cooperative governance

Department:
Cooperative Governance
REPUBLIC OF SOUTH AFRICA

MOHOKARE
LOCAL MUNICIPALITY

MUNICIPAL INFRASTRUCTURE SUPPORT AGENT

PROJECT: MISA/002/2013/TPSP/PROVINCES

PROVISION OF ENGINEERING AND PROJECT MANAGEMENT SUPPORT TO LOCAL MUNICIPALITIES

ABBREVIATED

MASTER PLAN FOR WATER AND SANITATION

FOR

MOHOKARE LOCAL MUNICIPALITY

(FINAL DRAFT: 28 FEBRUARY 2014)

PRO-PLAN
consulting engineers (pty) ltd

MAIN INDEX

EXECUTIVE SUMMARY

Pro-Plan Consulting Engineers (Pty) Ltd were appointed by the Municipal Infrastructure Support Agent (MISA) to provide engineering and project management support to certain municipalities in Free State Province, one of which is Mohokare Local Municipality (LM). One of the requirements of the appointment is infrastructure master planning, with the preparation of an abbreviated water and sanitation master plan being one of the milestones.

As development in Mohokare happens, the first demand for engineering services is for a secure supply of potable water and concomitant sanitation infrastructure. Because of the concentrated nature of urban developments, the water supply experiences peak demands at certain times of the day, with even possible higher demands in the case of a fire situation. Similarly, the wastewater flow also shows higher flows related to the water demand peaks.

The objectives of the abbreviated Water and Sanitation Master Plan are:

- A status quo evaluation of the infrastructure elements already in place;
- an engineering determination of the required elements of supply, storage and distribution of water as well as the disposal of wastewater; and
- a prioritisation of projects required to manage, complete and maintain the water and sanitation scheme(s) in the short, medium and long term.

One of the important issues identified is the lack of proper asset management programmes; this will inevitably lead to the deterioration of the infrastructure and poor service provision. It is therefore of cardinal importance that asset management programmes be initiated as a matter of urgency.

The overall condition of the water and sanitation infrastructure has not yet been quantified on a town for town basis. This quantification is considered to be a task of immediate urgency. The records that do exist should be integrated in order to focus expenditure.

The sewer systems are very old, with blockages occurring regularly. There is also a general problem with foreign matter being deposited in the systems, e.g. rags, plastic bags, sacks, newspaper, etc. This is a problem especially in the low income areas, where the use of toilet paper is not common. Public awareness campaigns to address this issue are recommended.

The main focus of the abbreviated Water and Sanitation Master Plan is to consolidate and coordinate the planning actions of Mohokare LM. The purpose is to present an acceptable water and sanitation infrastructure development plan to the Municipality in order to assist with the implementation of projects that will ensure the improvement and sustainability of the current infrastructure. The Master Plan should be seen as the first step in a continuous process of project identification and prioritisation, design, allocation of funding, and development of an asset management programme.

A: GENERAL

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FIGURES:

1. INTRODUCTION

1.1 Appointment / Terms of Reference

Pro-Plan Consulting Engineers (Pty) Ltd was appointed by the Municipal Infrastructure Support Agent (MISA) to provide engineering and project management support to certain municipalities in Free State Province, one of which is Mohokare Local Municipality (LM). The commencement and completion dates of the project are 1 March 2013 and 30 June 2014 respectively.

In accordance with the requirements of the appointment, a Project Implementation Plan (PIP) was prepared in consultation with MISA and Mohokare LM, in which the project scope, budget, milestones and time frames were included. Infrastructure master planning was identified as a necessary task, with an abbreviated water and sanitation master plan being one of the milestones.

1.2 Background information

Mohokare LM is situated in the Xhariep District Municipality, in the southern part of Free State Province, and comprises the towns of Smithfield/Mofulatshepe, Rouxville/Roleleathunya and Zastron/Matlakeng, as well as the surrounding rural areas as demarcated by the Demarcation Board of South Africa. The municipality shares a boundary with Lesotho to the east and the Eastern Cape to the south, further bordering Kopanong Municipality to the west and Naledi Municipality to the north.

According to the Mohokare SDF Review 2011/2012, the total population in 2007 was 41 859, representing a population density of approximately 5 persons/km^2. The total number of households in 2007 is given as 10 216, which implies an average household size of 4 persons. The number of households without access to potable water within at least the family yard in 2007 was 11%, those without access to at least a ventilated improved pit (VIP) toilet 38%, and those without access to a municipal waste removal service 19%. Since then water supply has improved, with no backlogs at present. However, there is still a backlog in sanitation provision, with 777 households in Roleleathunya and 52 households in Mofulatshepe still using the bucket system. There are also 30 bucket systems in Refengkgotso, adjacent to Matlakeng, but this is an interim measure until problems with the sewer system in this township have been resolved (see section 3.1.4 of the Sanitation Master Plan).

There is also a general tendency of migration from rural to urban areas, as is the case in the rest of the province, which is characterised by mainly low-income individuals and households. The majority of the rural population is active within the agricultural sector.

In accordance with the Municipal Structures Act (Act 117 of 1998) Mohokare LM has been classified as a Category B municipality, meaning that it consists of a plenary executive system combined with a ward participatory system.

Mohokare LM is a Water Services Authority (WSA). The towns within the municipality are operating as WSAs and they are their own service providers, both bulk and retail.

Figure A1 indicates a locality plan of Mohokare LM, while the road map in Figure A2 shows the three towns.

1.3 Key physical features

The main physical features of the municipality include the following:

- National route N6, which traverses the municipality in a north-south direction.
- The Caledon River, which crosses the N6 in an east-west direction between Smithfield and Rouxville.
- The Aasvoëlberg with the Eye of Zastron, a 9m wide hole through sandstone rock.
- The Orange River, which borders the municipality to the south and is a key water resource area of importance at both provincial and national levels.

