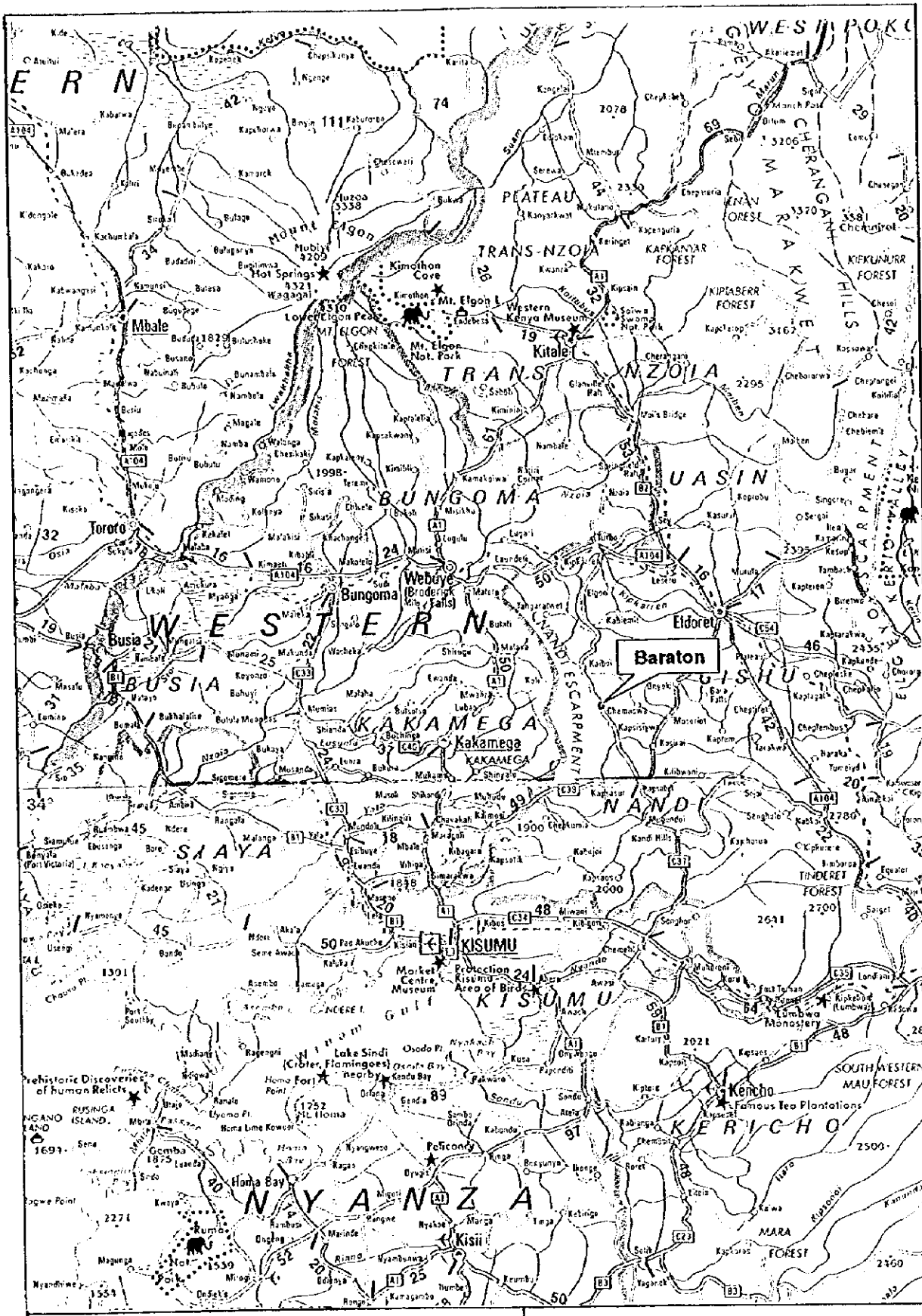


THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN	**Figure - Existing Water Supply Schemes (630 SIAYA District)**
JAPAN INTERNATIONAL COOPERATION AGENCY	

General

Name of Rural water Supply: *Baraton* Location / District: *Nandi*

Organisation / Water Undertaker: *University of EA Baraton* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1988* Phase II: *1990* Phase III *1998*

Constructed By: *Contract* Funded By: *Seventh Day Adv. Mission*

Total Construction Cost *N/A*

Year Operation Started: *N/A*

Existing Facilities

Water source: *Kimondi river, Spring and B/Hole* Intake Facilities *Weir/ B-hole*

Raw Water Transmission *Pumping*

Treatment Facilities *1 No. Receving basin, 1 No. Mixing chamber, 2 No. Sedimentation basins, 2 No. Rapid sand filters and 1 No. Clear water tanks*

Chemicals Dosed *Chlorine, Alum,Soda ash*

Master Meter Details *None*

Distribution Mains

Diameter	*100mm*				
Length	*1km*				
Materials	*UPVC*				

1 No.	*1200m³ elevated R.C. tank*				

Service Reservoirs

Pump Details *1 No. pump for raw water, Q=30m³/hr; 3 No. booster pumps, 1 No. borehole pump (not operational)*

Customer Details

Households Served

Members	Other H.H's	Total
135		*135*

Customers Metered yes Metered *50* Unmetered *85*

Operation & Maintenance

Water Production

	Production	H.H Served
1993	*300m³/d*	*127*
1994	*300m³/d*	*130*
1995	*350m³/d*	*135*
1996	*350m³/d*	*135*
1997	*350m³/d*	*135*

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
Information unavailable				

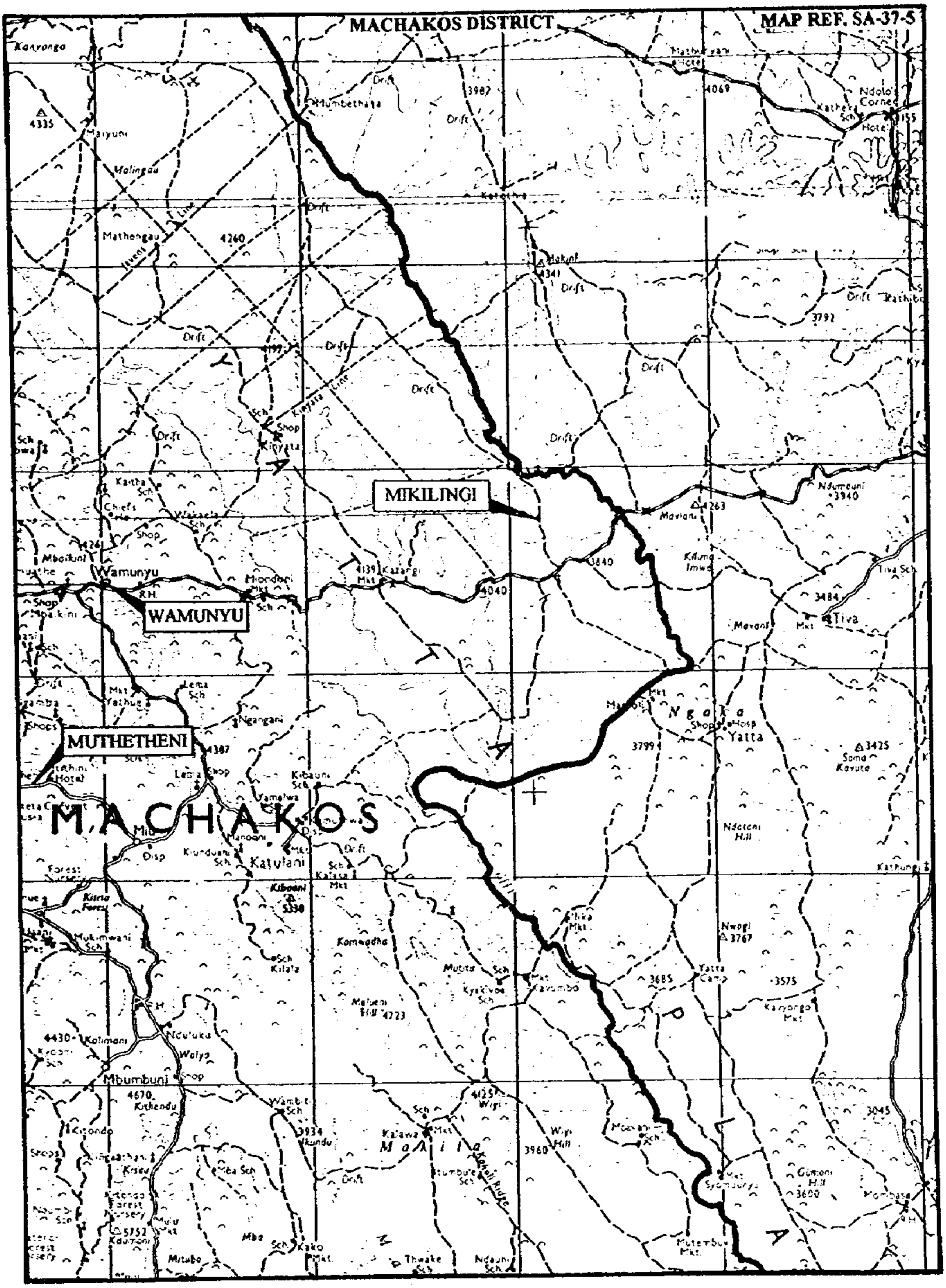
Problems / Future Expansion / Remarks

This is a University of East Africa, Baraton institutional scheme, but it serves the surrounding communities also

1. Borehole source is not operational due to financial constraints

2. Alum and Chlorine dosing is not being properly done as dosers are not working

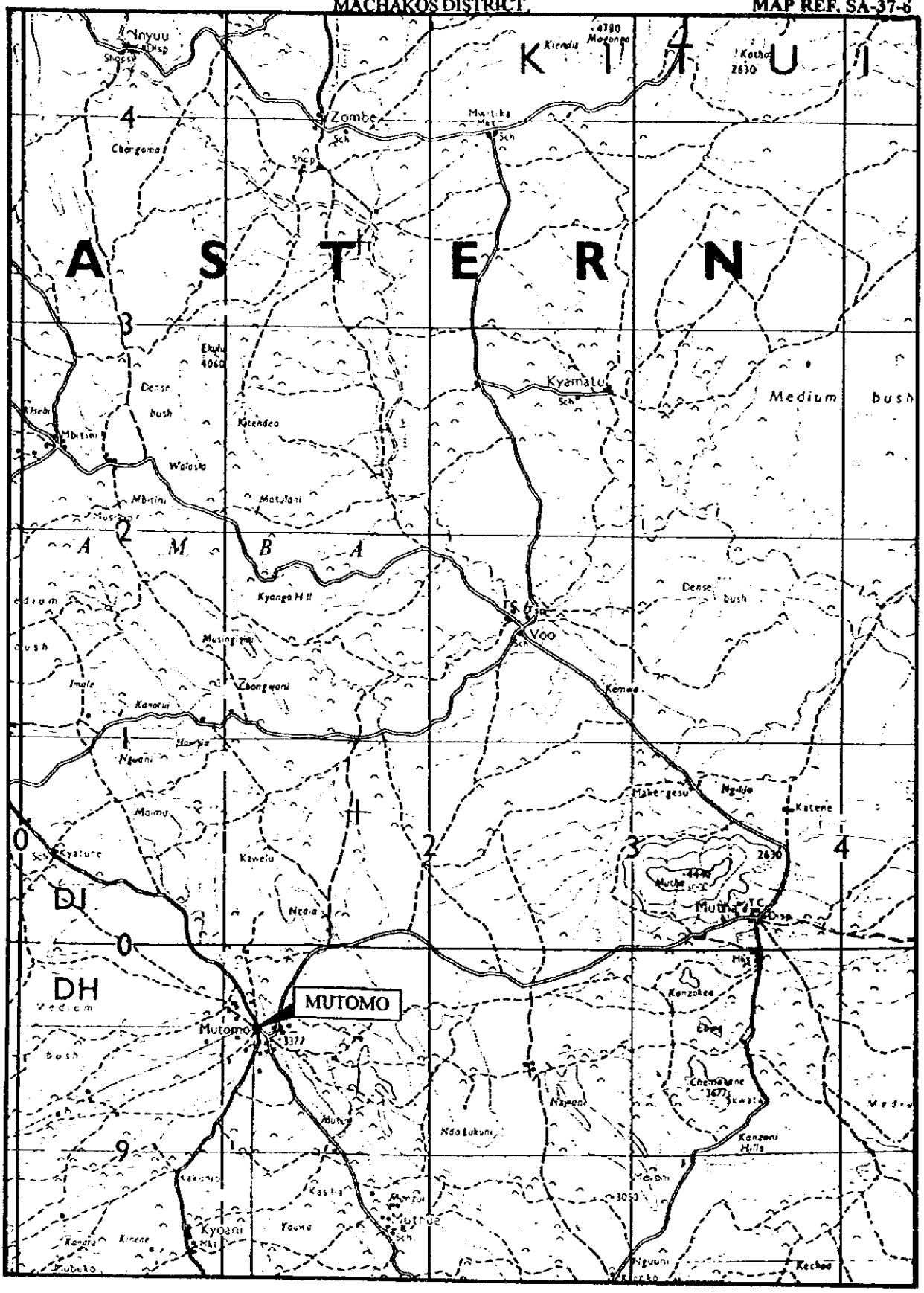
3. The scheme was adversely affected by the El- Nino floods


