



# Pre-Feasibility for Water Supply and Sanitation; Siavonga Border Town, Zambia

## Consolidated Pre-Feasibility Report

**Project Code and Title: FP09-004, 12 Towns Water and Sanitation**

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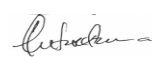

16 March 2016



**Quality Assurance Checklist:**

In preparing this Document CRIDF can confirm that it has followed CRIDF internal general procedures including, appropriate CRIDF generic scope of work and that it has undergone appropriate QA and quality control procedures as detailed in CRIDFs QA manual. Furthermore, CRIDF can confirm the applicable specific internal process and procedures have been followed as appropriate:

- CRIDFs cost benefit assessments (CBAs) guideline have been applied as appropriate;
- CRIDF Gender Equality and Social Inclusion (GESI) guidelines have been applied as appropriate;
- CRIDFs climate vulnerability mapping methodology has been applied as appropriate;
- CRIDF Climate Change Risk Assessment/Vulnerability mapping protocol have been applied as appropriate;
- CRIDFs Procurement guidelines have been followed as appropriate;
- The appropriate CRIDF screens.

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**Disclaimer**

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## List of Acronyms

Acronym	Long-Form
AfDB	African Development Bank
CCRA	Climate Change Risk Assessment
CRIDF	Climate Resilient Infrastructure Development Facility
IDP	Integrated Development Plan
GESI	Gender, Equality and Social Inclusion
GI	Galvanised Iron
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
HDPE	High Density Polypropylene
KII	Key Informant Interview
KfW	Kreditanstalt für Wiederaufbau
km	Kilometre
MLGH	Ministry of Local Government and Housing
MWS	Ministry of Works and Supply
NWASCO	National Water Supply and Sanitation Council
O&M	Operation and Maintenance
OBC	Outline Business Case
SADC	Southern African Development Community
SWSC	Southern Water and Sewage Company
USD	United States Dollar
WASH	Water, Sanitation and Hygiene
WSS	Water Supply and Sanitation
WTP	Willingness To Pay
ZESCO	Zambia Electricity Supply Corporation Limited
ZMW	Zambian Kwacha

## Section 1: Introduction

The Climate Resilient Infrastructure Development Facility (CRIDF) is DFID's innovative water infrastructure programme for southern Africa. Working to deliver sustainable small-scale infrastructure across 11 SADC countries, the demand-driven programme focuses on water services, water resource management, and water for livelihoods, fostering sustainable development of the region's water resources and addressing the water, food and energy nexus.

CRIDF prepares small-scale water infrastructure projects and facilitates access to finance for the implementation of these projects. Such interventions provide the entry point and platform for CRIDF to engage with, support and influence key SADC interventions, river basin organisations and national stakeholders. Activities are selected according to a set of CRIDF principles to ensure that investments align with strategic objectives that have been developed specifically for each SADC river basin.

Access to reliable and safe water supply and quality functional sanitation facilities at border towns in the Southern African Development Community (SADC) region has emerged as a major challenge and threat that needs urgent redress to assure continued and uninterrupted activities at these strategic centres. Inadequate levels of water access and sanitation facilities can result in water borne disease transmission across borders, which can lead to severed relations amongst neighbouring states and eventually impede trade, tourism and other commercial and social activities within the entire sub-region. Inadequate water supply especially can also become prevalent due to adverse unexpected changes in the climate evidenced by low rainfall, lowered water table levels, drying rivers, streams, wells, boreholes and springs.

### **Zambian Border Towns Projects**

The 12 Zambian Border Towns Water and Sanitation Project, henceforth referred to as the Zambian Border Towns project, was first identified in studies by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) several years ago. Various entities continued to cite the project in the following years, and the SADC Regional Water Infrastructure Investment Conference held in Maseru (Lesotho) in September 2011 identified it as a priority project.

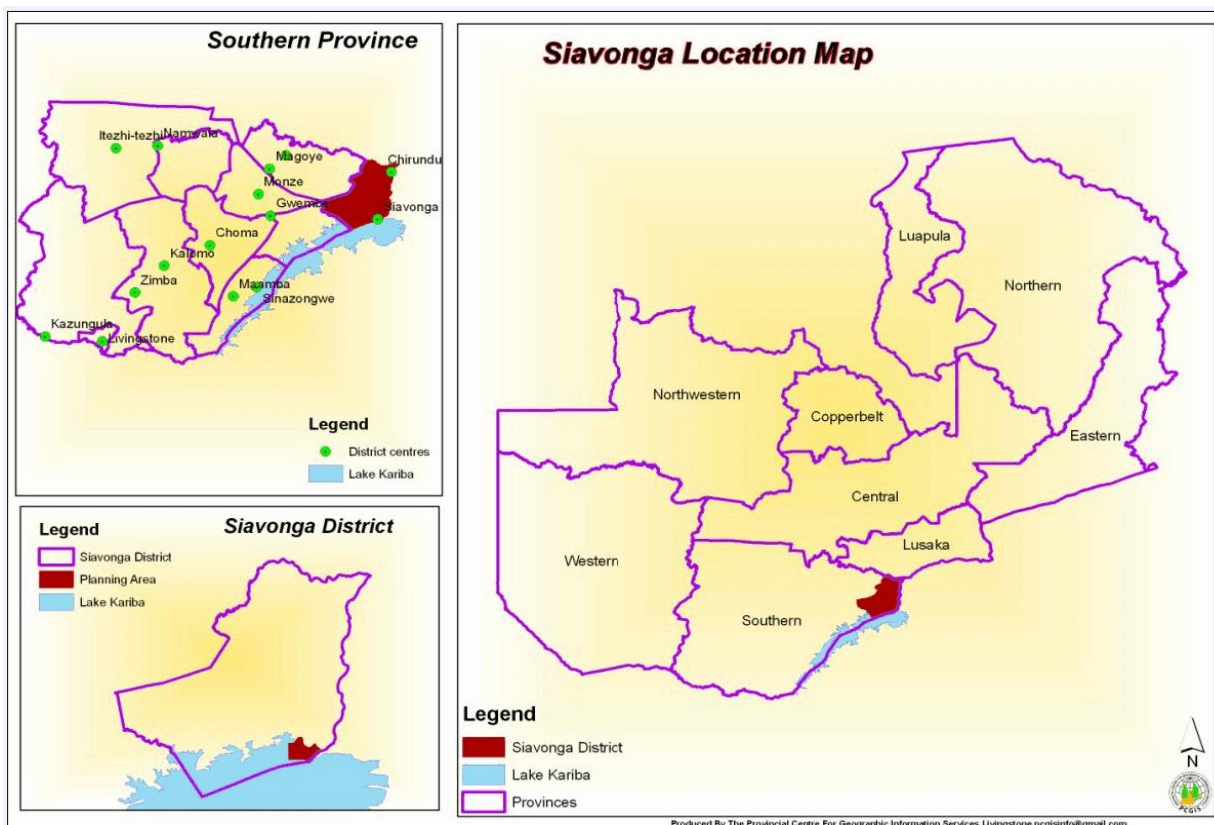
This suite of projects as originally envisaged to provide water through the rehabilitation of water supply systems and boreholes and to improve and promote favourable hygiene behaviours. These interventions are broadly intended to upgrade the water and sanitation services of the select towns whilst indirect benefits are due to accrue to improved regional trade and tourism as well as the reduced incidence of cross-border waterborne diseases.

Although the original project identified 12 border locations for project implementation, further analysis showed that only eight locations would justify investment in water supply and sanitation due to limited cross border traffic at the other four locations. From these eight, CRIDF is currently engaged in undertaking work in five of these towns, entailing a feasibility assessment for Chirundu town, preparing detailed design and financial

closure documents for Kazungula, Chipata (Mwami) as well as Chanida and a preliminary assessment activity in Siavonga (this report).

**Introduction to Siavonga**

The town of Siavonga is located on the banks of Lake Kariba, and links Zambia to Zimbabwe over the Kariba dam wall. Siavonga falls within the Siavonga District Council, which is part of the Southern Province of Zambia (Figure 1).



**Figure 1 : Locality of Siavonga District**

Siavonga was not initially prioritised by CRIDF for project support due to more pressing needs at other border towns in the country (such as Mwami (Chipata), Kazungula and Chirundu). However, the Siavonga project has received attention from the Zambian government, as well as prospective funders for the Zambia Border Towns project, making it beneficial for a pre-feasibility study to be undertaken by CRIDF.

While the Siavonga border post is not strategic in terms of its daily number of border patrons, its location indicates a level of importance for two reasons:

- 1) The town is built at the dam wall, close to the hydropower station on the left bank. Its residents are vital to its on-going operation and maintenance.
- 2) The town is built on the banks of Lake Kariba, ~200km from Lusaka. It therefore has the potential of being an important tourist destination for Zambia.

Thus, while the town is still relatively small and undeveloped, with the correct investment in infrastructure, it could grow into an important income-generating hub for the country.

In terms of its water supply and sanitation provision, the town services function relatively well. Southern Water and Sewage Company (SWSC) is active in the area, and is currently upgrading water infrastructure in the town. There are, however, severe challenges to water and sanitation provision in areas which have historically been serviced by Zambia Electricity Supply Corporation Limited (ZESCO). Thus, while the border post itself does not suffer from water supply challenges, the sprawling residential areas around the border post are seriously under-provided for.

ZESCO is currently providing water and sanitation infrastructure to these areas, but has limited incentive to provide a high-standard of service provision. SWSC on the other hand, while mandated to provide water within these areas, does not have an incentive to invest in infrastructure in the area due to ZESCO's ownership of the existing infrastructure. The result is that communities bear the brunt of this institutional complexity and lack sufficient quality water and sanitation services.

### **Findings of the Outline Business Case (OBC)<sup>1</sup>**

As the first phase of the pre-feasibility study, CRIDF prepared an Outline Business Case (OBC) to confirm the project met the CRIDF eligibility criteria. Specifically, the OBC serves to assess the project in terms of the following parameters:

- Demand risk;
- Expected scope and level of investment;
- Expected benefits; and
- Institutional arrangements necessary for sustainability
- Feasibility for cost recovery during the operation and maintenance (O&M) stage

The OBC selected Micho, a suburb of Siavonga and the closest proximity to the border post (

**Figure 2**), as the proposed CRIDF project. Micho, a township bordering the hydropower plant, is one of the areas supplied by ZESCO and is significantly underserved. Micho was initially developed by ZESCO as part of the Kariba Dam Hydropower project and is still managed by ZESCO, with the future expectation for SWSC to take over water supply and management. Until the institutional challenges in Micho Township are resolved,

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<sup>1</sup> CRIDF, ' Pre-Feasibility for Water Supply and Sanitation, Siavonga Border Town, Zambia, D01: Outline Business Case', February 2016



project financiers will be unable to provide support to SWSC for Water Supply and Sanitation (WSS) infrastructure.