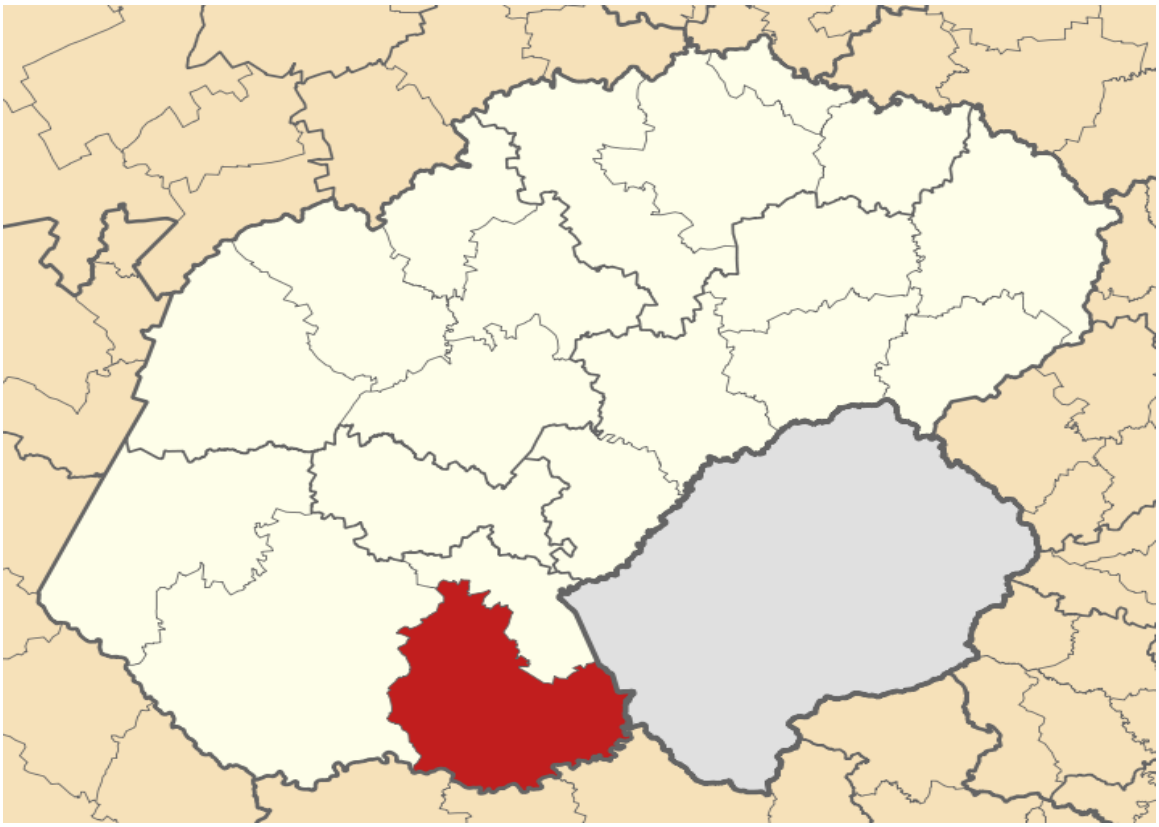

Figure A1: Locality plan of Mohokare LM

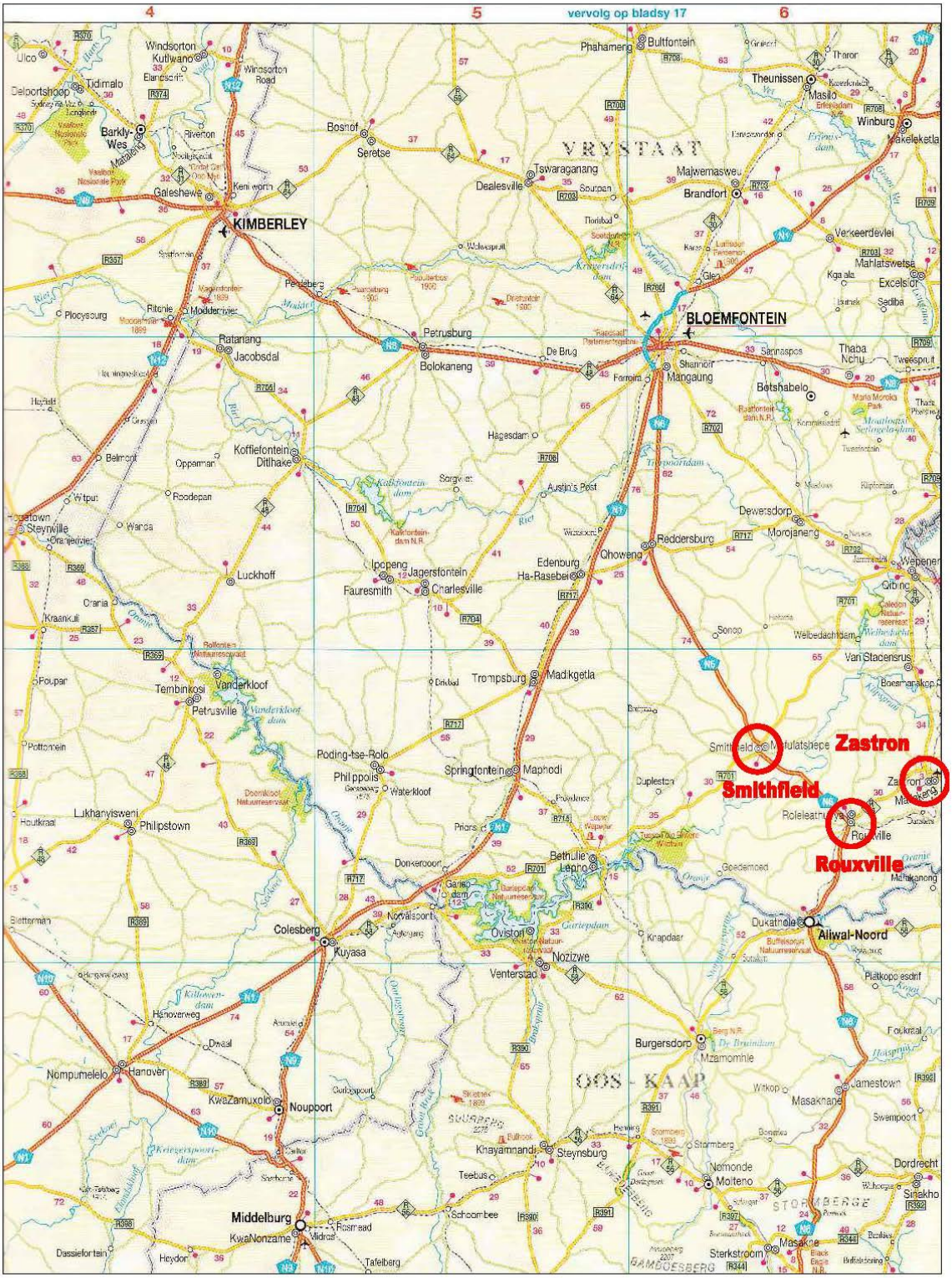

Figure A2: Road map of the towns comprising Mohokare LM

2. STUDY AREA

The urban boundaries currently include the following areas:

- Smithfield, with the townships of Mofulatshepe and Rietpoort to the east.
- Rouxville, with the townships of Roleleathunya to the north-east and Uitkoms to the south-east.
- Zastron, with the townships of Matlakeng, Refengkgotso, Phomolong, Esibeleng and New Rest to the east.

In addition to the above, future planning indicates proposed new developments as follows:

Smithfield:

- An area of high density residential development to the south-west; and
- an area of light industry development to the south-east.

Rouxville:

- An area of high density residential development north of Roleleathunya, adjacent to the N6;
- an area of business development around the N6/R26 intersection; and
- an area of light industry development on the western edge of Rouxville.

Zastron:

- An area of high density residential development to the north.

B: MASTER PLAN – WATER

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TABLES:

1. INTRODUCTION

1.1 Background

As development in Mohokare happens, the first demand for engineering services is for a secure supply of potable water. Because of the concentrated nature of urban developments, the water supply experiences peak demands at certain times of the day, with even higher demands in the case of a possible fire situation.

All the towns have experienced, and are still experiencing, problems with the provision of water to their respective communities, due to a shortage of bulk water supply. The demand for water is further increased by the development and upgrading of services that have taken place. New residential areas are also being planned, which will further increase demand for municipal services.

1.2 Objectives of the Master Plan

The objectives of the abbreviated Water Master Plan are:

- A status quo evaluation of the water supply elements already in place;
- an engineering determination of the required elements of supply, storage and distribution; and
- a prioritisation of projects required to manage and complete the water supply scheme(s) in the short, medium and long term.

2. INFRASTRUCTURE

2.1 Status quo evaluation

2.1.1 Supply, storage and distribution

General:

Municipal policy dictates that all water users enjoy a level of service higher than the RDP standard. This implies that all users have a water connection on their property. Furthermore, each household receives 6kl free water per month.

The three towns are reliant on a variety of groundwater and local surface water resources for bulk supply. However, both of these resources have proven to be unsustainable for the current and future water needs. Sustainable surface water resources are located between 15km and 30km from the towns. According to the report “Mohokare Local Municipality: Implementation Readiness Report: Mohokare Bulk Water Supply Scheme, 2009” the projected population to 2030 indicates that the peak demand for Smithfield, Rouxville and Zastron will exceed the available supply capacity from both surface and ground water.