MACHAKOS DISTRICT
MAP REF. SA-37-5
MIKILINGI
WAMUNYU
MUTHETHENI
MACHAKOS
Wamunyu
Mbumbuni
Katulani
Yatta
Tiva
Kinyata
Mumbetha
Kawethei
Mavoni
Ndolo's Corner

RURAL WATER SUPPLIES - LOCATION PLAN

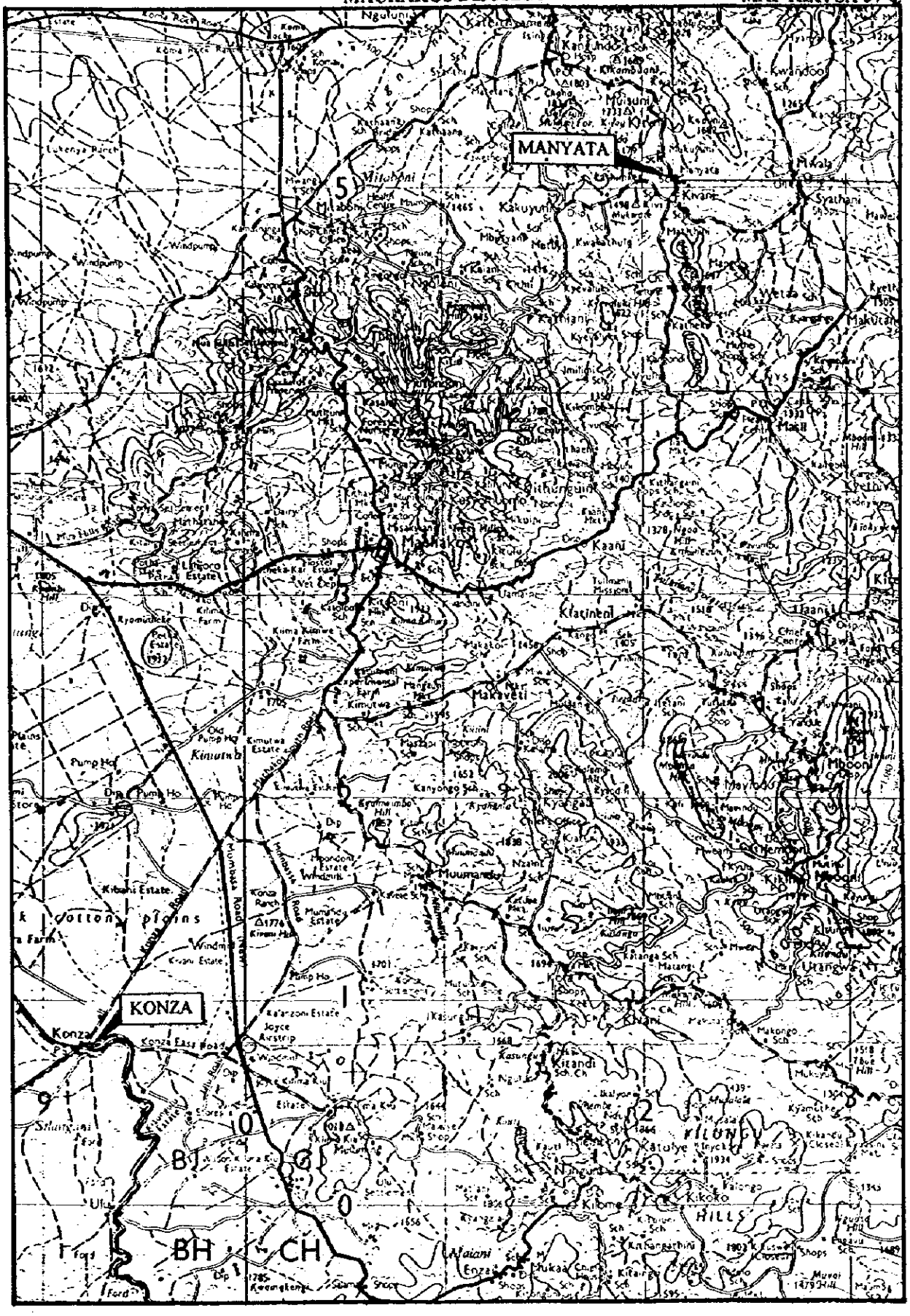
MACHAKOS DISTRICT

MAP REF. SA-37-6



RURAL WATER SUPPLIES - LOCATION PLAN

MACHAKOS DISTRICT **MAP REF. SA-37-6**



General

Name of Rural water Supply: *Wamunyu* Location / District: *Machakos*

Organisation / Water Undertaker: *MOWR* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1973-75* Phase II: Phase III

Constructed By: *MOWR* Funded By: *MOWR*

Total Construction Cost *Approx. Ksh 45,000,000*

Year Operation Started: *1975*

Existing Facilities

Water source: *Athi River at Ndeini* Intake Facilities: *Intake box*

Raw Water Transmission *Pumping 150mm G.S pipe 100m long*

Treatment Facilities *Full treatment*

Chemicals Dosed *Alum, Soda ash, Chlorine dosing as per tests carried out on site*

Master Meter Details *Meter in good condition*

Distribution Mains

Diameter	*150-37mm*	*100-37mm*	*50-37mm*	*37-25mm*	
Length	*8.5 km*	*11 km*	*4 km*	*3.8 km*	
Materials	*uPVC*	*uPVC*	*uPVC*	*uPVC*	

Service Reservoirs *2x90m³, 1x50m³, and 2x25m³ all masonry*

Pump Details *2 No. booster pumps each Q=7.91l/s H=136*

Customer Details

Households Served

Members	Other H.H's	Total
300		*300*

Customers Metered No/Yes Metered *about 150* Unmetered *about 150*

Operation & Maintenance

Water Production

	Production	H.H Served
1993	*300m³/d*	*N/A*
1994	*252m³/d*	*N/A*
1995	*1542m³/d*	*N/A*
1996	*4310m³/d*	*N/A*
1997		

Service Area about 12m²

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
70%	*20%*			*100%*

Problems / Future Expansion / Remarks

Problems include:

1. Frequent bursts in rising main

2. Old pumps require frequent repairs. This affects the continuity of supply

3. Poor payments by consumers Large numbers of consumers are disconnected

4. Intake, backwash tank, sedimentation chambers and sluice valves need repairs. Treatment units need augmentation

General

Name of Rural water Supply: *Konza* Location / District: *Machakos*

Organisation / Water Undertaker: *Community* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1968-92* Phase II: *1992* Phase III

Constructed By: *MOWR/ Contarctor* Funded By: *MOWR*

Total Construction Cost *Ksh. 724,691,000*

Year Operation Started: *1968- Boreholes; then Nol Turesh after 1992*

Existing Facilities

Water source: *Before 1992- Borehole,later pipe off-take from Nol Turesh W/S* Intake Facilities: *pipe off-take*

Raw Water Transmission *Now Gravity*

Treatment Facilities *Nol Turesh Treatment works*

Chemicals Dosed *Chlorinated supply from Nol Turesh*

Master Meter Details *None*

Distribution Mains

Diameter	*75mm-63mm*				
Length	*7.74 km*				
Materials	*G.I. and uPVC*				

Service Reservoirs *No storage for Nol Turesh supply*

Pump Details *No pumping. Comes under adequate pressure*

Customer Details

Households Served

Members	Other H.H's	Total
N/A		*N/A*

Customers Metered Yes Metered Unmetered

Large organisations and institutions are metered

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995	*358m³/d*	
1996		
1997		

Population served is about 3500 mostly by kiosks

Service Area is about 25m² including farms

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
80%	*20%*			*100%*

Problems / Future Expansion / Remarks

1. Distribution system needs improvement

2. Nol Turesh Supply is not reliable. A standby borehole supply should therefore be developed

General

Name of Rural water Supply: *Muthetheni Dam W/S* Location / District: *Machakos*

Organisation / Water Undertaker: *Muthetheni Community* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: 1984 Phase II: Phase III

Constructed By: *MOWR/MIDP* Funded By: *MIDP (Machakos Integrated Development Programme)*

Total Construction Cost *Ksh. 15,000,000*

Year Operation Started: 1985

Existing Facilities

Water source: *Dam on Kyethivu stream* Intake Facilities: *Chamber*

Raw Water Transmission *Pumping 75mm dia. uPVC 3 km long to elevated tank on Mbaani Hill*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *1 No. located at pump outlet*

Distribution Mains

Diameter	*100mm-60mm*				
Length	*13km*				
Materials	*uPVC*				

Service Reservoirs *1 No. 50m³ and 4No. 25m³ tanks*

Pump Details *3 No. pumps coupled to diesel Lister engines. Only 1 No. is operating*

Customer Details

Households Served

Members	Other H.H's	Total
9000 people		*9000 people and domestic animals*

Customers Metered Yes Metered Unmetered

Information not available

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995	*100m³/d*	*N/A*
1996	*100m³/d*	*N/A*
1997	*100m³/d*	*N/A*

Service Area about 12m²
19 No. kiosks sell water to the public

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
95%	*5%*			*100%*

Problems / Future Expansion / Remarks

1. *Treatment required*
2. *There is lack of trained operators*
3. *Engines and pumps need repair*
4. *The rising main needs augmentation*

General

Name of Rural water Supply: *Muthetheni Girls Institute* Location / District: *Machakos*

Organisation / Water Undertaker: *Institution* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1958* Phase II: *1972* Phase III

Constructed By: *Initially Catholic Mission* Funded By: *Catholic father*

Total Construction Cost *Unknown*

Year Operation Started: *1958*

Existing Facilities

Water source: *3 No. Boreholes* Intake Facilities: *B/Hole*

Raw Water Transmission *2 No. pumps one at Institution, one at Sisters' residence*