The OBC report came to the following conclusions:

- There is strong institutional buy-in from SWSC for the proposed project, which has already made in-kind contributions to project preparation by making its planning engineers available for conducting site inspections. Further, SWSC has a good record with tariff collection and operates on a 95% metering basis. Assuming that tariffs are levied on the use of the WSS infrastructure, it is likely that the operational sustainability of the project will be strong based on SWSC's experience in the rest of Siavonga.
- The investment will contribute to CRIDF's core objectives of climate resilience and pro-poor development, and is relevant at a regional level through its institutional arrangements and demonstration potential.

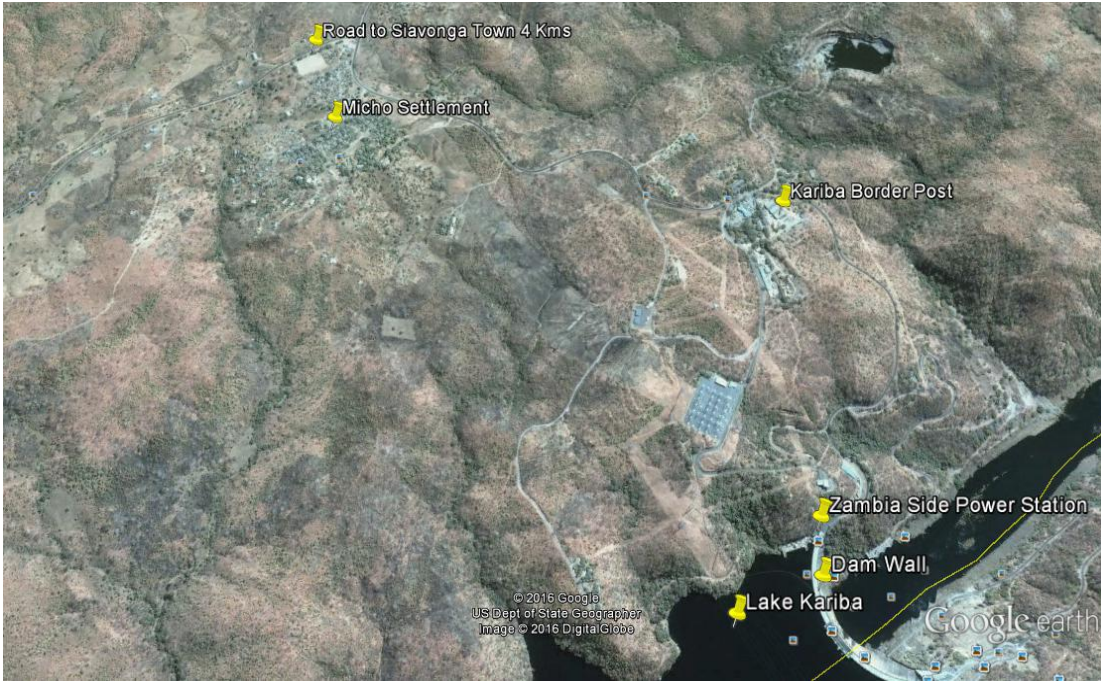
### **Pre-Feasibility Consolidated Report**

The pre-feasibility study follows on from previous work undertaken by CRIDF, including the Zambian Border Towns scoping mission conducted in 2013 and the Siavonga OBC.

This report therefore summarises the feasibility of providing improvements to the existing water supply and sanitation infrastructure at Micho settlement (located just north of the Kariba border post in Siavonga District, Southern Province of Zambia).

This report is divided into the following key sections:

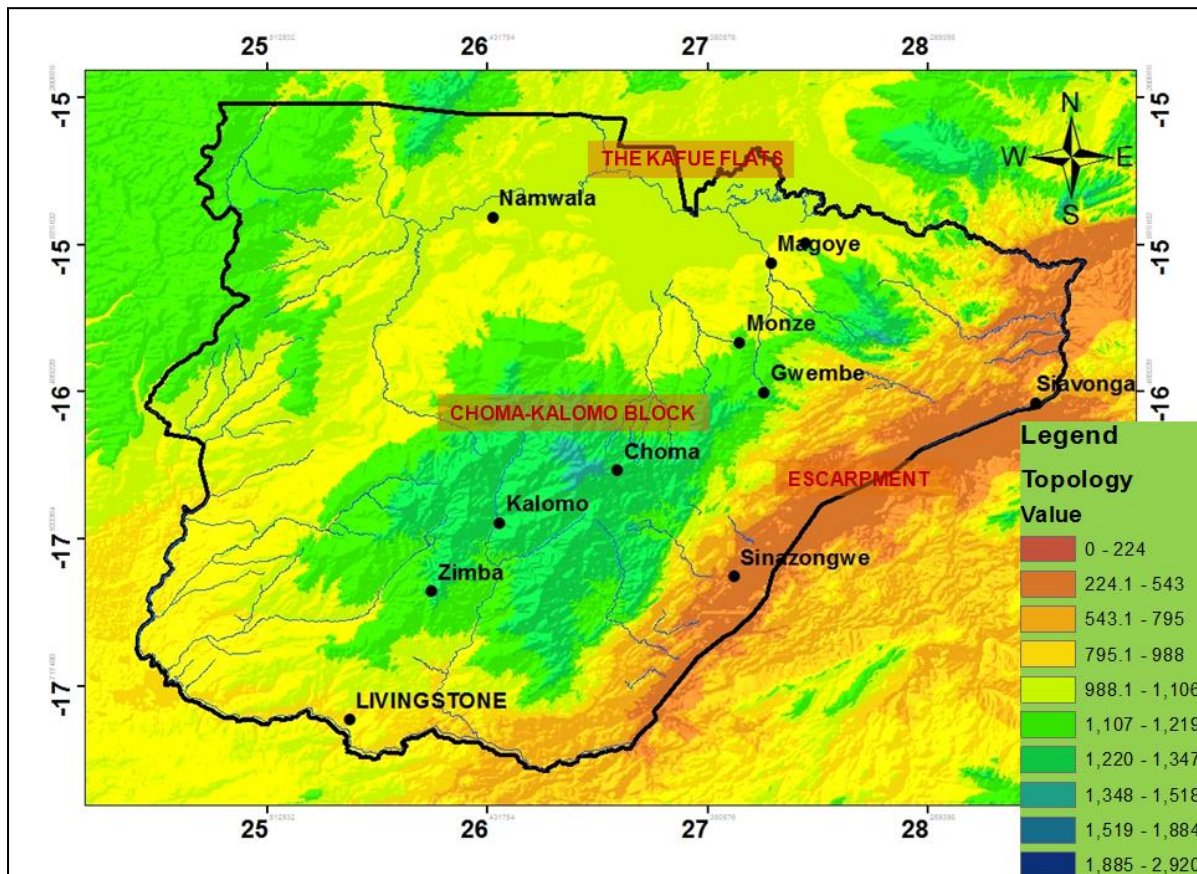
- Section 1 – Introduction (this section)
- Section 2 – Technical Scope and Assessment
- Section 3 – Layout Design and Budget Estimate
- Section 4 – Gender, Equality and Social Inclusion
- Section 5 – Climate Change and Environmental Considerations
- Section 6 – Institutional Capacity of the Southern Water and Sewerage Company
- Section 7 – Operation and Maintenance Issues
- Section 8 – Risk Analysis
- Section 9 – Conclusions and Recommendations



**Figure 2: Aerial view of Micho Settlement and its proximity to the border**

## Section 2: Technical Scope and Assessment

Siavonga is located on the eastern side of the Southern Province, which is located in the southern part of Zambia. It lies close to the Kariba Dam which is on the Zambezi River and is one of the low lying towns in Zambia with an elevation of just between 500 and 625 m above mean sea level (**Figure 3**).



**Figure 3: Topographical map of Southern Province**

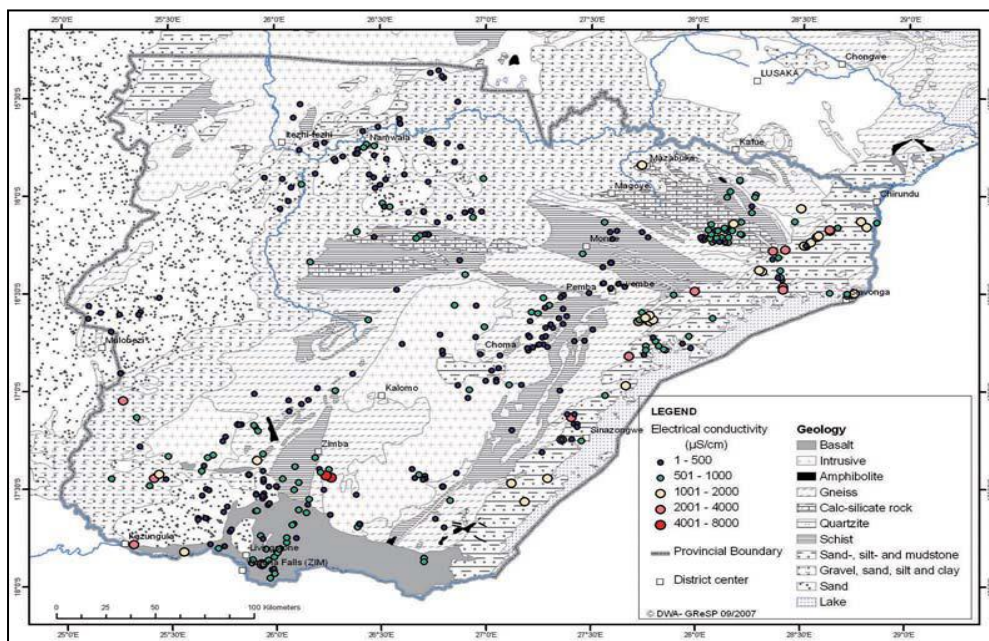
### Groundwater Resources – Quantity Aspects

The major aquifer system in the areas near Siavonga are gneiss and undifferentiated metamorphic rock whose lithology is predominantly gneiss and granitic gneiss within the Basement, Katanga and Muva Super groups. Groundwater in this type of lithology is restricted to fractured or weathered gneiss. This is an aquifer system associated with low yields. Specific yields are predominantly less than 1 l/s.m which would be inadequate to cater for the overall demand.

Bäumle et. al., (2007)<sup>2</sup> state that the majority of aquifer systems of southern province, especially those in the central areas which are formed by granitoidic and basement rocks, have limited potential. He suggests that these are only suitable for smaller withdrawals like private consumption or local rural water supply through hand pumps. *The low yield potential therefore discounts groundwater as a source as the low yields would result in low production and consequently low reliability.*

**Groundwater Resources – Quality Aspects**

Development of groundwater resources requires that the quality of the resource is assessed alongside the available quantity. Available data on groundwater quality for southern province for most parameters including nitrites, nitrates, iron, manganese, fluorides, arsenic as reported by Bäumle et. al., (2007) generally conform to the Zambian standard for drinking water quality (ZS 190<sup>3</sup>). However, sodium, and electrical conductivity (which is a measure of salinity) are reported to be high in the Zambezi Valley where Siavonga is located. Groundwater conductivity for boreholes in the vicinity of Siavonga that were analysed ranged from 500 to 2000 µS/cm. Water with conductivity above 1500 µS/cm is indicative of water with high salinity. This therefore means that for Siavonga, apart from the low aquifer yields, salinity could also be a problem (**Figure 4**). Treatment requirements for salinity are complicated and expensive.