Table B1: Water supply situation in 2007 (Source: Draft 2012 – 2017 IDP: Community Survey 2007)

Type of water supply	% of households
Piped water – inside dwelling	20.0
Piped water – inside yard	68.8
From access point outside the yard	4.7
Borehole	3.5
Spring	0.7
Dam/pool	0.5
River/stream	0.2
Water vendor	0.3
Rainwater tank	1.2
Other	0.1
Total	**100.0**

Since 2007, however, the water supply situation has improved to the point where all households have at least a yard tap.

Smithfield:

Demand exceeds supply in Smithfield.

Smithfield's main source of supply is the Caledon River, from where water is pumped to a desilting dam, after which it gravitates to the water treatment works (WTW) which has a design capacity of 3.2Ml/d. The two reservoirs (1Ml and 1.5Ml), from whence water gravitates to the town, cannot both be filled, with the result that the larger one is not presently being used. According to information at hand, there is actually sufficient water – the difficulty lies in getting it to the WTW in sufficient quantity. Higher-lying areas of the town experience supply difficulties during the day. Further problems are caused by the 200mm diameter AC rising main from the river to the desilting dam, which is subject to periodic bursting due to the allowable pressure being exceeded. This pipeline should be upgraded. There are also various (legal) connections to farmers on the section of line between the desilting dam and the town, which aggravate the supply problem.

A further source of supply is the Smithfield Dam, from whence water reaches the WTW via a siphon. However, this dam is frequently empty and is not considered a reliable source of supply.

There are five boreholes in Smithfield. However, only two are in working order, which supply the reservoirs. A programme to repair the faulty equipment should be put in place urgently.

Further planning includes the upgrading of the abstraction works on the Caledon River, construction of additional off-channel storage capacity adjacent to the abstraction works, and upgrading of the raw water pipeline to Smithfield. Implementation will depend on the availability of RBIG funds, however.

Rouxville:

Rouxville's main source of water is the Kalkoenkrans Dam. Water is pumped from the dam to the WTW; it is then pumped to three reservoirs, which have a total capacity of approximately

3.3Ml, from where it gravitates to the town. Paisley Dam is used to gravitate water to Kalkoenkrans Dam; however, future planning indicates that water will also be pumped from the Orange River to Paisley Dam. The project is supported by the Department of Water Affairs (refer to the abovementioned Implementation Readiness Report). This report also notes that Kalkoenkrans Dam has insufficient capacity to bridge a 1:50 year drought period.