Treatment Facilities *None. Only drinking water is boiled*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*50mm-12mm*				
Length	*750m*				
Materials	*G.S*				

Service Reservoirs *1 No. elevated steel tank 8m³, 1 No. corrugated and other small domestic tanks*

Pump Details *3 No. diesel generators, only two working: OLIMPIAN GE 40kw and Lister 32 hp*

Customer Details

Households Served (population)	Members	Other H.H's	Total	
	860		*860*	*students and staff*

Customers Metered No Metered Unmetered *All*

Operation & Maintenance

Water Production

	Production	H.H Served	
1993			
1994			*No records of production*
1995			*are kept*
1996			
1997			

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
90%		*4%*	*6%*	*100%*

Problems / Future Expansion / Remarks

1. The supply is entirely for institutional us. It is subsidised by contributions from parents of students

2. It ios well run but needs at least chlorination at storage before use.

3. The institution is in the course of increasing student enrollment so there is need toaugment the supply

4. There is a separate water supply for the surrounding community - see details under Muthetheni Dam

General

Name of Rural water Supply: *Mekilingi W/S* Location / District: *Machakos*

Organisation / Water Undertaker: *Community* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1981* Phase II: *1984* Phase III

Constructed By: *MIDP(Machakos integral* Funded By: *MOWR/EEC*

Total Construction Cost *Ksh 6,950,000* *MIDP- Machakos Integrated*

Year Operation Started: *1983* *Development Programme*

Existing Facilities

Water source: *Mekilingi river* Intake Facilities: *Dam*

Raw Water Transmission *Gravity150mm UPVC pipe 4189m long The dam has useful storage of 100,000m³*

Treatment Facilities *No treatment (Partial filtration at dam intake not functioning due to siltation)*

Chemicals Dosed *None*

Master Meter Details *N/A*

Distribution Mains

Diameter	75mm	63mm	50mm	40mm	32mm
Length	3,155.m	21,038m	7,580m	7,193m	5,600m
Materials	UPVC/GS	UPVC/GS	UPVC/GS	uPVC 'D'	uPVC 'E'

Service Reservoirs *100m³, 150m³, 50m³, 30m³, 25m³, 10m³ all masonry*

Pump Details *2 No. Lister diesel engines coupled to KSB centrifugal pump Q=6.5l/s H=135m*

One engine is broken down and is beyond economical repair

Customer Details

Households Served (population)

Members	Other H.H's	Total
10,000		10,000

Customers Metered Yes Metered Unmetered

Information not available

Operation & Maintenance

Water Production

	Production	H.H Served	
1993	100m³/d	15	
1994	100m³/d	16	
1995	120m³/d	18	*In addition, 15 No. kiosks- 400 persons*
1996	124m³/d	18	*are served*
1997			

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
45%	40%		15%	100%

Problems / Future Expansion / Remarks

Problems include:

1. Lack of funds for purchasing of new pumping set to replace the one broken down beyond economical repair

2. Lack of funds to overhaul pumpset currently in use

3. Water quality is very poor. Treatment is urgently required

4. The partial filtration system and dam scour are clogged. Desiltation is necessary

Future expansion is not envisaged as the system is good apart from the problems outlined above

General

Name of Rural water Supply: *Manyatta W/S* Location / District: *Machakos*

Organisation / Water Undertaker: *Manyatta Secondary School* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1984-1985* Phase II: *1988 - Extension to public kiosk*

Constructed By: *School* Funded By: *MOWD + Self Help*

Total Construction Cost *KShs. 1,700,000* *Originally public were allowed to use*

Year Operation Started: *1996* *1985* *this supply. As they do not share the expenses, the kiosk supply is cut off*

Existing Facilities

Water source: *Borehole C3066* *Borehole at Kyaana River* Intake Facilities: *Borehole*

Raw Water Transmission *Pumping 75mm dia. uPVC pipe about 1 km long to storage tank*

Treatment Facilities *None - only disinfection*

Chemicals Dosed *Only chlorine about 2 kg chlorinated line a day*

Master Meter Details

Distribution Mains

Diameter	*50mm*				
Length	*150m to School*				
Materials	*uPVC*				

Service Reservoirs *1 No. 100 m^3 masonry (1 No. + 65 m^3 for rain water collection)*

Pump Details *None on distribution system*

Customer Details

Households Served

Members	Other H.H's	Total
Only School population		*500*

Customers Metered Yes / No Metered *No* Unmetered *Yes*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994	*100 m^3/d*	-
1995	*100 m^3/d*	-
1996	*100 m^3/d*	-
1997	*100 m^3/d*	-

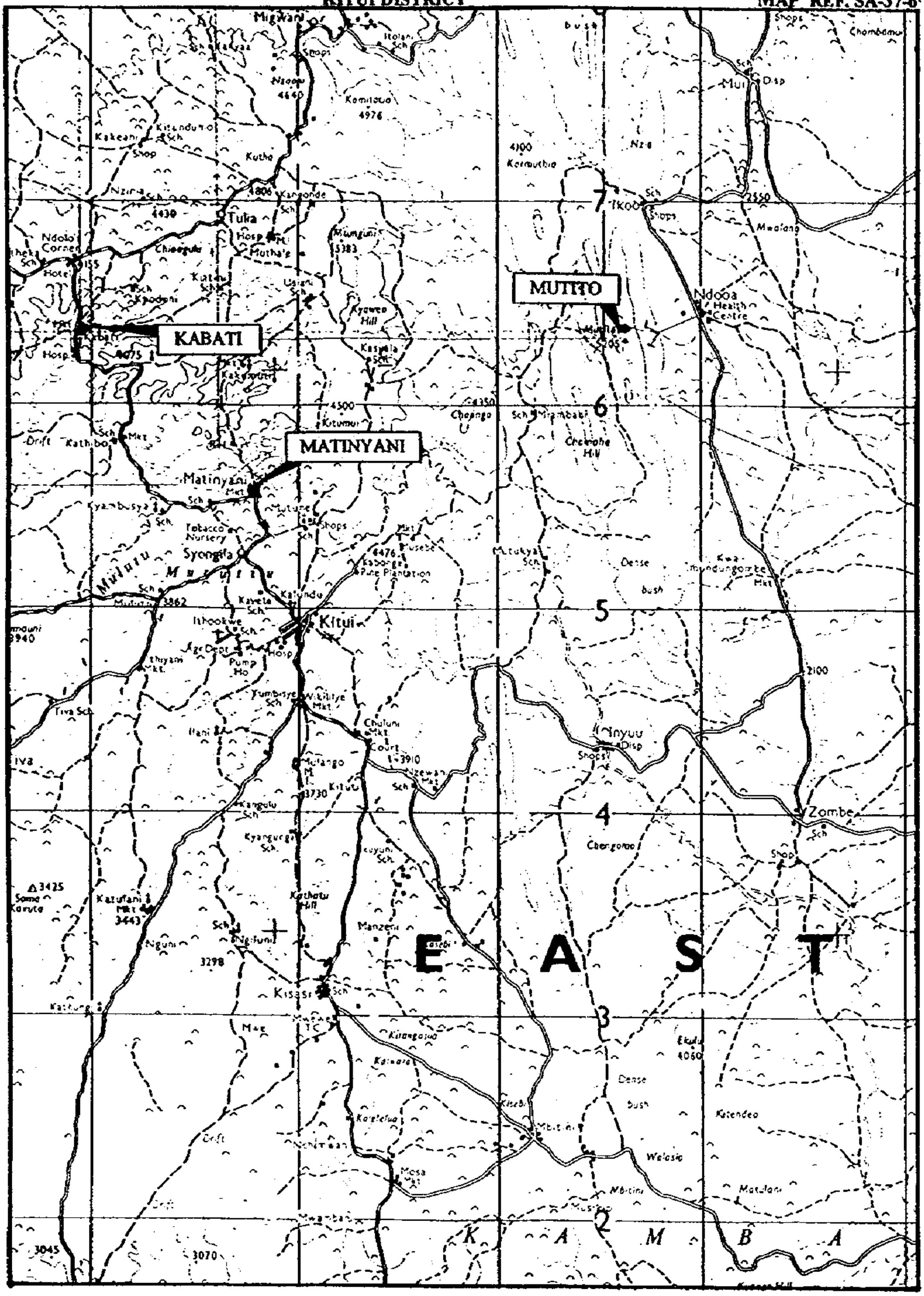
Water Consumption

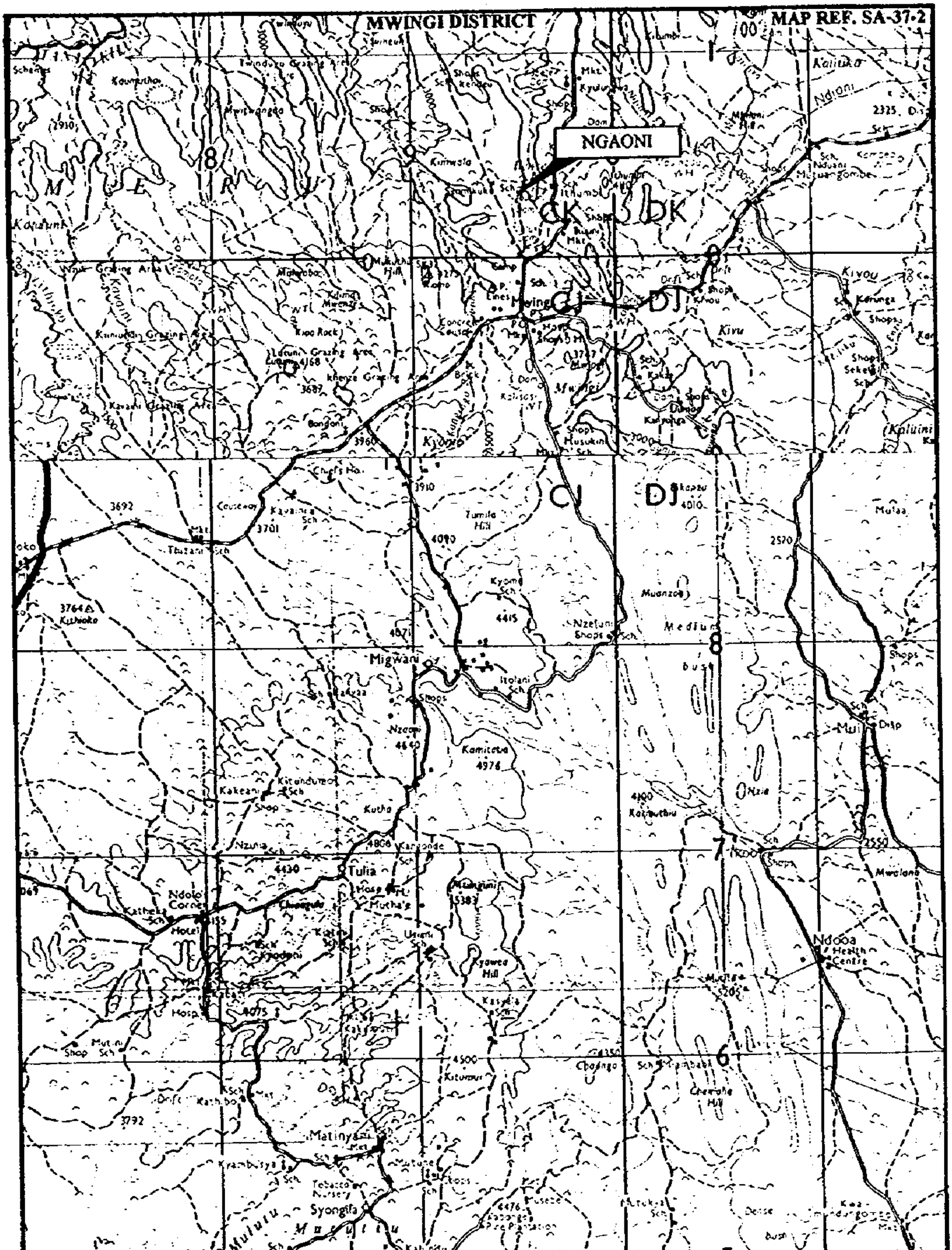
Domestic	Institutional	Irrigation	Others	Total
	100%	-	-	*100%*