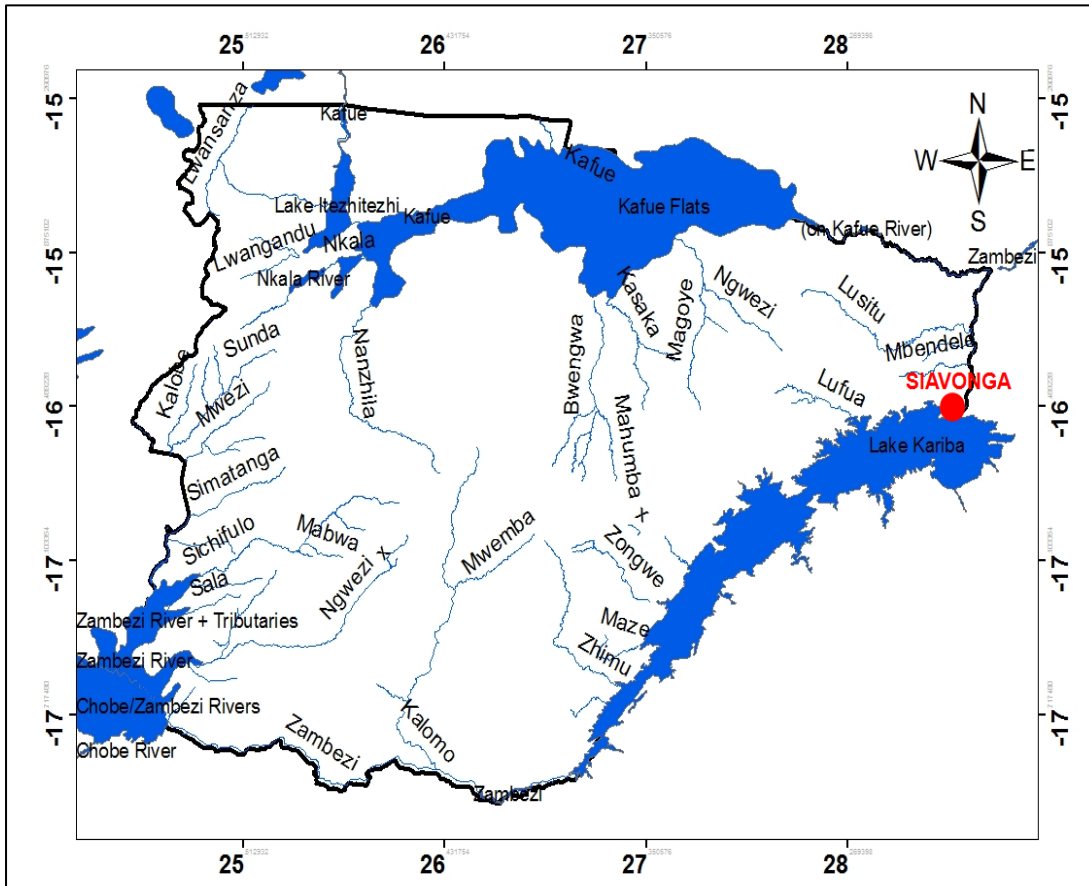
**Figure 4: Salinity distribution in groundwater in Southern Province**

<sup>2</sup> Bäumle R., Neukum C., Nkhoma J., Silembo O. (1997). *The Groundwater Resources of Southern Province, Zambia (Phase 1) Volume 1 - Technical Report*

<sup>3</sup> Zambian Bureau of Standards, ZS 190 - Drinking Water Quality Specification, 2010

**Surface Water Resources – Quantity Aspects**

The Southern part of Zambia, where Siavonga is located, receives the lowest rainfall in the country with mean annual rainfall ranging from 650 to 800mm. Most of the rivers in this part of the country are seasonal. However, Siavonga is located along the northern bank of Lake Kariba which has a volume of approximately 185 cubic km at maximum storage capacity ( Figure 5).



**Figure 5: Hydrological Map of Southern Province**

The lake is over 223 kilometers long and up to 40 kilometers in width covering an area of 5,580 square kilometers. The storage capacity of Kariba is sufficient to ensure adequate quantities for water supply to Siavonga all year round..

**Surface Water from Lake Kariba – Quality Aspects**

The lake acts like a massive sedimentation tank and hence subjects the water to “pre-treatment”. An enormous reservoir such as Lake Kariba also buffers water quality such that even under heavy storms, the water quality variation is within a small range. The retention time the water is subjected to enables suspended particle settlement which improves the aesthetic quality. The water quality results provided in

**Table 1** give an indication of the water quality that can be expected from Lake Kariba.

**Table 1: Water quality results for Lake Kariba raw water**

Parameter	Water Quality Result <sup>4</sup>	Zambian Standard Value
Phosphorus (mg/l)	0.0064	≤6*
Nitrate (NO <sub>3</sub> as N - mg/l)	0.015	≤10
Conductivity (µS/cm)	118.2	≤1,500
pH ( - )	7.4	6.5 – 8.5

\* WHO Guideline Value

These few water quality parameters are compared to acceptable drinking water quality and are all well within the requirements. Furthermore the low nutrient levels in the water indicate that algae will not be a problem.

Although no data is available for the suspended solids (measured as turbidity) of the water, it can be assumed that this would be the only parameter that may be a problem. However, as previously stated even the turbidity is expected to be low due to the large settlement time provided by the lake. In the dry season, this water would qualify for direct filtration using slow sand filters. Surface water therefore clearly is the best option as a source for raw water.

### Project Identification and Prioritization

During a site visit to Siavonga in January 2016, Micho, Nsanje Muleke (**Figure 6**) and Smoke were identified in Key Informant Interviews (KII) as priority areas. These Siavonga suburbs were also identified by the town's Integrated Development Plan (IDP) as the priority areas in need of support.

Due to Nsanje Muleka, Blacksoil and Smoke being semi-rural town developments, with low population numbers, it is proposed that they not be included in the first phase project design. Therefore Micho was selected as the priority project focus, due to the condition of the WSS infrastructure, the high population size and high population density.

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<sup>4</sup> Yalelo Limited, Environmental Impact Assessment Report, 'Development of a Tilapia Aquaculture Project in Kamimbi, Siavonga District on Lake Kariba', June 2012



**Figure 6: Sparsely populated area of Nsanje Muleke**

Source: CRIDF (2016)

### **Micho Background**

Micho was established by ZESCO as temporary housing for employees working on the construction of the Kariba Dam wall in the 1950s. Since then, the temporary residences have become permanent and the area faces severe socio-economic challenges, particularly in the acute shortage of public services to residents in the area. Micho currently has a population of approximately 5,022 people which reside in 930 households (5.4 people per household). Of these, approximately 230 are original ZESCO houses.

Micho is currently not served by SWSC, but by ZESCO due to the legacy of ZESCO employees living in the area. The quantity of water supplied by ZESCO in Micho is currently insufficient and the water quality is poor due to the fact that water pipes and sewer pipes share inspection chambers.<sup>5</sup> SWSC have noted that water supplied through this network of pipes is currently not suitable for human consumption.<sup>6</sup>

### **Water Demand of Micho**

The current water provision to Micho is not representative of the water demand of a reliable water supply system. The water demand calculations presented in the OBC<sup>7</sup> report highlighted a number of challenges:

- Growth rates, which vary significantly between the district and Siavonga Town, and
- Consumption demand, which will vary based on the type of connection, the type of household and the ability to pay.

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<sup>5</sup> Siavonga IDP (2012) Status Quo Report

<sup>6</sup> Siavonga IDP (2012) Status Quo Report

<sup>7</sup> CRIDF, 'Pre-Feasibility for Water Supply and Sanitation, Siavonga Border Town, Zambia, D01: Outline Business Case', February 2016

The OBC estimated that the future water demand would be about 270 to 300 m<sup>3</sup>/d. However, this report used a consumption estimated average of 40 l per person per day.

As an indication of the required current and future water demand, the water demand was estimated for Micho based on variation of the consumption. The average consumption per household type as per **Table 2** was used to calculate the water demand. It should be noted that the selected consumption is lower than those proposed in the Zambian Standard ZS 361, 'Water supply systems-consumption figures for design - guidelines'. The reason for using lower figures is the expectation of the ability to pay for water services.

**Table 2: Typical Average Per Capita Consumption**

Category	Average per capita consumption litre/capita /day
High Cost	100
Medium Cost	75
Low Cost and Transient Consumers	40
Low cost – communal (Peri-Urban / Rural)	25

The total number of households in Micho is estimated as 930. The proportion of households falling into each of these categories has been assumed as per

**Table 3.** These proportions should be confirmed in future studies.

**Table 3: Assumed proportions of existing housing categories in Micho**

	Proportion and Number of Houses by Category			
	High Cost	Medium Cost	Low Cost	Low Cost - Communal
Proportion	Formal ZESCO houses	10%	40%	50%
Houses	230	70	280	350
Population	1,242	378	1,512	1,890

Based on these assumptions, the estimated water demand is presented in

**Table 4.**

**Table 4: Estimated Water Demand for Micho**

Household Type	Consumption (l/c/d)	Population	Demand (m <sup>3</sup> /day)
High Cost	100	1,242	124.2
Medium Cost	75	378	28.4
Low Cost (Yard)	40	1,512	60.5



Low Cost (Kiosk)	25	1,890	47.3
			260.4

At a growth rate of 3%, the water demand in 2026 will be about 350 m<sup>3</sup>/d.

## Section 3: Layout Design and Budget

### Existing Situation

The CRIDF team were not allowed access to the water abstraction and treatment infrastructure operated by ZESCO, since the intake and treatment plant is situated within the power station precinct, which is regarded as a “security-sensitive area”. Therefore the technical team could not verify the capacity, configuration or conditions of the existing infrastructure operated by ZESCO.

SWSC reported that<sup>8</sup> the Micho abstraction and water processing infrastructure was adequate to meet current demand in the original plus the expanded areas of Micho.

The current WSS infrastructure operated by ZESCO to provide services to Micho settlement (currently only a small proportion) comprises the following:

- i) Intake and abstraction pumps, abstracting raw water from the Zambezi River
- ii) A mini water treatment plant, with conventional treatment, comprising coagulation, sedimentation, filtration and chlorination
- iii) High lift pump units at the intake point
- iv) Concrete ground storage tank, capacity 200m<sup>3</sup>
- v) Distribution pipe network to ZESCO households (230 households)
- vi) Communal ablution facilities for ZESCO households
- vii) Communal septic tanks for ZESCO households

The following figures provide a photographic record of the existing infrastructure in Micho.

