individuals at least 60 days out of the year (RCAP, 2005).

The above definitions are not appropriate in South Africa because the Water Services Act (WSAct, 1997) states that water is a basic human right such that all people living in South Africa should have access to adequate, safe and appropriate and affordable water services (DWA, 2003: Strategic Framework) and the interruptions experienced should not be more than 15 days in a year. In addition, water services related policies/legislations/frame work in South Africa do not reference a CWS, however the Water Services Act of 1997 refers to basic water supply which is defined as minimum standard of water supply services necessary for the reliable supply of a sufficient quantity and quality of water to households, including informal households, to support life and personal hygiene (WSAct, 1997). In simple terms it means 25 L of potable water per capita per day must be supplied within 200 m of a household and a minimum flow of 10 L/min (in the case of communal water points) or 6000 L of potable water supplied per formal connection per month (in case of yard or house connections) (DWA, 2003). It has been identified by the project team that:

- There is no formal definition of community water system in South Africa.
- There is no formal definition of small systems in South Africa.
- The Department of Human Settlements (2009) indicated that there is no universally accepted definition for rural areas. Rural areas are diverse in nature, location and circumstances, ranging from commercial farming areas to subsistence farming areas (with communal tenure) and often include small towns and settlements which are largely dependent on agriculture.

Considering the above definitions from the reviewed literature and the South African circumstances, it is proposed that community water systems are systems that are mostly in rural communities with informal supply systems (meaning it is a system with some, not all, elements of the water supply system that include source, treatment, distribution, network up to the point of use).

Therefore CWS is characterised by the following:

- Drinking water service provided in rural areas,
- where little municipal involvement exists,
- where there is either no supply, or water is provided up to a communal standpipe.

NOTE: The size of the serviced area and associated population are not considered as deciding factors.

The systems targeted in this study therefore are categorised by one or a combination of the following:

- Pumping from a source or receiving bulk water-to a treatment system-to storage-distributed to the network and to a communal standpipe within or further than 200m from a dwelling.
- Receiving non treated water from the sources directly (e.g. rivers, well, springs, boreholes, etc.), which is considered “no supply”.
- Practising communal rainwater harvesting via collecting water into a communal reservoir or individual rainwater harvesting via collecting water into a storage tank.
- Transporting water by tankers to a communal reservoir or directly to consumers.

2.3 INTERNATIONAL WATER SAFETY AND EMERGENCY RESPONSE PLANNING PRACTICES

This section presents some of the international practices and guides relating to developing and implementing emergency response plans.

2.3.1 WHO Water Safety Planning

WHO (2009) stated that there is no one way to undertake the WSP approach. The most important thing is that the WSP approach fits in with the way the organisation is organised and operates. A WSP is only useful if it is implemented and revised. The approach adopted when developing a WSP typically comprises the following sequential steps (WHO, 2009):

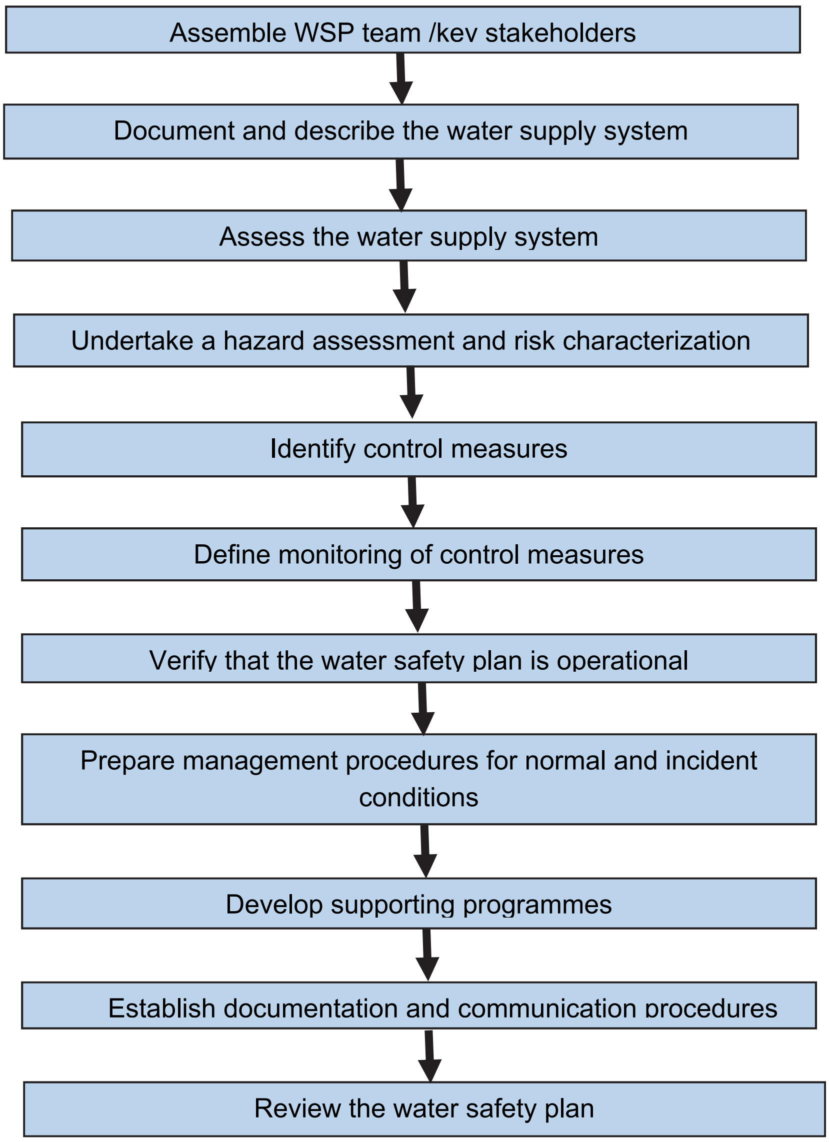


Figure 2.1: Water safety planning steps (WHO, 2009)

2.3.2 EPA Emergency Response Planning

The EPA emergency response plan guidance for small and medium community water systems assists water service providers to comply with the public health security and bioterrorism preparedness and response act of 2002. EPA (2004) indicates that there are 8 ERP core elements to consider when developing an emergency response plan, these are:

1. **System specific information** – this is the information that is readily available about the system (e.g. detailed plan drawings, site plans, source water location and operations manuals). This information could have either been reviewed or developed during a vulnerability assessment. The information may include:
    - The system's ID and name,
    - System address or location,
    - Directions to the system,
    - As-built drawings of the system,
    - Population served and number of service connections,
    - System owner,
    - Communications system,
    - Employee's roles and responsibilities and
    - Information about the person in charge of managing the emergency.

2. **Roles and responsibilities** – when an emergency occurs, there can be confusion, lack of co-ordination and poor communication if there is no person designated to co-ordinate emergency response effort. Having a chain of command that defines clear lines of authority and responsibilities for system personnel during an emergency speeds up the response time and helps eliminate confusion. System personnel need to know who to report the emergency to, who manages the emergency, who makes decisions, and what their own responsibilities are.

3. **Communication procedures** – this contains a list of people and entities to be contacted in case of emergency (including internal and external personnel). The list may include names of people to be contacted, titles, mailing address and telephone numbers.

4. **Personnel safety** – during an emergency, personnel may be at risk of harm, injury or even death. Therefore direction on how to safely implement a variety of response actions at specific situations should be clearly provided.

5. **Identification of alternate water sources** – this should address alternate water supplies available during both short term and longer outages. This means a clear understanding of the current water supply demand is required when developing an ERP.

6. **Replacement equipment and chemical supplies** – based on the vulnerability assessment, an understanding of where and how to find equipment, spare parts and chemicals should have been established. The ERP should therefore identify equipment that can significantly lessen the impact of an emergency on public health and protect the safety and supply of drinking water.

7. **Property protection** – protecting infrastructure facilities is essential to restoring operations once a major event has occurred. The ERP should identify measures and procedures that are aimed at securing and protecting the system after a major event.

8. **Water sampling and monitoring** – this should be an integral part of the ERP and not an afterthought. This is where the extra-ordinary water sampling and monitoring issues that may arise during and after an emergency are identified (i.e. non routine but emergency sampling).

Once all 8 core elements have been addressed, the information can be packaged into one single document which becomes an Emergency Response Plan. The EPA 2005 approach is such that the threats/vulnerabilities and risks identification should include recording, operations, maintenance, water availability and water quality.

2.3.3 EPA Water Security Handbook

The EPA Water and Security Handbook (2006) guide focuses on water quality aspects such that the approach suggested is to identify possible threat (that can contaminate water) and the actual incident (that have been found to contaminate water). The handbook suggests that the first step in managing threats and incidents is to clearly define threats and incidents.

Step 1: Identify Possible Threats and Incidents
It was stated that a threat may be considered as a suggestion or an indication that water has been or will be contaminated without any conclusive proof. Whilst an incident an incident is when a presence of a harmful contamination has been confirmed or verified.
Threats and contamination incidents may impact the public in the following ways:

- Cause harm to public health (illness, disease, or death).
- Cause fear or loss of public confidence towards the provider.
- Disrupt the water system or cause long-term shortage of potable water to customers.
- Disrupt businesses and services that depend on a safe water supply.
- Cause damage to the water system infrastructure (e.g. pumps, storage, pipes, wells, treatment system) resulting in contamination or interference with treatment or delivery.
- Result in significant cost for remediation or replacement.

When planning for the management of the identified threats, the probability that the threat will occur should be verified by identifying:

- How likely is the contamination of the drinking water system?
- Could it happen again?
- How serious would it be?

Following identifying threats and incidents, a procedure on how to manage threats should be developed which could include the following.

Step 2: Contamination Threat Management

- Allocate roles and responsibilities
- Develop a general plan for responding to threats and incidents
- Identify how to make the right decisions and when to make them
- Identify types of information needed to evaluate threats
- Develop an action plan to protect public health

Step 3: *Site Characterization and Sampling*

- Site characterization involves investigating the site to find out the *what, where, when, who, why* and *how* of the contamination threat. A site could be the entire water system or a component of it, such as the distribution system, source water, treatment facility, storage tanks or some other area that may have been contaminated. Site characterization activities include site investigation, field safety screening, rapid field testing of the water and water sampling.

Step 4: Analyses

- This process is aimed at the staff that will plan, order and interpret laboratory analyses of water samples collected from the site of a suspected incident. At this stage, plans for sample analyses should be made for before a contamination threat or incident happens (what to ask the lab to analyse for, how to set data quality goals and what precautions to take when handling or shipping samples) and after.

Step 5: *Public Health Response Guide*

There are five steps to consider in planning for effective public health response:

- Plan a public health response to a contamination threat or incident before a threat or incident occurs;
- When a threat or incident occurs, determine the public health consequences;
- Carry out operational response actions to contain the contaminant and protect public health;
- Communicate effectively with other agencies, utilities and the public through a communication and notification plan; and
- Provide an alternate short-term water supply (your utility's ERP should provide options for an alternate water supply).

2.3.4 Emergency Response Planning Guide for Public Drinking Water – Rural Community Assistance Partnership (RCAP)

Table 2.1 shows the procedures to be followed in order to develop and implement an emergency response plan according to the Rural Community Assistance Partnership (2005).

Table 2.1: RCAP ERP Guide to develop and implement an ERP

DESCRIPTION OF TASK	KEY QUESTIONS
1. Assemble a team according to the nature of the system	Who needs to be, should be and wants to be involved?
2. Document and describe the community water supply systems	Proper documentation of the community water supply with drawings, maps, photos, water quality records and relevant management and institutional records)
3. Identify and asses threats, vulnerabilities and risks associated with the system	What are current and possible threats vulnerabilities and risks and How serious is the risk of a hazard causing harm?
4. Identify possible emergencies associated with each component of the system	
5. Develop emergency response plans • Procedures • Communication protocol • Assign responsibilities	How do we get to where we want to be?
6. Document, review all aspects of CWS implementation	What do we need to do to ensure that our CWS works well and to improve them continuously?

2.3.5 Water System Security and Emergency Response Planning – Washington State Department of Health

Washington state department of health (2011) suggested the following procedure to prepare for emergencies. Security seems to be the main focus in developing emergencies in this reference.

1. Prepare or update an emergency response plan including security considerations.
2. Post updated 24-hour emergency contact information in highly visible areas around the water system. Give the information to key persons and local response officials.
3. Get to know your local; law enforcement. Ask them to add your facilities to their routine rounds.
4. Fence and secure your water system facilities and vulnerable areas (e.g. pump house, reservoirs) and install adequate lighting around critical facilities such as sources, treatment works.
5. Watch for suspicious activity, suspicious deliveries, change in water quality and increased customer complaints.
6. Make security a priority for employees. Ensure employees know the importance of vigilance and seriousness of security. Provide staff training and checklists on how to handle threats. Rehearse response actions to familiarise staff with the process.
7. Conduct a vulnerability assessment to determine vulnerable components and possible disruption points, and identify security measures to include in your emergency preparedness plan.
8. Designate an emergency co-ordination to ensure effective preparation, communication, and procedures for an event.
9. Identify and establish agreements for a safe alternative water supply if a supply disruption occurs. Options include an emergency source, water truck, etc.
10. Know how to issue a Health Advisory, (i.e. boil water order or drinking water warning), in consultation with relevant officials (e.g. DoH).

2.3.6 Australia: Risk management applications guide manual

The Australian guide (2004) suggests the following core elements in developing and implementing an ERM. The Australian guide refers to treatment of risks which would be what is normally called control measures or remedial actions in South Africa.

Step 1: Establish the Context

Establishing the context incorporates the following:

- Define the task
- Establish the ERM framework
- Develop risk evaluation criteria

Step 2: Identify Risks

- Risk is generated by the potential for a source of risk to interact with an element of the community and the environment. The focus of the identify risks activity in the ERM process is to identify and describe the nature of risks within the ERM scope. This is done in the form of risk statements, which are then documented in a risk register. This identification process must be comprehensive because any area of risk not identified may not be included in the risk analysis and evaluation phases.

Step 3: Analysing Risk

- Analysing a risk is about developing an understanding of the risk. Through understanding a risk and any existing controls to minimise its impact, the likelihood and expected consequences of a risk can be estimated, allowing a level of risk to be determined.

Step 4: Evaluating Risk

- Evaluating a risk means making a decision about whether a risk is being satisfactorily managed or if it requires further treatment. The decision about whether a risk needs to be treated is based on the risk analysis risk evaluation criteria. Even if treatment strategies are not justified, the risk should be listed, as well as information about consequence, likelihood and risk level. Subsequently it should be monitored and reviewed to make sure that the decision not to treat this risk is still appropriate.

Step 5: Risk Treatment

- Risk treatment involves identifying a range of options for managing risks, assessing these options, and the preparation and implementation of management plans. It is sometimes more appropriate to develop a range of management options to effectively remove or reduce risks within a community. Therefore, several management options may need to be incorporated into a strategy that may span the responsibility of several agencies/organisations and levels of government. Risk treatment includes the following steps:
    - Developing a risk treatment strategy
    - Communicating and consulting
    - Monitoring and reviewing this activity
    - Documenting this activity

2.4 WATER SAFETY AND EMERGENCY RESPONSE PLANNING IN SOUTH AFRICA

In South Africa, most municipalities became aware of WSPs as part of the introduction of DWS's Blue Drop Certification programme (late 2008). Furthermore, the DWS supports international best practices and consequently indicated that it expects municipalities to manage their water supply systems against WSPs (DWA, 2009). WSPs have therefore been adopted as a tool to fulfil the objective of ensuring safe drinking water supply through the use of a comprehensive risk assessment and risk management approach. This objective is equally applicable to large piped drinking-water supplies and small community systems. The approach adopted when developing a WSP typically comprises the following (WHO, 2009):

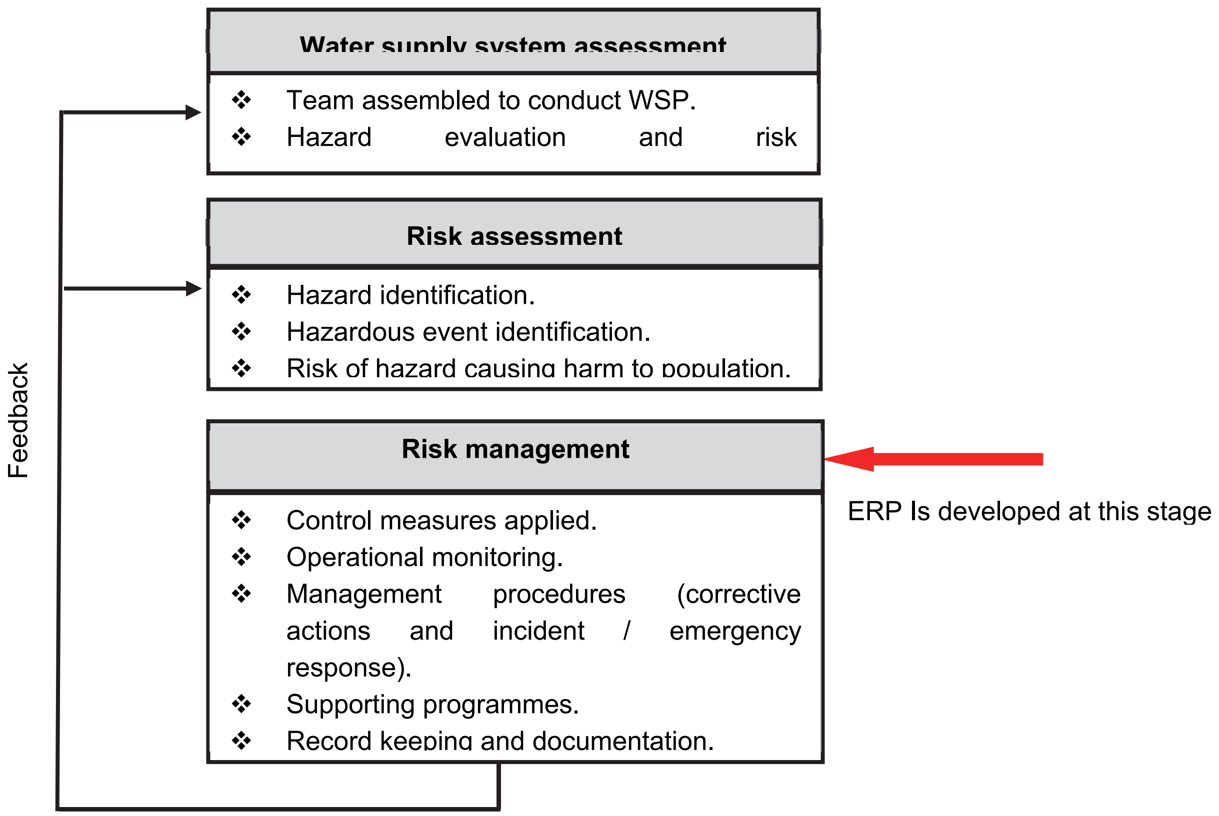


Figure 2.2: Water safety planning steps (Thompson et. al, 2009; WHO, 2009)

Emergencies happen due to a variety of reasons or events including:

- Natural disasters/ accidents (e.g. floods, windstorms, droughts, earthquakes),
- Inappropriate or poor design and planning (e.g. inappropriate budgeting)
- System neglect or poor maintenance (e.g. pump malfunctions).
- Poor operations (e.g. use of incompetent skilled staff)
- Vandalism (e.g. pipe breaks)

Emergencies can drastically affect the water supply system and the community that depends on it. Each emergency has unique effects on different parts of a water system. Floods can cause widespread bacterial contamination. Storms, floods, earthquakes can damage sources and distribution systems, and can disrupt power supplies. The common element is that each emergency may threaten the system's ability to deliver safe and reliable water.

2.4.1 Roles and Responsibilities in water services

In South Africa, water services are the responsibility of various government spheres with different responsibilities. Table 2.3 illustrates the various government departments responsible for water services.