Problems / Future Expansion / Remarks

1). Replacement of generator diesel engine for borehole
2) Chlorination required

KITUI DISTRICT MAP REF. SA-37-8




MWINGI DISTRICT
MAP REF. SA-37-2
NGAONI
CK
DK
CJ
DJ
Mwingi
Migwani
Tulia
Ndooa
Matinyani
Syongila
Kitui
Mui
Kyome
Nzeluni
Kiomo
Mutitu
Kaluluka
Ndooni
Kivou
Kiviu
8
7
6
5

General

Name of Rural water Supply: *Nguni Water Supply* Location / District: *Kitui District*

Organisation / Water Undertaker: *Ministry of Water Resources* Map Ref. *1:250,000 - SA-37-2*

Drainage Sub Basin _____ Co- Ords. *X: 38° 19' E Y: 01° 48' S*

Construction Details

Year of Construction Phase I: *1981-1983* Phase II: _____ Phase III _____

Constructed By: *MOWR* Funded By: *MOWR*

Total Construction Cost *2.0 million (1981)*

Year Operation Started: *1983*

Existing Facilities

Water source: *Hand dug well on River Enziu's bank* Intake Facilities: *Direct abstraction*

Raw Water Transmission *Pumping - southern cross pump - 5 m^3/hr*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *No master meter*

Distribution Mains

Diameter	*40mm*				
Length	*5 km*				
Materials	*GI*				

Service Reservoirs *1 No. 50 m^3 masonry tank + 2 No. 7 m^3 elevated tanks*

Pump Details

Customer Details

Households Served

Members	Other H.H's	Total
120 HHs	*80*	*200 HHs*

Customers Metered Yes / No Metered _____ Unmetered _____

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996		
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
80%	*20%*	-	-	*100%*

Problems / Future Expansion / Remarks

Nguni Water Supply was abandoned some time in 1984 due to high sulphide content of the borehole water. The above details were as of when the supply was operational. For future, a new borehole(s) need to be drilled to produce 150 m^3/d

General

Name of Rural water Supply: *Mutomo Water Supply* Location / District: *Kitui District*

Organisation / Water Undertaker: *Ministry of Water Resources* Map Ref. *1:250,000 - SA-37-6*

Drainage Sub Basin _____ Co-Ords. *X: 38° 12' E Y: 01° 51' S*

Construction Details

Year of Construction Phase I: *1973* Phase II: *1976* Phase III _____

Constructed By: *MOWR* Funded By: *MOWR*

Total Construction Cost _____

Year Operation Started: *1976*

Existing Facilities

Water source: *Tira Borehole* Intake Facilities: _____

Raw Water Transmission *Pumping - 1 No. pump - KSB, 12 m³/hr*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *Master meter in poor condition*

Distribution Mains

Diameter	*80mm*				
Length	*17 km*				
Materials	*uPVC*				

Service Reservoirs *4 No. masonry tanks with total capacity of 146 m³*

Pump Details *3 No. pumps within distribution at 8 m³/hr*

Customer Details

Households Served

Members	Other H.H's	Total

Customers Metered Yes / No Metered _____ Unmetered _____

Operation & Maintenance

Water Production

	Production	H.H Served
1993	*5,100*	
1994		
1995		
1996		
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
75%	*20%*	-	*5%*	*100%*

Problems / Future Expansion / Remarks

The borehole yield has dropped considerably. Costs of Operation & Maintenance very high compared to revenue collected. Operations are normally suspended due to delay in repairs. This is caused by inadequate funds

General

Name of Rural water Supply: *Mutito Water Supply* Location / District: *Kitui District*

Organisation / Water Undertaker: *MOWR* Map Ref. _____

Drainage Sub Basin _____ Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1958-59* Phase II: *1974-75* Phase III _____

Constructed By: *MOWR* Funded By: *Government of Kenya*

Total Construction Cost *5,000,000*

Year Operation Started: *1959*

Existing Facilities

Water source: *Ngutini / Muthua Springs* Intake Facilities: *Weir*

Raw Water Transmission *Gravity - 8 km 75mm diameter pipe*

Treatment Facilities *None*

Chemicals Dosed *Chlorination done during epidemics*

Master Meter Details *Master meter not functioning*

Distribution Mains

Diameter	*75mm*	*75mm*			
Length	*4 km*	*4 km*			
Materials	*uPVC*	*GI*			

The gravity main (8 km - 75mm dia.) also acts as the distribution main

Service Reservoirs *1 No. but abandoned 20 years ago due to rusting*

Pump Details *No pumps*

Customer Details

Households Served

Members	Other H.H's	Total
	500	*500*

Customers Metered Yes / No Metered _____ Unmetered _____

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994	*11,460*	-
1995	*17,460*	-
1996	*17,460*	-
1997	*17,460*	-

Not available

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
80%	*10%*	*5%*	*5%*	*100%*

Problems / Future Expansion / Remarks

Since the scheme is unmetered, there is a high tendency of leaving taps open and thus heavy wastage. Repairs are delayed largely due to lack of funds.

General

Name of Rural water Supply: *Kabati Water Supply* Location / District: *Kitui District*

Organisation / Water Undertaker: *Community* Map Ref. *1:250,000 - SA-37-6*

Drainage Sub Basin _____ Co- Ords. X: *37° 55' E* Y: *01° 14' S*

Construction Details

Year of Construction Phase I: _____ Phase II: *1992-93* Phase III: _____

Constructed By: *British Army* Funded By: *British/Kenya Army and DANIDA*

Total Construction Cost _____

Year Operation Started: *Before 1940*

Existing Facilities

Water source: *2 No. Boreholes* Intake Facilities: _____

(1 No. operational, 1 No. abandoned) _____

Raw Water Transmission *Pumping - 8.2 m^3/hr (operational until August 1997)*

Pumping - 4.9 m^3/hr (abandoned)

Treatment Facilities *None. DPD tablets are given to residents to sterilise the raw water*

Chemicals Dosed _____

Master Meter Details *No master meter*

Distribution Mains

Diameter	*50mm*	*38mm*			
Length	*1.5 km*	*4 km*			
Materials	*uPVC*	*uPVC*			

Service Reservoirs *3 No. masonry tanks of 100 m^3, 50 m^3 and 50 m^3*

Pump Details

Customer Details

Households Served

Members	Other H.H's	Total
1,000	*300*	*1,300*

Customers Metered Yes / No Metered _____ Unmetered _____

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996		
1997		

Not available

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
75%	*10%*	-	*20%*	*100%*

Problems / Future Expansion / Remarks

Of the two boreholes, one has been abandoned a long time back. The pump in the operational borehole fell into the borehole and attempts to retrieve have failed to date.
The Masinga-Kitui pipeline is the viable source of water for Kabati.

General

Name of Rural water Supply: *Matinyani W/S* Location / District: *Kitui*

Organisation / Water Undertaker: *Committee* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1993-94* Phase II: Phase III

Constructed By: *MOWR* Funded By: *DANIDA*

Total Construction Cost *KShs. 6,400,000*

Year Operation Started: *1994*

Existing Facilities

Water source: *Borehole at Kafia* Intake Facilities: *Borehole*

Raw Water Transmission *Pumping - 63mm dia GS pipe 1.9 km to distribution tank and 12 m^3/h*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *63mm master meter in good condition*

Distribution Mains

Diameter	*75mm*	*63mm*	*32mm*	*25mm*	
Length	*1.1 km*	*2.0 km*	*7.0 km*	*2.0 km*	
Materials	*30% GS, 70%*	*uPVC*	*uPVC*	*uPVC*	

Service Reservoirs

1 No.	*100m^3 masonary tank*			

Pump Details *None on distribution*

Customer Details

Households Served

Members	Other H.H's	Total
50	*Kiosk 19*	*69*

Customers Metered Yes / No Metered *Yes* Unmetered

Operation & Maintenance

Water Production

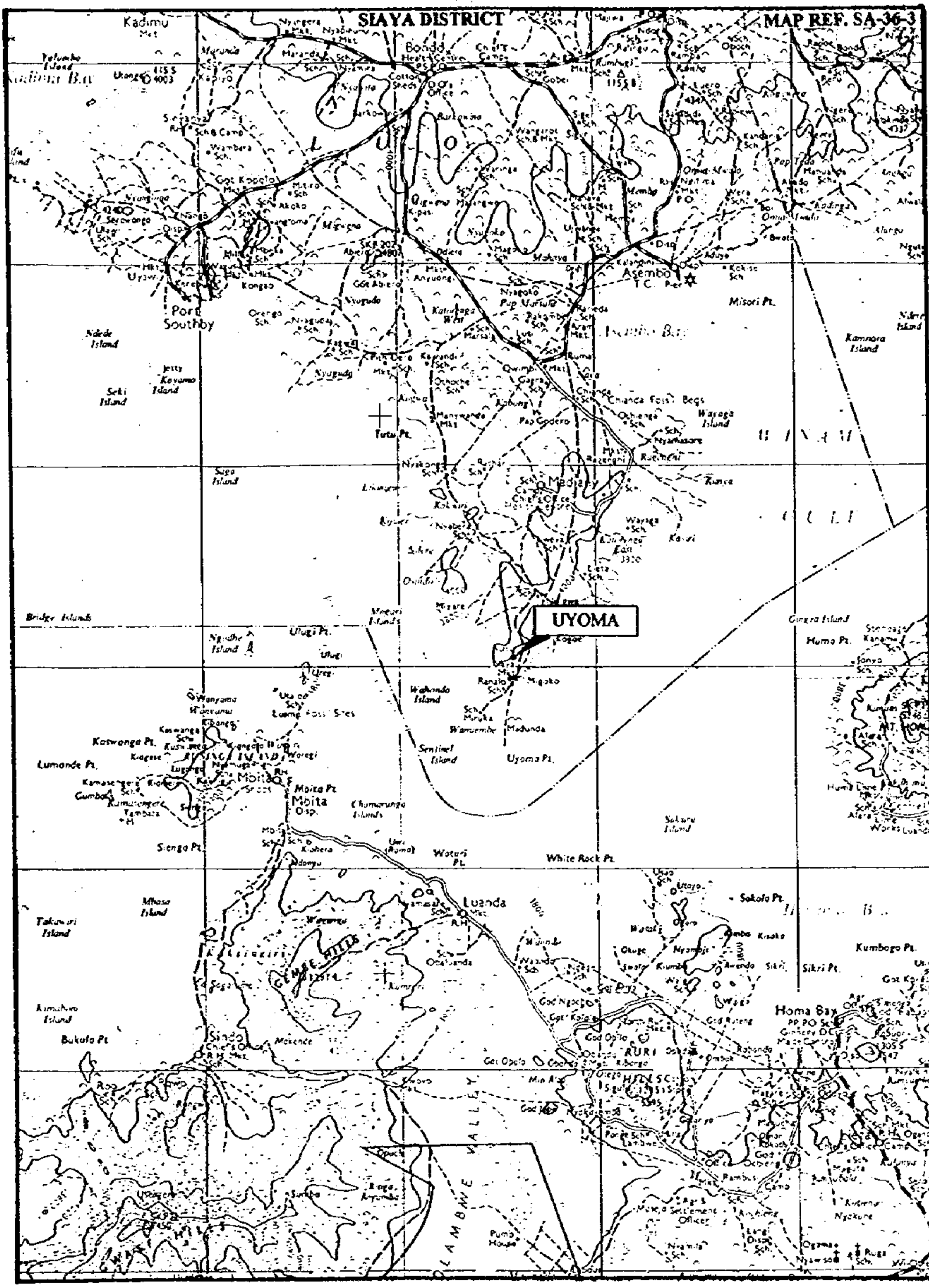
	Production	H.H Served	
1993			
1994			
1995	*120 m^3/d*		*During day session*
1996			*12 m^3/h x 14 hrs pumping = 168 m^3/d*
1997			