**Figure 7** is a photograph of the Micho storage tank, which is developing severe cracks and therefore is in dire need of replacement.

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<sup>8</sup> Field discussions with District Manager for SWSC Mr Francis Siatwinda



**Figure 7: 200 cubic meters existing concrete tank**

**Figure 8** is a typical ZESCO house in Micho. Although the ZESCO houses are old and require maintenance and repairs, they nonetheless have access to a household tap.



**Figure 8: Typical ZESCO house in Micho Settlement**

These households have access to communal ablution facilities which flow into communal septic tanks, shown in **Figure 9**.



**Figure 9: Communal ablution block and septic tanks**

Water and sanitation facilities provided by ZESCO, have not been expanded to service the growing local population. Of the 930 households in the area, approximately 700 (**Figure 10**) are without formal access to water and sanitation.<sup>9</sup> Instead, they are required to collect water at the ZESCO houses which have a water supply. This situation is problematic, particularly due to the fact that the ZESCO households currently only receive water for two or three hours a day. The area is in need of additional communal and household water connections.

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<sup>9</sup> Meeting Minutes (Appendix 1)



**Figure 10: Part of the un-serviced 700 no households in Micho Settlement**

### **Key Issues - Water Supply**

The current water supply layout that services the 230 ZESCO houses requires rehabilitation and upgrade to improve the carrying capacity and overall reliability. The water quality is also reported to be poor due to the fact that water pipes and sewer pipes share inspection chambers.<sup>10</sup> SWSC have noted that water supplied through this network of pipes is currently not suitable for human consumption.<sup>11</sup>

The other 700 households in Micho access water from the ZESCO houses.

### **Key Issues - Sewerage Services**

ZESCO housing units have access to communal ablution blocks that use common septic tanks. These septic tanks have not been serviced by ZESCO (or SWSC) for over three years and need to be serviced and emptied.

The other 700 households in Micho access the ZESCO ablution facilities, have dug informal pit latrines or practice open defecation.

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<sup>10</sup> Siavonga IDP (2012) Status Quo Report

<sup>11</sup> Siavonga IDP (2012) Status Quo Report

The highly undulating topography of Siavonga coupled with the haphazard layout of houses in the Micho settlement severely complicates the construction of a sewerage network. A sewerage network will prove to be unaffordable due to the following:

- i) Requirement for several pumping stations to provide the required head to the sewage flowing through the pipes. These will require energy and increased manpower
- ii) Micho is an un-planned settlement as evidenced by the jumbled layout of the houses. Construction of a sewerage network would require that some houses be demolished along the proposed routes which would increase the project costs as compensation would have to be availed to those affected
- iii) Would require the construction of a conventional sewage treatment plant
- iv) There could be resistance from the community

On-site sanitation is therefore the most appropriate solution. However the community would need to be trained on how to properly construct improved pit latrines as opposed to the current informal toilet structures (**Figure 11**).



**Figure 11: Poorly constructed latrines in Micho Settlement**

### **Proposed Infrastructure Intervention - Water Supply**

The following water supply infrastructure upgrades are proposed for the Micho community:

- Provision of a supply network to service the unserved part of Micho (Micho Extension).
- Replacement of the pipe network in Micho, removing leaking pipes and unintended contamination of water supply (High Density Polypropylene (HDPE) pipes will be replaced with Galvanised Iron (GI),

due to the rocky geology the pipes need to be buried at a shallow depth. GI pipes perform better under these circumstances in very hot environments such as the Siavonga area.

- Installation of bulk meters to manage water balances
- Construction of water kiosks to supply unserved areas
- New 300 m<sup>3</sup> Braithwaite pressed steel storage tank
- Refurbishment of Treatment Works

The proposed pipe layout and detailed legend is given on the drawing attached in **Appendix 2**.

### Proposed Infrastructure Intervention – Sewerage

The following sewerage infrastructure upgrades are proposed for the Micho community:

- Provision of new communal ablution blocks to the unserved part of Micho (Micho Extension), together with required septic tanks.
- Emptying of existing septic tanks
- Refurbishment of existing communal ablution blocks and septic tanks
- Behavioural change programme
- Information sharing to individual households for onsite Ventilated Improved Pit Latrines (VIPs).

### Project Budget

The cost of the proposed project as shown in **Table 5** is estimated to cost approximately £200,000.

**Table 5: Proposed budget**

Cost Item	ZMW	GBP
Storage Reservoir	250,000	15,500
Pipe network and accessories including chambers, valves and 3 water vending kiosks	2,165,000	134,500
Sanitation facilities and assistance with existing septic tanks	645,000	40,000
Refurbishment of treatment works	160,000	10,000
<b>Total</b>	<b>3,220,000</b>	<b>200,000</b>

### Other Projects that could be included in the Feasibility Study

The Outline Business Case (OBC) and Pre-Feasibility report have identified Micho as the priority project for full assessment. There are, however, many projects in Siavonga that could also be considered and should be further scoped as part of the Feasibility Study – possibly for future funding initiatives:

- SWSC indicated that at present the Non-Revenue Water (NRW) in Siavonga is 50%. This could be a valid climate resilient intervention for the broader town of Siavonga, which would include meters and leak detection.
- The water supply of the peri-urban areas around Siavonga is excluded due to the low population and population density. Information on these areas should be documented.



## Section 4: Gender, Equality and Social Inclusion

This section of the report gives a brief presentation and rating of the existing Gender Equality and Social Inclusion (GESI) issues in the Pre-feasibility for Water Supply and Sanitation, Siavonga Border Town, Zambia. The aims of conducting a GESI assessment include determining how and to what extent the project would produce benefits for the poor and contribute to pro-poor development; examining expected social impact and changes in quality of life to women and children. This GESI assessment was conducted through a desk review of project information provided by the Technical and Economic experts on the pre-feasibility team, and existing secondary sources. Therefore, in the absence of a detailed social and environmental assessment, some statements are largely generic to the WSS sector.

### **Supporting Legislative and Policy Frameworks for Gender and Water Supply and Sanitation**

There are a number of national legislative and policy frameworks that promote delivery of water and sanitation services to the Zambian populations both in rural and urban areas. The overriding principal document is the Constitution of the Republic of Zambia which guarantees measures with respect to the participation of women and men in the development process with equal opportunities where every person has the right to a reasonable standard of water and sanitation and that any law, culture, custom or tradition that undermines the dignity, welfare, interest or status of women or men is prohibited. The National Water Policy of 2010 and the National Water and Sanitation Policy under revision is intended to provide clear guidelines on how players of sub-sectors should maintain standards of hygiene and clean water supply provision. This is in addition to many other national and international policy documents such as the National gender Policy, the Sixth National Development Plan and the 2013 Southern African Development Community (SADC) Gender Protocol Barometer.

These mentioned instruments have assisted in raising awareness amongst water and sanitation service institutions of the need to ensure full coverage of services regardless of the status of the settlements. This is with realisation of the measureable and immeasurable positive impacts of reliable water supply and sanitation service systems.

However, Micho is currently supplied with water and sewerage services by ZESCO due to the historical linkage to the Kariba Dam construction and hydropower project. The critical institutional issue of transferring the Micho infrastructure (and responsibility for development and service delivery) should be resolved as it is delaying investments and accrued benefits of reliable adequate water supply and sanitation to the residents of Micho settlement.

### **Risks and Impacts of Current Water Supply and Sanitation in the Project Area**

The Project area (Micho settlement) presents a picture of a peri urban area characterised by limited service provision in terms of water supply, sanitation, road infrastructure, markets and other services. The sprawling unplanned housing area could have been due to limited housing and plots in the planned areas of the town.

Unplanned areas are regarded as illegal and not part of the council's budget administratively but would be politically recognised. Water supply and sanitation deficits in these areas lead to the following risks and impacts for residents.

#### **a. Time constraints**

Since fetching water and ensuring good hygiene are commonly a responsibility of girls, boys and women, there is a constant demand on their time and emotional energy to ensure that households have adequate clean water. Therefore provision of reliable water supplies either through a house connection or a communal water point within a stipulated distance of the required 200m from the furthest house shortens the distance and reduces the time spent in fetching water; this results in more time for school children to study and women to engage in other social, religious and income earning activities.

#### **b. Health Impacts**

The proposed Project will not only enhance the health of all members of households but also contribute to the general economy of the district upon which it depends. Where people do not have access to clean water (from source and storage) and good sanitation, they are likely to suffer a myriad of complications that affect their health and economic potential. In the absence of proper infrastructure for WSS, communities are often susceptible to water borne diseases, with time and money spent on caring for patients. Since women are responsible for care giving, an increase in water borne diseases limits their potential economic freedom. Providing quality water reduces water borne diseases, which relieves women of the burden of care for the sick. Girls also suffer the disproportionate impact of poor WSS services, as they face specific risks with regard to privacy and security with respect to sanitation at home.

#### **c. Power and decision-making**

User's and particularly women's low participation in decision-making in WSS projects has serious implications for maximising their benefits. CRIDF's participatory approach of consulting Project users shall enhance women's empowerment and benefits. Specifically women's involvement in decision making on water point siting, design, management, WSS pricing options, and access is critical. If women's participation is limited, full and appropriate usage of infrastructure improvements may not be realised and might result in negative impact on achievement of Project objectives.

#### **d. Social inclusion**

SWSC like other commercial utilities provide four main water supply levels namely:

- i) House connections, where a house has plumbing facilities supplying water to the kitchen and bathrooms;
- ii) yard connections, which is a provision of a tap outside the house to service one household that does not have house plumbing facilities inside the house. Usually water vending from this source is not allowed;
- iii) water kiosks and Trusts– these receive treated water from the company through a piped distribution network and residents buy water at a lower tariff compared to the house and yard connections. These kiosks

can be operated by employees of the company or self-employed operators under a contract from the company of community Trust;

iv) standpipes – this is a community water tap where community members draw water at a fee.

*If above service level options are considered, the Project shall optimally cater for different socioeconomic groups such as the poor who shall be accorded an opportunity to select a service they would be able to afford.*

Similarly, Micho residents should be given a range of sanitation technologies that are socially acceptable, affordable and environmentally friendly to avoid cumulative environmental degradation and public health problems in case of deterioration.

#### **e. Empowerment and improved quality of life attained through Employment creation and access to opportunities**

The Project will meet this significant success factor, as it will provide both short and long term employment. During installation of water reticulation systems, improvement of ablution facilities, sanitation infrastructure and construction of kiosks, a few locally available skilled, semi-skilled and unskilled workers will be employed for a limited number of days. If kiosks are installed priority should be given to women to be employed as private kiosk operators. Kiosk management is particularly suitable for disabled members of the community.