Table 2.2: Government spheres responsibilities in water services

Government Department	Roles and responsibilities
Department of Water and Sanitation (DWS)	DWS is the national department responsible for water matters addressing both water resource management and water services provision. DWS has a central role to play in four areas: 1. *Policy*: sector leadership, promotion of good practice, development and revision of national policies, oversight of all legislation impacting on the water sector, coordination with other national departments on policy, legislation. 2. *Support:* of other spheres of government and water institutions to achieve the goals of the water sector. 3. *Regulation:* comprising three functions: establishing national standards, monitoring sector performance and making regulatory interventions. 4. *Information*: development and maintenance of an information base for the sector for purposes of management, support, monitoring and regulation.
National Treasury (NT)	• National Treasury co-ordinates the overall allocation of government's contribution towards municipal infrastructure. • Administers legislation that has implications for municipal service delivery. • Provides supports to municipalities in terms of all financial matters relating to municipal infrastructure.
Department of Cooperative Governance and Traditional Affairs (DCOG)	• DCOG ensures that local government provides basic services. • Ensures that IDPs properly address municipal infrastructure requirements. • Supports municipalities to develop their capacity to effectively manage the delivery of infrastructure.

Government Department	Responsibilities
Department of Health (DoH)	• Department of Health is responsible for policy and operational activities that impact directly on close cooperation between DWS and the DoH. • Ensures that all hospitals and clinics are provided with adequate water and sanitation facilities.
Department of Environmental Affairs (DEA)	• DEA ensures that environmental impact assessments for water services infrastructure projects are carried out.
Department of Public Works (DPW)	• The national DPW is responsible for implementing the community based public works programmes.
Local Government: Municipalities (District and Local Municipalities)	The Constitution indicates the following responsibilities of local government: • Ensures the provision of services (e.g. water) to the community in a sustainable manner. • Promotes social and economic development. • Encourages the involvement of communities and community organisations in the matters of local government.

Effective communication to increase community awareness and knowledge of drinking-water quality issues and the various areas of responsibility helps the community to understand and contribute to decisions about the service provided. The community should be kept informed of developments relating to the availability and quality of water. They can help in reducing wastage and identifying leaks in the distribution system. This guide brings about that awareness and provides recommendations on how the community can take responsibility with regard to water related issues.

The policies, legislation and strategies developed by the sector are utilised at a local government to effectively plan, budget, maintain and manage the water services. The policies, strategies and legislations will not be discussed in detail in this document, however brief discussions of these, relevant to the study, will be provided. Mackintosh et. al. (2008), Momba (2008), Momba (2005), Mosdel (2001), Stephenson et. al. (2001) discuss these water related regulatory issues in more detail.

2.4.2 Regulatory framework for water security and safety

2.4.2.1 *National Water Act*

The National Water Act, 1998 defines management of South Africa's scarce water resources. This Act sets out the fundamental principles where sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. These guiding principles recognise the basic human needs of present and future generations which include:

- The need to protect water resources. The need to share some water resources with other countries,
- The need to promote social and economic development through the use of water, and
- The need to establish suitable institutions in order to achieve the purpose of the Act.

In summary, some of the aspects covered in the National Water Act include:

- National Water Resource Strategy – provides a framework for the protection, use, development, conservation, management and control of water resources.
- Protection of water resources – states a series of measures which are together intended to ensure the comprehensive protection of all water resources.

- Use of water – highlights the responsibility for an authority over water resource management including the equitable allocation and beneficial use of water in the public interest, a person can easily be entitled to use water.
- Financial provision – is a measure to finance the provision of water resource management services as well as financial and economic measures to support the implementation of strategies aimed at water resource protection, conservation of water and the beneficial use of water.

2.4.2.2 *Water Services Act*

The Act emphasizes the right of access to basic water supply and basic sanitation by stating that;

- Everyone has a right of access to basic water supply and basic sanitation
- Every water services institution must take reasonable measures to realise these rights.
- Every water services authority must, in its water services development plan provide for measures to realise these rights.
- The rights mentioned in this section are subject to the limitations contained in this Act.

Basic water supply is defined as minimum standard of water supply services necessary for the reliable supply of a sufficient quantity and quality of water to households, including informal households, to support life and personal hygiene (WSAct, 1997). In simple terms, DWA (2003) explains that basic water supply means:

- 25 litres of potable water per capita per day supplied within 200 m of a household, and
- a minimum flow of 10 L/min (in the case of communal water points) or
- 6000 L of potable water supplied per formal connection per month (in case of yard or house connections).

If the water services provided by a water services institution are unable to meet the requirements of all its existing consumers, it must give preference to the provision of basic water supply and basic sanitation to them. In summary, some of the aspects covered in the Water Services Act include:

- Duties to provide water services – emphasizes the right of access to basic water supply and basic sanitation.
- Duties of WSA – indicates the responsibility to all consumers or potential consumers in its area of jurisdiction to progressively ensure efficient affordable, economical and sustainable access to water services.
- The Act states that, in emergency situations, Water Services Institutions (WSIs) must take reasonable steps to address incident to minimise health steps.

2.4.2.3 *Compulsory National Standards for potable water*

According to Section 9 (1) of the Water Services Act, the Minister of Water and Sanitation may introduce compulsory national standards for various aspects of water services delivery. Compulsory National Standards for potable water document (DWA, 2002b) emphasises that a WSA must include a suitable programme for sampling the quality of potable water provided by it to consumers in its water services development plan. The water quality sampling programme must specify the points at which potable water provided to consumers will be sampled, the frequency of sampling and for which substances and determinants the water will be tested. A water services institution must compare the results obtained from the testing of the samples with SANS 241: Specifications for Drinking Water.

Should the comparison of the results indicate that the water supplied poses a health risk, the water services institution must inform the Director-General of the Department of Water Affairs and the head of the relevant Provincial Department of Health and it must take steps to inform its consumers:

a) that the quality of the water that it supplies poses a health risk;
b) of the reasons for the health risk;
c) of any precautions to be taken by the consumers; and
d) of the time frame, if any, within which it may be expected that water of a safe quality will be provided.

In summary, some of the aspects covered in the Compulsory National Standards and measure to conserve include:

- Quality of portable water – provides guide how to structure a sampling programme,
- Repairing of leakages,
- Measure/control of water supplied,
- How to detect pressure in reticulation,
- The need and how to report compliance.

2.4.2.4 *SANS 241 Drinking water specifications*

The guiding drinking water quality document is SANS 241 (current version is 2015):

- Part 1: The quality of acceptable drinking water, defined in terms of microbiological, physical, aesthetic and chemical determinands, at the point of delivery.
- Part 2: How to achieve the numerical limits specified in part 1.

In summary, SANS 241 highlights the following aspects:

- Drinking water compliance specifications
- Key elements for implementing management actions to comply with SANS 241 Part 1

Considering what is presented above, it is important to note that people in poor rural areas are entitled to the same rights. Hence this project is aiming to assist in equipping the community with preparations for dealing with emergencies and ensure that the management of the targeted water supply systems is planned for.

2.4.2.5 *Strategic framework for water services*

DWA (2003) Strategic framework for water services indicates the importance of having community involvement in water services. This can be achieved through:

- Engaging community organisations in policy development, research and advocacy, and assisting with planning, implementation and management of programmes and projects at community level;
- Supporting the development of capacity in community organisations;
- Encouraging community to help monitor sector performance at all levels;
- Engaging community organisations in creating a link between government and local communities;
- Engaging capacitated community-based organisations to manage water services projects at the local level (where appropriate); and
- Assisting in the mobilisation of funds for non-government and community-based organisations where appropriate.

2.4.2.6 *Disaster Management Act*

The Act states that every municipality must establish and implement a framework for disaster management in the municipality aimed at ensuring an integrated and uniform approach to disaster management in its area. A disaster management plan for the municipal area must:

a) form an integral part of the municipality's integrated development plan;
b) anticipate the types of disasters that area likely to occur in the municipal area and their possible effects;
c) place emphasis on measures that reduce the vulnerability of disaster prone areas, communities and households;
d) seek to develop a system of incentives that will promote disaster management in the municipality;
e) identify the areas, communities or household at risk;
f) take into account indigenous knowledge relating to disaster management;
g) promote disaster management research;
h) identify and address weaknesses in capacity to deal with possible disasters;
i) provide for appropriate prevention and mitigation strategies;
j) facilitate maximum emergency preparedness; and
k) contain contingency plans and emergency procedures in the event of a disaster, providing for –
    i. the allocation of responsibilities to the various role players and coordination in the carrying out of those responsibilities
    ii. prompt disaster response and relief;
    iii. the procurement of essential goods and services;
    iv. the establishment of strategic communication links;
    v. the dissemination of information; and
    vi. other matters that may be described.

It is important to understand the policies, strategies and frameworks presented above in order to understand what should be done to achieve them. It has been indicated that water provided to the people should be safe for consumption; hence, this project aims to assist in equipping the responsible parties with information for dealing with emergencies and ensure that the day-to-day management of the targeted water systems are correctly planned.

2.4.2.7 *Blue Drop incentive regulation programme*

One of the initiatives was the introduction of an incentive based regulation scheme, namely Blue Drop Certification (BDC) for drinking water services and Green Drop Certification (GDC) for wastewater services in 2008 by DWS. These programmes prescribe key requirements for effective and efficient management of drinking and wastewater by municipalities in South Africa. Incentive based regulation is an alternate and one of the four recognised approaches to regulation in South Africa as per South Africa's strategic framework.

One of the foundations of BDC is the use of a Water Safety Planning approach to identify and manage risks. When DWS introduced the need for development and implementation of WSPs by all WSIs as a requirement of the BDC programme, the Water Research Commission (WRC) of South Africa saw the challenges faced by WSIs in developing and implementing WSPs. WRC therefore initiated projects to guide WSIs in development and implementation of WSPs through:

1) a guideline document (Generic Water Safety Plan for Small Community Water Supplies: Thompson and Majam, 2009) and associated spreadsheet and

2) web-based water safety planning tools (Guidelines on using the refined and translated web-enabled Water Safety Plan tool: Jack and de Souza, 2013) to assist WSIs with water safety planning activities.

As mentioned before, one of the WSP key elements is development of management procedures (including emergency response plans/incident management protocol (IMP)).

2.5 BENCHMARKING SOUTH AFRICAN PRACTICES TO INTERNATIONAL GUIDES

From the references provided above, it can be noted that, although each country has its own methodology, there is a similar flow and/or elements in developing and implementing ERPs. The approaches to developing an ERP from all the countries presented above contain some WSP elements. Some, (RCAP, 2005 and EPA, 2006) closely follow similar steps as WSP development. It is clear that there are similarities or an overlap between Water Safety Planning and Emergency Response Planning.

Water Safety Planning is a risk management tool which encompasses the water management chain from catchment to consumer. The primary objectives of a WSP in ensuring good drinking-water supply practice are:

- the minimization of contamination of source waters,
- the reduction or removal of contamination through treatment processes and
- the prevention of contamination during storage, distribution and handling of drinking water; seeking to identify hazards that the water resource and supply system are exposed to and the level of risk associated with each.

In South Africa, most municipalities became aware of WSPs as part of the introduction of DWS's Blue Drop Certification programme (late 2008). Furthermore, the DWS supports international best practices and consequently indicated that it expects municipalities to manage their water supply systems against WSPs (DWA, 2009). WSPs have therefore been adopted as a tool to fulfil the objective of ensuring safe drinking water supply through the use of a comprehensive risk assessment and risk management approach. This objective is equally applicable to large piped drinking-water supplies and small community systems.

This project approach to developing ERPs is similar to the one of RCAP (2005) and EPA (2006). These follow a similar approach / steps considered in water safety planning that most Water Service Institutions are familiar with in South Africa (WRC, 2012). In this approach, Emergency response planning is a component of a WSP as shown in the figure below.

A WSP typically comprises the following sequential steps:

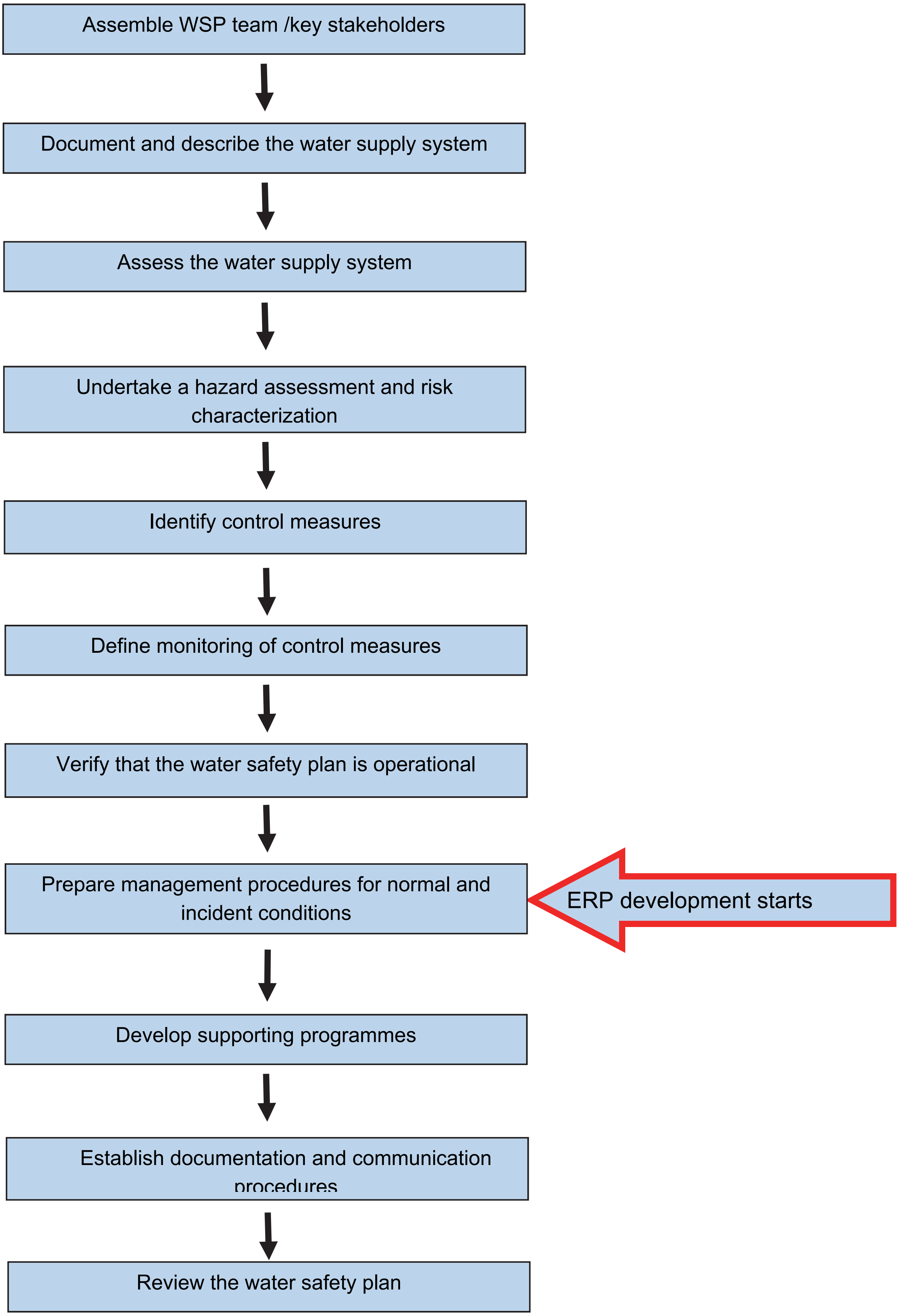


Figure 2.3: *WSP vs ERP*

CHAPTER 3: EMERGENCY RESPONSE PLANNING PRACTICES IN SOUTH AFRICA – SITE VISITS

3.1 INTRODUCTION

Site visits were conducted to determine both the background information of the community water systems and the water safety planning and emergency response planning status in South African communities. Site visits were conducted in three selected regions of Eastern Cape, KwaZulu-Natal and Northern Cape. Municipalities involved in these regions are as follows:

- Eastern Cape
  - Joe Gqabi District Municipality
  - Chris Hani District Municipality
- KwaZulu-Natal
  - Newcastle Municipality
- Northern Cape
  - Hantam Municipality

3.2 SITE VISIT METHODOLOGY

A meeting was held with the selected municipalities where the project was introduced. At this meeting, the appropriate systems were selected and discussed including background information on community water system type; water safety planning status, based on selected aspects of the Water Safety Plan (WSP) (Figure 3.1); as well as their ERP status. The discussions were based on the following aspects:

Background information on the system

- General description of the system
- Delivery methods
- Ownership
- water quality monitoring
- Common threats, vulnerabilities and risks experienced

Selected aspects of the ERP

- ERP/IMP status (presence/absence of the plan and team)
- On-site observations
- Identified threats vulnerabilities and risks

3.3 JOE GQABI DISTRICT MUNICIPALITY – EASTERN CAPE

3.3.1 Background information

Joe Gqabi is a District Municipality (DM) and a Water Service Authority (WSA) in the Eastern Cape region. Local municipalities within the district have been serving as Water Service Providers (WSPs) which were using service providers for the management of their systems. The district has, however recently taken over that functionality (July 2012) and therefore is both the WSA and WSP. All the visited systems are therefore managed by Joe Gqabi DM. The DM has not developed ERPs/IMPs for all of the CWSs. None of the CWS is described nor documented.

Four community water systems (Ncembu, Ntsilithwa, Nyibibeni and Lunyaweni) that form part of Elundini Local Municipality within Joe Gqabi district were visited on the 7th and 8th November 2013. Elundini is located in a mountainous area where most of the sources are springs that run down the mountains. The area experiences snow in winter. It was indicated that there are responsible community people to operate.

3.3.2 Ncembu community water system

3.3.2.1 *System description*

Ncembu's water supply flows down from the mountain and captured in a fenced well along the way. Water from the well is pumped using a diesel generator from the well to a cement reservoir. It passes through a pressure filter from the well to the reservoir. A chlorine float is used in the reservoir for disinfection. Water gravitates from the reservoir to communal standpipes. Water demand is always higher than the availability at this system. As a result of that, there is always intermittent supply. The filter is supposed to be cleaned once a week during summer seasons. There are however no operations and maintenance plans in place. Diesel is delivered every day to the pump house because if it is kept on site it gets stolen, as the house is often vandalised.

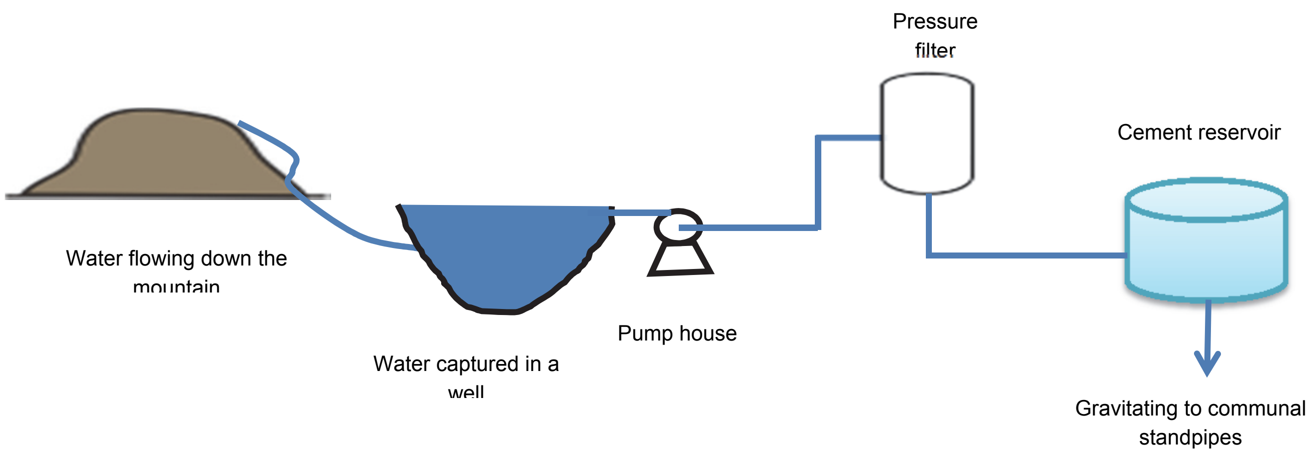


Figure 3.1: Ncembu community water system representation

3.3.2.2 *On-site observations*

- Livestock is grazing in the mountain and/or vicinity.
- Pump house is enclosed and locked.
- Evidence of meter reading, operational hours and the times for filling the diesel are kept in a record book in the pump house.
- Filter is enclosed with the fence and locked.
- Few houses practise rain water harvesting.
- Local clinic is also provided by the system.
- It looks dry around the stand pipes indicating that water has not been supplied for an extended period.
- The fence used to protect the well is broken.