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
80%	*10%*	*10%*		*100%*

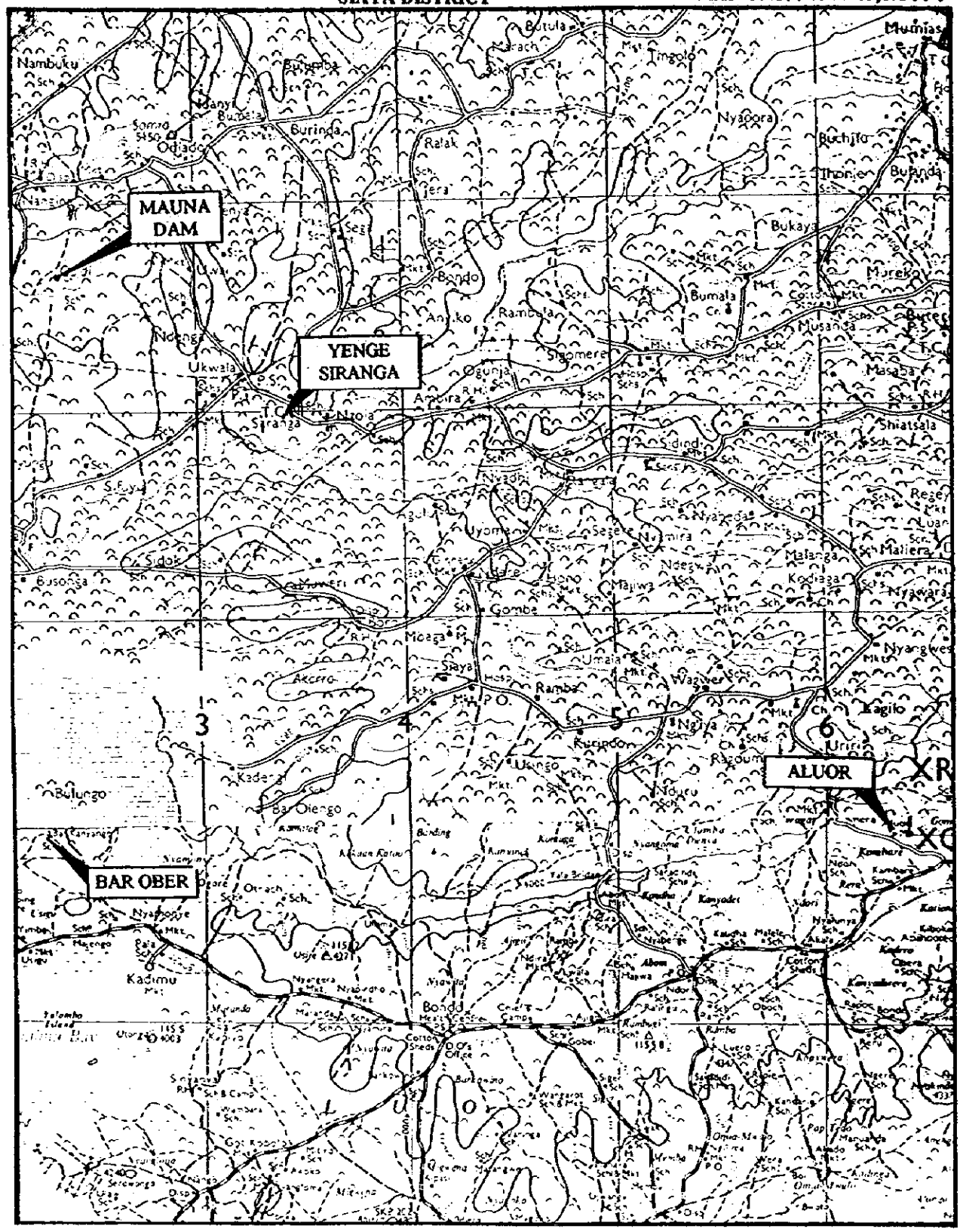
Problems / Future Expansion / Remarks

1) This is a good example of well run rural scheme making profit
2) The supply is also used a lot by other rural centres through kiosks in Matinyani
3) Chlorination required


SIAYA DISTRICT
MAP REF. SA-36-3
UYOMA
Bondo
Port Southby
Asembo
Madiany
Luanda
Homa Bay
Moita
Sindo
LAMBWE VALLEY

RURAL WATER SUPPLIES - LOCATION PLAN

SIAYA DISTRICT **MAP REF. NA-36-15,SA-36-3**



General

Name of Rural water Supply: *Uyoma* Location / District: *Siaya*

Organisation / Water Undertaker: *MOWR+Community* Map Ref *SA-36-3*

Drainage Sub Basin _____ Co- Ords. *X: 38° 1E Y: S00° 22'*

Construction Details

Year of Construction Phase I: *1970-1973* Phase II: *1988-1989* Phase III _____

Constructed By: *MOWR* Funded By: *MOWR+ Community*

Total Construction Cost *N/A*

Year Operation Started: *1973*

Existing Facilities

Water source: *Lake Victoria* Intake Facilities: *Direct Suction*

Raw Water Transmission *Pumping 100mm uPVC pipe 100m long; 2 No. pumps each 25m³/hr driven by lister engines*

Treatment Facilities *Filtration and Chlorination*

Chemicals Dosed *Tropical Chloride of Lime (TCL)*

Master Meter Details *None*

Distribution Mains

Diameter	*200mm-75mm*		*75mm*		
Length	*1500m*		*22km*		
Materials	*G.I.*		*G.I.?uPVC*		

Service Reservoirs	*4 No.*	*80m³ masonry tanks*			

Pump Details *3 No high lift pumps coupled to 43HP Lister engines*

Customer Details

Households Served

Members	Other H.H's	Total
1000		*1000*

Customers Metered No _____ Metered _____ Unmetered _____

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994	*394,200m³*	*271*
1995		
1996		
1997		*1000*

Service area 25km²

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
70%	*20%*		*10%*	*100%*

Problems / Future Expansion / Remarks

1. Pumping equipment is very old and delipidated

2. Poor access to the scheme makes diesel delivery difficult

General

Name of Rural water Supply: *Aluor W/S* Location / District: *Siaya*

Organisation / Water Undertaker: *MOWR* Map Ref *SA-36-3*

Drainage Sub Basin _____ Co- Ords. X: 34° 28' Y: S00° 00' 30"

Construction Details

Year of Construction Phase I: *1971-1972* Phase II: _____ Phase III _____

Constructed By: *Self help and MOWR* Funded By: *MOWR*

Total Construction Cost _____

Year Operation Started: *1972*

Existing Facilities

Water source: *Ogomo River* Intake Facilities: *Chamber*

Raw Water Transmission *Pumping 37mm uPVC/G.I. pipe 4 km long: lister engine driven 12HP, pump 90 m head*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*60mm*	*50mm*			
Length	*6km*	*4km*			
Materials	*G.M.S.*	*uPVC*			

Service Reservoirs

1 No.	*90m³ steel tank*			

Pump Details *1 No. pump Q= 6m³/hr H=90m*

Customer Details

Households Served

Members	Other H.H's	Total
2000 people		*2000 people*

Customers Metered Yes _____ Metered _____ Unmetered _____ No records available

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996		
1997		

2000 people currently *being served*

Water Consumption

Domestic	Institutional	Irrigation	Others	Total

Problems / Future Expansion / Remarks

1. All pumping equipment needs replacement

2. Chlorination is required

Lack of funds has resulted in scheme stopping operations since 1992

General

Name of Rural water Supply: *Yenga Siranga* Location / District: *Siaya*

Organisation / Water Undertaker: *Community* Map Ref *NA-36-15*

Drainage Sub Basin Co- Ords. *X: 34° 13 Y: s 00° 12'*

Construction Details

Year of Construction Phase I: *1980-1983* Phase II: Phase III

Constructed By: *MOWR + Self Help* Funded By: *N/A*

Total Construction Cost *Ksh. 1,260,000*

Year Operation Started: *1983*

Existing Facilities

Water source: *Yenga river* Intake Facilities: *Small Dam*

Raw Water Transmission *2 No. pumps each Q=40m³/hr, H=122m, 100mm G.I./uPVC pipe*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*50mm*				
Length	*N/A*				
Materials	*uPVC*				

Service Reservoirs	*3No. R.C 48m³ each*				

Pump Details *Raw water pumps only*

Customer Details

Households Served

Members	Other H.H's	Total
N/A		*N/A*

Customers Metered Yes/No Metered Unmetered

Information unavailable

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996		
1997		

Service Area 36m²

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
100%				*100%*

Problems / Future Expansion / Remarks

1. The scheme is not operational due to lack of funds and poor management

2. Chlorination will be required when the sheme becomes operational

General

Name of Rural water Supply: *Mauna Dam* Location / District: *Siaya*

Organisation / Water Undertaker *MOWR* Map Ref *NA-36-15*

Drainage Sub Basin Co- Ords. *X: 34° 07' Y: N 00° 14'*

Construction Details

Year of Construction Phase I: *1970-1977* Phase II: Phase III

Constructed By: *MOWR* Funded By: *MOWR*

Total Construction Cost N/A

Year Operation Started: *1977*

Existing Facilities

Water source: Mauna Dam and Spring Intake Facilities: sump

Raw Water Transmission *Pumping*

Treatment Facilities *Only Chlorination - At present no chlorination is being done as dosers have broken down*

Chemicals Dosed *None currently*

Master Meter Details *Installed but not functioning*

Distribution Mains

Diameter	100mm	100mm	80mm	50-20mm	50-20mm
Length	6.8 km	1.4km	2km	14.7 km	22.3km
Materials	uPVC	G.S.	G.S	G.I.	uPVC

Service Reservoirs

1 No 136m³ masonry tank					

Pump Details *2 No pumps- only one operational when scheme last worked in 1992*

Customer Details

Households Served

Members	Other H.H's	Total
2500		*2500*

1997

Customers Metered Yes Metered *10* Unmetered *2490*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996		
1997		

Area covered is about 80km²

Water Consumption

Domestic	Institutional	Irrigation	Others	Total

Problems / Future Expansion / Remarks

The scheme has been inoperational since 1992 due to lack of funds.

Needs replacement of 1 No. pumpset, repairs to storage tanks , cattle troughs and some pipes.