There are five boreholes in Rouxville. However, only two are in working order, which supply the reservoirs. A programme to repair the faulty equipment should be put in place urgently.

The existing WTW has a capacity of 1.4Ml/d. A new WTW is currently being constructed adjacent to the existing WTW. This will be a separate system, with its own supply from the Kalkoenkrans Dam. From the new WTW a new rising main will carry water to the three existing reservoirs. The total capacity of the new WTW will be 2.9Ml/d.

Zastron:

Demand exceeds supply in Zastron. Most areas have a serious lack of supply that lasts for the whole day until after the evening peak. Special problem areas are the high-lying school and hospital, where water is unable to be pumped into the overhead tanks during this time.

Zastron's sources of water are the Montague Dam and the Kloof Dam (the latter being mainly a conservation dam). Water is pumped from the Montague Dam to a balancing dam, from where it is further pumped to the WTW, which has a capacity of 3.0Ml/d. According to information at hand, there is actually sufficient water – the difficulty lies in getting it to the WTW in sufficient quantity. The pipeline to the WTW is a 200mm diameter AC, which is old and subject to periodic bursting.

There are three boreholes in Zastron, but these have not been equipped, with the result that they cannot supply any water to the reservoirs. It is recommended that funds for equipping these boreholes should be budgeted for.

In the abovementioned Implementation Readiness Report it is also noted that Montague Dam has insufficient capacity to bridge a 1:50 year drought period.

There are three reservoirs of 1Ml each at the WTW. At a lower level are two further reservoirs of 1.5Ml and 0.9Ml respectively.

Future planning to resolve Zastron's water supply problems include the construction of an abstraction works on the Orange River, a pipeline from the river to Montague Dam, as well as the upgrading of the WTW. This is dependent on the availability of RBIG funding, however.

2.2 Required water supply system

General:

A study was financed by Bloem Water ("Bloem Water: Bulk Water Supply to Rouxville, Smithfield and Zastron (Regional Scheme), May 1999) to report on the bulk water supply in Mohokare Municipality in order to recommend sustainable water sources for all the towns up to the year 2020. The study indicated that the existing water resources were insufficient and recommended that additional sources be investigated. The report also noted that, as the

housing backlog in the municipality is addressed, additional bulk water infrastructure will be required.

Tables B2, B3 and B4 below show the estimated demands and flows. The following should be noted:

- The number of erven was counted from aerial photographs.
- The number of persons per erf was estimated based on similar areas and experience.
- Estimated water demand is based on the publication *Guidelines for Human Settlement Planning and Design* ("Red Book"). This is 120 l/p/d for higher income areas and 80 l/p/d for lower income areas.
- System losses of 40% have been taken into consideration in the expected daily demands. The expected demands are therefore 168 l/p/d and 112 l/p/d respectively.
- WTW capacities have been taken from information provided by Mohokare LM.
- A population growth rate of 2.5% per annum was assumed.

Smithfield/Mofulatshepe:

Table B2: Water demand – Smithfield/Mofulatshepe

Area	No. of erven	Estimated persons per erf	Estimated no. of persons	Expected water demand (l/p/d)	Expected water demand (Ml/d)	48h storage capacity (Ml)	WTW capacity (Ml/d)	Storage capacity as indicated by municipality (Ml)
Smithfield	300	3	900	168	0.15	0.30	3.2	2.5
Mofulatshepe	1 390	5	6 950	112	0.78	1.56		
New devel	470	5	2 350	112	0.26			
Totals	**2 160**		**10 200**		**1.19**	**2.38**		

Based on requirements inside the urban edge, the Smithfield area experiences a water demand of approximately 1.19Ml/d now, which will increase to 1.77Ml/d by 2030. It is seen that the capacity of the WTW is adequate; the problem with shortage of water lies thus with the supply from the source. Storage capacity is sufficient now, but will need to be augmented by about 2020.

Rouxville/Roleleathunya:

Table B3: Water demand – Rouxville/Roleleathunya

Area	No. of erven	Estimated persons per erf	Estimated no. of persons	Expected water demand (l/p/d)	Expected water demand (Ml/d)	48h storage capacity (Ml)	WTW capacity (Ml/d)	Storage capacity as indicated by municipality (Ml)
Rouxville	310	3	930	168	0.16	0.32	2.9	3.3
Roleleathunya	1 900	5	9 500	112	1.06	2.12		
New devel	855	5	4 275	112	0.48			
Totals	**3 065**		**14 705**		**1.70**	**3.40**		

Based on requirements inside the urban edge, the Rouxville area experiences a water demand of approximately 1.70Ml/d now, which will increase to 2.52Ml/d by 2030. It is seen that the capacity of the WTW is adequate; the problem with shortage of water lies thus with the supply from the source. Storage capacity is sufficient now, but will need to be augmented soon.

Zastron/Matlakeng:

Table B4: Water demand – Zastron/Matlakeng

Area	No. of erven	Estimated persons per erf	Estimated no. of persons	Expected water demand (l/p/d)	Expected water demand (Ml/d)	48h storage capacity (Ml)	WTW capacity (Ml/d)	Storage capacity as indicated by municipality (Ml)
Zastron	640	3	1 920	168	0.32	0.64	3.0	5.4
Matlakeng	3 495	5	17 475	112	1.96	3.92		
New devel	760	5	3 800	112	0.43			
Totals	**4 135**		**23 195**		**2.71**	**5.42**		

Based on requirements inside the urban edge, the Zastron area experiences a water demand of approximately 2.71Ml/d now, which will increase to 4.02Ml/d by 2030. It is seen that the capacity of the WTW is adequate now, but will need to be upgraded by about 2020. The problem with shortage of water lies thus with the supply from the source. Storage capacity is sufficient now, but will need to be augmented soon.