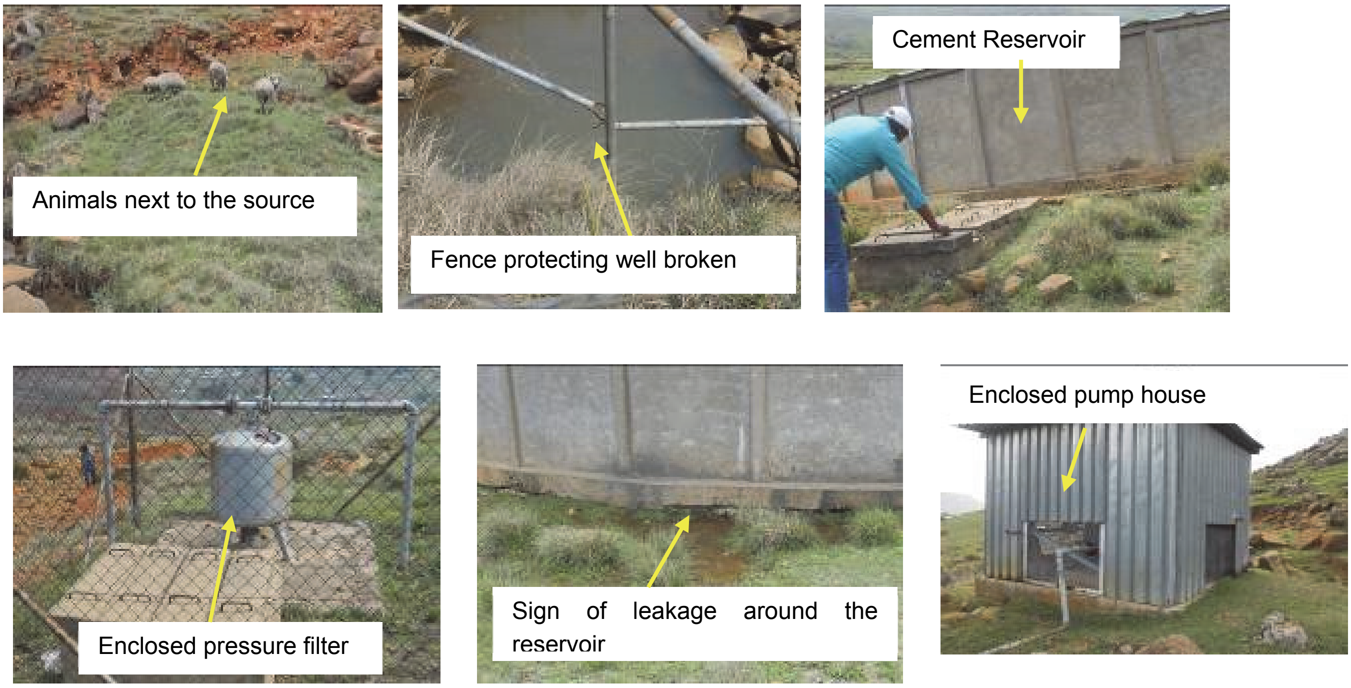


Figure 3.2: *Ncembu community water system photos*

3.3.2.3 *Threats, vulnerabilities and risks*

- Access roads to the source, pressure filter and reservoir are poor. A car has to be left at a distance and the bottom of the mountain. When the reservoir was maintained, donkeys had to be hired to transport the material.
- Water quantity that does not meet consumer demands. During the festive season this gets worse when people are back from their places of work.
- Run off from livestock may end up in the well.
- The source has not dried up since 2004 (meaning it has dried out before and it has the possibility to do so again). Therefore an alternative source is needed.
- The pump draws water from the bottom of the well which may result in high sediment content.
- There is no reservoir maintenance programme.
- Reservoir is accessible to the public.
- There is a sign of leakage on the reservoir.

- Some of the pipes are exposed above the ground.
- Erosion that is worsened by animals dragging fire wood result in pipes being exposed above the ground.

3.3.3 Ntsilithwa community water system

3.3.3.1 *System description*

Ntsilithwa has two raw water sources, the spring from the mountain and a borehole. The borehole is only used when the spring is running dry. Borehole water table is considered very high such that water availability is not a challenge in this area. Water from the spring gravitates to three storage tanks. From the borehole, water is also pumped to the same three storage tanks. A diesel pump is used for pumping from the borehole.

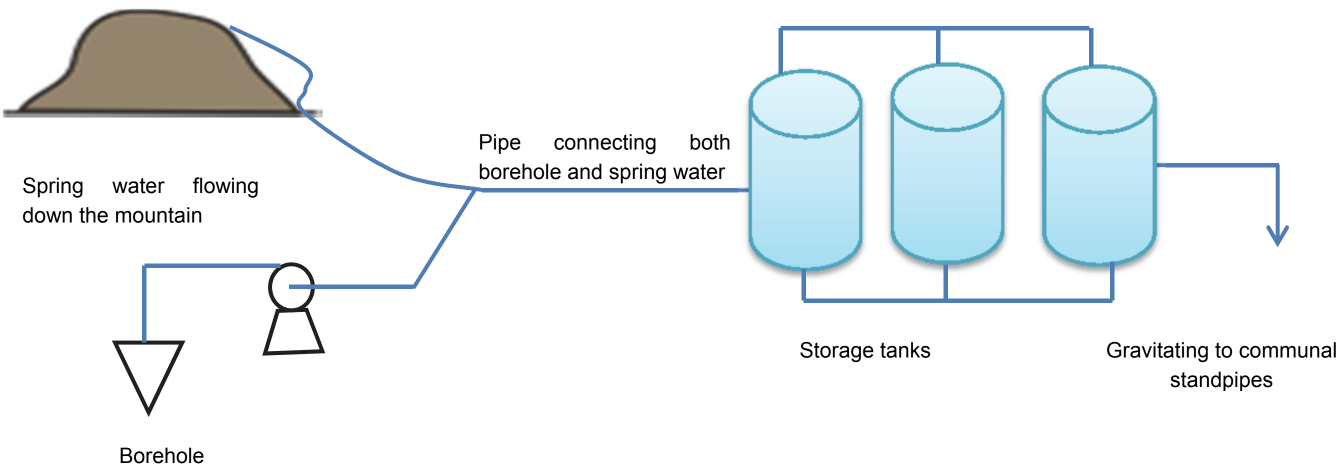


Figure 3.3: Ntsilithwa community water system representation

3.3.3.2 *On-site observations*

- One of the three storage tanks is broken and seems not to be in use. This has been noted not to affect the reservoir capacity versus water demand.
- Storage tanks are enclosed with the lid.
- The tanks are linked together and there are pipes connected to the overflow weir.
- Evidence of rain-water harvesting by some residents.
- The pump house is located close to a wetland and pit latrines.
- There is evidence of littering around the wetland.
- Storage tanks are easily accessible to the public.
- There is no clear indication where overflow from the storage tanks discharge to.

3.3.3.3 *Threats, vulnerabilities and risks*

- There is always water in the pump house due to the high water table level which may damage the equipment.
- Groundwater may be contaminated by pit latrines if not protected.
- Groundwater may be contaminated by wetland
- Distribution pipes are exposed above the ground due to erosion.

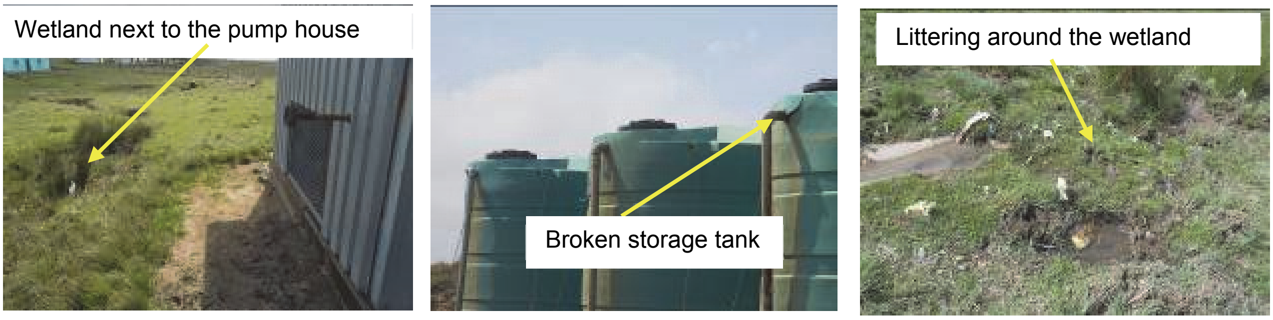


Figure 3.4: *Ntsilithwa community water system photos*

3.3.4 Nyibibeni community water system

3.3.4.1 *System description*

Nyibibeni water supply comes from the spring from a mountain. Water is captured and allowed to settle in a settling weir that is covered with cement slabs. The settling weir has a desludge valve at the bottom and an overflow channel for when it is full. From the settling weir, it gravitates to a cement reservoir. There is not much population growth in the area and the water supply is always sufficient.

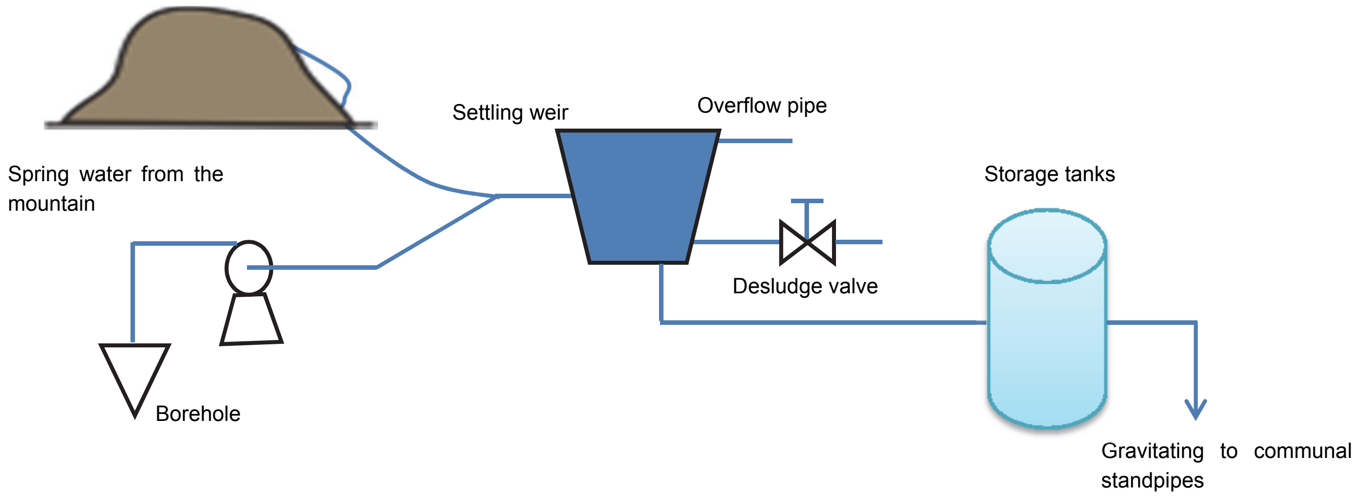


Figure 3.5: Nyibibeni community water system representation

3.3.4.2 *On-site observations*

- Source at the mountain is fenced.
- This area consists of a small population with low population growth.
- Water supply is always sufficient.
- There was a lot of sediment in the settling weir that needs to be desludged.
- Slabs that are covering the settling weir are sometimes removed.
- Evidence of community members violating the use of a standpipes was seen (irrigation pipe connected from the tap to a single house for construction).
- No evidence of rain water harvesting in the area.

Figure 3.6: *Nyibibeni community water system photos*

3.3.4.3 *Threats, vulnerabilities and risks*

- Settling weir is not adequately covered.
- Some of the cement slabs that cover the settling weir are cracked.
- Some of the distribution pipes are exposed above the ground.
- Contamination of taps through the connected pipes may occur.
- Stagnant dirty water next to the stand pipes.

3.3.5 Lunyaweni community water system

3.3.5.1 *System description*

Lunyaweni water system has two raw water sources, a spring from the mountain and a borehole. The borehole is located next to a wetland and is used when the spring is running dry. Water from the spring gravitates to a cement reservoir. Water from a borehole is pumped using a diesel generator to the cement reservoir. Water gravitates from the cement reservoir to three storage tanks. It was indicated that borehole yield is checked and recorded.

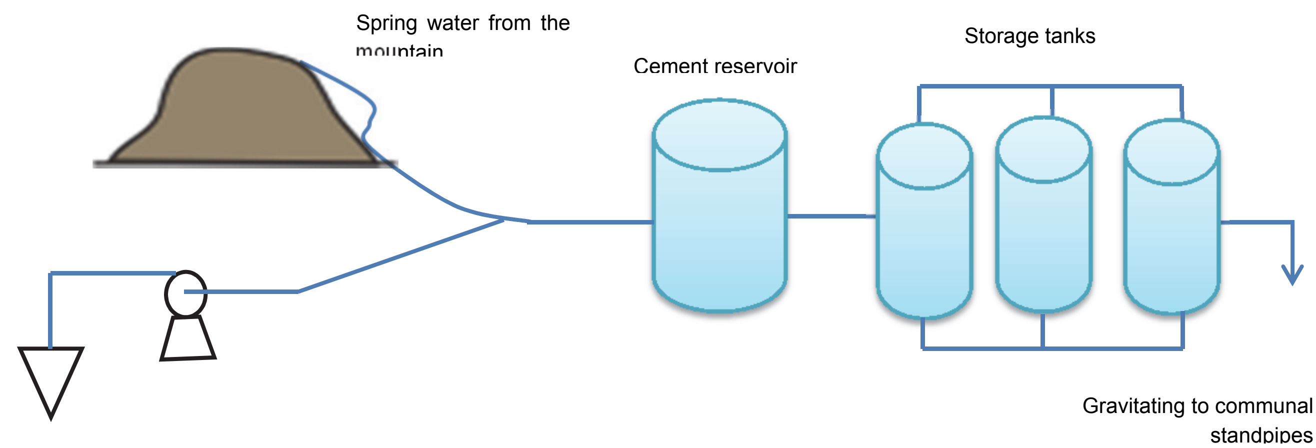


Figure 3.7: Lunyaweni community water system representation

3.3.5.2 *On-site observations*

- Pump house easily accessible to the public.
- Pump house is located next to the wetland.
- Zinc is used as a bridge to the pump house.
- Record keeping book is evident onsite.
- Rainwater harvesting is practised by some of the households.
- There is air ventilation at the pump station.
- There is evidence of leakage from the pipes connecting to the spring.
- There is evidence of oil or diesel leakage at the pump house.
- The reservoir is easily accessible to the public.

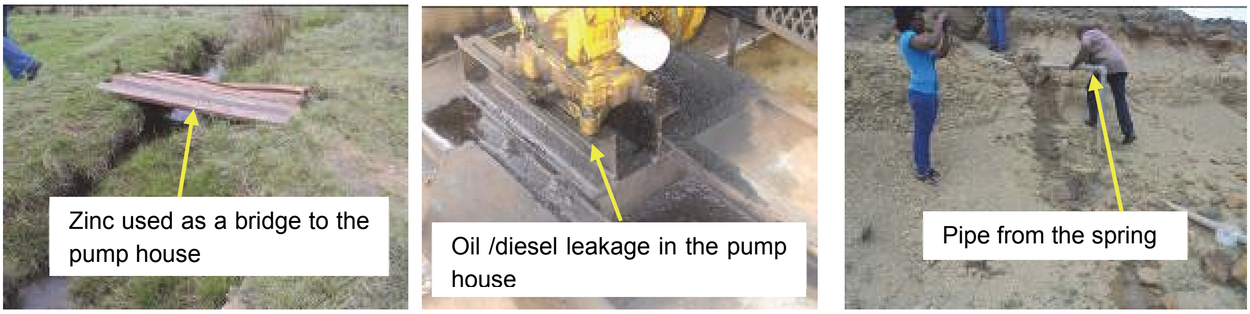


Figure 3.8: Lunyaweni community water system photos

3.3.5.3 *Threats, vulnerabilities and risks*

- The zinc used as a bridge is not safe to cross over.
- The wetland next to the borehole may contaminate groundwater.
- Colour of water is dark greenish (aesthetically not appealing)
- It is wet around the pump house (pump house is surrounded by a wetland) which may damage the equipment.
- Pipes that were previously underground are exposed due to erosion.

3.4 CHRIS HANI DISTRICT MUNICIPALITY – EASTERN CAPE

3.4.1 Background information

Chris Hani is a District Municipality and a WSA in the Eastern Cape region. Local municipalities within the district serve as WSPs. The assessed community water systems in Chris Hani DM are owned by the DM, however managed by the Local Municipalities. All of the CWS visited are owned and managed by the DM. The DM has not developed ERPs/IMPs for all of the CWSs. None of the CWS is described nor documented. It was indicated that there are responsible community people to operate and maintain these systems who may, however require appropriate training. Three LMs including Sakhisizwe (Upper Lufutha and Upper Ndwana), Intsika Yethu (Lubisi and Mtshabe) and Engcobo (Gqobonco and Msawawa) were visited on the week of 11-15 November 2013. Two community water systems were visited in each of these LMs. Water quality monitoring is conducted at some of these CWSs (these are noted under threats, vulnerabilities and risks of each). Observations from site visits are presented below.

3.4.2 Sakhisizwe LM: Upper Lufutha community water system

3.4.2.1 *System description*

Upper Lufutha water supply comes from the spring up the mountain and is captured in a well along the way. Just below the well is a ditch that was used as a chlorination point. Water from the ditch gravitates to the cement reservoir. It passes through a disinfection unit, which uses pills, that is situated just before the cement reservoir. Water gravitates from the cement reservoir to the communal stand pipes. Water shortage has never been experienced and it is believed that the springs that are joining together have a good yield.

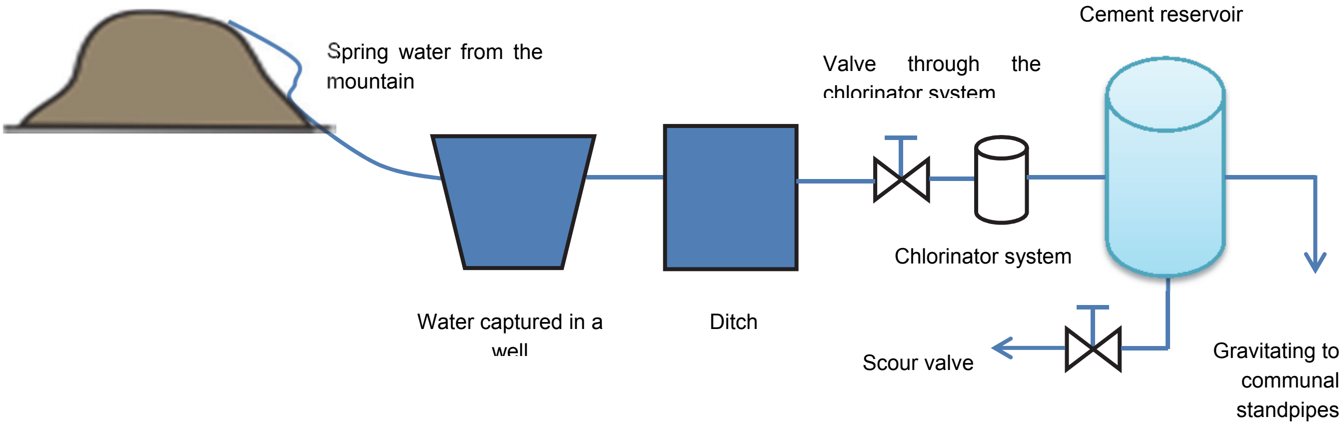


Figure 3.9: Upper Lufutha community water system representation

3.4.2.2 *On-site observations*

- Access road to the source is poor. A car has to be left at a distance and the bottom of the mountain.
- Bones of dead animals in the source were evident.
- Cement reservoirs looks old.
- The new chlorination system (located next to the reservoir) and the reservoir are easily accessible to the public.
- The pipe connected to draw water from the source is held in place by stones.
- Some pipes are exposed above the ground.
- There is no evidence of rainwater harvesting from the households in the area.
- Reservoir is not properly closed (cement lid put on the side).

3.4.2.3 *Threats, vulnerabilities and risks*

- Poor access may lead to poor operation and maintenance at the source.
- Livestock droppings may be washed into the source. Livestock dying may contaminate the source.
- There was once an epidemic of water borne disease amongst children and reports from the clinic.
- A recent incident of contaminated water due to animals dying in the source was reported.
- No water quality monitoring is taking place.
- People have resorted to alternative water supplies because of poor water quality that is supplied by this facility.