General

Name of Rural water Supply: *Bar Ober* Location / District: *Siaya*

Organisation / Water Undertaker: *Community* Map Ref *SA-36-3*

Drainage Sub Basin Co- Ords. X: 34° 07' Y: S00° 01'

Construction Details

Year of Construction Phase I: *1976-1981* Phase II: Phase III

Constructed By: *MOWR* Funded By: *MOWR and Community*

Total Construction Cost *Ksh.1,200,000*

Year Operation Started: *1981*

Existing Facilities

Water source: *Spring at Bar Ober* Intake Facilities: *Sump*

Raw Water Transmission *Pumping: 80mm dia. G.S pipe - 2 No. pumps to elevated tank*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*80mm*				
Length	*N/A*				
Materials	*N/A*				

1 No.	*30m³ elevated tank*			

Service Reservoirs

Pump Details *Raw water pumps*

Customer Details

Households Served

Members	Other H.H's	Total
2000 people		*2000 people*

Customers Metered No Metered Unmetered

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996		
1997		

2000 people currently to be served served when operational

Water Consumption

Domestic	Institutional	Irrigation	Others	Total

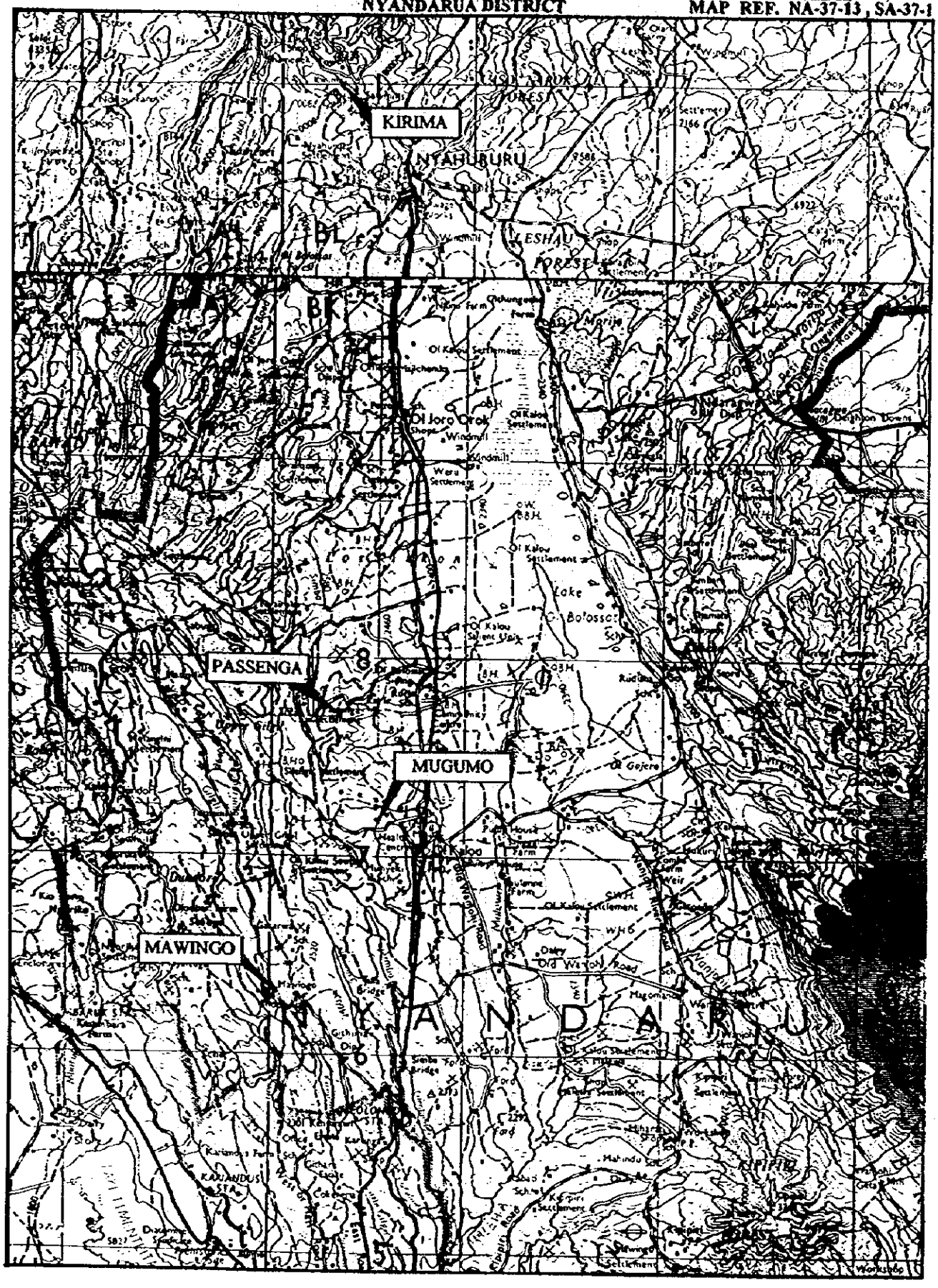
Problems / Future Expansion / Remarks

1. Scheme is not operational due to lack of funds

2. Chlorination required when the sceme is functional

RURAL WATER SUPPLIES - LOCATION PLAN

NYANDARUA DISTRICT MAP REF. NA-37-13 , SA-37-1



General

Name of Rural water Supply: *Huhirio W/S* Location / District: *Nyadarua*

Organisation / Water Undertaker: *Community* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1991-95* Phase II: *1996-97* Phase III 1998

Constructed By: *Self help and MOWR* Funded By: *Community, Red Cross 3, Catholic Mission*

Total Construction Cost *Kshs. 1,400,000*

Year Operation Started: 1996

Existing Facilities

Water source: *River Malewa* Intake Facilities: *Sump*

Raw Water Transmission *Gravity 100mm G.S pipe 200m long*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*100mm*	*80mm*	*60mm*	*40mm*	
Length	*Total 25km*		*UPVC*		
Materials	*UPVC*	*UPVC*	*UPVC*	*UPVC*	

1 No.	*300m³ Reiforced concrete tank*			

Service Reservoirs

Pump Details *Gravity*

Customer Details

Households Served

Members	Other H.H's	Total
150	*30*	*180*

Member have to pay 3,000/= to connected about 10% have not paid

Customers Metered Yes / No Metered *No* Unmetere *Yes*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996	*44m2/d*	
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
70%	*30%*			*100%*

Problems / Future Expansion / Remarks

General

Name of Rural water Supply: *Passenga W/S* Location / District: *Nyadarua*

Organisation / Water Undertaker: *Passenga Secondary school* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1967* Phase II: Phase III

Constructed By: *Contractor under MOWR* Funded By:

Total Construction Cost

Year Operation Started: 1968

Existing Facilities

Water source: *Nyairoko river* Intake Facilities: *WEIR*

Raw Water Transmission *Pumping. 37mm UPVC pipe for 1km long Q+ 12.6m3/hr , head 26m driven by lister engine*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None but tests are carried out twice a year*

Distribution Mains

Diameter	*50mm-25mm*				
Length	*10kkm total*				
Materials	*UPVC*				

Service Reservoirs

1 No.	*80m³ masonary and 50m3 masonary tank*	

Pump Details *Raw water pumps delivery to distribution tanks*

Customer Details

Households Served

Members	Other H.H's	Total
Serving only Passenga Secondary School		

Customers Metered Yes / No Metered *No* Unmetere *Yes*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		*349*
1994		*547*
1995		*612*
1996		*650*
1997	*8-10m2/d*	

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
	100%			*100%*

Problems / Future Expansion / Remarks

1). Originally the community was managing the scheme tank failed to run it effeciently Currently the school is running it

2) The public is using river water directly

3) Need full treatment

General

Name of Rural water Supply: *Kirima W/S* Location / District:

Organisation / Water Undertaker: *MOWR* Map Ref

Drainage Sub Basin Co-Ords. X: Y:

Construction Details

Year of Construction Phase I: *1968* Phase II: *1980-82* Phase III

Constructed By: *MOWR* Funded By: *Community*

Total Construction Cost

Year Operation Started: 1968

Existing Facilities

Water source: *River Pesi,Karurumaand Kahaho* Intake Facilities: *WEIR*

Raw Water Transmission *Gravity, 150mm- 100mm - 80mm UPVC pipe for 3.5 km*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None but tests are carried out twice a year*

Distribution Mains

Diameter	*80,50mm*				
Length	*26k*				
Materials	*UPVC*				

Service Reservoirs	*5 No.*	*100m³ tanks*			

Pump Details *distribution by gravity*

Customer Details

Households Served

Members	Other H.H's	Total
659		

Customers Metered Yes / No Metered *No* Unmetere *Yes*

Operation & Maintenance

Water Production

	Production	H.H Served
1993	*166m²/d*	*349*
1994	*233m2/d*	*547*
1995	*256m2/d*	*612*
1996	*258m2/d*	*650*
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
60%	*40%*			*100%*

Problems / Future Expansion / Remarks

1). Treatmnt required

2) Repairs to burst pipes

General

Name of Rural water Supply: *Mawingo* Location / District: *Nyandarua*

Organisation / Water Undertaker: *Community* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1988-95* Phase II: Phase III

Constructed By: *Self-help* Funded By: *Community, Rural Developmentfund*

Total Construction Cost *3,800.00*

Year Operation Started: *1996*

Existing Facilities

Water source: *Kiriundu spring* Intake Facilities: *Dam*

Raw Water Transmission *Pumping 100mm, and GS pipe 400m long Q 20m3, Head 200m, pump GRUNDFOSS CR 30*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*100mm*				
Length	*650m*				
Materials	*CS*				

Service Reservoirs

1 No.	*100m³ Masonary tank*			

Pump Details *Raw water pump delivers water to distribution tank*

Customer Details

Households Served

Members	Other H.H's	Total

Customers Metered Yes / No Metered Unmetered

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996	*7m³/d*	
1997	*7m³/d*	

Service area 0.3 km²

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
	100%			*100%*

Problems / Future Expansion / Remarks

1) The scheme is only serving the dispensary at Mawingo

2) Requires chlorination

3) Lack of funds prevents supply to public

General

Name of Rural water Supply: *Mugomo* Location / District: *Nyandarua*

Organisation / Water Undertaker: *Community* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *Pre independence* Phase II: *1982-96* Phase III

Constructed By: *MOWR+Direct labour* Funded By: *Community, MOWR,DDC.*

Total Construction Cost

Year Operation Started: *1996*

Existing Facilities

Water source: *Borehole C3066* Intake Facilities: *B/H*

Raw Water Transmission *Pumping 50mm pipe 20m long to tank*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*75mm*	*32mm*	*25mm*		
Length	*1.6km*	*1.6km*	*1.65km*		
Materials	*GI/UPVC*	*UPVC*	*UPVC*		

Service Reservoirs	*1 No.*	*6m³ area*	*bohole*	*100m³*	*Reinforced tank*

Pump Details *From tank pumping to distribution tank pump Q16m3/head/200., GRUNDFOS CR 16 motor 15km*

Customer Details

Households Served

Members	Other H.H's	Total
29	*Hospital*	*30*

Customers Metered Yes / No Metered *Yes* Unmetere *No*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996	*53m³/d*	
1997	*53m³/d*	