2.3 Asset management

One of the important issues identified is the lack of proper asset management programmes. This will inevitably lead to the deterioration of the infrastructure and poor service provision. It is therefore of cardinal importance that asset management programmes for all infrastructure elements (i.e. supply, storage and distribution) be initiated as a matter of urgency.

The overall condition of the water distribution pipe network has not yet been quantified on a town for town basis. This quantification is considered to be a task of immediate urgency. The records that do exist should be integrated in order to focus expenditure. Meticulous records should also be kept of burst pipe occurrences. The following should be recorded for each incident:

- Street address of burst locality, including locality sketch;
- pipe details (size, type, lining, etc.);
- ground conditions; and
- details of fracture.

2.4 Condition assessment

Water supply pipes in the towns of Smithfield, Rouxville and Zastron are AC, which are subject to frequent bursting, while the adjacent townships all have PVC pipes in relatively good condition.

The reservoirs are not cleaned frequently, with the result that there is a problem with siltation. To maintain the desired water quality, it is essential that regular reservoir cleaning (at least once per year) takes place. A programme should be put in place to carry out the required maintenance.

It is further reported that the Smithfield 1.5Ml reservoir is cracked and has not been sealed yet. This should be attended to before the reservoir can be used again.

3. TECHNICAL CRITERIA

Reference should be made to chapter 9 of the CSIR publication *Guidelines for Human Settlement Planning and Design* ("Red Book") for the consideration of all future supply, storage and distribution elements of both domestic and non-domestic water schemes in the municipality. This should encompass water supply options, design criteria, transmission, storage and distribution, as well as management of the installed systems.

4. WATER QUALITY

4.1 Background

Water quality is a broad term used for the various chemical (phosphate, iron, etc.), physical (temperature, turbidity, etc.) and biological (bacteria, algae, etc.) constituents of water. Water resources exposed to pollutants may contain high levels of heavy metals (copper, zinc, etc.), nutrients (nitrate, phosphate, etc.) and/or the physical characteristics may change (i.e. temperature, oxygen content, conductivity, etc.). Changes in water quality act as important indicators to establish the degree of impact that human activities have on a catchment. Unmanaged urbanisation or industrial, mining and agricultural activities can result in a deterioration of the surface and groundwater quality within the catchments. Pollutants resulting from these activities accumulate in rivers, dams and underground aquifers.

4.2 Pollutants in the Mohokare area

Algae in Smithfield Dam is a problem. Cattle around the dams at all three towns also cause water pollution. In Zastron, sewage spills from the wastewater treatment works (WWTW) into the Montague Dam.

There are also problems with the abattoir in Zastron discharging pollutants such as animal faeces, blood, fat, urine, etc. into the sewer. This wastewater usually has a very high organic and bacteriological load that requires pre-treatment before being discharged. It is a high-strength effluent that has a negative impact on the performance of a domestic WWTW, and pollution of the watercourses is the result. The wastewater needs to be pre-treated on site in order to comply with the requirements for discharge usually set out in municipal by-laws. In order for the municipality to protect the WWTW, it is vital to have updated by-laws in place that require an abattoir or industry to apply for discharge to the municipal sewer and which specify a tariff based on the volume and quality of effluent. Regular inspections and sampling of the abattoir and industrial effluent will ensure that the wastewater complies with the requirements for discharge as set out in the by-laws. Failure to comply should elicit a heavy penalty based on a formula specified in the by-laws.

4.3 Water quality in Mohokare

Information ant hand suggests that water quality in the municipality complies generally with SANS 241, except for some problems with coliforms at Rouxville due to chlorine dosing deficiencies. The Municipality does the water sampling and tests physical parameters, but is unable to do chemical or microbiological analyses due to lack of a laboratory and equipment (these analyses are being carried out by the Institute of Water Studies at Free State

University). Currently, Mohokare's Blue Drop score is 77%. Maintenance on the treatment plants is also inadequate due to a lack of funds and shortage of operators.

As mentioned in section 2.3 above, adequate maintenance is very important. Proper asset management plans for the various WTW should therefore be put in place as a matter of urgency.

5. WATER LOSS MANAGEMENT

According to the "Water Demand Management Programme Business Plan, DBSA, June 2007", water losses (i.e. unaccounted-for water) in Mohokare are 40%. These water losses are aggravated by the Municipality's lack of awareness regarding the water balance in the networks.

Mohokare has a Council-approved Water Demand Management Plan but has no funds to implement it. This problem is addressed in the water conservation and water demand management plan.

6. WATER SUPPLY SCHEME STRATEGY

6.1 General

When studying the different demand and supply factors, and acting on the present and future state of development in Mohokare, the following should be taken into account:

- Present growth patterns and trends
- Known planned development proposals
- Present supply
- Future water demand
- Present storage capacity
- Present and future storage requirements
- Present water distribution extensions required
- Present water network distribution status
- Present water network maintenance requirements.

It is evident that a long term or overall strategy formulation is required to support the expected development in Mohokare. This development should be supported by an adequate water supply, storage and distribution scheme. The implementation of the spatial planning proposals contained in the SDF will require renewal and/or upgrading of all bulk infrastructure services.

6.2 Supply

A realistic bulk water usage of 8.3Ml/d can be expected in Mohokare in the medium to long term (i.e. by 2030). This will be made up as follows (see section 2.2 above):

- Smithfield/Mofulatshepe : 1.8Ml/d
- Rouxville/Roleleathunya : 2.5Ml/d
- Zastron/Matlakeng : 4.0Ml/d

  TOTAL : 8.3Ml/d

6.3 Reservoir storage capacity

Reservoir storage in all three towns is sufficient at present, but will need to be augmented soon (see section 2.2 above) in order to maintain a 48 hour storage capacity.

6.4 Network extensions

In order to meet the expected development pressures, the networks in all three towns will need to be extended into the new townships described in section A2 above in order to make potable water available to all.