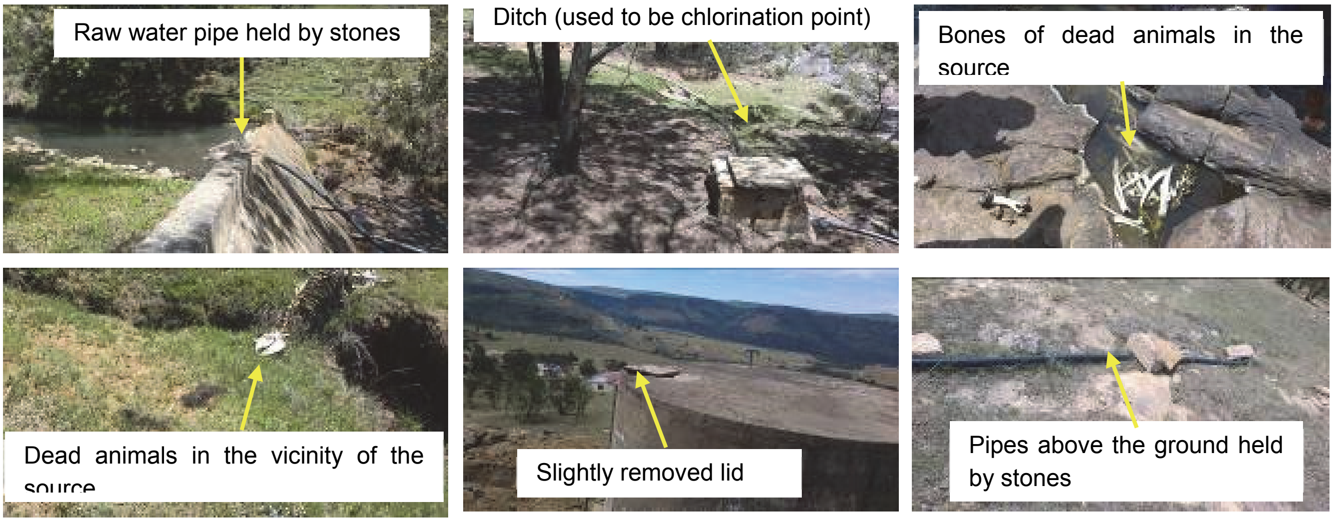


Figure 3.10: ***Upper Lufutha community water system photos***

3.4.3 Sakhisizwe LM: Upper Ndwana community water system

3.4.3.1 *System description*

Upper Ndwana community system uses tanker service to deliver water that is collected from Cala Water Treatment Works to storage tanks in the area. The tankers are owned by the municipality. There are areas that do not have storage tanks where the community use their drums to collect water from the tankers. There are schools and clinics in the area that are provided by the tankers. Water is transported weekly to the storage tanks.

Figure 3.11: Upper Ndwana community water system representation

3.4.3.2 *On-site observations*

- Municipal plastic tanks have a different bluish colour that distinguishes them from the usual green tanks.
- Some storage tank stands are cracked.
- Rainwater harvesting is practised by many of the households in the area.
- Some of the storage tank lids are not properly closed.
- There is evidence of water spillage around the storage tank.

Figure 3.12: ***Upper Ndwana community water system photos***

3.4.3.3 *Threats, vulnerabilities and risks*

- The cracked stands may not be stable enough to carry the weight of the storage tanks.
- Storage tank lids that are not properly closed may be vulnerable to pollution.
- Lack of water converstaion may lead to future shortage of water.
- Some of the drums that are used to collect water are not hygienically kept (e.g. enclosed with rusted zinc).

3.4.4 Intsika Yethu LM: Lubisi (kwaGcina) community water system

3.4.4.1 *System description*

Water is drawn from the river that runs along the mountain. A pipe is connected into the river to divert the flow to a weir where it is collected and allowed to settle. The pipe goes through some rocks and the terrain that goes up and down to the weir. A man made filter/sieve (made from making holes at the bottom of a can) is placed at the point where the pipe draws water. Water is directed, through the pipe, to a storage tank where disinfection is practised using chorine floats. Water quantity is always sufficient. The community has indicated that there is a borehole (that has not been drilled) on the other side of the mountain, however, may not be sufficient for the visited community including the other nearby communities.

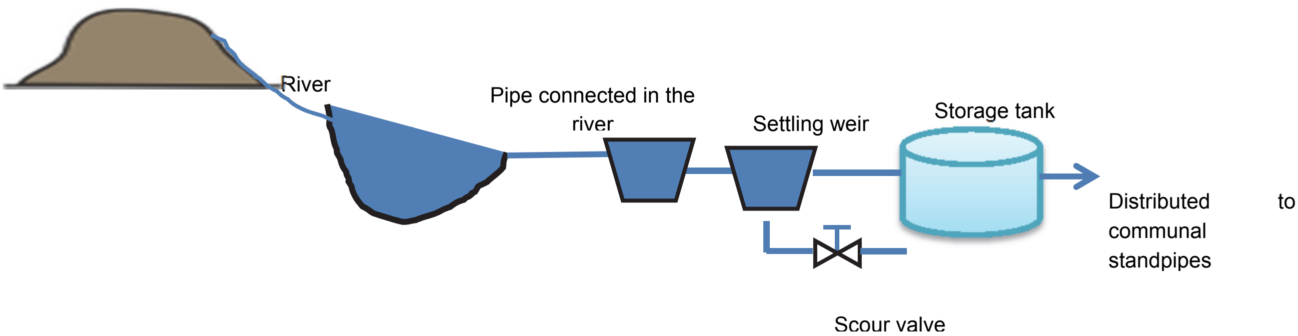


Figure 3.13: Lubisi (kwaGcina) community water system representation

3.4.4.2 *On-site observations*

- Animals are grazing close and around the river.
- This is a small community that is not growing and a community representative is responsible for operating and maintaining the system.
- The pipes that transport water from the river to the settling weir and reservoir are exposed above the ground.
- The home-made filter may prevent larger particles to go in, however, sand and other particles will still pass through.
- At the time of the site visit, the water was not getting through to the settling weir.
- It was indicated that the community cleans the storage tank when they feel it is necessary.
- It was evident that there is sand/sediment within the storage tank.

Figure 3.14: *Lubisi (kwaGcina) community water system photos*

3.4.4.3 *Threats, vulnerabilities and risks*

- Livestock may die in the source contaminating water.
- The filter/sieve at the start of the pipe may be blocked with algae.
- The pipe following the terrain may not have sufficient pressure at times to support gravity flow.
- There is a possibility of the supply being disturbed and/or blocked by the entry of sand in the pipes or air lock.
- There is no water quality monitoring conducted.

3.4.5 Intsika Yethu LM: Mtshabe (Ngingqini) community water system

3.4.5.1 *System description*

Water is drawn from the spring that flows down the mountain. At the source of the spring (where it comes out of the ground), a well has been dug and protected by covering with rocks. Water continues to flow down to a shallow well where a pipe is connected and directed to the stand pipes.

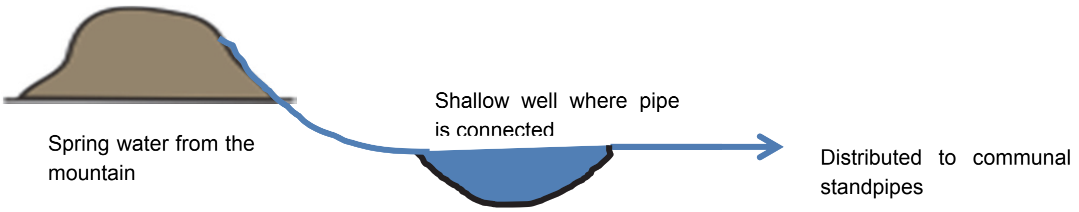


Figure 3.15: *Mtshabe (Ngingqini) community water system representation*

3.4.5.2 *On-site observations*

- Animals are grazing up the mountain.
- The community is small with no signs of population growth.
- One of the stand pipes was stolen leaving water just flowing from the pipe.
- The community would leave the tap open even after the container has been filled.
- The sieve that was placed at the source is not serving its intended the purpose.
- There are mud balls in the shallow well.
- There is no sense of water conversation.
- The community is involved.

Figure 3.16: ***Mtshabe (Ngingqini) community water system photos***

3.4.5.3 *Threats, vulnerabilities and risks*

- There is no water treatment practised.
- Mud balls could block the pipe connected in the shallow well.
- Animal activity may contaminate the water in the shallow well.
- Pipes exposed above the ground may be damaged.
- Water losses may lead to future shortage of water.

3.4.6 Engcobo LM: Nkondlo (Gqobonco) community water system

3.4.6.1 *System description*

Water is pumped from a borehole using an electrical pump to an elevated steel tank. Water gravitates from the steel tank to the standpipes. It was indicated that chlorine floats are installed within the steel tank. It was also indicated there is a person responsible for operations and maintenance of the system. Water demand in the area always meets the capacity. Water supply is believed to meet the community demands in the area.

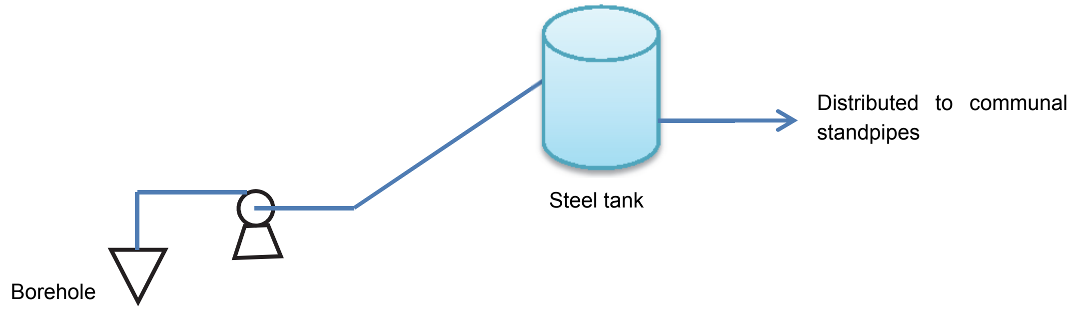


Figure 3.17: Nkondlo (Gqobonco) community water system representation

3.4.6.2 *On-site observations*

- Borehole is situated next to a low flowing river where brick making is practiced.
- Pump house is fenced with locked gates.
- Steel tank stand has a ladder to access the tank.
- Communal taps are made from plastic.
- Standpipes are easily accessible to animals.

Figure 3.18: ***Nkondlo (Gqobonco) community water system photos***

3.4.6.3 *Threats, vulnerabilities and risks*

- There is no alternative power supply (e.g. back-up generator), and therefore if there is problem (power failure) with electricity, water supply (pumping) will be affected.
- The ladder to the steel tank is for easy access during maintenance and operation, however, could potentially be used for sabotage.
- Taps are easily accessible to animals,
- Tanks are elevated and it is therefore not easy to detect when the tanks are full.
- The borehole may be contaminated by activities performed at the river.

3.4.7 Engcobo LM: Msawawa community water system

3.4.7.1 *System description*

Water is pumped from a borehole using a diesel pump to four storage tanks close by. The storage reservoirs are connected to other reservoirs in another section. When those are full, the water is pumped back to an elevated storage tank at the site with four reservoirs. Chlorine floats are installed in the reservoirs. Bacteriological monitoring is conducted monthly. Water supply is believed to meet the community demands in the area.

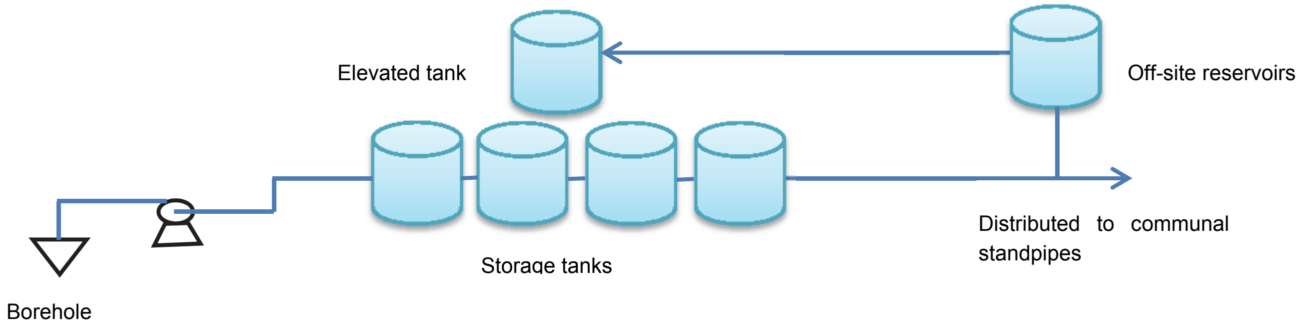


Figure 3.19: Msawawa community water system representation

3.4.7.2 *On-site observations*

- Borehole is situated next to a low flowing river where brick making is practiced.
- Pump house has a burglar gate which stays locked; however, the site is not fenced.
- The zinc sheets of the pump house roof are lifting off.
- The storage tank site is fenced with locked gates.
- The storage tanks overflow is not covered to prevent birds and/or insects from entering.
- Stand pipe taps are made from brass or copper.
- Standpipes are easily accessible to animals.

Figure 3.20: ***Msawawa community water system photos***

3.4.7.3 *Threats, vulnerabilities and risks*

- The borehole may be contaminated by activities performed at the river.
- Taps are easily accessible to animals.
- Birds and small insects may enter the storage tanks through the overflow and die within the tank thus contaminating the water supply.
- The lifting roof may be used as a point of entry to the pump house.

3.5 HANTAM LOCAL MUNICIPALITY – NORTHERN CAPE:

3.5.1 Background information

Hantam Local Municipality is a WSA in the Northern Cape region within the Namakwa District Municipality. The Local Municipality also serve as a WSP in its area of jurisdiction. The region is dry and relies mostly on groundwater sources. It was indicated that there are municipal people to operate and maintain the systems. The LM has not developed ERPs/IMPs for all of the CWSs. None of the CWS is described nor documented.

The two community water systems visited in Hantam Municipality on the 5th and 6th September 2013 were (1) Loeriesfontein and (2) Swartkop, both which are managed by Hantam LM. Observations from site visits are presented below.

3.5.2 Loeriesfontein community water system

3.5.2.1 *System description*

Loeriesfontein is supplied with groundwater abstracted from 10 boreholes. The supply from the boreholes was indicated not to meet the community demands. Water is pumped from the boreholes through a water treatment system which only consists of Sodium Hypochlorite addition for disinfection. The system was not functioning well at the time of site visit. Water is stored in two cement reservoirs. Two plastic storage tanks are also available to serve some areas that experience pressure issues. The water level in the reservoirs/storage tanks is always low due to water shortages. The water gravitates to the yard taps. There is a person responsible for the operation and maintenance of the system.

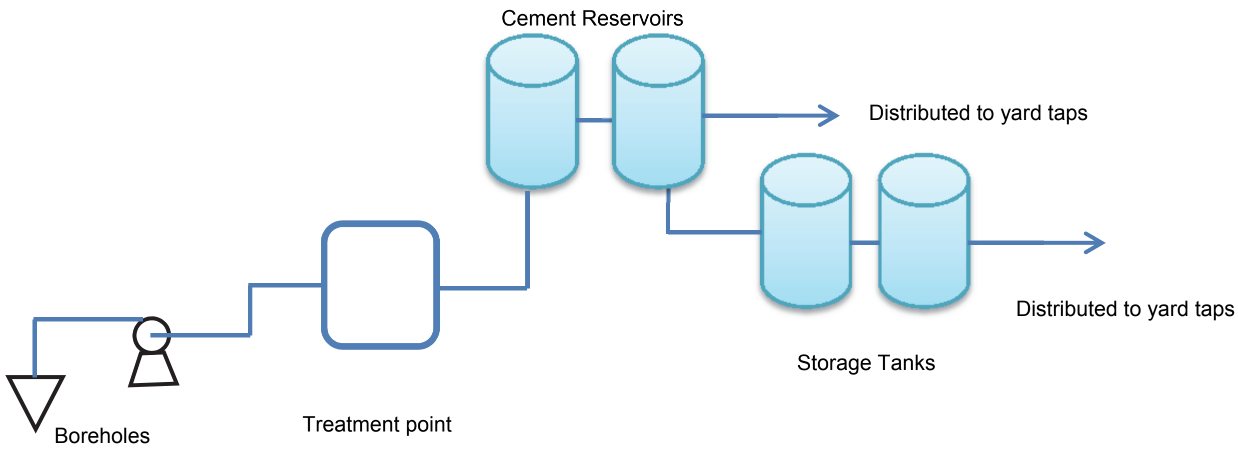


Figure 3.21: Loeriesfontein community water system representation

3.5.2.2 *On-site observations:*

- The system provides water to a small community with approximately 1500 households.
- The reservoir and storage tanks are easily accessible (i.e. not fenced).
- Reservoirs are properly closed.
- There is a hospital and schools in the area that relies on the Loeriesfontein CWS.

- There are areas that still have asbestos pipes though the newly installed pipes are PVC pipes.
- Some pipes are above the ground.
- Rainwater harvesting is practised by many of the households.

Figure 3.22: ***Loeriesfontein community water system photos***

3.5.2.3 *Threats, vulnerabilities and risks*

- Water quantity is a major problem as boreholes do not provide sufficient yield and there is current exposure to drought.
- The dysfunctional disinfection system may result in water quality challenges.
- The unprotected reservoirs may be accessed by the community that is not getting sufficient water from the system.
- Monthly compliance water quality monitoring is carried out.
- Complaints regarding bad smells within the water (Hydrogen Sulphide) have been received by the municipality.

3.5.3 Swartkop community water system

3.5.3.1 *System description*

The system provides water to the community that work in nearby privately owned farms. The municipality had an agreement with the agriculture board regarding water service provision in the area, it is not known whether this agreement is formally recorded. The source of water for this system is two boreholes that use three solar panels as source of energy. The panels are cleaned three times a day. There is a backup generator when needed. Water from the borehole is pumped to one elevated tank which is connected to two other elevated storage tanks. When the tanks are full, water is diverted into an animal pan/ trough. Water from the storage tanks gravitates to yard taps. It was indicated that there are plans to install a new chlorination system that will use Sodium Hypochlorite. Fluoride was indicated to be a water quality challenge in the area. There is a person responsible for operating and maintaining the system.

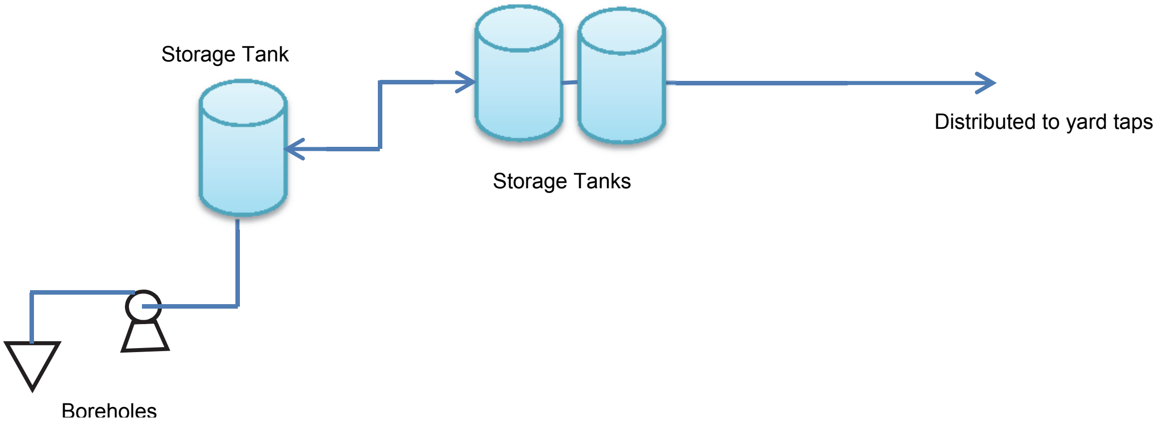


Figure 3.23: ***Swartkop community water system representation***

3.5.3.2 *On-site observations*

- Boreholes are located closer to the pit latrines (some pit latrines are lined and others not).
- The new water meters that have just been installed do not have stop cocks (i.e. cannot isolate for repairs).
- A new disinfection dosage point has been set up, it was not yet functional at the time of the site visit.
- Scale build-up (indicator of hard water) is evident (e.g. on pipes).
- The raw water supply has high level of fluoride (the occurrence of brown teeth within the community is noticeable).
- Storage tanks do not have a non-return valve.
- The steel stands for elevated storage tanks are corroded.
- Pipes are above the ground and in some instances held in place by stones.
- Plastic taps have cracks.
- There is no evidence of rain water harvesting.