Water Consumption

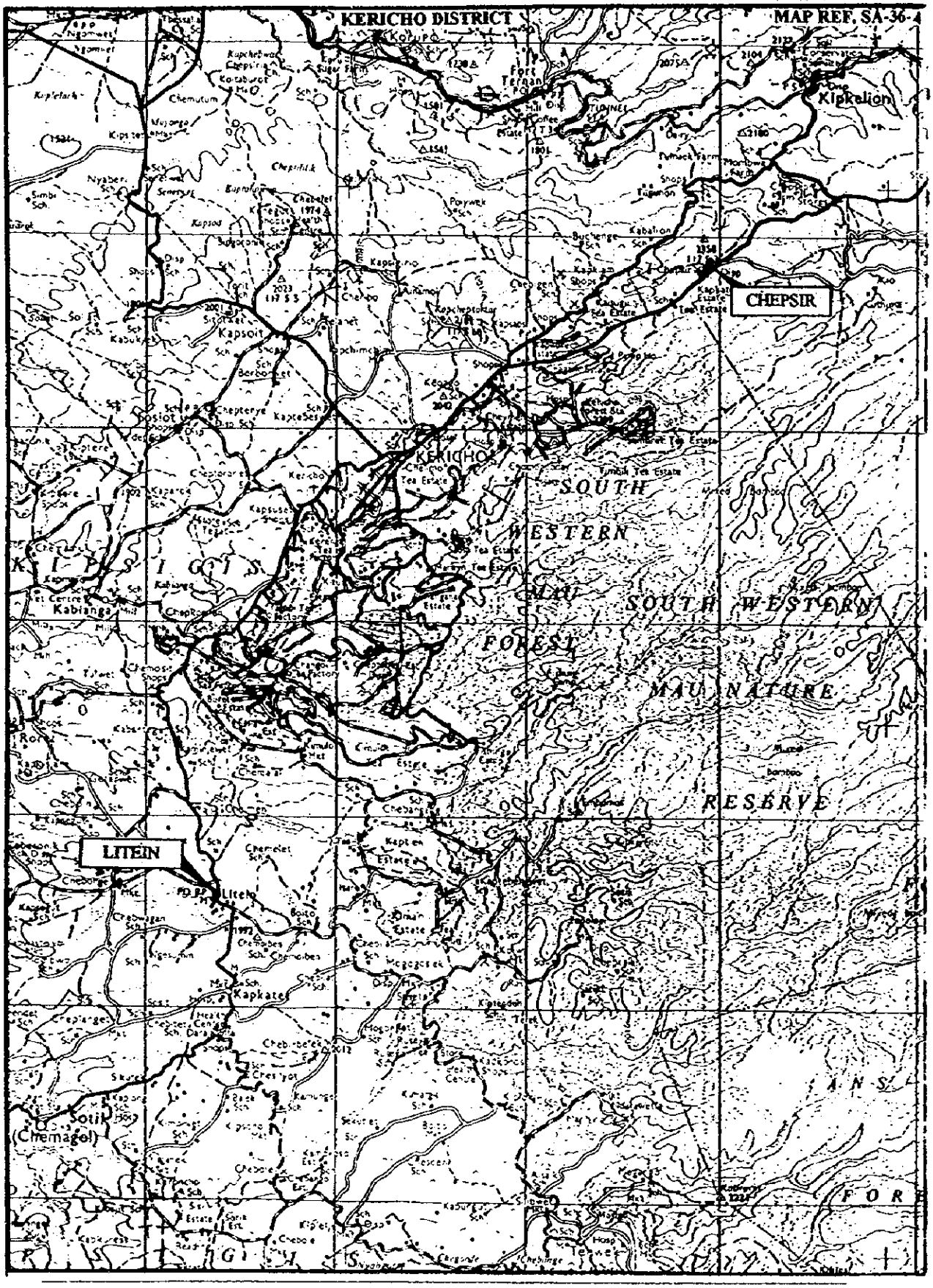
Domestic	Institutional	Irrigation	Others	Total
30%	*70%*			*100%*

Problems / Future Expansion / Remarks

1). Requires chlorination

2) Repairs to pipes bursts

RURAL WATER SUPPLIES - LOCATION PLAN



General

Name of Rural water Supply: *Tegunot/Nyakinyua W/S* Location / District: *Kericho*

Organisation / Water Undertaker: *Community* Map Ref *1:250,000* *SA-36-4*

Drainage Sub Basin _____ Co- Ords. X: _____ Y: _____

Construction Details

Year of Construction Phase I: *Before 1988-91* Phase II: _____ Phase III _____

Constructed By: *MOWR* Funded By: *District Development Committee*

Total Construction Cost - *Community*

Year Operation Started: *1991*

Existing Facilities

Water source: *Dam* Intake Facilities: *Dam*

Raw Water Transmission *Pumping - 100mm dia. GS pipe 1 km long. Pump Q = 16 m^3/hr*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*32mm*				
Length	*3.6 km*				
Materials	*uPVC*				

Service Reservoirs *1 No. 135 m^3 masonry tank*

Pump Details *Raw water pump deliver to distribution tank*

Customer Details

Households Served

Members	Other H.H's	Total
13	-	*13*

Customers Metered Yes / No Metered *No* Unmetered *Yes*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995	*No records*	
1996		
1997		

Service area 6 km^2

Water Consumption

Domestic	Institutional	Irrigation	Others	Total

Problems / Future Expansion / Remarks

1) Phase II of the scheme
a) New rising main
b) Storage tank
c) Distribution main

General

Name of Rural water Supply: *Litein* Location / District: *Kericho*

Organisation / Water Undertaker: NWCPC Map Ref: *SA-36-4*

Drainage Sub Basin Co- Ords. *X:35° 1 Y: 500° 35'*

Construction Details

Year of Construction Phase I: *1979 - 1980* Phase II: Phase III

Constructed By: *Zakhim International* Funded By: *MOWR*

Total Construction Cost *Kshs. 50 million*

Year Operation Started: *1980*

Existing Facilities

Water source: *Itare River* Intake Facilities: *Weir*

Raw Water Transmission *Pumping - 2Nos duty, 1No. standby - capacity 70m³/hr each*

Treatment Facilities *Conventional full treatment with capacity of 8,000 m³/day*

Flow measurement, mixing, coagulation, sedimentation, filtration & disinfection by chlorine (TCL)

Chemicals Dosed *Alum @ 150kg'd and 100 kg'd in wet and dry season respectively Soda ash @ 25kg'd and TCL @ 10kg'd*

Master Meter Details

Distribution Mains

Diameter	450	400	350	300	250	200
Length	1465	4480	1315	2639	7465	16892
Materials	uPVC	Steel				
Diameter	150	100	80	50		
Length	25210	10172	4480	135		
Materials	uPVC	Steel				

Service Reservoirs *8 No. with a total capacity of 3,455m³*

Pump Details *3Nos. raw water pumps with capacity of 70m³/h and 5 Nos. treated water pumps - capacity 100m3/hr each*

Customer Details

Households Served

Members	Other H.H's	Total
		5639

Customers Metered Yes / No Metered 425 Unmetered 5214

Operation & Maintenance

Water Production

	Production	H.H. Served
1993		
1994		
1995	6850m³/d	5,639
1996		
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
65%	20%		15%	100%

Problems / Future Expansion / Remarks

The existing scheme is managed by NWCPC and is not able to meet the demand in the area of supply due ti various constraints. The constraints are lack of operation and maintenance funds, facilities were constructed to meet the 1988 water demand of 7,940m³/day whereas the present water demand is 17,750m³/day, wastage of water due to taps left open as majority of consumers are on flat rate. Preliminary design for rehabilitation of existing scheme and expansion including bulk and individual metering has been carried out by a firm of Consulting Engineers.

General

Name of Rural water Supply: *Chepsir Zone A&B* Location / District: *Kericho*

Organisation / Water Undertaker: *MOWR* Map Ref *SA-36-4*

Drainage Sub Basin Co- Ords. *X: 35° 25' Y: S 00° 17'*

Construction Details

Year of Construction Phase I: *1979-1989* Phase II: _____ Phase III _____

Constructed By: *Self Help* Funded By: *GOK (Rural Dev. Fund)*

Total Construction Cost *N/A*

Year Operation Started: *1989*

Existing Facilities

Water source: *Zone A- Small Dam; Zone B-spring* Intake Facilities: *Small Dam/Sump*

Raw Water Transmission *Zone A and B- Lister engines coupled to Grundfos pumps Q=27m³/hr each*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details

None	*Zone A*	*ZoneB*			
Distribution Mains					
Diameter	*37mm*	*37mm*			
Length	*7km*	*7km*			
Materials	*uPVC*	*uPVC*			

Service Reservoirs *1 No. 135m³ tank in each zone and 225m³ tank in zone A, all masonry*

Pump Details *2 No. raw water pumps deliver untreated water to storage tanks, Q=27m³/hr each*

Customer Details

Households Served

Members	Other H.H's	Total
10-A, 9-B		*19*

Customers Metered No Metered _____ Unmetered *All consumers*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996		
1997		

Service Area 21m²

Information unavailable

Water Consumption

Domestic	Institutional	Irrigation	Others	Total

Problems / Future Expansion / Remarks

1. Some of the customers have defaulted on payment and have been disconnected

2. Treatment required urgently.

3. The dam in zone A requires desilting

General

Name of Rural water Supply: *Ngecherok* Location / District: *Kericho*

Organisation / Water Undertaker: *Community* Map Ref *1:250,000 SA-36-4*

Drainage Sub Basin *3SK* Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1978-87* Phase II: Phase III

Constructed By: *Self Help* Funded By: *Rural Development Fund*

Total Construction Cost - *MOWR*

Year Operation Started: *1987*

Existing Facilities

Water source: *Kiboit River* Intake Facilities: *Weir*

Raw Water Transmission *Pumping - 150mm dia. PVC - 24 km long electrically operated - Pump GRUNDFOS Q = 27 m^3/h Head 153m*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*75,50,37,25mm*				
Length	*Total 18 km*				
Materials	*PVC & GS*				

Service Reservoirs *1 No. 135 m^3 masonry*

Pump Details *Raw water pump deliver to distribution tank*

Customer Details

Households Served

Members	Other H.H's	Total
360	-	*360*

Customers Metered Yes / No Metered *No* Unmetered *Yes*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996		
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total

Problems / Future Expansion / Remarks

1) Storage tank to be rebuilt
2) Treatment required

General

Name of Rural water Supply: *Bargeywet W/S* Location / District: *Kericho*

Organisation / Water Undertaker: *MOWR* Map Ref 1:250,000

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1989* Phase II: Phase III

Constructed By: *MOWR* Funded By: *MOWR*

Total Construction Cost -

Year Operation Started: *1989*

Existing Facilities

Water source: *Bargeywet Spring* Intake Facilities: *Sump*

Raw Water Transmission *Gravity 80mm dia. GI/PVC pipe - 4 km long*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*50,37,20mm*				
Length	*Total 4 km*				
Materials	*uPVC*				

Service Reservoirs *None*

Pump Details *Gravity*

Customer Details

Households Served

Members	Other H.H's	Total
60	-	*60*

Customers Metered Yes / No Metered *No* Unmetered *Yes*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995	*No records*	
1996		
1997		