Further, though for a short while, women will have the opportunity to sell food and other perishables sourced locally to contractors and their workers. This will improve the local economy and ultimately the quality of life. Involvement of residents in the design, development and post implementation gives them a feeling of ownership and contribute to sustainability.

#### **f. Cleaner Secured physical environment**

Currently, the conditions, particularly in areas surrounding the original residential area, is very risky due to the numerous public health threats of inadequate water supply and the absence of formal sanitation facilities. The environmental threats due to leakages of pipes, dysfunctional ablution facilities with accompanying emissions of harmful polluting gases into the atmosphere make the program a very timely and opportune intervention for public health reasons.

Emissions create an environment of odours and flies, which coupled with rain water leads to unfavourable physical environment. This makes life for children and women who are normally at home unbearable. In addition dilapidated infrastructure increases the chances of infiltration and exfiltration leading to contamination of clean water.

#### **g. Safety**

From the gender perspective, improved pit latrines, which are not part of the main dwelling place are not encouraged as they make it difficult for household members to access in the night. In Zambia and elsewhere,

it is a common norm that women and girls bear the burden of ensuring that the household has adequate WSS facilities at the household level. As a result, they are exposed to sexual harassment and abuse while collecting water and accompanying children in the night to sanitation facilities that are outside the house. Furthermore there is lack of privacy and increased workload of cleaning of these facilities.

#### **h. Payment for Water and Sewerage (for ZESCO employees) services**

A major challenge that is yet to be substantiated are that the poorest households, some of which could be female or child headed households, may not be able to access the benefits of the Project because they may not be able to pay for construction of environmentally friendly latrines, and water bills that accompany improved sanitation and clean drinking water. Payment for water and sanitation might be particularly difficult for Micho residents who are used to ZESCO supplied free water services. This makes it unattractive for the SWSC to operate and manage the WSS investments..

#### **i. Increased rental housing**

Rental housing is commonplace in most peri-urban areas like many other residential housing areas. The associated risk of rental housing to the poor include the possibility that landlords will increase rent after installation of WSS systems, potentially forcing poor tenants or caretakers guarding unfinished houses to consider alternative unsafe housing. In such an eventuality, the objective of ensuring pro poor development is lost as the intended poor lose or receive minimal benefits of improved WSS services.

In general particular challenges are expected to increase as the Commercial utility increases its service to the poor, while at the same time aiming to cover its operational costs for operations, maintenance and management of the provided services. Some the risks that impact negatively on the Commercial Utility will have to be addressed during the formulation and design stages to ensure that users are aware of the added cost of improved WSS services.

Below is the projects assessment/rating on gender and social inclusion.

This template is subject to revision in the event of new information from further detailed studies.

**Table 6: GESI Rating Operations Table**

DIMENSIONS	CRITERIA: THE ACTIVITY...	CHECKLIST: DOES THE PROJECT...	CHECK	SCORE	RATING
Analysis	Includes analysis and/or consultation on gender related issues	Identify and analyse gender issues <u>relevant</u> to the project objectives or components?	✓		
		<ul style="list-style-type: none"> <li>Report findings of country/regional gender diagnostics (gender assessment, poverty assessment, etc.) as part of a social, economic and/or environmental impact assessment</li> </ul>	✓ <sup>12</sup>		
		<ul style="list-style-type: none"> <li>Report findings of country/regional gender diagnostics (gender assessment, poverty assessment, etc.) relevant to project development objectives of components.</li> </ul>	✓		
		<ul style="list-style-type: none"> <li>Reflect the result of consultations with women/ men/ girls/ boys/ indigenous groups/marginalised groups and/or NGOs that focus on these groups and/or their specific line ministries?</li> </ul>	✓		
If at least one check above (yes)				YES	

<sup>12</sup> Information obtained from the OBC only and secondary sources. More information to be obtained from further studies in future.

DIMENSIONS	CRITERIA: THE ACTIVITY...	CHECKLIST: DOES THE PROJECT...	CHECK	SCORE	RATING
Significance rating (relevant, evidence-based & numerical/proportional significance) (None = 0; weak = 1; modest = 2; encouraging = 3; and significant = 4)					4
Actions	Is expected to narrow gender disparities, including through specific actions to address the distinct needs of women/ girls and/or men/ boys/ and/or marginalised or vulnerable groups and/or to have positive impact(s) on gender equality and/or social inclusion	<ul style="list-style-type: none"> <li>• Include specific or targeted actions that address the needs of women</li> </ul>	✓ <sup>13</sup>		
		<ul style="list-style-type: none"> <li>• Propose gender specific and/or social inclusion safeguards in a social/environmental assessment or in a resettlement framework</li> </ul>	x <sup>14</sup>		
		<ul style="list-style-type: none"> <li>• Show how interventions are expected to narrow existing gender disparities</li> </ul>	✓ <sup>15</sup>		
If at least one check above (yes)				YES	
Significance rating (relevant, evidence-based & numerical/proportional significance) (None = 0; weak = 1; modest = 2; encouraging = 3; and significant = 4)					
Monitoring & Evaluation	Includes mechanisms to monitor gender impact and facilitate gender disaggregated analysis	<ul style="list-style-type: none"> <li>• Include specific gender and sex-disaggregated indicators in the results framework?</li> </ul>	x <sup>16</sup>		
		<ul style="list-style-type: none"> <li>• Propose an evaluation, which will analyse the gender specific impacts of the project?</li> </ul>	x		

<sup>13</sup> Project will significantly address the current social and environmental impacts of the absence and poor WSS service that affect all residents particularly women and children.

<sup>14</sup> This shall be achieved at the feasibility stage

<sup>15</sup> Project will significantly address the current social and environmental impacts of the absence and poor WSS service that affect all residents particularly women and children.

<sup>16</sup> The feasibility and technical documents should include a monitoring and evaluation framework that include gender and social inclusion indicators and data sources

DIMENSIONS	CRITERIA: THE ACTIVITY...	CHECKLIST: DOES THE PROJECT...	CHECK	SCORE	RATING
If at least one check above (yes)				YES	
Significance rating (relevant, evidence-based & numerical/proportional significance) (None = 0; weak = 1; modest = 2; encouraging = 3; and significant = 4)					3

RATINGS					
Overall Score	In how many dimensions does the project score 1?			3/3	
GESI-informed	Does the document score in at least one dimension			Y	
GESI significance	In how many dimensions does the project demonstrate a contribution to GESI results				3/3
Significance Score	What is the total score across all three dimensions related to demonstrating a contribution to GESI results (none = 0; weak = 1; modest = 2; encouraging = 3; and significant = 4)				8/12

The moderate 'significance' scoring (8/12) of this Project indicates that overall the pre-feasibility study has moderately analysed and assessed GESI issues in the pre-feasibility for water supply and sanitation, Siavonga Border town Zambia. More information should be generated through Focussed Group Discussions with the beneficiaries and other relevant stakeholders at a later project stage.

## Section 5: Climate Change and Environmental Considerations

### Climate Change

Implementation of projects that have infrastructure components that augments climate resilience and sustainability is one of the key objectives of this project. The principle source of water for domestic and industrial use is from the Lake Kariba, which has been confirmed by SWSC as the preferred source. Lake Kariba has a storage capacity of 185 cubic km when full. The inflow from the Zambezi River averages at about 1350 cubic meters per second (equivalent to 3 seconds of Siavonga's daily demand). Additionally, there is provision in the Water Resources Management Act No 21 of 2011, which prescribes on the "management, development, conservation, protection and preservation of a water resource and also ensures the right to draw or take water for domestic and non-commercial purposes". Section 6(b) states that, "*water is a basic human need and as such domestic and non-commercial needs shall enjoy priority of allocation use*". It follows therefore that based on the volume of water stored in Lake Kariba the probability of water scarcity for Siavonga due to reduced rainfall (and also inflow) arising out of the climate change phenomenon is extremely low. This is also compounded by the law cited above that gives precedence for water for domestic use before other uses. The infrastructure provided needs to consider the variability to ensure that the infrastructure can still operate efficiently under flooding and droughts.

As part of the Pre-Feasibility Study, the CRIDF Climate Change Risk Analysis (CCRA) tool was used to identify climate change risks and possible mitigation actions. The outcomes from the CCRA will be used in further studies to improve the climate resilience technical inputs on the project.

The detailed CCRA is included in **Appendix 3** – the following section presents some of the key findings and recommendations.

- The project area faces extremely high seasonal variability, with flood occurrence and drought severity medium to high risks. In addition to these factors regulatory and reputation risk is extremely high risks that could have an impact on the ability to supply services to the beneficiaries.
- Climate projections for project area include:
  - Precipitation variability - Continuing trend of seasonal and inter-annual variability in precipitation, decreased winter rainfall and increased aridity. A transition zone between areas where the annual rainfall is more likely to increase (to the north) and more likely to decrease (to the south).
  - Temperature variability - Continuing trend of increased mean annual air temperature, possibly up to 3°C but 2055. Some increase in length of warm spells and reduced frequency of cold periods.
  - Extreme events - More erratic precipitation and temperature regimes, resulting in some likely increase in extreme flood/drought events.



- Agriculture - Food insecurity arising from political instability across the region and challenges to both food production and supply, climatic instability.
- Health - Pockets of different disease types as a result of site-specific water/air/pollution, amplified by incorrect water, agricultural and land management practices, and mining wastes. Low nutrition/health in some areas due to food insecurity.
- Flooding is not seen as a high risk, since Siavonga is on the banks of Lake Kariba, which will have a damping effect on floods through available storage and the relatively small water level rise over the dam spillway even during flooding.
- Drought, with associated dry / hot conditions which exacerbate the risk of fires, is seen as a potential risk and any infrastructure should be specifically designed to consider the impact of drought.
- The improvement of the water supply at Micho, Siavonga is perceived to have the following benefits:
  - Improved water supply, which will reduce water loss, increase revenue and improve customer satisfaction, which will improve willingness to pay for the service.
  - Improvement to livelihoods
  - Reduced incidence of waterborne disease through a clean water source and more water for improved hygiene, which will reduce the time of caring for the ill and cost of medication.
  - Reduced time for collection of water, which will mostly improve the time available for women and children to attend to other more productive activities or studies.

It is recommended that the project should address the specific future changes in precipitation due to climate change as projected by climate models. Furthermore institutional strengthening of the water and sewerage supply company, which can address long terms aspects like water conservation, demand management and reduction of non-revenue water, could influence the volume of water required to supply the town. Climate projections should be shared and discussed with local stakeholders by the project team to explore future and alternative risk mitigation options. The climate resilience of the project should be continuously considered during the development stages of the project.