6.5 Maintenance of existing networks

Intensive maintenance of the present networks is an ongoing requirement and a maintenance programme should be put in place urgently. For a list of required maintenance items, reference should be made to “Service delivery and infrastructure maintenance plan” in the “Implementation Readiness Report: Mohokare Bulk Water Supply Scheme.”

Maintenance should be part of the infrastructure development budget when new services are commissioned. It would be prudent to take this factor into consideration, as it will be more expensive over the long term if existing and newly installed infrastructure is allowed to deteriorate to such an extent that it needs to be replaced at greater cost in the future.

A maintenance management system should be included in the infrastructure asset management systems of Mohokare LM. A maintenance budget should ideally be 2% to 4% of the capital value of the infrastructure.

7. BACKLOGS AND FUTURE DELIVERY REQUIREMENTS

7.1 Community infrastructure needs and policy options

There are areas within Mohokare Municipality that do not have an acceptable level of service of water supply. Decisions regarding infrastructure development must be made within the framework of the IDP and the available resources. The appropriate service levels should be selected and questions must be asked about affordability and sustainability. Infrastructure development has ongoing cost implications for municipalities and different infrastructure assets can have varying cost implications depending on the level of service. External funding is often available for infrastructure development, but ongoing operating and maintenance costs must be paid from the municipal budget.

Mohokare LM has a large percentage of indigent citizens who cannot afford to pay for municipal services, such as water or electricity for example. The revenue base is therefore smaller, and different policy options should be considered when deciding on infrastructure development, for example:

- Basic level of service : Communal standpipes
- Intermediate level of service : Yard taps, yard tanks
- Full level of service : In-house water.

Since National Government has a pro-poor policy, the poorest should be prioritised when resources are scarce. This also determines the type of infrastructure development the Council is willing to provide, and at what cost.

7.2 Community involvement

All infrastructure programs are important, but some may be more urgent than others. For example, water and proper sanitation facilities are basic needs, and may be more important for a community than improving the roads. It is important to involve the community in setting the priorities and to keep communication channels such as ward committee meetings open and transparent in order to properly discuss programmes and priorities. In this manner, ownership of the infrastructure is taken by the communities. Awareness is also created about available financial resources, thus projects can be prioritised.

8. PROJECT LIST

8.1 General

The implementation of the spatial planning proposals as contained in the Spatial Development Framework (SDF) will require renewal and/or upgrading of various infrastructure services.

The projects identified for prioritisation were drawn from the IDP as well as from discussions with the Technical Department of Mohokare LM. A technical analysis was used to propose projects that would contribute to solving the key issues identified in the IDP.

8.2 Service levels

Service level is a concept used to describe the level of infrastructure provision (see section 7.1 above). Within Mohokare LM the long term goal is to provide all citizens with the same level of service, irrespective of property value or levels of rates and taxes being paid. Due to imbalances inherited from the past, however, this will not be possible for the foreseeable future. As an interim measure, minimum levels of service should be adopted. In the prioritisation of projects, cognisance should be taken of wards where minimum service levels are not being met, and these should enjoy preference. Backlogs in terms of service levels, therefore, form part of the prioritisation method proposed.

8.3 Project list

This is shown in Annexure A.

9. CONCLUSIONS

The main focus of this abbreviated Water Master Plan was to consolidate and coordinate all the planning actions of Mohokare LM. The purpose was to present an acceptable infrastructure development plan to the Municipality in order to assist with the implementation of projects that will ensure the improvement and sustainability of the current water infrastructure so that the required economic growth of the area can be realised.

The Master Plan should be seen as the first step in a continuous process consisting of:

- Project identification, normally based on an recognised problem or need;
- preliminary design of project solution;
- inclusion of project in database and on maps;
- prioritisation of projects;
- allocation of funding and project execution;
- updating of project status in database and on maps; and
- development of an asset management programme for all the infrastructure.

The above process should be integrated into the normal operation of the Technical Department of Mohokare LM.

ANNEXURE A

PROJECT LIST - WATER

C: MASTER PLAN – SANITATION

INDEX

TABLES:

1. INTRODUCTION

1.1 General

Water services in South Africa, i.e. water supply and sanitation, are controlled by the Water Services Act (Act 108 of 1998). This Act deals with water services provision to consumers.

The provision of appropriate sanitation to a community should take place in accordance with national policy. Some of the more important aims and principles of the National Sanitation Policy are as follows:

- Improvement of health and quality of life.
- Development of communities.
- Protection of the environment.
- Household sanitation is the responsibility of the family or householder.

The minimum acceptable basic level of sanitation is:

- Appropriate health and hygiene awareness and behaviour for all.
- Provision of a system for disposal of human excreta, household wastewater and refuse. This system must be acceptable and affordable to all users, it must be safe, hygienic and easily accessible to all, and must not have an unacceptable impact on the environment.
- A toilet facility for each household.

As can be seen, the National Sanitation Policy distinctly addresses practicalities such as the direct need for a toilet facility for each household, and also takes the broader view that sanitation goes hand in hand with an effective health care education programme and the need for maintaining a healthy environment.

For the purposes of the Mohokare Sanitation Infrastructure Master Plan, it is assumed that for the provision of a toilet facility for each household, whether located in an existing or new development, or a future low-cost housing unit, the policy of the Municipality is provision of a sewer connection point as the eventual minimum basic level of sanitation.

Cognisance will also be taken of the following five criteria for any sanitation system proposed for Mohokare:

- Reliability
- Acceptability
- Appropriateness
- Affordability
- Sustainability.

With this in mind, the following principles from the White Paper on Basic Household Sanitation, September 2001, apply:

<u>Integrated planning and development</u>:

The health, social and environmental benefits of improved sanitation are maximised when sanitation is planned for and provided in an integrated way with water supply and other municipal services. The focal mechanism of achieving integrated planning and development is the municipality-driven Integrated Development Planning (IDP) process.

Basic sanitation is a human right:

Government has an obligation to create an enabling environment through which all South Africans can gain access to basic sanitation services.