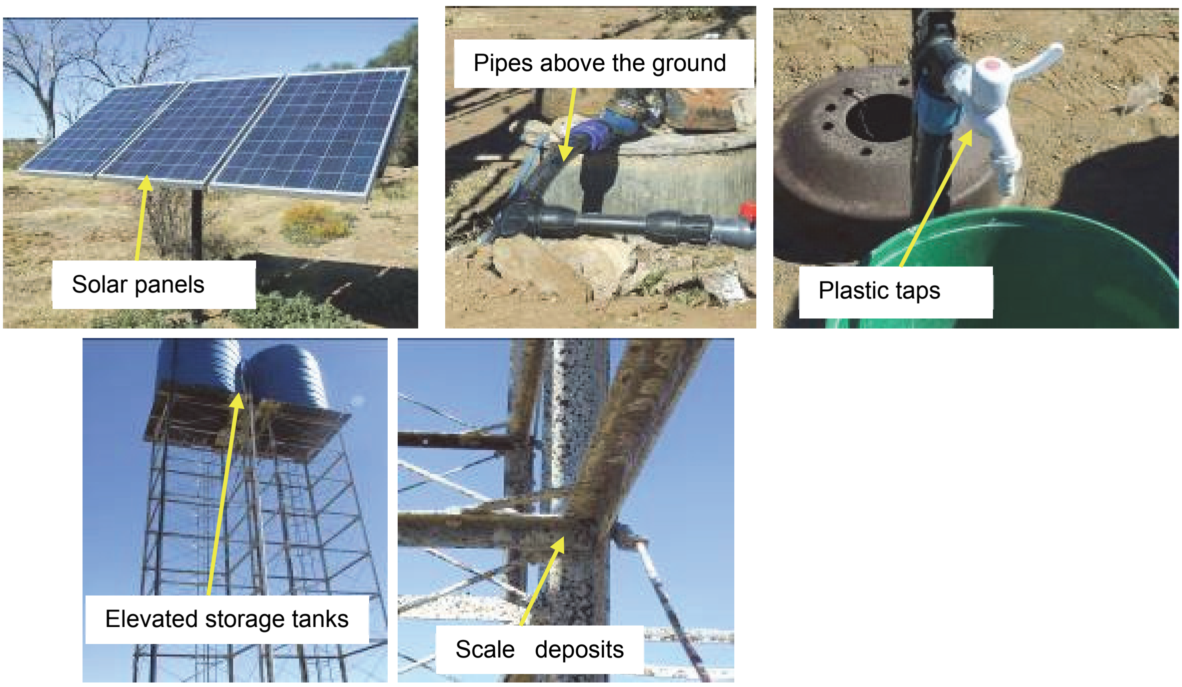


Figure 3.24: Swartkop community water system photos

3.5.3.3 *Threats, vulnerabilities and risks*

- No water treatment currently practised (i.e. no disinfection, no fluoride removal).
- The pipes above the ground may be easily vandalised and their lifespan may be shortened.
- Corroded storage tank stands may lose their stability.
- Cracked taps may leak.
- The height and absence of a ladder at the storage tanks makes it difficult to clean.
- There are no stop cocks on meters.
- No water quality monitoring currently conducted. The municipality aims to implement monitoring shortly.

3.6 NEWCASTLE LOCAL MUNICIPALITY – KWAZULU-NATAL

3.6.1 Background information

Newcastle Local Municipality (LM) is a WSA in KwaZulu-Natal within the Amajuba District Municipality. The Local Municipality also carries the task of water service provision in its area of concern; therefore it is also a Water Service Provider. None of the CWS is described nor documented. It was indicated that there are responsible municipal personnel who operate and maintain the systems. The LM has not developed ERPs/IMPs for all of the CWSs.

The four community water systems visited on the 23rd and 24th October 2013 in Newcastle are (1) Ingogo section 1 and 2, (2) Charlestown, (3) Nomandien and (4) Bothas Pas. All the visited systems are managed by Newcastle LM. These visited systems are part of the massification project the municipality has embarked on. The project was done in phases, therefore some of the identified issues may be in a plan for the following phases. Three of these sites (excluding Charlestown) are small communities within farms that are privately owned. The purpose of the project is to provide water to these communities. Observations from site visits are presented below.

3.6.2 Ingogo Section 1 community water system

3.6.2.1 *System description*

Ingogo section 1 is a community with a very small population (probably less than 50 people). Water that is collected from the Newcastle water treatment works is delivered by a tanker to a storage tank in the area. The tanker is owned by the municipality. The storage tank is filled once a week.

Figure 3.25: Ingogo Section 1 community water system representation

3.6.2.2 *On-site observations*

- A stone is placed on top of the lid of the storage tank to keep it in place.
- The storage tank tap is leaking.
- The overflow of the tank is not covered to prevent birds and/or insects from entering.

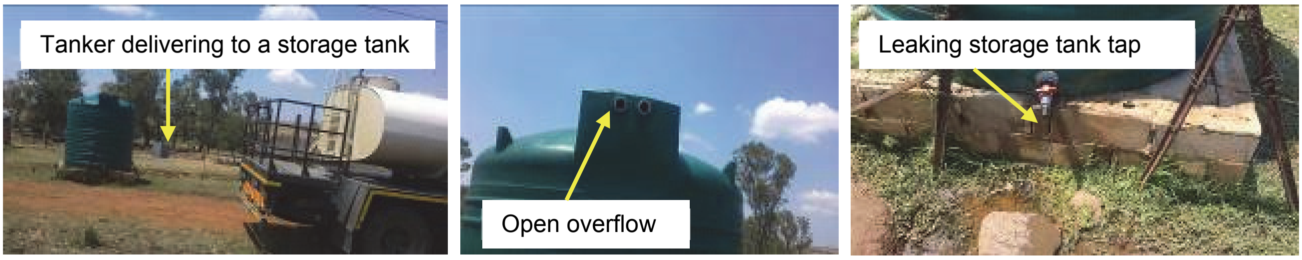


Figure 3.26: Ingogo Section 1 community water system photos

3.6.2.3 *Threats, vulnerabilities and risks*

- Bird's droppings are visible on the stone that is placed on the lid and this could contaminate the supply.
- If not properly maintained, the tanker could contaminate the water.
- If not properly maintained, the storage tank could contaminate the water.

3.6.3 Ingogo Section 2 Community Water System

3.6.3.1 *System description*

Ingogo section 2 system is supplied by a borehole that has been recently installed. Water is pumped from the borehole using an electrical pump to an elevated steel tank. The electricity is not installed yet at the pump house and the system is not functioning yet. There is a clinic, police station and school in the area.

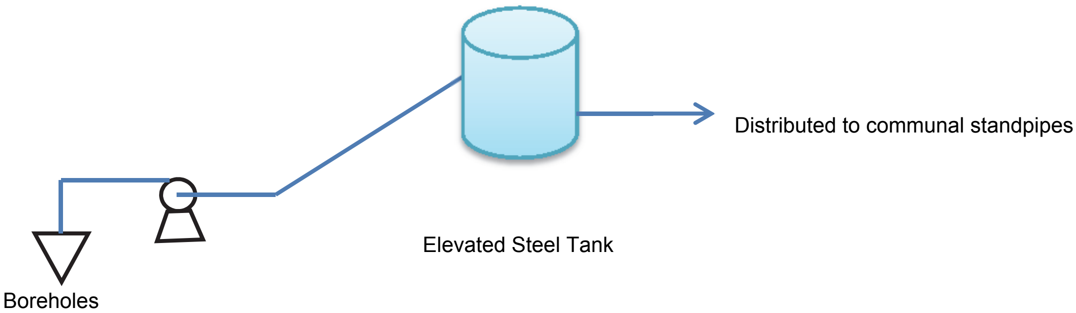


Figure 3.27: Ingogo Section 2 community water system representation

3.6.3.2 *On-site observations*

- The pump house was being fenced at the time of site visit.
- The pump motor is kept off site until the site is fenced and there is electric supply.
- Trenches where pipes are being laid were being covered at the time of site visit.
- The clinic has its own storage tanks that are connected to a rainwater harvesting system.

Figure 3.28: Ingogo Section 2 community water system photos

3.6.3.3 *Threats, vulnerabilities and risks*

- No treatment practised at the time of site visit.
- If no back-up supply planned, pumping may not take place when there is a power failure.
- If no borehole water level monitoring and appropriate planning occurs, water shortages may be experienced in the future.
- If no water quality monitoring is conducted, water quality related issues may not be identified and corrective actions taken.

3.6.4 Charlestown community water system

3.6.4.1 *System description*

The new Charlestown system is supplied via two boreholes. Water is pumped from the boreholes to an elevated tank using a diesel generator. From the elevated tank, it gravitates to communal standpipes. There are new RDP houses that are under construction in the area. One section of Charlestown community is supplied by the existing Volksrust system which is managed by a service provider. The new system will provide the remainder of the community and the new area that is being established.

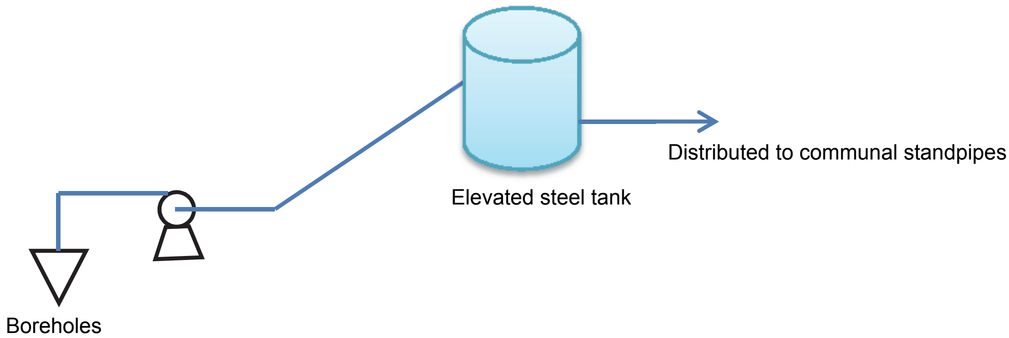


Figure 3.29: Charlestown community water system representation

3.6.4.2 *On-site observations:*

- There was a 30 litre drum with diesel at the pump station.
- There are RDP houses that are under construction.
- There is a clinic and a school in the area (provided by Volksrust system).
- The pump house is locked but not fenced.
- No evidence of rainwater harvesting.

- Pit latrines are used as sanitation method.
- Trenches where pipes are laid were being covered at the time of the site visit.
- The steel storage tank was not yet formally connected to the system. The pipe connected was used for testing purposes.

Figure 3.30: Charlestown community water system photos

3.6.4.3 *Threats, vulnerabilities and risks*

- If no borehole water level monitoring occurs, water shortages may be experienced in the future.
- If no water quality monitoring is conducted, water quality related issues may surface.

3.6.5 Normandien community water system

3.6.5.1 *System description*

Water is drawn from a spring that is dug up in the area. The spring is believed to have a very high yield. The spring is fenced and a weir has been built on one side of the spring to prevent flowing to the dwellings. Water gravitates from the spring to two storage tanks on site. There is a valve that regulates the flow from the spring to the storage tanks. One off-site storage tank is fed by the two on-site storage tanks. From the storage tanks it gravitates to communal standpipes. Another pipe from the spring is diverted to the troughs to provide animals with drinking water.

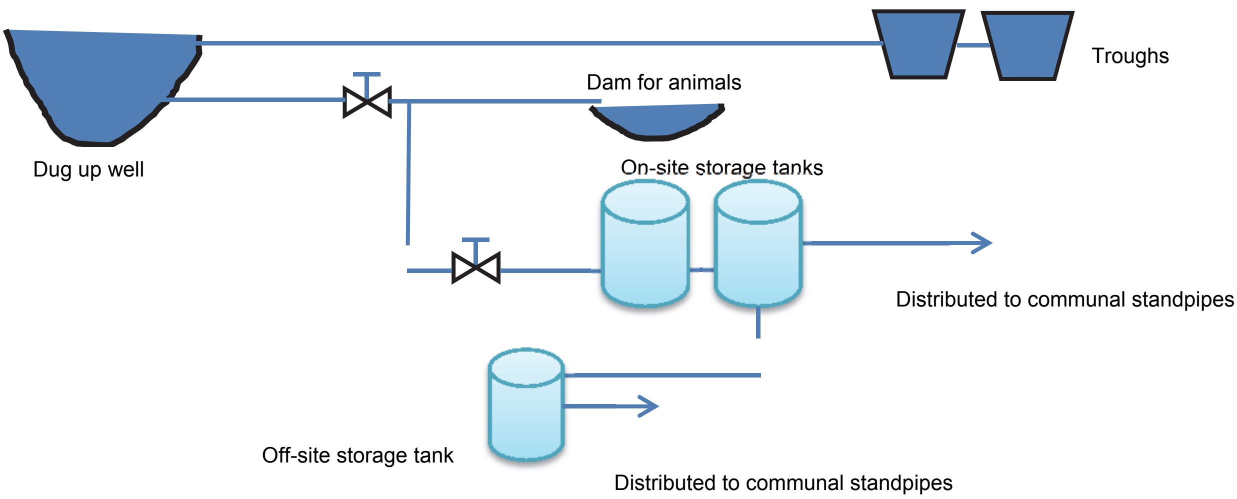


Figure 3.31: Normandien community water system representation

3.6.5.2 *On-site observation*

- There is a low bridge on the way to the farm.
- The spring is fenced and locked.
- The key to the spring is kept by a community member.
- There are trees, foliage and dead wood around the spring.
- There is evidence of the community connecting hose pipes to the storage tanks.

Figure 3.32: Normandien community water system photos

3.6.5.3 *Threats, vulnerabilities and risks*

- When it is raining, it may be a challenge to cross the low bridge.
- There is no treatment practised.
- The open spring is vulnerable to contamination, and after heavy rain, high turbidity is likely.
- If no water quality monitoring conducted, water quality related issues surface.
- Hosepipes connected to the storage tank may contaminate the water.

3.6.6 Pass Community Water System

3.6.6.1 *System description*

Water is supplied by five drilled springs of which three are within a fence together with three storage tanks and a pump house. The other two springs are outside the fenced area. Water is pumped from the springs using an electric pump to the storage tanks. It gravitates from the storage tanks to the household taps.

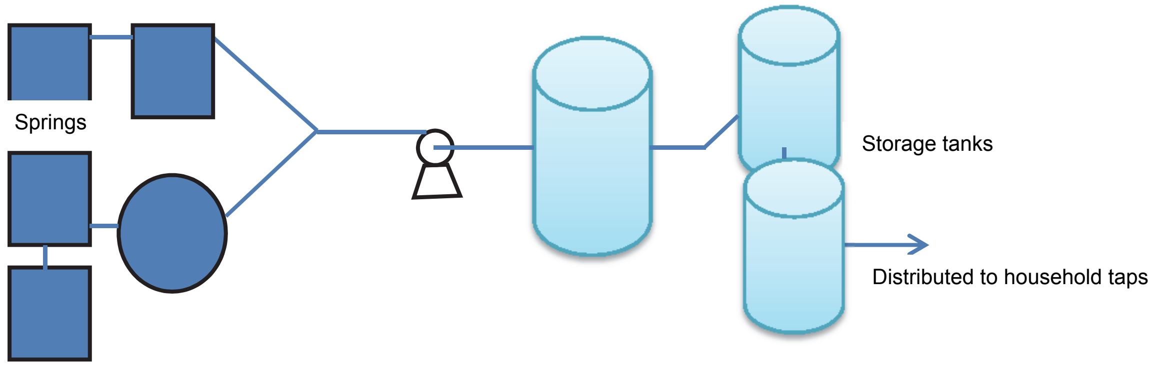


Figure 3.33: Bothas Pass community water system representation

3.6.6.2 *On-site observations:*

- Four of the springs are covered with heavy cement slabs and one is covered with rusted zinc.
- The site is fenced with a gate. The fence, however, does not reach the ground at some parts because of the terrain (i.e. site could still be accessed).
- Pipes from the springs are above the ground in some parts.
- It is very wet around the storage tanks with algal growth. Smells are noted (could be animal droppings).
- There is evidence of animals coming on-site around the reservoirs.
- The pipe connecting the storage tanks is leaking.
- The pipe to the main storage tank is not secured.
- There is water next to some of the springs (could be leaking).

Figure 3.34: Bothas Pas community water system photos

3.6.6.3 *Threats, vulnerabilities and risks*

- The spring covered with zinc may be contaminated.
- Leaking pipes result in water wastage.
- Animals can crawl into the site through the fence not reaching the ground.
- If no borehole water level monitoring occurs, water shortages may be experienced in the future.
- If no water quality monitoring is conducted, water quality related issues may surface.
- No treatment practised.

3.7 SUMMARY – SITE VISITS

Considering the observations from the sites visited from all there provinces, the following could be suggested:

- Source protection (fencing) in some instances may not be effective. Other methods of ensuring safe drinking water should therefore be considered.
- Improved community awareness is required. Focus items include water quality, water conservation and household treatment methods.
- Community involvement may result in more responsibility being taken by the community.
- Water quality monitoring is crucial to understand if water is safe or if additional treatment is required.
- Development of operations and maintenance programmes is vital.

CHAPTER 4: THREATS, VULNERABILITIES AND CHALLENGES ASSOCIATED WITH COMMUNITY WATER SUPPLY SYSTEMS

4.1 INTRODUCTION

This section reports on threats, vulnerabilities and challenges associated with each component of the CWS as experienced at these CWS and as identified through site visits.

4.2 SOURCE RELATED VULNERABILITIES, THREATS AND CHALLENGES

The basic source of water is rainfall, which collects in rivers, dams, under the ground and in artificial reservoirs. Source examples are rivers, wells, spring, dams or boreholes. Water that collects in rivers, wells, springs, dams, or reservoirs is called surface water. Water that is found beneath the earth's surface is called ground water (e.g. boreholes). The quality and quantity of water from any source varies with time. These changes can be short term, seasonal or long term fluctuations. The sustainability of the water sources, both in terms of quantity and quality is very important as the raw water quality affects the treatment processes selected as well as the cost of water treatment. Some of the threats identified at the source are shown in the tables that follow.

Table 4.1: Examples of surface water *related threats, vulnerabilities and challenges*

Surface water (e.g. rivers, springs and wells)			
Threats/ Vulnerability	**Emergency type**	**How to identify possible threats**	**Possible emergencies/effects**
Source water may be contaminated by communities (recreational use, etc.).	Water quality	• Children swimming at the source • Fishing at the source (using chemicals)	**Human health impacts** • Gastro-enteritis, fever, and cholera. **Environmental impacts** • Contaminated water results to infectious diseases that infect aquatic life and terrestrial life through drinking water.
Agricultural practices may increase nutrient levels in water due to entry of fertilizers or pesticides.	Water quality	• Agricultural farms in the nearby location. • Algal blooms at the source.	**Human health impacts** • Diarrhoea, blue baby syndrome at High Nitrogen concentrations. **Environmental impacts** • Nutrients such as Nitrogen can also degrade ecosystems by making water more acidic killing some aquatic plants while promoting the growth of other kinds of plants (e.g. Algae).
Agricultural practices and livestock can cause erosion on the water body and lead to an increase in turbidity.	Water quality	• Livestock grazing nearby the source and drinking from the source. • Muddy or cloudy looking water.	**Human health impacts** • Water carrying suspended particles are likely to have pathogens. These pathogens are difficult to remove at high turbidity even during treatment.