### **Environmental Considerations**

The scope of works for improved water supply to Micho settlement shall mainly comprise installation of a new elevated storage tank to replace the existing concrete ground tank with a steel panelled Braithwaite tank, network upgrading and general refurbishment of the existing water distribution lines, and extension into the “overspill” segment of Micho settlement. Issues that require environmental consideration with regard to compliance with the set are described in the Environment Management Act No 12 of 2011 as follows:

*3. (1) A developer shall not implement a project for which a project brief or an environmental impact statement is required under these Regulations, unless the project brief or an environmental impact assessment has been concluded in accordance with these Regulations and the Council has issued a decision letter.*

- (2) The requirement for a project brief<sup>17</sup> applies to:-
- (a) a developer of any project set out in the First Schedule, whether or not the developer is part of a previously approved project;
  - (b) any alterations or extensions of any existing project which is set out the First Schedule, or;
  - (c) any project which is not specified in the First Schedule, but for which the Council determines a project brief should be prepared.
4. A developer shall prepare a project brief under regulation 3, stating in a concise manner:-
- (a) the site description of the environment;
  - (b) the objectives and nature of the project and reasonable alternatives;
  - (c) the main activities that will be undertaken during site preparation, and construction and after the development is operational;
  - (d) the raw and other materials that the project shall use;
  - (e) the products and by-products, including solid, liquid and gaseous waste generation;
  - (f) the noise level, heat and radioactive emissions, from normal and emergency operations;

The second schedule section 2(d) prescribes the types of projects that require an environmental impact statement<sup>18</sup> are as follows:

*“pipelines for water, diameter 500mm and above and length 10 km outside built up area, for oil 15 km or more of which 5 km or more of their length will be situated in a protected area or a serious polluted water abstraction area”.*

The scope of works for the proposed project falls within these parameters hence **a project brief will be required** as opposed to a full environmental impact statement.

The envisaged impacts arising out of this project shall include:

- Some jobs to be created for the construction works which will mainly comprise kiosk construction, excavation and pipe laying for a period not exceeding 3 months (40 jobs)
- Manning of the kiosk water vending points (6 jobs)
- Materials for pipework shall be galvanised iron pipes, brass for gate valves and galvanised steel for the overhead storage tanks and stand
- Negligible amounts of dust emission arising out of construction works (excavation and backfilling)
- No houses will need demolition to make way for pipe network (so no persons will be re-settled)
- Reduced time spent on acquiring daily water requirements due to improved infrastructure

The application will be submitted at time of seeking construction approval (planning permission) from the Siavonga District Council which is also a key stakeholder in this project.

### **Environmental Health Considerations**

The Environmental Health considerations presented are typical concerns found throughout Zambia, borrowing on experience from similar border towns. Future studies should obtain locally available data for Siavonga to identify specific issues.

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<sup>17</sup> **Project brief** is defined as a report made by the developer including preliminary predictions of possible impacts of a proposed project on the environment and constituting the first stage in the environmental impact assessment process

<sup>18</sup> An **environmental impact assessment** means a systematic examination conducted to determine whether or not a proposed project, or alteration to an existing project, or alternatives, may have significant adverse or beneficial impacts on the environment

Typically the vector transmitted disease Malaria has a high prevalence in communities, followed by Acute Respiratory Infections (ARIs). The incidence of ARI transmission is often associated with poor hygienic practices, particularly handwashing. The incidence of diarrhoea, which is the main indicator for many faecal-oral diseases such as cholera, typhoid fever, dysentery and Hepatitis A, can be lower than Malaria and ARIs, but still widespread. However it is likely that this is under-reported, as the population may often self-treat or be failing to present themselves at the clinic for diarrhoea treatment.

Typically aspects that will improve environmental health (not project specific):

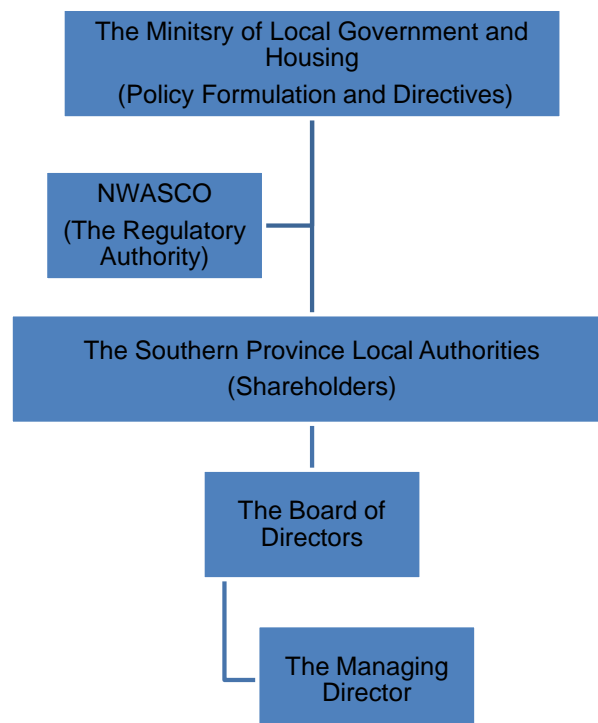
- Lack of solid waste management facilities provides breeding ground for disease vectors.
- The liquid waste disposal method in Siavonga is on-site via septic tanks and pit toilets. Problems with shallow rock, low permeability and space constraints relating to the digging of new toilets once the existing pit is full are often sited problems. There are currently no pit and septic tank emptying services operating in Siavonga.
- Open defecation and poor hygienic conditions are prevalent in Micho.
- The majority to the toilets constructed are basic pit toilets, with limited facilities for odour and fly control.
- Few have handwashing facilities such as tippy taps at the toilet.
- Newly arriving residents may not immediately prioritise the construction of a toilet, leading to temporary open defecation.

## Section 6: Institutional Arrangements

The SWSC is a publicly owned water and sewerage company jointly owned by all the districts (local authorities) in the southern province of Zambia. In part 3 of the WSS Act No. 28 of 1997 it is stated that, “a local authority may resolve to establish a water supply and sanitation utility as a company under the Companies Act as follows”;

- (a) as a public or private company
- (b) as a joint venture with an individual or with any private or public company
- (c) as a joint venture with another local authority or several other local authorities

SWSC therefore operates under a delegated mandate from the local authorities as shown in **Figure 12**.



**Figure 12: SWSC relationships with other stakeholders**

The board members are drawn from various constituencies comprising the shareholders, professional bodies and consumers. The Chairperson and Vice Chairperson are nominated and appointed directly by the Minister using his or her own discretion. The organisation structure of SWSC is shown in **Figure 13**.

The Board meets ideally once every quarter and holds an annual general meeting to enable shareholders conduct business, which includes approval of the audited financial statements. Other mandatory reports include those outlining operations, which are submitted to NWASCO every month and quarter.

There are significant institutional challenges present in the Micho Water Supply and Sanitation project, in terms of the current operational responsibility of ZESCO. ZESCO is currently providing water and sanitation infrastructure to Micho, but has limited incentive to provide a high-standard of service provision. SWSC on the other hand, while mandated to provide water within these areas, does not have an incentive to invest in infrastructure in the area due to ZESCO's ownership of the existing infrastructure. The result is that communities bear the brunt of this institutional complexity and lack sufficient quality water and sanitation services.

It is thus recommended that the first step in this project would be to support the transfer of the current Water Supply and Sanitation (WSS) infrastructure from ZESCO to SWSC. This process has already been initiated through discussions with the Regional Manager for SWSC, as well as a meeting with the national urban water supply and sanitation regulatory authority, National Water Supply and Sanitation Council (NWASCO) in Lusaka. This process may benefit from external support in the form of capacity building in the two institutions. Arrangements in terms of asset transfer and transfer costs need to be negotiated and agreed.

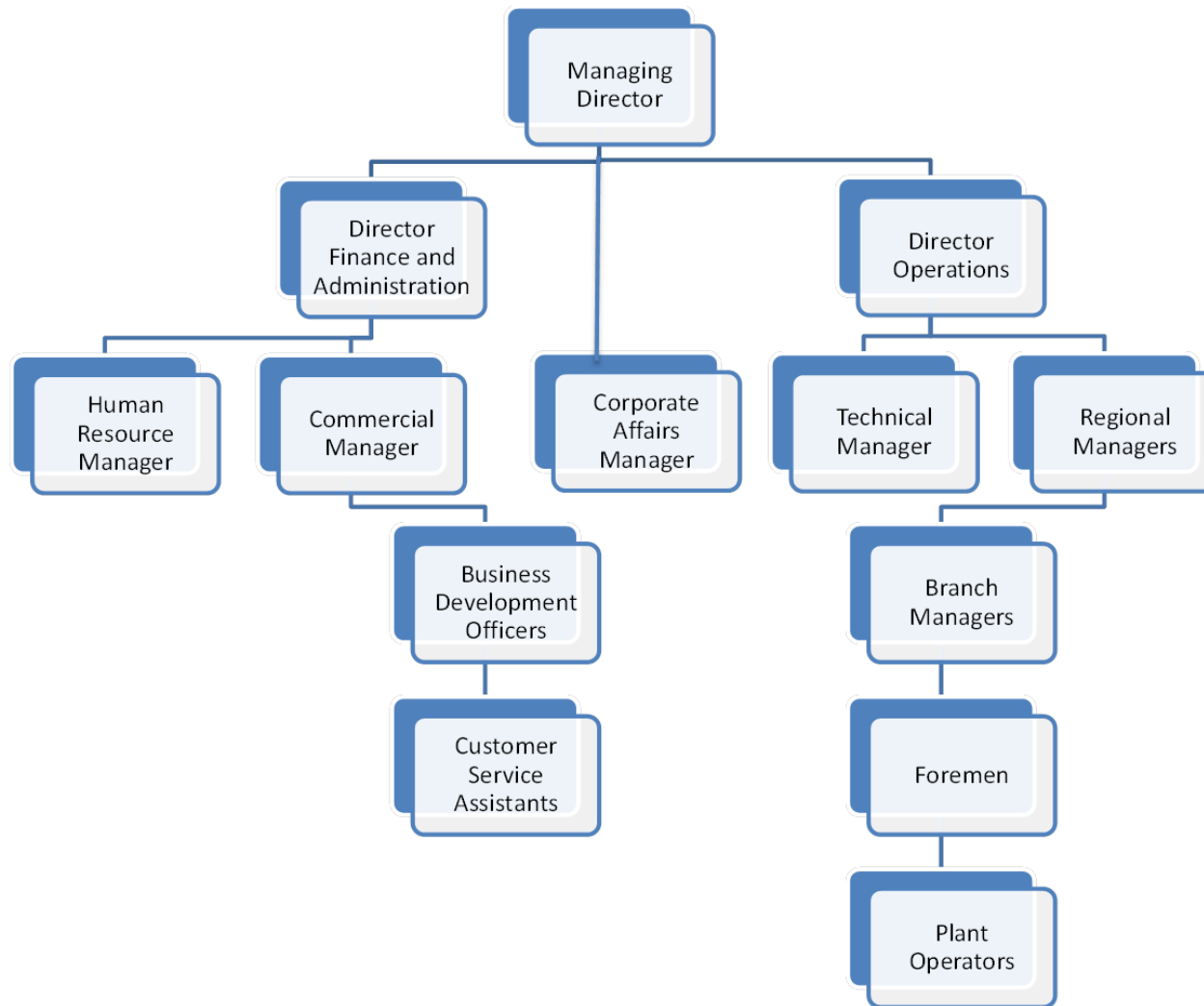


Figure 13: The organisational structure of SWSC

## Section 7: Operation and Maintenance Issues

Southern Water and Sewerage Company (SWSC) has as one of its guiding principles a strict adherence to sound operation and maintenance practice realising that this is the main cornerstone to assure and enhance sustainability and reliability. The SWSC technical services unit has implemented a robust maintenance system that focuses on the following:

- Daily maintenance;
- Weekly maintenance;
- Quarterly maintenance; and
- Replacement

Key areas of focus as per the schedule (**Appendix 4**) include:

- Pump-set maintenance
- Borehole condition monitoring and equipment maintenance
- Water treatment infrastructure maintenance (i.e. pumps, dosing units, control units, switching mechanisms, valves, etc.)