The provision of access to sanitation services is a local government responsibility:

Local Government has the constitutional responsibility to provide sanitation services, while provincial and national government have a constitutional responsibility to support local government in a spirit of co-operative governance.

Water has an economic value:

The way in which sanitation services are provided must take into account the growing scarcity of good quality water in South Africa.

The "Polluter Pays" principle:

Polluters must pay the cost of cleaning up the impact of their pollution on the environment.

Sanitation services must be financially viable:

Sanitation services must be sustainable, in terms of both capital and recurrent costs.

Environmental integrity:

The environment must be protected from the potentially negative impacts of sanitation systems.

1.2 Objectives of the master plan

The objectives of the abbreviated Sanitation Master Plan are:

- A status quo evaluation of the sanitation systems already in place;
- an engineering determination of the required elements of sanitation systems; and
- a prioritisation of projects required to manage and complete the sanitation scheme(s) in the short, medium and long term.

2. BACKGROUND

Various sanitation technologies are available; however they are not all discussed in this document. It is accepted that human and industrial waste in Mohokare will be mixed with water, conveyed off site and treated elsewhere. This can be described as full waterborne sanitation with off-site treatment. In extreme cases where effluent needing special treatment is generated, it may be a requirement that on-site treatment is required, either fully or partially, before discharge into the municipal sewer system takes place.

The availability and increase in quantity of water supplied to an area naturally also increases the quantity of wastewater for disposal. This in turn leads to an increased demand for sanitation infrastructure such as reticulation pipes, outfall sewers, pump stations and treatment facilities. There are currently three wastewater treatment works (WWTW) in Mohokare Municipality, namely at Smithfield, Rouxville and Zastron. Each has a design capacity of 1.5Ml/d.

3. INFRASTRUCTURE

3.1 Status quo evaluation

3.1.1 General

Currently, Mohokare's Green Drop score is 65%, and there is thus much room for improvement in the operation of the various WWTW. A Green Drop Improvement plan has been prepared for the Municipality, and if the recommendations contained therein are implemented then much progress can be made in this regard.

Poverty is a great problem in Mohokare, with the result that many people with waterborne sewerage connections do not use toilet paper, and resort to materials such as newspaper, plastic bags, rags, etc. instead. This has predictable results as far as pipe blockages are concerned, and spillages are common. At Refengkgotso this problem is particularly exhibited, as described below.

Maintenance difficulties are also manifest, with tree roots entering pipelines being a particular problem. This problem is compounded by the fact that there is a shortage of vehicles for maintenance crews, and there is also a lack of sewer unblocking equipment in Smithfield and Rouxville. These issues should be addressed urgently. There are further problems caused by stormwater infiltrating the sewer reticulation systems, which causes the manholes to overflow; this is also a stormwater management issue, however.

There are still a number of cast iron covers on sewer manholes, which have a tendency to get stolen. These should be replaced by concrete covers as a matter of urgency.

3.1.2 Smithfield

It is reported that the Mofulatshepe outfall sewer is too small (200mm diameter) and subject to frequent blockages, causing spillages at manholes. As this pipe has probably reached the end of its design life, it should be upgraded.

There are still 52 bucket toilets in Mofulatshepe.

3.1.3 Rouxville

A section of Roleleathunya does not have any water connections to the toilets and also has no sewerage network. The community refuses to accept VIP toilets as they are demanding waterborne sanitation. There are consequently still 777 bucket toilets in existence here.

3.1.4 Zastron

The Zastron outfall sewer is also too small (150mm diameter) and should be upgraded.

There is a current project to upgrade the WWTW in Zastron.

There are still 10 bucket toilets in Refengkgotso.

The problem at Refengkgotso:

There are frequent blockages in the pipe network in Refengkgotso, which cause sewage to overflow at various manholes and house connections.

In June 2012 Messrs Isa & Partners Consulting Engineers investigated the problem of recurring sewage spillages. It was found that several foreign objects had been thrown into the sewer manholes; these included rocks, bricks, sheepskins, shoes, bottles, carpets, clothing, and even human foetuses. Manhole covers were being left open by Mohokare's sewer maintenance team and other unknown persons, which made it easy for this to occur. Furthermore, cleaning equipment (rods and heads) for unblocking sewers were being left abandoned in the pipelines by the maintenance team. In addition, rodding eye covers on various erven had been removed, which facilitated the deposition of foreign objects into the sewer erf connections. Ten connections had also been damaged by Centlec installing electricity poles, necessitating replacement, while eleven were so severely blocked that the pipes had to be replaced; similarly, four required re-installation due to pipeline gradient problems.

In July 2013 Messrs Pro-Plan Consulting Engineers carried out an additional investigation into the problem (see report "Investigation of sewer problems in Refengkgotso Township for Mohokare Municipality, August 2013"). A survey was performed that included taking levels of the as-built manhole inverts, from which pipeline longitudinal sections were produced. These showed a number of problems with regard to the gradient of some sections of the pipelines (either a negative or an extremely flat gradient). Full or overflowing manholes were also in evidence at these places.

It was not possible with a limited investigation to determine whether there were any other problems in the network, such as pipes sagging between manholes, broken pipes, etc. In order to quantify this problem, a detailed CCTV camera investigation was carried out in February 2014. It was confirmed that various sections of pipe were deformed and sagging between manholes, with numerous occurrences of reverse slope. Additionally, there were instances of cracked and broken pipes. It would appear that the initial construction of the pipelines was poor. Furthermore, it will not be possible to rectify the problem without complete re-construction of the affected sections.

3.2 Requirements for the Mohokare wastewater treatment works

The water demand figures in Tables B2 to B4 in the water master plan above have been used for the purposes of calculating the expected wastewater flows. Return flows have been assumed to be as follows:

- Smithfield, Rouxville and Zastron: 60% of water consumption
- Mofulatshepe, Roleleathunya and Matlakeng: 90% of water consumption.

WWTW capacities were taken from information provided by Mohokare LM, and a population growth rate of 2.5% per annum was assumed.