Table 4.1 (continued): Examples of surface water *related threats, vulnerabilities and challenges*

Threats/ Vulnerability	Emergency type	How to identify possible threats	Possible effects
Illegal dumping, littering and other debris can lead to solid waste directly entering source water.	Water quality	• Evidence of illegal dumping near or at the source.	**Human health impacts** • Waste releases toxic chemicals in water that are harmful to human beings. **Environmental impacts** • Unhygienic practices can cause soil contamination.
The well or spring situated on the flood plain/low lying area.	Water quality	• Wells or springs get sediments after heavy rain. • Gullies and dongas around the source may be formed.	**Human health impacts** • Intrusion of faecal coliform causing cholera, diarrhoea.
Dead animals within the surface water source or next to the source.	Water quality	• Dead animals near or at the source. • Previous cases of dead animal at the source. • Evidence of animal bones and animal hides near or at the source.	**Human health impacts** • Gastro-enteritis, fever Diarrhoea and cholera.
Access to the source or other infrastructure is restricted due to poor roads.	Water quality	• Source located far from the road e.g. mountains where it is not easy to access.	**General impacts** • Poor access may lead to system neglect resulting in poor system maintenance and / or monitoring.
Domestic waste (infiltration or overflow from septic tanks, pit latrines) can pollute the surface water.	Water quality	• Evidence of nearby septic system. • Evidence of unlined pit latrines that are located near the source.	**Human health impacts** • Gastro-enteritis, fever, and cholera.
Unavailability of alternative water source in case the primary source is contaminated or water is unavailable.	Water quantity	• Unavailability of a backup raw water source or water provision methods in-case the source water is contaminated.	**Human health impacts** • Use of contaminated water from the primary source. • Dehydration. **Social impacts** • Unhygienic practices, loss of livestock due to dehydration and crop farming threat.
Falling water levels due to long periods without rain.	Water quality	• Long periods without rain. • High concentration of salt in water. • Significant drop in the water level. • Water with too much solids.	**Human health impacts** • Laxative effects with adverse effects on individuals with renal disease. • Dehydration
Drought.	Water quantity	• Unavailability of water • Dried up source. • High concentration of salts in water.	**Human health impacts** • Dehydration. • Animals and people dying. **Environmental impacts** • The low moisture and precipitation that often characterize droughts can create hazardous conditions.

Table 4.1 (continued): Examples of surface water *related threats, vulnerabilities and challenges*

Threats/ Vulnerability	Emergency type	How to identify possible threats	Possible effects
Raw water turbid after heavy rain.	Water quality	• Cloudy or muddy appearance of water.	**Human health impacts** • Water carrying suspended particles are likely to have pathogens. These pathogens may cause diseases such as cholera. **Aesthetic impacts** • Murky colour and taste of water.
Flood	Water quality	• Muddy or cloudy looking water. • High solid content in water.	**Human health impacts** • Flood waters provide an ideal breeding ground for mosquitoes and an increased risk of diseases such as malaria. • Contaminated runoff can cause gastro-enteric, fever and cholera. **Environmental impacts** • Erosion • Destruction of property and/or infrastructure.

Table 4.2: Examples of borehole/groundwater *related threats, vulnerabilities and challenges*

Borehole/ Ground water			
Threats/ Vulnerability	**Emergency type**	**How to identify possible threats**	**Possible effects**
Water may contain naturally occurring health related chemicals (e.g. arsenic, fluoride, iron, nitrates) as a result of local geology.	Water quality	• Chemicals cannot be detected by naked eye. Therefore sampling and testing is needed.	**Human health impacts (DWA et.al, 1998)** • Arsenic may cause sense of sensory loss in the peripheral nerves. • Fluoride causes discoloration of teeth and hardening of bones making them brittle. • Excessive intake of Iron may cause acute poisoning in infants and young children and chronic iron poisoning to anyone due to many years intake. • Long term exposure to excessive Manganese concentrations may cause brain damage. • Long term exposure to Nitrates causes tiredness and failure to thrive. In bottle fed infants under the age of 1 year it may cause blue baby syndrome.
Domestic waste infiltration (Wastewater, on-site septic tanks, litter, etc.) can pollute the borehole.	Water quality	• Landfill sites and septic tanks located nearby water source. • Traces of faecal matter inside the water source. • Chemical contamination	**Human health impacts** • Domestic waste has a potential of introducing faecal coliform which may cause Gastro-enteritis, fever, cholera. **Environmental impacts** • Decomposition of organic waste, forming gaseous products such as carbon dioxide and methane.

Table 4.2 (continued): Examples of borehole/groundwater related threats, vulnerabilities and challenges

Threats/ Vulnerability	Emergency type	How to identify possible threats	Possible effects
No alternative power supply in case of power failure.	Water quantity	• System shutdown when there is power failure. • No provision of if water after a prolonged time.	**Human health impacts** • No water supply.
Vandalism or sabotage.	Water quantity and quality	• Inadequate security e.g. fencing, gates and locks at the pump stations. • Stolen equipment. • Failing infrastructure.	**Human health impacts** • No water supply. • Contaminants that have a potential health hazards maybe introduced into the water. **Supply system impacts** • Ineffective supply system • Loss of infrastructure (which has value).
Unavailability of operational equipment (e.g. diesel).	Water quantity	• No back up supply of operational equipment.	**Human health impacts** • No water supply
Access to borehole, water intake or other infrastructure is restricted due to poor roads, poor access.	Water quantity	• Borehole located far from the road e.g. mountains where it is not easy to access.	**General impacts** • System neglect which may result in poor system operation and maintenance.
Ageing infrastructure.	Water quantity and quality	• Dripping or leaking infrastructure. • Rusty infrastructure with holes • Infrastructure far exceeding their expected life span as per asset register.	**Human health impacts** • Contaminants may enter the broken infrastructure leading to water contamination. **Environmental impacts** • Water may be lost through the aged system resulting in water wastage.
Insufficient maintenance.	Water quantity and quality	• Broken equipment. • Malfunctioning equipment. • Non-maintained equipment.	**General impacts** • Inadequate maintenance will lead to poor performance of the operational equipment. • Water quality may be compromised leading to diseases.
Physical obstacles (trees, roots, cracks) can damage the pump facility and lead to a shortage/unavailability of water.	Water quality	• Trees/plants close to the pump whose roots can reach the pumps. • Trees/plants close to the pump which may fall over the pumps.	**General impacts** • Roots from trees and plants can damage infrastructure and extensive root systems may limit access to pipelines.

Table 4.2 (continued): Examples of borehole/groundwater related threats, vulnerabilities and challenges

Threats/ Vulnerability	Emergency type	How to identify possible threats	Possible effects
Surface water entering a borehole can increase the turbidity and / or may contain micro-organisms.	Water quality	• Surface water running into the borehole.	**Human health impacts** • Contaminated surface water running into the borehole may result in Gastro-enteric, diarrhoea, intestinal worm infestations. • Groundwater can be contaminate with nutrients or chemicals when surface water carrying these substances drains into the groundwater environment.
Aquifer not sufficiently fed with water can lead to a shortage of resources.	Water quantity	• Drop in volume of the yield. • Long periods without rain. • Significant increase in the use of borehole water.	**Health impacts** • Intermittent water supply. • Shortage in water supply. • Dehydration.
Earthquake.	Water quantity	• Earthquake	**Environmental impacts** • Destruction of infrastructure.

4.3 TREATMENT RELATED THREATS, VULNERABILITIES AND CHALLENGES

Raw water contains different inorganic/organic substances and micro-organisms that should be removed during water treatment to produce water that is fit for domestic use. To achieve this goal, a variety of purification and treatment processes are utilized which employ various physical and chemical phenomena to remove or reduce undesirable constituents from the water. Selection of appropriate and effective treatment processes and proper design of the individual processes and process combinations are essential for the successful performance of a water treatment works. Some of the threats, vulnerabilities and challenges affecting treatment system are shown in Table 4.3.

Table 4.3: Examples of treatment related threats, vulnerabilities and challenges

Treatment			
Threats/ Vulnerability	**Emergency type**	**How to identify possible threats**	**Possible effects**
The site is not secured.	Water quality	• No fencing, gates, locks, safety/warning signs, inadequate security.	**Human health impacts** • Treatment facility could be sabotaged or vandalised leading to deteriorated water quality or failure to water provision.
Access to treatment system or other infrastructure is restricted due to poor roads, poor access.	Water quality	• Treatment facility located far from the road or where access road to the facility is poor.	**General impact** • Treatment system neglect resulting in poor water quality production.

Table 4.3 (continued): Examples of treatment related threats, vulnerabilities and challenges

Threats/ Vulnerability	Emergency type	How to identify possible threats	Possible effects
No documentation available about the treatment system.	Water quality	• Unavailability of operation and maintenance manual and schedule. • Unavailability of records of what to do in case of specific emergencies. • Unavailability of water quality records and guidance on how to use results to optimise operation process.	**General impact** • Poor operation and maintenance. • Poor water quality production. • Poor budgeting.
Inadequate storage of chemicals.	Water quality	• No designated suitable area to store chemicals. • Chemicals are not ordered timeously.	**System impacts** • Poor water quality production.
Operating staff have inadequate skills to operate the system.	Water quality	• Process controller does not know what to do, how and why. • Process controller cannot read or write.	**Human health impacts** • Poor water quality production.
Inappropriate treatment methods for the raw water quality and quantity can impact on the treated water quality.	Water quality	• Unavailability of raw water quality information. • Lack of raw water quality and quantity monitoring. • Frequently failing water quality.	**Human health impacts** • Poor water quality production.
Poor operational monitoring can lead to delayed reaction to urgent issues of concern.	Water quality	• Operational monitoring that is not conducted daily or weekly. • Unavailability of operational monitoring data.	**System impacts** • Poor operation. • Poor water quality production. • Poor budgeting.
No alternative power supply in case of power failure.	Water quality	• System shutdown when there is power failure. • No provision of water after a prolonged time.	**Human health impacts** • No water supply.
Treatment system infrastructure is old and more prone to breakdown or need repair.	Water quality and quantity	• Infrastructure that breaks more often. • Excessive water losses at the facility.	**Human health impacts** • System unreliability • Water wastage. • Iron dissolves in the water.
Natural disasters can damage treatment unit operations.	Water quantity	• Storms, floods, earthquake	• Natural disasters have an ability to destroy the treatment facility and its equipment.

4.4 DISTRIBUTION SYSTEM RELATED THREATS, VULNERABILITIES AND CHALLENGES

The series of pipes that carry water from the treatment works or reservoir to the consumer are called distribution pipes. Distribution pipes usually distribute large amounts of water over long distances. The distribution system is typically the last municipal infrastructure before water reaches the consumer. It is necessary to maintain and renew the distribution network infrastructure (including storage reservoirs and network pipes) so that it does not deteriorate. Some of threats, vulnerabilities and challenges affecting the distribution are shown in Table 4.4.

Table 4.4: Examples of distribution system related threats, vulnerabilities and challenges

Distribution: Storage tanks / Reservoirs			
Threats/ Vulnerability	**Emergency type**	**How to identify possible threats**	**Possible effects**
Storage tanks are overdesigned.	Water quality	• Storage tanks are sufficient for the community demands, however the treatment system cannot fill the tank. • Water that stands in the tank for a longer period (e.g. > 5 days).	**Human health impacts** • Water standing in the tank for longer periods may be re-contaminated. • Bacteriological contamination.
Storage tanks are under designed.	Water quantity	• Storage tank that does not meet the community demands. • Storage tanks that are never full.	**Human health impacts** • Water shortages
Storage tanks are easily accessible to the public	Water quality	• Reservoirs that have insufficient security (fencing , locks and gates)	**System impacts** • Storage tanks that are easily accessible to the public are more prone to theft and contamination.
Uncovered tanks are vulnerable to contamination	Water quality	• Evidence of no storage tank lids. • Open storage tanks. • Dead birds and unwanted objects are found inside the tank. • Greenish water in the storage tank.	**Human health impacts** • Contaminated water may cause human health impacts.
Vandalism or sabotage	Water quantity / quality		**Human health impacts** • No water supply. • Contaminants that have a potential health hazards maybe introduced into the water. **Supply system impacts** • Loss of infrastructure (which has value).
Leaks, corrosion or damage is evident on the reservoirs, inlets, outlets, etc.	Water quality	• Evident cracks on the storage walls. • Reddish water coming out of the tanks.	**Human health impacts** • Dissolved iron in water **System impacts** • Loss of water

Table 4.4 (continued): Examples of distribution system related threats, vulnerabilities and challenges

Threats/ Vulnerability	Emergency type	How to identify possible threats	Possible effects
Poor maintenance of the reservoir	Water quality	• Unavailability of maintenance manuals or procedures. • Muddy / cloudy looking water. • Water that does not meet water quality standards.	**Human health impacts** • Poor maintenance in the storage tanks may cause organic growth, sediments, chemical sludge and fungus.
Natural disasters can damage treatment unit operations.	Water quantity	• Storms, floods, earthquake	**General impact** • Natural disasters can destroy the storage tanks leading to water unavailability.
Distribution: Pipes			
Pipe burst and leaks can interrupt the water supply.	Water quantity and quality	• Rusted pipes. • Pipes with holes. • Pipes exceeding their lifespan. • Dirty / cloudy looking water.	**Human health Water quality impact** • Disturbed water supply **Human health Water quality impact** • Contaminants may enter into the burst pipe.
Pipes above the ground	Water quantity	• Uncovered pipes	**System impacts** • Pipes lifespan may be reduced due to exposure in changing weather conditions.
Poor network maintenance.	Water quality	• Unavailability of maintenance manuals or procedures. • Muddy / cloudy looking water. • Water that does not meet water quality standards.	**Human health impacts** • Poor maintenance of pipes may lead to organic growth and sediments within the pipe.
Vandalism or sabotage	Water quantity / quality	• Broken pipes. • Pipes lying above ground	**System impacts** • Compromised infrastructure
Distribution: Tankers / water carts			
Unclean tankers used.	Water quality	• Water with offensive taste and odour. • Muddy / cloudy looking water.	**Human health impacts** • Water may be contaminated in the tanker.
Untreated water transported and provided to the community.	Water quality	• Untreated water collected from the river.	**Human health impacts** • Gastro-enteritis, fever, and cholera.
Unsuitable tanker used.	Water quality	• Tanker that is used to carry other liquids (e.g. milk, liquids containing chemicals). • Water with unusual taste and odour.	**Human health impacts** • Water may be contaminated by chemicals contained in other liquids.

4.5 POINT OF USE RELATED THREATS, VULNERABILITIES AND CHALLENGES

Point of use can be described as the consumer's or public premises such as household taps, household storage material, etc. Some of threats, vulnerabilities and challenges affecting the point of use are shown in Table 4.5.

Table 4.5: Examples of point of use related threats, vulnerabilities and challenges

Point of use: Rainwater harvesting			
Threats/ Vulnerability	**Emergency**	**How to identify possible threats**	**Possible effects**
Rusty gutters and roofs.	Water quality	• Evident rust in gutters and roofs. • Reddish water. • Water with unusual taste.	•
Dirty gutters and roof tops.	Water quality	• Roofs and gutters that are never cleaned. • Muddy / cloudy looking water.	**Water quality effect** • Water may be contaminated by dirty gutters and roofs.
First flush of water can enter storage tank.	Water quality	• Water collected in the tank after long periods without rain.	**Water quality effect** • Rainwater after a long dry period contains dust from the air.
Point of use: Household			
Water stored in open containers.	Water quality	• water containers with no lid/cap	**Human health effects** • Water in open containers may be contaminated.
Unhygienic practices when handling/drawing water from the storage container.	Water quality	• Dirty containers used. • Dirty water drawing utensils used. • Use of recycled cans that used to contain chemicals.	**Health Impacts** • Water may be re-contaminated.

CHAPTER 5: DEVELOPMENT OF EMERGENCY REPSONSE PLANS

5.1 INTRODUCTION

This section provides feedback on how the guideline document, for developing and implementing Emergency Response Plans (ERPs), was developed. The proposed structure is based on both international practices and local observations. The guideline document will not be presented in this document. Only the approach used and the summarised content is presented. Remember that an ERP is developed as a component of a Water Safety Plan (WSP). Therefore it is expected that the steps of WSP prior to development of ERP have been considered and the necessary information exists. A section that guides CWS that do not have a WSP in place, to develop one was included as a starting point to develop ERP. That section includes the following considerations.

5.2 GUIDANCE ON DEVELOPING WATER SAFETY PLANS

The WSP should be an integral part of the water system routine operations. An example of aligning the two is provided below.

WSP

- Assemble WSP team /key stakeholders
- Document and describe the water supply system
- Assess the water supply system and undertake risk assessment
- Identify control measures
- Verify that the water safety plan is operational
- Prepare management procedures for normal and incident conditions
- Develop supporting programmes

System operations

- O&M personnel should be part of the team to raise awareness, influence change and implement change about O&M issues.
- Conditions and performance of supply system components should be taken into consideration.
- Typical O&M hazardous events should be included.
- Typical O&M control measures linked with hazardous events should be compiled.
- Relevant O&M activities considered critical must be periodically evaluated. Is our O&M budget spent wisely?
- Develop operations and maintenance manuals and SOPs for system operations and maintenance.
- Preventative and corrective maintenance plans are an example.

Figure 5.1: Aligning WSP and system operations

Simplified steps to consider when developing a standard WSP were presented along with examples. Blank templates that can be used are included in the appendix. The steps to consider include:
Step 1: Assemble the WSP team
Step 2: Document and describe the water supply system
Step 3: Assess the water supply system
Step 4: Undertake a hazard assessment and risk characterisation
Step 5: Identify control measures
Step 6: Verify that the WSP is operational
Step 7: Develop supporting programmes
Step 8 and 9: Prepare management procedures and establish documentation and communication procedures. These are covered under the development of an ERP section
Step 10: Review the WSP

5.3 GUIDANCE ON DEVELOPING EMERGENCY RESPONSE PLANS (ERPS)

Once the first steps of the water safety plan have been considered, the plan for the anticipated emergency triggers should be considered. Remember that emergency is defined as an indication that water is contaminated or unavailable or is in excess (in the case of floods). It is suggested that the user should not wait for an emergency to happen, but to plan ahead so that when/if it happens they are better prepared to manage it. This means that the plans developed should not only focus on emergencies, but should include day to day procedures and protocols that will minimise the likelihood of emergencies.

The "identifying the emergency triggers and analysis" steps (when developing a WSP) should be used as a guide in identifying the types of procedures and plans to be developed. It is more appropriate to develop a range of options to effectively remove or reduce emergency causes within a CWS.

Planning for anticipated emergencies includes:

- Identifying a range of options for managing possible emergency causes.
- Assessing the identified options.
- Preparation and implementation of management plans.

The following should be considered when planning for emergencies:

Plan for anticipated emergencies	How do we get to where we want to be? • Assign responsibilities • Develop communication protocol/s • Identify alert levels • Develop emergency response procedures (step by step what to do or how to react) (e.g. daily inspections – what should be inspected, how?) • Plan for management of resources (equipment, people, services, money) • Plan for infrastructure protection

It is suggested that the community may consider the following approach as a guide to developing an ERP.

Approach to developing Emergency Response Plans:

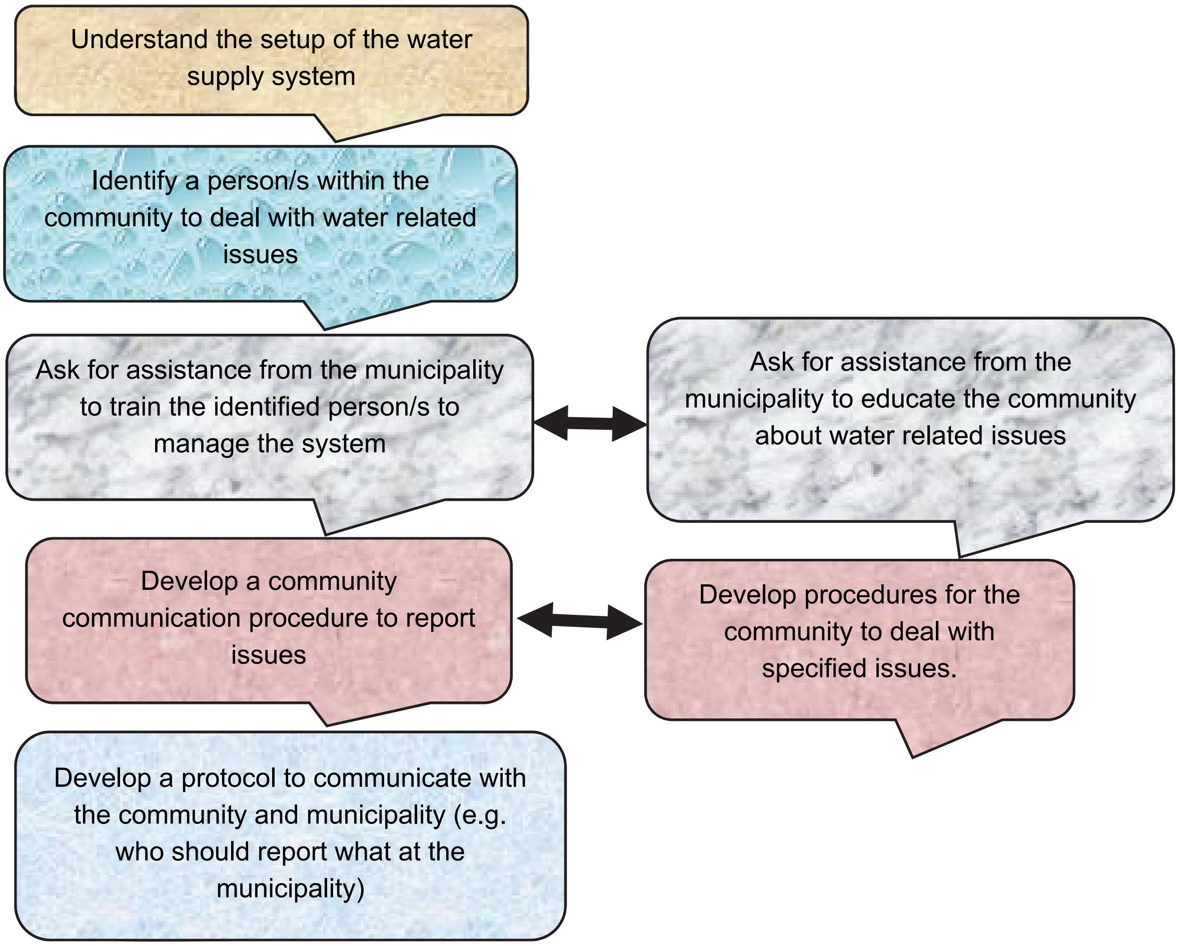


Figure 5.2: Suggested approach to develop and implement CWS ERP

The common element is that each emergency may threaten the system's ability to deliver safe and reliable water.