Evidence of these activities is contained in the maintenance schedule attached in this report.

SWSC clearly demonstrates through this process that they are and will be able to competently and satisfactorily maintain any equipment and associated infrastructure availed for their operations.

It is, however, very important that the project is sustainable and that the revenue provides sufficient funds to operate and maintain the asset.



## Section 8: Risk Analysis and Recommendations

The main risks identified at this stage of the project are included in **Table 7**. These risks should be managed during future stages of the project to mitigate or reduce the impact of the risk.

**Table 7: Risk Analysis Table**

Risk	Mitigation	Other Comments
ZESCO may refuse to handover water treatment plant to SWSC	NWASCO are vigorously following up this issue and discussions have reached an advanced stage. NWASCO is proposing a similar solution to that implemented at Ithezi-Ithezi dam and power station where ZESCO handed over the operations of water supply infrastructure to the mandated provider for the area.	Siavonga District Council fully supports the position of SWSC
Micho Community may resist tariff regime to be effected by SWSC	Good culture of payment for services prevalent in entire Siavonga service area where collection efficiency is in the region of 95%. The improvement in terms of quality, quantity and reliability need to be incorporated into the reasons for any tariff increase.	SWSC can also use the community water watch groups to sensitise Micho residents
Affordability and financial feasible	As part of the Feasibility Study, the affordability and financial feasibility of the project will need to be confirmed.	
SWSC may not be able to implement and operate the new project and facilities to be installed	SWSC have vast experience in implementing similar projects some of which have been of much higher value e.g. 30million euros KfW funded expansion and rehabilitation works	

## Section 9: Conclusions and Recommendations

Siavonga Town has a number of water supply and sanitation challenges; however the priority identified during preparation of the Pre-Feasibility Study is the suburb of Micho and surrounding areas.

The proposed water supply and sanitation interventions include refurbishing the existing system and expanding to unserved areas. Through these interventions, Micho and surrounding areas can be supplied with reliable climate resilient water and sanitation services to meet the requirements of 2026, while meeting CRIDF criteria.

The current Micho population is 5,022 (3,780 unserved and 1,242 under-served). The current water supply only provides water for about 2 or 3 hours per day (capacity constraints) and SWSC has stated that it does not meet potable water standards.

The Micho population is expected to grow to 7,651 by 2026. The future population will have a daily water demand of about 350 m<sup>3</sup>.

The estimated capital cost for the proposed interventions is £200,000.

Based on the high number of beneficiaries and the relative low capital cost per beneficiary, the project stands as being feasible in light of the assessments herein. The project progression will be dependent on how Siavonga, especially Micho, compares with the other towns considered under the Zambian Border Towns project in terms of need.

Although the majority of the benefits will be local to Micho, because Siavonga remains a popular border crossing for tourists (current heavy load restrictions on the Kariba Dam wall), there is a transboundary health benefit associated with the service level improvements. Furthermore the project is pro-poor, contributes to climate resilience and will improve the lives of woman and children. It is therefore recommended that the project proceed to full feasibility to confirm findings of the Pre-Feasibility Study and provide additional input on financial / economic feasibility, GESI, Climate Risk and technical assessment.

It will not be possible for this project to proceed without handover from ZESCO to SWSC of the infrastructure and responsibility for Micho water supply and sanitation services. It is therefore further recommended that CRIDF determine whether there is any assistance they can provide to ZESCO, SWSC or NWASCO to facilitate the transfer of the infrastructure to SWSC.

## Appendix 1: Meeting Notes / Key Informant Interview Record

<b>Institution Name</b>	Southern Water and Sewerage Company Ltd.	
<b>Date of call/meeting</b>	9 <sup>th</sup> December, 2015, Choma	
<b>Key contact</b>	<i>Charles Shindaile</i>	
	<i>Managing Director</i>	
	<a href="mailto:shindailecm@zambia.co.zm">shindailecm@zambia.co.zm</a> ; +260977418391	
<b>Others present at the meeting</b>	<i>nil</i>	
<b>Discussion detail</b>		
<ul style="list-style-type: none"> <li>• <i>Southern Water and Sewerage Company (SWSC) Ltd. Welcomes the initiatives by CRIDF to probe into the Water Supply and Sanitation (WSS) situation in Siavonga Town where SWSC has full mandate</i></li> <li>• <i>SWSC intends to only have one raw water intake point from the Lake Kariba as opposed to the current two. The intention will be to reduce operational costs and enhance efficiency</i></li> <li>• <i>There is a proposal to extend the network to BLACKSOIL settlement which is located adjacent to the junction between the Siavonga and Border roads</i></li> <li>• <i>Key challenge for sanitation improvements is the hilly terrain of Siavonga, hence reliance on on-site sanitation i.e. pit latrines</i></li> <li>• <i>There is need to regularise the service provision in MICHU Township adjacent to power station location as currently area is serviced by the power utility company ZESCO Ltd</i></li> </ul>		
<b>Subject</b>	<b>Key points arising</b>	
<b>Siavonga District</b>	<ul style="list-style-type: none"> <li>• Anomaly of ZESCO providing service in MICHU as opposed to SWSC</li> <li>• How is BACKSOIL categorised by the Siavonga District Council</li> <li>• Population of MICHU</li> <li>• Sanitation (Sewerage) disposal in MICHU?</li> </ul>	
<b>Actionable Steps</b>		
<ul style="list-style-type: none"> <li>• <i>To seek further information on MICHU area regularisation of service from the Siavonga District Manager a Mr Francis Siatwinda</i></li> <li>• <i>Advised to confer with Siavonga District Council who are a key stakeholder for water and sewerage service provision in Siavonga to solicit their views</i></li> <li>• <i>To verify on the current categorisation of BLACKSOIL: is it an 'urban' or 'rural' settlement, as this has a bearing on whether it should be serviced by SWSC or Siavonga District Council</i></li> </ul>		

<b>Institution Name</b>	Southern Water and Sewerage Company Ltd.	
<b>Date of call/meeting</b>	11 <sup>th</sup> December, 2015, Siavonga	
<b>Key contact</b>	<i>Francis Siatwinda</i>	
	<i>District Manager, Siavonga</i>	
	<a href="mailto:francissiatwinda@gmail.com">francissiatwinda@gmail.com</a> ; +260955526444	
<b>Others present at the meeting</b>	<i>nil</i>	
<b>Discussion detail</b>		
<ul style="list-style-type: none"> <li>• <i>Raw water for district is extracted directly from Lake Kariba via 2 no treatment plants and undergoes conventional treatment namely: coagulation, sedimentation, filtration and chlorination before transmission to overhead tanks through an elevation of 400 m</i></li> <li>• <i>Supply is good and reliable 24 hrs per day (i.e. in town area and not at MICH0 settlement next to border post and power station)</i></li> <li>• <i>Groundwater in area is very saline and unpalatable</i></li> <li>• <i>1000 no of connections</i></li> <li>• <i>100,000 m3 per month</i></li> <li>• <i>Non-Revenue Water is at 50%</i></li> <li>• <i>Collection rate in Siavonga is very good (over 90%)</i></li> <li>• <i>Supply level at MICH0 is average 3hrs per day provided by ZESCO and at times extremely erratic</i></li> <li>• <i>MICH0 sewerage is disposed in communal septic tanks that are in a poor state due to inadequate water available to effectively convey the faecal matter from the households</i></li> <li>• <i>MICH0 was originally workers camp for workers engaged to construct the Kariba North Bank Power Station in the 1970s</i></li> </ul>		
<b>Subject</b>	<b>Key points arising</b>	
<b>Siavonga District</b>	<ul style="list-style-type: none"> <li>• Anomaly of ZESCO providing service in MICH0 as opposed to SWSC. The service provision responsibility should be transferred to SWSC from ZESCO if improvements are to be realised</li> <li>• Continued erratic supply to MICH0 area which is next to border post having a total of 930 households poses a serious risk of diseases such as cholera, dysentery and diarrhoea etc. due to poor hygiene which can easily be transmitted across the border to Zimbabwe and stifle border operations (Note that the original MICH0 comprises 230 households)</li> <li>• The average household population is 5.4 (Census), but sometimes as high as 6 persons per household</li> </ul>	
<b>Actionable Steps</b>		

- *To seek clarification from Siavonga District Council on their view on ZESCO providing the service to MICHHO area*
- *To seek the National Regulatory Authority's (NWASCO) views on ZESCOs current service provision*
- *Liaise with SWSC on scope of works and costings for network improvements to improve supply in MICHHO settlement*

<b>Institution Name</b>	Siavonga District Council	
<b>Date of call/meeting</b>	11 <sup>th</sup> December, 2015, Siavonga	
<b>Key contact</b>	<i>Brian Musonda</i>	
	<i>District Planning Officer, Siavonga</i>	
	<a href="mailto:beewilz@yahoo.com">beewilz@yahoo.com</a> ; +260977316769	
<b>Others present at the meeting</b>	<i>nil</i>	
<b>Discussion detail</b>		
<ul style="list-style-type: none"> <li><i>The Council (SDC) is very concerned about ZESCOs continued role of service provision as the level of service is poor and erratic</i></li> <li><i>SDC must assume full responsibility. NWASCO had assured SWSC that they would take up this matter with the relevant authority's</i></li> <li><i>MICHO area will experience rapid growth with improved supply</i></li> </ul>		
<b>Subject</b>	<b>Key points arising</b>	
<b>Siavonga District</b>	<ul style="list-style-type: none"> <li>• District Plan collected from the Director of Planning</li> <li>• SWSCs revenue base will improve with the addition of MICHO</li> <li>• SDC will support SWSC's efforts to improve supply</li> </ul>	
<b>Actionable Steps</b>		
<ul style="list-style-type: none"> <li>• <i>To seek clarification from NWASCO on progress so far</i></li> </ul>		