Smithfield/Mofulatshepe:

Table C1: Wastewater flows – Smithfield/Mofulatshepe

Area	Water demand (Ml/d)	Sewage flow (Ml/d)	WWTW capacity (Ml/d)
Smithfield	0.15	0.09	1.5
Mofulatshepe	0.78	0.70	
New development	0.26	0.23	
Totals	**1.19**	**1.02**	

Based on requirements inside the urban edge, the Smithfield area experiences a sewage flow of approximately 1.02Ml/d now, which will increase to 1.51Ml/d by 2030. It is seen that the capacity of the WWTW will be adequate up to at least 2030, after which it will need upgrading.

Rouxville/Roleleathunya:

Table C2: Wastewater flows – Rouxville/Roleleathunya

Area	Water demand (Ml/d)	Sewage flow (Ml/d)	WWTW capacity (Ml/d)
Rouxville	0.16	0.10	1.5
Roleleathunya	1.06	0.95	
New development	0.48	0.43	
Totals	**1.70**	**1.48**	

Based on requirements inside the urban edge, the Rouxville area experiences a sewage flow of approximately 1.48Ml/d now, which will increase to 2.20Ml/d by 2030. It is seen that the capacity of the WWTW is adequate at present, but will need to be upgraded soon.

Zastron/Matlakeng:

Table C3: Wastewater flows – Zastron/Matlakeng

Area	Water demand (Ml/d)	Sewage flow (Ml/d)	WWTW capacity (Ml/d)
Zastron	0.32	0.19	1.5
Matlakeng	1.96	1.76	
New development	0.43	0.39	
Totals	**2.71**	**2.34**	

Based on requirements inside the urban edge, the Zastron area experiences a sewage flow of approximately 2.34Ml/d now, which will increase to 3.47Ml/d by 2030. It is seen that the capacity of the WWTW, which has just been upgraded, is inadequate.

3.3 Asset management and maintenance

One of the important issues identified, as in the water master plan above, is the lack of proper asset management programmes; this will inevitably lead to the deterioration of the infrastructure and poor service provision. It is therefore of cardinal importance that asset management programmes be initiated as a matter of urgency.

Intensive maintenance of the present networks is an ongoing requirement and a maintenance programme should be put in place urgently. For a list of required maintenance items, reference should be made to “Service delivery and infrastructure maintenance plan” in the “Implementation Readiness Report: Mohokare Bulk Water Supply Scheme.”

4. TECHNICAL CRITERIA

Reference should be made to chapter 10 of the CSIR publication *Guidelines for Human Settlement Planning and Design* (“Red Book”) for the consideration of all future collection, transport, treatment and disposal elements of both domestic and non-domestic wastewater schemes in the municipality. This should encompass design options and design criteria, as well as management of the installed systems.

5. BACKLOGS AND FUTURE DELIVERY REQUIREMENTS

5.1 Community infrastructure needs and policy options

Similar to the water supply situation, there are areas within Mohokare Municipality that do not have an acceptable level of service of sanitation. Decisions regarding infrastructure development must be made within the framework of the IDP and the available resources. The appropriate service levels should be selected and questions must be asked about affordability and sustainability. Infrastructure development has ongoing cost implications for municipalities and different infrastructure assets can have varying cost implications depending on the level of service. External funding is often available for infrastructure development, but ongoing operating and maintenance costs must be paid from the municipal budget.

Mohokare LM has a large percentage of indigent citizens who cannot afford to pay for municipal services, such as water or electricity for example. The revenue base is therefore smaller, and different policy options should be considered when deciding on sanitation infrastructure development, for example:

- Basic level of service : VIP toilets
- Intermediate level of service : Flush toilets with septic tanks
- Full level of service : Full waterborne sewerage system.

Since National Government has a pro-poor policy, the poorest should be prioritised when resources are scarce. This also determines the type of infrastructure development the Council is willing to provide, and at what cost.

5.2 Community involvement

All infrastructure programs are important, but some may be more urgent than others. For example, water and proper sanitation facilities are basic needs, and may be more important for a community than improving the roads. It is important to involve the community in setting the priorities and to keep communication channels such as ward committee meetings open and transparent in order to properly discuss programmes and priorities. In this manner, ownership of the infrastructure is taken by the communities. Awareness is also created about available financial resources, thus projects can be prioritised.

6. PROJECT LIST

6.1 General

The projects identified for prioritisation were drawn from the IDP as well as from discussions with the Technical Department of Mohokare LM. A technical analysis was used to propose projects that would contribute to solving the key issues identified in the IDP.

6.2 Service levels

Service level is a concept used to describe the level of infrastructure provision (see section 5.1 above). Within Mohokare LM the long term goal is to provide all citizens with the same level of service, irrespective of property value or levels of rates and taxes being paid. Due to imbalances inherited from the past, however, this will not be possible for the foreseeable future. As an interim measure, minimum levels of service should be adopted. In the prioritisation of projects, cognisance should be taken of wards where minimum service levels are not being met, and these should enjoy preference. Backlogs in terms of service levels, therefore, form part of the prioritisation method proposed.

6.3 Project list

This is shown in Annexure B.

7. CONCLUSIONS

The main focus of this abbreviated Sanitation Master Plan was to consolidate and coordinate all the planning actions of Mohokare LM. The purpose was to present an acceptable infrastructure development plan to the Municipality in order to assist with the implementation of projects that will ensure the improvement and sustainability of the current sanitation infrastructure.

The Master Plan should be seen as the first step in a continuous process consisting of:

- Project identification, normally based on an recognised problem or need;
- preliminary design of project solution;
- inclusion of project in database and on maps;
- prioritisation of projects;
- allocation of funding and project execution;

- updating of project status in database and on maps; and
- development of an asset management programme for all the infrastructure.

The above process should be integrated into the normal operation of the Technical Department of Mohokare LM.

ANNEXURE B

PROJECT LIST - SANITATION