Simplified steps to consider when developing a standard ERP with examples are presented in a separate guideline document. Figure 5.3 shows basic key elements of an ERP. Blank templates that can be used are included in the appendix. The steps to consider include:

- Assign roles and responsibilities
- Identify alert levels/ develop protocols to respond to failures
- Develop communication protocol/s
- Develop emergency response procedures/protocols
- ERP review

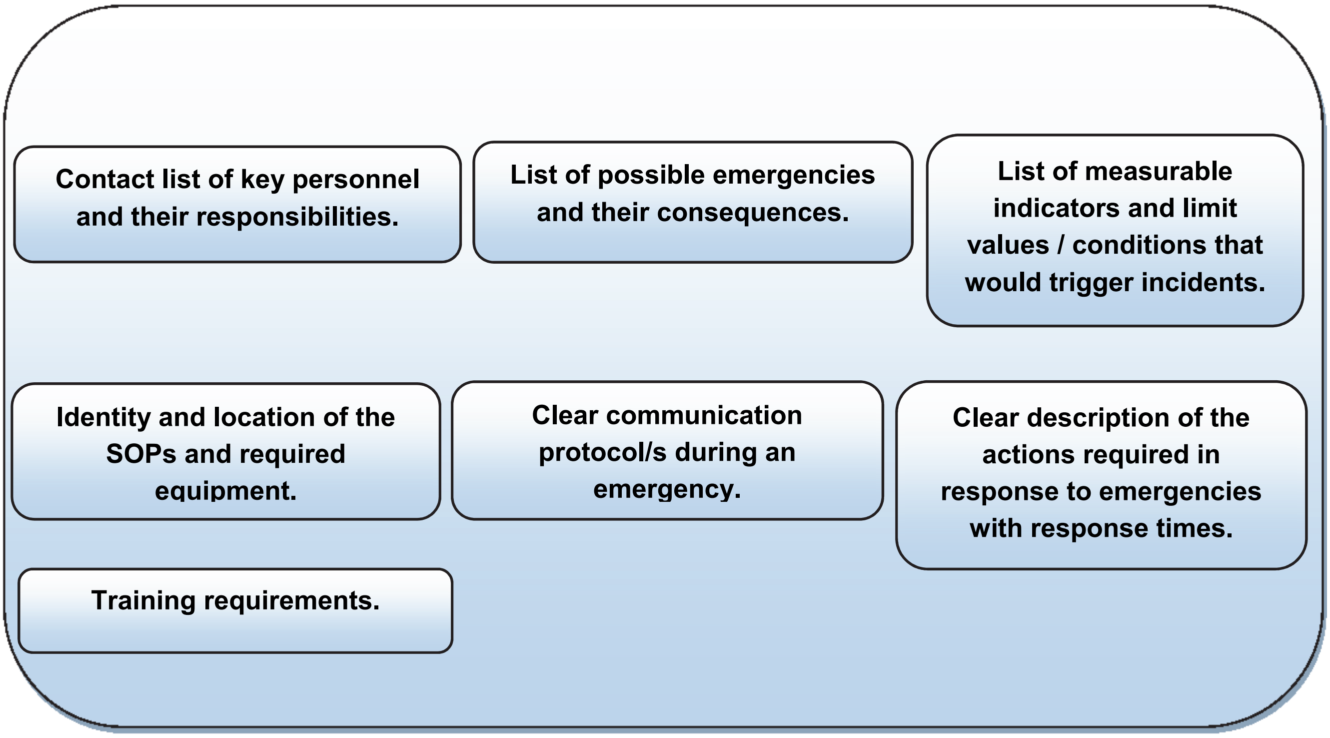


Figure 5.3: Key elements of an ERP

5.4 WORKSHOPS

This section provides feedback on the workshops conducted on the draft guideline document that was developed. The workshops were held at selected municipalities where site visits were conducted.

The purpose of the workshop was to:

- Workshop the draft guideline document with selected CWS.
- Develop draft ERPs for selected CWS.
- Identify if there are any outstanding requirements for the draft guideline document.
- Gather inputs for the developed draft ERPs for amendments.
- Review and finalise the draft guideline according to the feedback received.

5.4.1 Workshop methodology

Workshop invitations were sent to the municipalities with the draft proposed agenda, as per the example below.

AGENDA

ERP Workshop – Chris Hani DM

Location: Chris Hani DM Offices, Queenstown
Date: 24 February 2015
Time: 9:00 – 15:00
Invitees: Chris Hani Technical Services Officials, Other relevant Municipal Officials (EHPs, Customer Care, Disaster Management), Relevant stakeholders representatives e.g. (schools, health care centers, community leaders, community), Project Team

9:00 – 9:10	Welcome & Agenda Finalization	Chris Hani Rep
9:10 – 9:30	Introductions & Objectives of ERP	Project team
9:30 – 9:45	**Step 1**: Assemble ERP Team	All
09:45 – 10:15	**Step 2**: Describe the system	All
10:15 – 10:25	*Break*	
10:25 – 11:00	**Step 3**: Identify types of challenges/emergencies to be addressed	All
11:00 - 11:30	**Step 4**: Analyse possible challenges/emergencies	All
11:30 - 13:00	**Step 5**: Plan for anticipated emergencies	All
13:00 - 13:30	*Lunch*	
13:30 – 14:00	**Step 6 & 7**: Sampling and ERP Review	All
14:00 – 14:30	General / Questions	All
14:30 – 15:00	ERP Assessment tool verification	All
15:00	Closure	Project team

The expected invitees from the municipalities were stated and the municipalities were requested to invite stakeholders that could be part of their CWS. The following representatives were suggested:

- Municipal technical department
- EHPs
- Customer care
- disaster management
- Other stakeholder representatives (e.g. schools, clinics, community leaders, people who are managing the CWS, etc.).

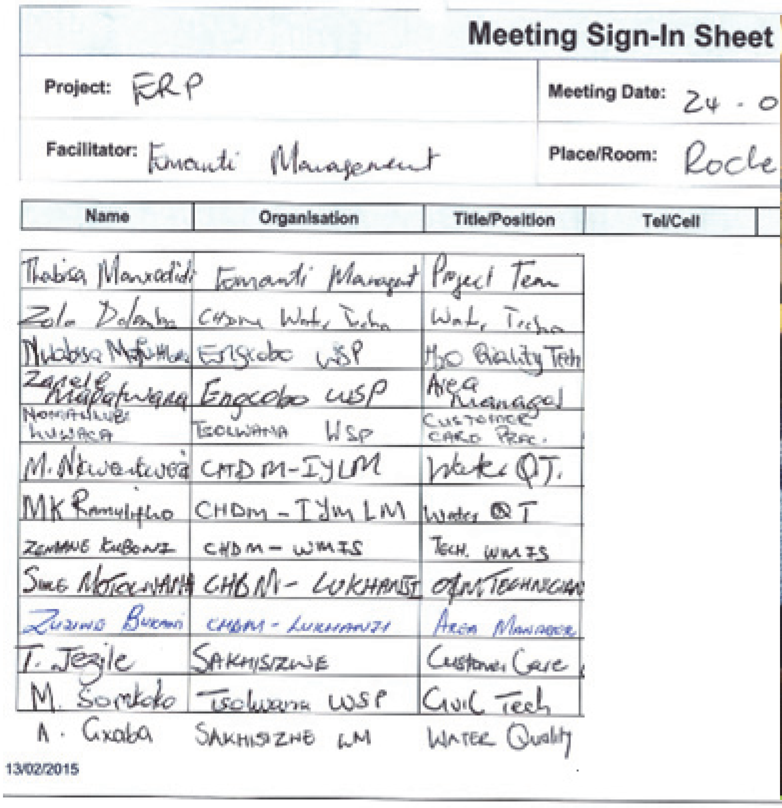
A brief presentation about the project was given by the project team, followed by the workshop session. During the workshop session, the draft guideline document was provided to the municipalities where each step was explained. The municipalities were provided with blank templates where they were guided to develop their draft ERPs. The workshop process was followed as indicated in the draft agenda above. The following summary feedback was received from the workshops.

5.4.2 Workshop feedback

5.4.2.1 *Eastern Cape: Chris Hani DM*

The Chris Hani workshop was attended by all 8 LMs that form the Chris Hani district including some district municipality representatives. This means that 5 LMs that were not part of the pilot/ visited site, were part of the workshop. Attendees ranged from area managers, water quality technicians, civil technicians, customer care representatives and EHPs (see attendance register in the appendix). There were no external stakeholders at the workshop.

The following people attended the workshop:



Meeting Sign-In Sheet

Project: ERP | Meeting Date: 24 - 0

Facilitator: Emanti Management | Place/Room: Rocle

Name	Organisation	Title/Position	Tel/Cell
Thabisa Manxodidi	Emanti Management	Project Team	
Zola Dalasha	CHDM Water Techn	Water Techn	
Nkobisa Mafuthu	Engcobo WSP	H2O Quality Tech	
Zanele Mafatywana	Engcobo WSP	Area Manager	
Nomathemba Kuwaca	Tsolwana WSP	Customer Care Rep.	
M. Ntwentwe	CHDM-IYLM	Water QT.	
MK Ramyiliho	CHDM - IYM LM	Water QT	
Zewane Kubonz	CHDM - WMIS	Tech. WMIS	
Sme Ntsetwana	CHDM - Lukhanji	O&M Technician	
Zuzwino Buwani	CHDM - Lukhanji	Area Manager	
T. Jezile	Sakhisizwe	Customer Care	
M. Somtoko	Tsolwana WSP	Civil Tech	
A. Gxaba	Sakhisizwe LM	Water Quality	

13/02/2015

Meeting Sign-In She

Project: ERP | Meeting Date: 24

Facilitator: Emanti Management | Place/Room: Ro

Name	Organisation	Title/Position	Tel/Cell
Gcobisa Mdabane	CHDM - Lukhanji LM	Water Quality Technician	
Nomhle Bongweni	CHDM	Snr tech : WCOM	
Nozuko Ncoko	CHDM	Civil technician	
[illegible]	Sakhisizwe WSP	Civil Eng Tech	
T. Tele	CHDM - Lukhanji LM	Social facilitator	
[illegible]	CHDM - Lukhanji LM	Civil Technician	
W. Mweuka	CHDM - Intsika	Civil technician	
Nqiwa - S	CHDM	Snr WMIS Tech	
S [illegible]	CHDM - Eng Cluster	Social facilitator	
S. Ntsele	CHDM - Sakhisizwe	Electro-Mech	
[illegible]	CHDM - Inkwanca	Social facilitator	
[illegible]	CHDM - Inkwanca	Water Quality	
Vuyelwa Ngqungqu	INKWANCA	Civil Tech	

30/01/2015

Meeting Sign-In Sheet

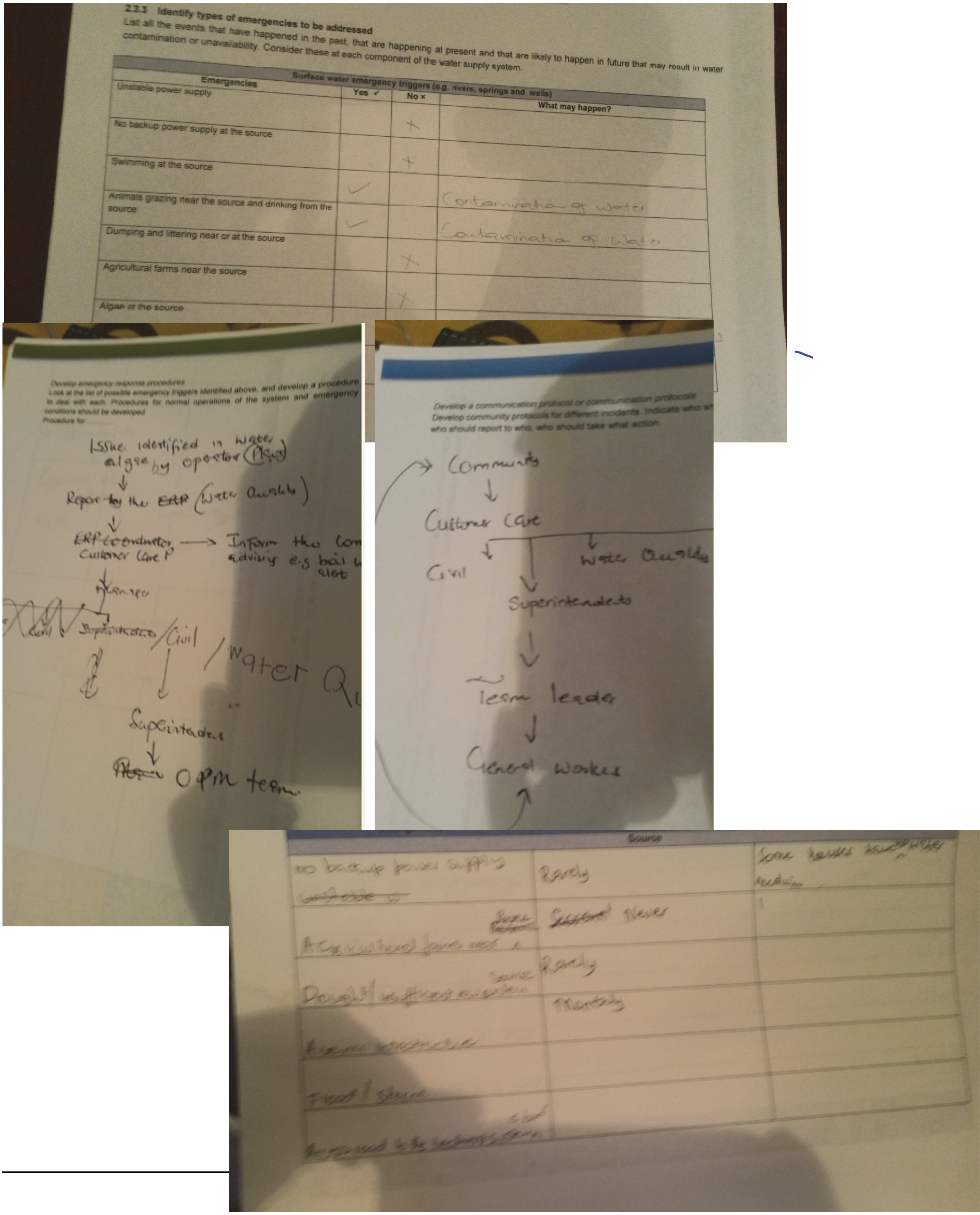
Project: | Meeting Date: 24

Facilitator: | Place/Room:

Name	Organisation	Title/Position	Tel/Cell
Sidliki L	CHDM	EHP	
T. Makwabe	CHDM	WSP Area Manager	
N.B Mbanxa	Emalahleni WSP	Customer Care Practitioner	
Mlandi Lumka	CHDM	WSP Technician	
Y. Mreele	CHDM	Customer Care (WSP)	
Dlamini P	CHDM	EHP	

13/02/2015

Blank templates were filled in to develop draft ERPs as shown in the photos below:



Feedback received from the workshop:

- The guideline and the templates provide good guidance for the municipalities to develop their ERPs.
- The concern was that some municipalities have many of these systems (more than 50) and there is no capacity to develop ERPs for all systems.
- The need and importance to involve other stakeholders was noted.
- The municipality may request assistance from the project team to conduct community awareness.
- It was requested that an electronic copy of the guideline be provided to be able to copy and paste where/when necessary.
- Ageing infrastructure emergency triggers should be included in surface water as possible emergency triggers.
- A question was tabled asking how strict the municipality should be when following the guide provided for ranking the risk. It was indicated that if the municipality does not agree with the ranking, the most suitable/ appropriate ranking should be used.
- Another question about water quality testing kits (maybe presence/absence indicators) that can be used for these systems, was tabled.
- There was a concern whether the municipality should develop procedures just for ERP, if there are relevant existing SOPs.

5.4.2.2 *Eastern Cape: Joe Gqabi DM*

Joe Gqabi workshop was attended by all 4 LMs that form the Joe Gqabi district including some district municipality representatives. This means that three LMs that were not part of the pilot/ visited site, were part of the workshop. Attendees ranged from WSA manager, water manager, water quality scientist, compliance officer, ISD officers, supervisors and superintendents (see attendance register in the appendix). There were no external stakeholders at the workshop. The following people attended the workshop:

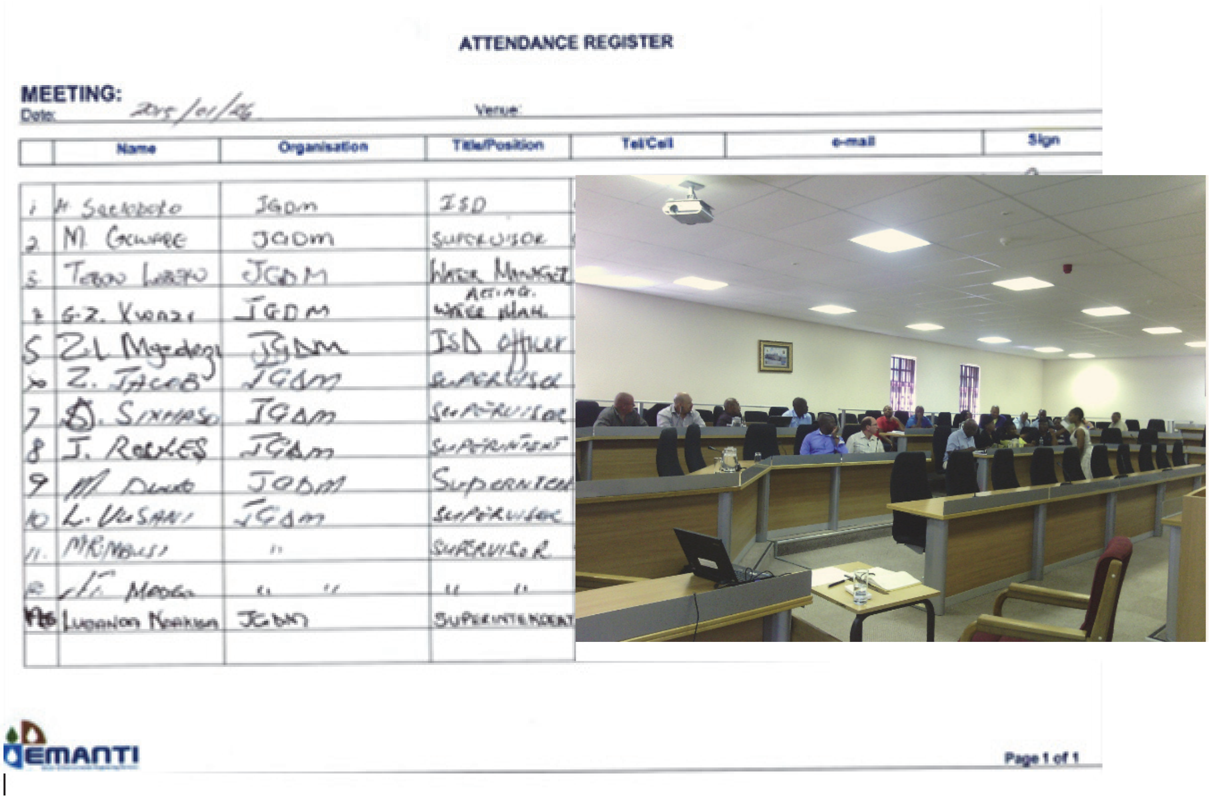
ATTENDANCE REGISTER

MEETING: ERP Workshop

Date: 26-01-2015

Venue: Joe Gqabi Council chambers

	Name	Organisation	Title/Position	Tel/Cell	e-mail	Sign
Ms	[illegible]	Emanti	ERP Project Team			
Ms	[illegible]	Emanti	Project team			
Mr	T Ngceba	Joe Gqabi DM	Water Manager			
Mr	[illegible]	Joe Gqabi D.M.	Water Quality Scientist			
	[illegible]	[illegible]	Manager: WSA			
	[illegible]	JGDM - Gariep	Acting Water Manager			
Ms	[illegible]	[illegible]	[illegible]			
Mr	[illegible]	JGDM	[illegible]			
Ms	N. [illegible]	JGDM	COO			
Mr	PG [illegible]	JGDM	Water Manager			
Mr	[illegible]	JGDM	Water Manager			
Mr	[illegible]	JGDM	Water Manager			
Ms	[illegible]	JGDM	Compliance Officer			
Ms	[illegible]	JGDM	Plant Controller [illegible]			



ATTENDANCE REGISTER

MEETING:
Date: 2015/01/26
Venue:

	Name	Organisation	Title/Position	Tel/Cell	e-mail	Sign
1	H Seelobelo	JGDM	ISD			
2	M. Gcwabe	JGDM	Supervisor			
3	Tebo Lebeko	JGDM	Water Manager			
4	G.Z. Kwazi	JGDM	Acting Water Man.			
5	Z.L. Mgedezi	JGDM	ISD officer			
6	Z. Jacob	JGDM	Supervisor			
7	S. Sixhaso	JGDM	Supervisor			
8	J. Rolles	JGDM	Superintendent			
9	M Dlwati	JGDM	Superintendent			
10	L. Vusani	JGDM	Supervisor			
11	MKMBUSI	"	Supervisor			
12	T. Mboca	" "	" "			
13	Luvuyo Nkahleni	JGDM	Superintendent			

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The workshop process was followed as indicated in the previous draft agenda. Below is the summary feedback that was received from the workshop.