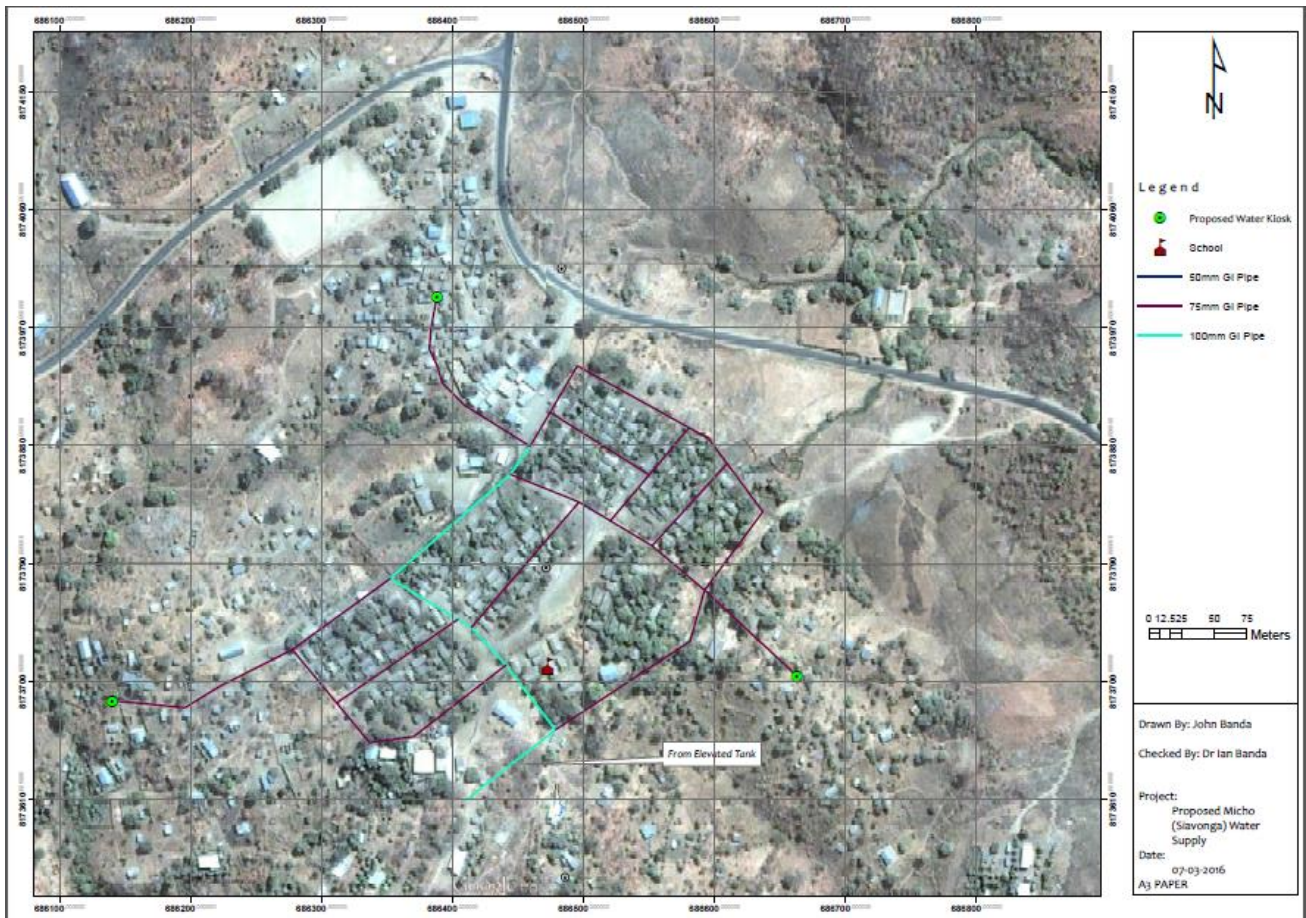
<b>Institution Name</b>	Siavonga District Council
<b>Date of call/meeting</b>	13 <sup>th</sup> January, 2016, Siavonga
<b>Key contact</b>	<i>Carol Mkandawire</i>
	<i>Town Clerk, Siavonga</i>
	<a href="mailto:carolchichulaz@gmail.com">carolchichulaz@gmail.com</a> ; +260979430975
<b>Others present at the meeting</b>	<p><i>Happy Chilongo, District Rural Water Supply and Sanitation Officer</i></p> <p><i>Brian Musonda, District Planning Officer</i></p> <p><i>Amelia Midgely, CRIDF</i></p>
<b>Discussion detail</b>	
<ul style="list-style-type: none"> <li>• <i>SDC reiterates it's support to SWSC to improve supply in line with the delegated mandate as per Water Supply and Sanitation Act No 28 of 1997</i></li> <li>• <i>SWSC and SDC have just completed a joint venture project (on cost sharing basis) to improve supply to a new settlement called MATINAGALA</i></li> <li>• <i>MICHO supply should be transferred from ZESCO to SWSC</i></li> <li>• <i>SMOKE and NSANJE MULEKE areas adjacent to MICHO will need SWSC intervention. Currently supplied via handpumps under the department of Rural Water Supply and Sanitation in SDC</i></li> <li>• <i>There was experienced a water-borne disease outbreak 6 months ago</i></li> <li>• <i>MICHO will grow with improved supply rom SWSC</i></li> </ul>	
<b>Subject</b>	<b>Key points arising</b>
<b>Siavonga District</b>	<ul style="list-style-type: none"> <li>• There is demonstrable evidence showing that SDC and SWSC are able to cooperate on capital projects (i.e. MATINAGALA AREA supply)</li> <li>• Anomaly of ZESCO providing service in MICHO as opposed to SWSC. The service provision responsibility should be transferred to SWSC from ZESCO if improvements are to be realised</li> <li>• Continued erratic supply to MICHO area which is next to border post having a total of 930 households poses a serious risk of diseases such as cholera, dysentery and diarrhoea etc. due to poor hygiene which can easily be transmitted across the border to Zimbabwe and stifle border operations</li> </ul>
<b>Actionable Steps</b>	
<ul style="list-style-type: none"> <li>• <i>SWSC has exhibited ability to undertake small to medium sized water supply improvement projects 'in-house', (MATINAGALA AREA)</i></li> <li>• <i>To seek the National Regulatory Authority's (NWASCO) views on ZESCOs current service provision</i></li> </ul>	

<b>Institution Name</b>	Southern Water and Sewerage Company Ltd.	
<b>Date of call/meeting</b>	13 <sup>th</sup> January, 2016, Siavonga	
<b>Key contact</b>	<i>Francis Siatwinda</i>	
	<i>District Manager, Siavonga</i>	
	<a href="mailto:francissiatwinda@gmail.com">francissiatwinda@gmail.com</a> ; +260955526444	
<b>Others present at the meeting</b>	<i>Amelia Midgely, CRIDF</i>	
<b>Discussion detail</b>		
<ul style="list-style-type: none"> <li>• ZESCO were made to repair network in MICHO the same week due to complaints from residents</li> <li>• Network pipes in the MICHO mainly comprise UPVC pipes which easily deform due to Siavonga's excessive heat they need replacement with GI Pipes</li> <li>• The storage tank is made of concrete material and has a capacity of 200 m3. The tank is in a poor structural condition</li> </ul>		
<b>Subject</b>	<b>Key points arising</b>	
<b>Siavonga District</b>	<ul style="list-style-type: none"> <li>• Anomaly of ZESCO providing service in MICHO as opposed to SWSC. The service provision responsibility should be transferred to SWSC from ZESCO if improvements are to be realised</li> <li>• ZESCO supplies 230 households with an erratic supply averaging 3 hrs per day</li> <li>• Continued erratic supply to MICHO area which is next to border post having a total of 930 households poses a serious risk of diseases such as cholera, dysentery and diarrhoea etc. due to poor hygiene which can easily be transmitted across the border to Zimbabwe and stifle border operations</li> </ul>	
<b>Actionable Steps</b>		
<ul style="list-style-type: none"> <li>• <i>Design and Costing of new network layout that effectively cater for all the households in MICHO</i></li> <li>• <i>Consult Director Operations SWSC Mr Gift Monde for layout drawings</i></li> </ul>		



<b>Institution Name</b>	National Water Supply and Sanitation Council (NWASCO)
<b>Date of call/meeting</b>	14 <sup>th</sup> January, 2016, Lusaka
<b>Key contact</b>	<i>Kasenga Hara</i>
	<i>Technical Inspector</i>
	<a href="mailto:khara@nwasco.co.org">khara@nwasco.co.org</a> ; +260967108246
<b>Others present at the meeting</b>	<i>Josephine Goma, NWASCO</i> <i>Amelia Midgely, CRIDF</i>
<b>Discussion detail</b>	
<ul style="list-style-type: none"> <li>• NWASCO stated that it was aware of intentions by the Government of Zambia through SADC initiatives to effect water supply and sanitation access improvements at border points. NWASCO has so far participated in discussions facilitated by SADC on Kasumbalesa border post (Zambia-DRC) and Nakonde post (Tanzania-Zambia)</li> <li>• NWASCO will fully support any initiatives that will aim at enhancing access to water supply and sanitation services at border posts</li> <li>• NWASCO is actively pursuing the Kariba Siavonga border post area supply by ZESCO with the ultimate aim of regularising service delivery i.e. transfer to SWSC and that this will happen very soon</li> <li>• NWASCO stated that this is not the first such incident as there have been similar situations at Itezhi Tezhi dam area where ZESCO were previously supplying water but later transferred responsibility to Lukanga Water and Sewerage Company who are the mandated service providers for the area</li> <li>• NWASCO also emphasised that full cost recovery would have to be achieved in all areas serviced by SWSC as this was in line with Government policy for urban water provision.</li> <li>• NWASCO indicated too that cross-subsidisation is imperative within a service area i.e. high consuming customers pay at a higher tariff than the low consuming (poor) customers, hence there is a cross subsidisation which enables a service provider to provide a similar standard and level of service to all within a service area</li> </ul>	
<b>Subject</b>	<b>Key points arising</b>
<b>Siavonga District</b>	<ul style="list-style-type: none"> <li>• Tariffs set by NWASCO based on affordability, the area socio-economic profile and the operational requirements</li> <li>• SWSC will soon acquire the ZESCO serviced area</li> <li>• Full cost recovery is Government policy</li> </ul>
<b>Actionable Steps</b>	
<ul style="list-style-type: none"> <li>• Analyse the prevailing tariff structure in Siavonga and its would – be impact on MICHU area</li> </ul>	

# Appendix 2 Proposed Water Supply layout for Micho Settlement



## **Appendix 3 Climate Change Risk Analysis for Siavonga**

The CCRA Report is attached as a separate Annex to this document.

## **Appendix 4      SWSC Maintenance Management Schedule**

The SWSC Maintenance Management Schedule is attached as a separate Annex to this document.

CRIDF 