Blank templates were filled in to develop draft ERPs as shown in the photos below:

Feedback received from the workshop:

- Workshop attendance certificates were requested.
- The need and importance to involve other stakeholders was noted.

- The municipality will utilise the existing rural committees where water issues are discussed as part of the team.
- It is anticipated that the community will have a broader picture of what is happening within the municipality.
- It is anticipated that the community will be able to respond to specific incidents.
- The ERP will assist in clearly indicating areas of vulnerabilities where urgent actions are required. Therefore the ERP will be used as a report to table issues to management.
- It was suggested that an index referring to parts of the water supply system is provided.
- The municipality referred to the existing SOPs where necessary when developing ERPs.

5.4.2.3 *KwaZulu-Natal: Newcastle LM*

At the time of workshop, the project team was informed that the municipality is in a crisis of shortage of water. Therefore most of the technical team was attending to the crisis. Attendees included the WSA manager, two technical assistants and an engineering technician. There were no external stakeholders at the workshop. The people who attended the workshop are indicated in the following images

Meeting Sign-In Sheet

Project: NLC ERP
Meeting Date: 16/02/2015
Facilitator: Gmanti
Place/Room: Nedbank building boardroom (Nev

Name	Organisation	Title/Position	Tel/Cell	e-mail	Sign
Unathi Jace	Gmanti	Project leader			
Clive Cumming	Emanti	Project team			
Lungisa Sibiya	Newcastle LM	Technical Ass.			
Nkululeko Ncube	" "	WSA Manager			
Xolani Sithole	" "	Engineering and Regulation Technician			
Nqobile Zulu	" "	Technical Assistant			
Thabiso Mawandla	Emanti	Project Team			

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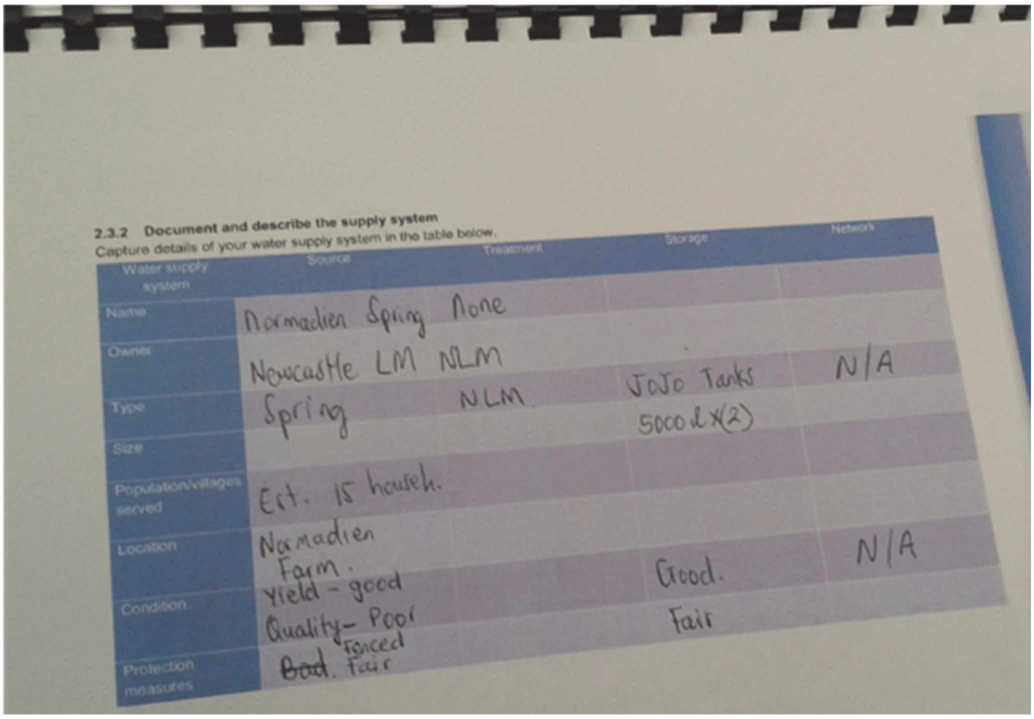
The workshop process was followed as indicated previously in the draft agenda. The summary feedback that was received from the workshop follows.

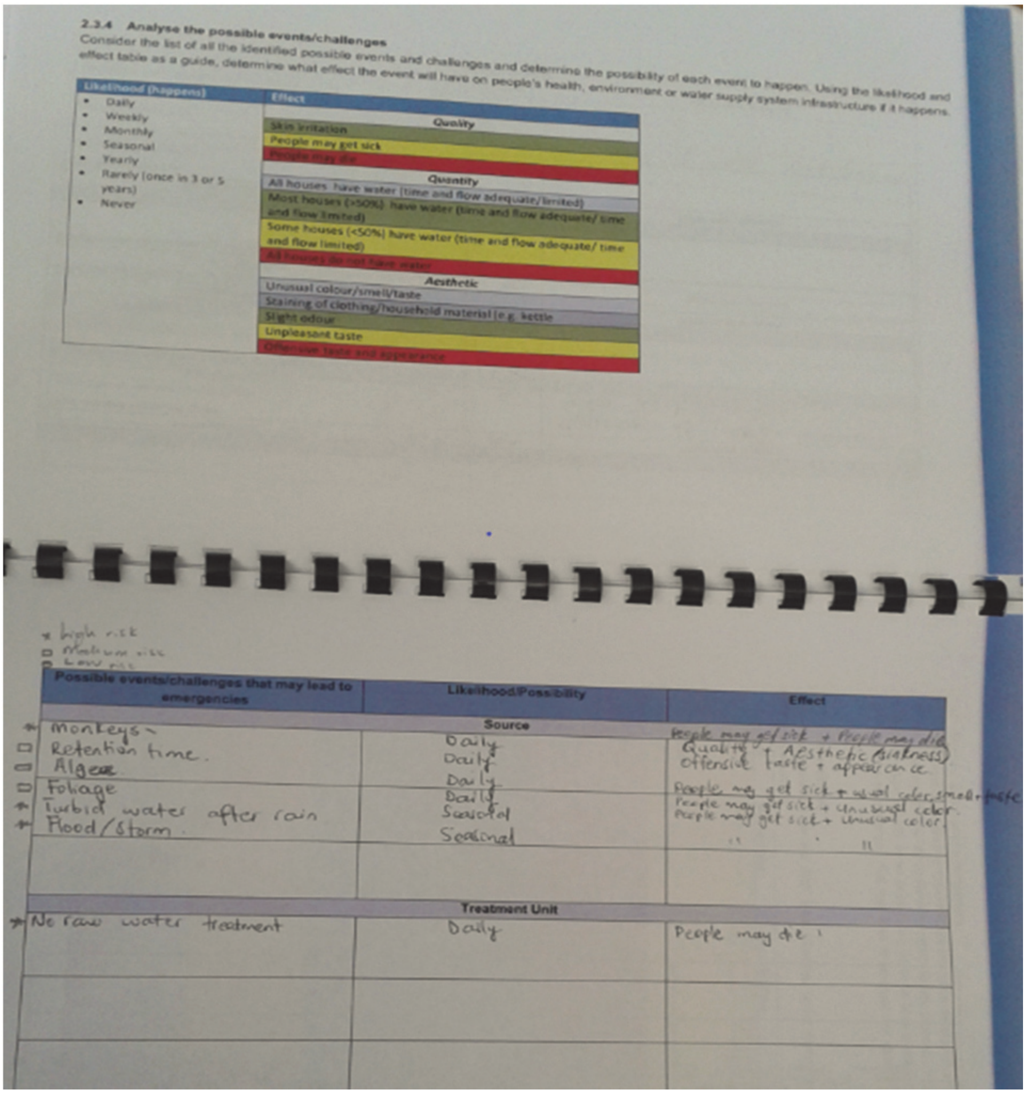
Blank templates were filled in to develop draft ERPs as shown in the photos below:



2.3.2 Document and describe the supply system

Capture details of your water supply system in the table below.

Water supply system	Source	Treatment	Storage	Network
Name	Normadien Spring	None		
Owner	Newcastle LM	NLM		N/A
Type	Spring	NLM.	JoJo Tanks	
Size			5000 ℓ x(2)	
Population/villages served	Est. 15 househ.			
Location	Normadien Farm.			N/A
Condition	Yield – good Quality – Poor		Good. Fair	
Protection measures	~~Bad.~~ Fenced. Fair			



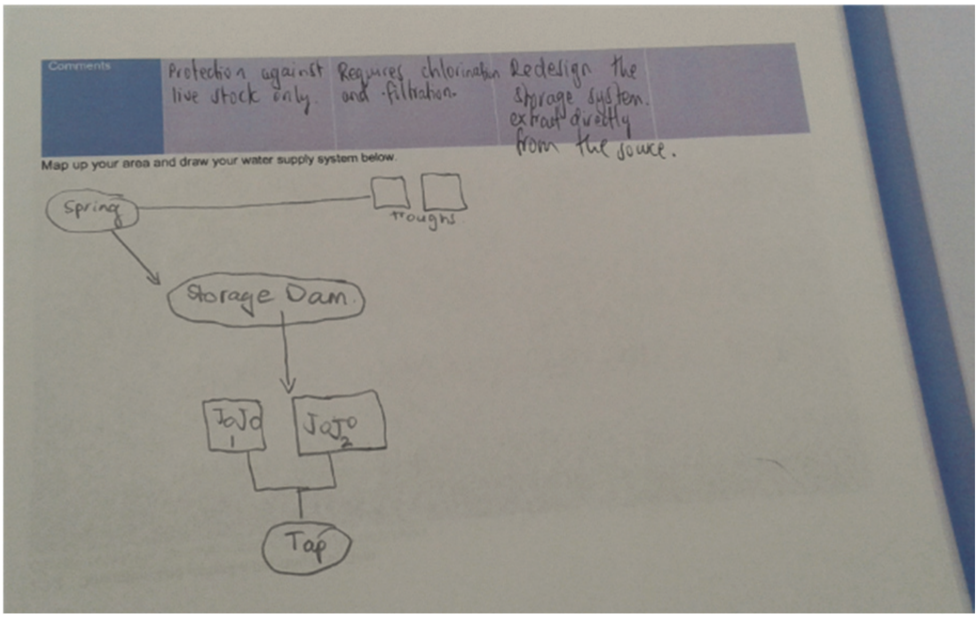
2.3.4 Analyse the possible events/challenges

Consider the list of all the identified possible events and challenges and determine the possibility of each event to happen. Using the likelihood and effect table as a guide, determine what effect the event will have on people's health, environment or water supply system infrastructure if it happens.

Likelihood (happens)	Effect
• Daily • Weekly • Monthly • Seasonal • Yearly • Rarely (once in 3 or 5 years) • Never	***Quality*** Skin irritation People may get sick People may die ***Quantity*** All houses have water (time and flow adequate/limited) Most houses (>50%) have water (time and flow adequate/ time and flow limited) Some houses (<50%) have water (time and flow adequate/ time and flow limited) All houses do not have water ***Aesthetic*** Unusual colour/smell/taste Staining of clothing/household material (e.g. kettle Slight odour Unpleasant taste Offensive taste and appearance

* high risk
□ Medium risk
□ Low risk

Possible events/challenges that may lead to emergencies	Likelihood/Possibility	Effect
Source		
* Monkeys □ Retention time. □ Algae	Daily Daily Daily	People may get sick + People may die Quality + Aesthetic (sickness) Offensive taste + appearance
□ Foliage * Turbid water after rain * Flood/Storm.	Daily Seasonal Seasonal	People may get sick + usual color, smell + taste People may get sick + Unusual color. People may get sick + Unusual color. " "
Treatment Unit		
* No raw water treatment	Daily	People may die!



Feedback received from the workshop:

- The WSA manager indicated that the workshop was conducted at a most suitable time. That is, it relevant to their present situation of a water shortage crisis.
- The municipality aims to have draft ERPs for all their CWS by June 2015.
- The municipality may request assistance from the project team to conduct community awareness.
- The municipality does not have recorded SOPs and this will assist them in identified what SOPs to develop.
- It was suggested that a space for user defined emergency triggers be provided in step 3.
- It was suggested that an “easily accessible” emergency trigger be clearly explained or rephrased.
- Aesthetic risk rating should be reconsidered.
- With respect to the review step, the “yes/no” options should be in the same column as updated.
- In the monitoring programme, “source” should be used as opposed to “borehole”.

5.4.2.4 *Northern Cape: Hantam LM*

Hantam attendees included water technicians, foremen and a process controller. There were no external stakeholders at the workshop. The following people attended the workshop.

Meeting Sign-In Sheet

Project: K5/2213 : WATER SAFETY & SECURITY PLANS	**Meeting Date:** 17/2/2015
Facilitator: PHILIP DE SOUZA	**Place/Room:** COMMITTEE ROOM, HANTAM, CALVINIA

Name	Organisation	Title/Position	Tel/Cell	e-mail	Sign
P. DE SOUZA	EMANTI	PROJECT TEAM			
C. BAREND SEPTEMBER	HANTAM	WATER OPERATOR			
D. GOUWS	HANTAM	WATER			
ARRIE SASS	HANTAM	VOORMAN			
H. GOEIMAN	HANTAM	WATER			
J. Muller	" "	water			
Chris Koopman	HANTAM MUN	VOORMAN			
[illegible]	Hantam Mun	Voorman			
Patrick Corrie Mguil	Hantam Mun	Voorman			

13/02/2015

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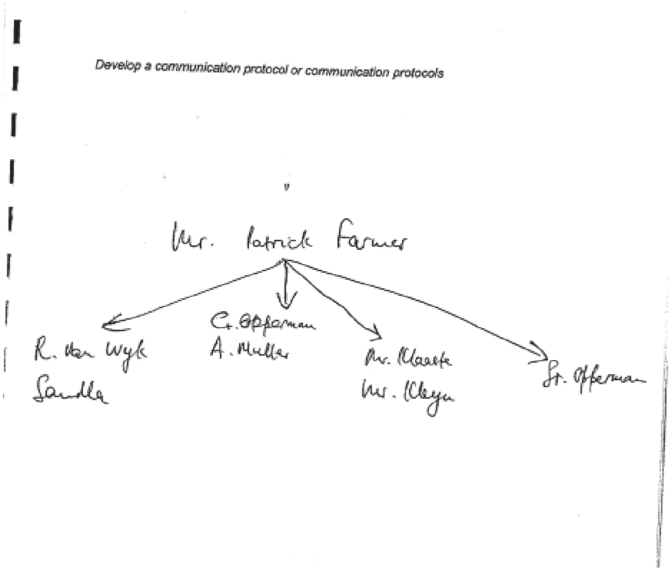
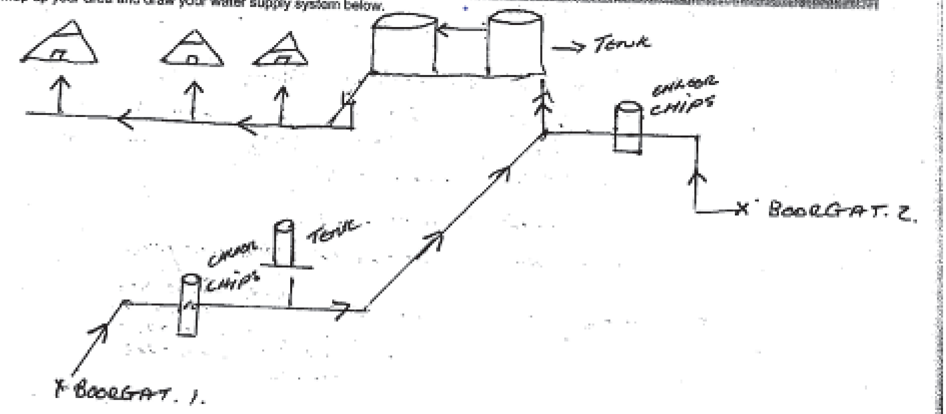
The workshop process was followed as indicated in the previous draft agenda. Below is the summary feedback that was received from the workshop.

Blank templates were filled in to develop draft ERPs as shown in the photos below:



Map up your area and draw your water supply system below.



Develop emergency response procedures

Look at the list of possible emergencies identified above, and develop a procedure to deal with each. Procedures for normal operations of the system and emergency conditions should be developed.

Procedure for ....

- Take (Jaco) borehole levelmeter (dip meter) with when do the dialy watermeter readings.
- After the watermeter reading - put the levelmeter (dip meter) into the borehole monitoring pipe.
- When the probe reach the water level, it will shows on the meter.
- Mark the robe and take the reading.
- Record into the logbook.

Feedback received from the workshop:

- Workshop attendance certificates were requested.
- The question was raised whether the ERP could replace a WSP and will DWS accept it in place of a WSP? The municipality indicated that the ERP looks simpler and anticipates that it should be easier to implement. There was an indication that the municipality finds it difficult to implement their existing WSP.
- It was requested that the guideline is web-enabled or made available electronically so that the central office can easily access ERPs from other offices.
- Ageing infrastructure should be included as an emergency trigger.
- A guide on how to decide on the risk rating should be provided.
- Relevant surface water emergency triggers should be included underground water.
- With regard to completing table 2, a note should be included that indicates how to fill in if there is more than one source.

5.5 SUMMARY AND RECOMMENDATIONS

- Suggestions related to the guideline were considered and amendments made accordingly.
- The request to provide certificates of attendance at workshops is feasible.
- Provision of the guideline document in an electronic (e.g. in a CD) format is approved by WRC.
- All CWS visited did not have a WSP nor ERP. Therefore there is a need for the final guideline to be workshopped at more CWS.
- Project team assistance at the municipalities requesting assistance with community awareness campaigns, should be considered. This could include workshopping the final guideline document with involved external stakeholders.

REFERENCES

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