Water Consumption

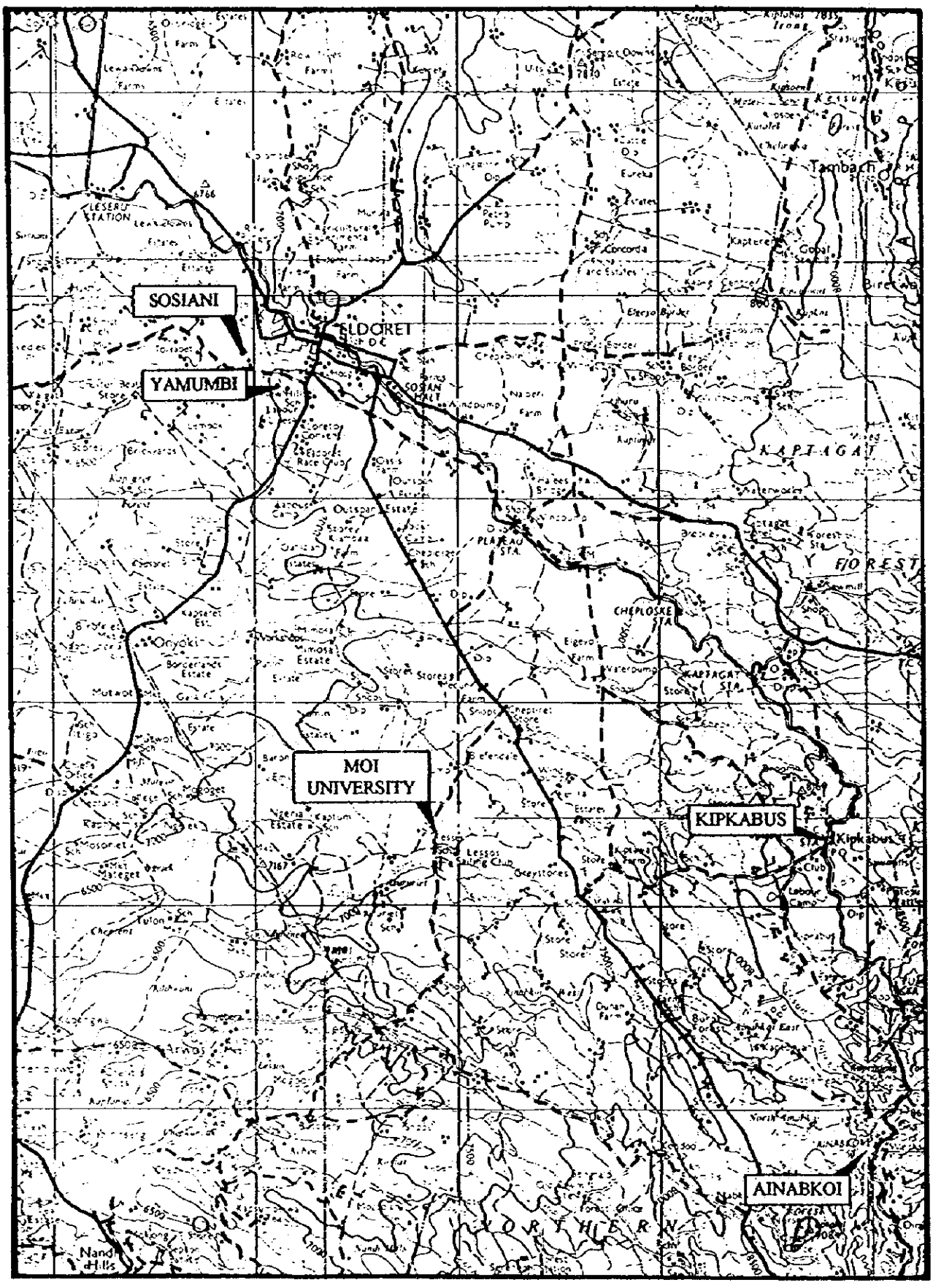
Domestic	Institutional	Irrigation	Others	Total
80%	*20%*	-	-	*100%*

Problems / Future Expansion / Remarks

1) Treatment works required
2) Protection of intake required
3) Desilting of the sump area

RURAL WATER SUPPLIES - LOCATION PLAN

UASIN GISHU DISTRICT **MAP REF. NA-36-16**



General

Name of Rural water Supply: *Kipkabus* Location / District: Uasin Gishu

Organisation / Water Undertaker: *Community* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1985* Phase II: Phase III

Constructed By: *MOWR Direct Labour* Funded By: *GOK*

Total Construction Cost *Ksh 13,044,000/-*

Year Operation Started: 1988

Existing Facilities

Water source: *Lolgarini Springs* Intake Facilities: dam

Raw Water Transmission *Pumping*

Treatment Facilities *None. The treatment works are incomplete*

Chemicals Dosed *None*

Master Meter Details *None installed*

Distribution Mains

Diameter	*100mm*	*75mm*	*50mm*		
Length				*} Total length 10km*	
Materials	*UPVC*	*UPVC*	*UPVC*		

Service Reservoirs	*2 No.Masonry tanks each 100m3*			

Pump Details *Raw water pumps delivery to distribution tanks by 1 No pump Q=30m3/hr, H=100m*

Customer Details

Households Served

Members	Other H.H's	Total
390		*390*

Customers Metered No Metered Unmetere *390*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996	1397m3	*390*
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
100%				*100%*

Problems / Future Expansion / Remarks

No treatment is being done as the treatment works is not complete

The immediate need now is to complete the treatment works

Prepared by POM Date: 5/3/98

General

Name of Rural water Supply: *Yamumbi* Location / District: Uasin Gishu

Organisation / Water Undertaker: *Passenga Secondary school* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: 1981 Phase II: Phase III

Constructed By: *MOWR* Funded By: *EEC Micro Projects*

Total Construction Cost *Ksh. 2.5 million*

Year Operation Started: 1984

Existing Facilities

Water source: *river* Intake Facilities: *WEIR*

Raw Water Transmission *Pumping.*

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None*

Distribution Mains

Diameter	*160mm-40mm*			
Length	*17.5km*			
Materials	*UPVC with G.I.sections*			

Service Reservoirs	*1 No.*	*2m³ elevated steel tank*		

Pump Details *1 No. Lister engine-driven high lift pump Q=33m3/hr, H=120m*

Customer Details

Households Served

Members	Other H.H's	Total
1500		*1500*

Customers Metered No Metered Unmetere *1500*

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995		
1996		
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
100%				*100%*

Problems / Future Expansion / Remarks

The scheme has no traetment facility, even chlorination!

Eldoret Municipal Council has agreed to supply the community from its water suply system but the community must supply the necessary pipes and fittings for an off-take

Prepared by POM Date: 5/3/98

General

Name of Rural water Supply: *Moi University W/S* Location / District: *Kesses/Uasin Gishu*

Organisation / Water Undertaker: *Moi University* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Old W/S *1985* Phase1A *1988* Ph 1B,II *1990*

Constructed By: *Self help* Funded By: *Local community*

Total Construction Cost *Ksh. 86 millin (original)*

Year Operation Started: *1990*

Existing Facilities

Water source: *Samul River* Intake Facilities: *Lesses dam*

Raw Water Transmission *Old W/S - gravity/pumping; Ph 1A, 1B-gravity*

Treatment Facilities *Coagulation, Sedimentation, Filtration and Chlorination*

Chemicals Dosed *At new T/works only - Alum, Soda Ash, Chlorine*

Master Meter Details *Not yet installed*

Distribution Mains

Diameter	*315mm-75mm*				
Length	*10km*				
Materials	*UPVC/GI*				

Service Reservoirs | *1 No. 6250m³ R.C.; 1 No. 328m³ elevated steel tank* | | |

Pump Details *1 No.raw water pump Q=20l/s H=90m; 2 No. distribution pumps at new T/works Q=125l/s H=90. (2 No. backwash pumps not yet installed)*

Customer Details

Households Served (Population)

Members	Other H.H's	Total
150		*150*

Customers Metered Yes Metered *150* Unmetered

Only staff quarters are metered

Operation & Maintenance

Water Production

	Production	H.H Served
1993	*584,000m³*	*150 staff houses and 3500 students*
1994	*584,000m³*	*150 staff houses and 3500 students*
1995	*584,000m³*	*150 staff houses and 3500 students*
1996	*584,000m³*	*150 staff houses and 3500 students*
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
	90%	*5%*	*5%*	*100%*

Problems / Future Expansion / Remarks

This an institutional water supply scheme serving the University students and staff. The total population served is estimated to be 4,700

Major problems include:

1. Power supply interruptions

2. Incomplete Phase 1B and II whereby backwash pumps are not yet installed and treatment works are incomplete

These problems have resulted in inadequate supply and the scheme is not operating to optimal design capacity

General

Name of Rural water Supply: *Sosiani* Location / District: *Uasin Gishu*

Organisation / Water Undertaker: *MOWR* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1978* Phase II: Phase III

Constructed By: *MOWR Direct Labour* Funded By: *GOK*

Total Construction Cost *Ksh. 3,209,000*

Year Operation Started: *1981*

Existing Facilities

Water source: *2 No. Boreholes* Intake Facilities: *B/Hole*

Raw Water Transmission *Pumping*

Treatment Facilities *No treatment*

Chemicals Dosed *None*

Master Meter Details *1 No. 75mm dia. Kent meter*

Distribution Mains

Diameter	*75mm*	*50mm*			
Length	Total length 8 km				
Materials	*UPVC*	*UPVC*			

Service Reservoirs | *1No. 45m³ elevated steel tank* | | | |

Pump Details *2 No. borehole pumps, each Q=3m³/hr. H=190m*

Customer Details

Households Served

Members	Other H.H's	Total
104		*104*

Customers Metered *No/Yes* Metered Unmetered

Information not available

Operation & Maintenance

Water Production

	Production	H.H Served
1993		
1994		
1995	*1,814m³*	*104*
1996	*680m³*	*104*
1997		

Water Consumption

Domestic	Institutional	Irrigation	Others	Total
100%				*100%*

Problems / Future Expansion / Remarks

Pumps break down very frequently. This is probably the reason for the low production in 1996

Chlorination t should be carried out as a priority

General

Name of Rural water Supply: *Arangai* Location / District: *Ainabkoi/ Uasin Gishu*

Organisation / Water Undertake *Community self help* Map Ref

Drainage Sub Basin Co- Ords. X: Y:

Construction Details

Year of Construction Phase I: *1969* Phase II: *1983* Phase III

Constructed By: *MOWR Direct Labour* Funded By: *GOK*

Total Construction Cost

Year Operation Started: *1989 (Ph. II)*

Existing Facilities

Water source: *River Rongai* Intake Facilities: *WEIR*

Pumping: 300m of 150mm dia G.I pipe; 1620m of 150mm dia. uPVC pipe

Treatment Facilities *None*

Chemicals Dosed *None*

Master Meter Details *None installed*

Distribution Mains

Diameter	150mm	100mm	100mm	80mm	
Length	2400m	3300m	3060m	2830m	
Materials	uPVC 'B'	uPVC 'C'	uPVC 'B'	uPVC 'B'	

Service Reservoirs	2No. masonry $50m^3$;	1No. masonry $100m^3$		
Pump Details	1 No. pump, $Q=50m^3/hr$; $H=150m$			

Customer Details

Households Served	Members	Other H.H's	Total
(persons)	5290	N/A	5290

Customers Metered *No* Metered Unmetered

Operation & Maintenance

	Production	H.H Served	
Water Production 1993			}
1994			}
1995			} *No records*
1996			}
1997			}

Water Consumption	Domestic	Institutional	Irrigation	Others	Total
	40%	60% KCC			100%

Problems / Future Expansion / Remarks

It is noted that no treatment at all is being done. As an immediate measure,chlorination should be carried out.

The main problems are lack of community organisation and management

Arangai is one of the 7 shemes under the Ainabkoi complex

A new sceme is proposed with lake Narahsa as source

DATA BOOK V

RESULT OF SURVEY ON EXISTING SEWERAGE SYSTEMS

THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN

DATA BOOK

DATA BOOK V : RESULTS OF SURVEY ON EXISTING SEWERAGE SYSTEMS

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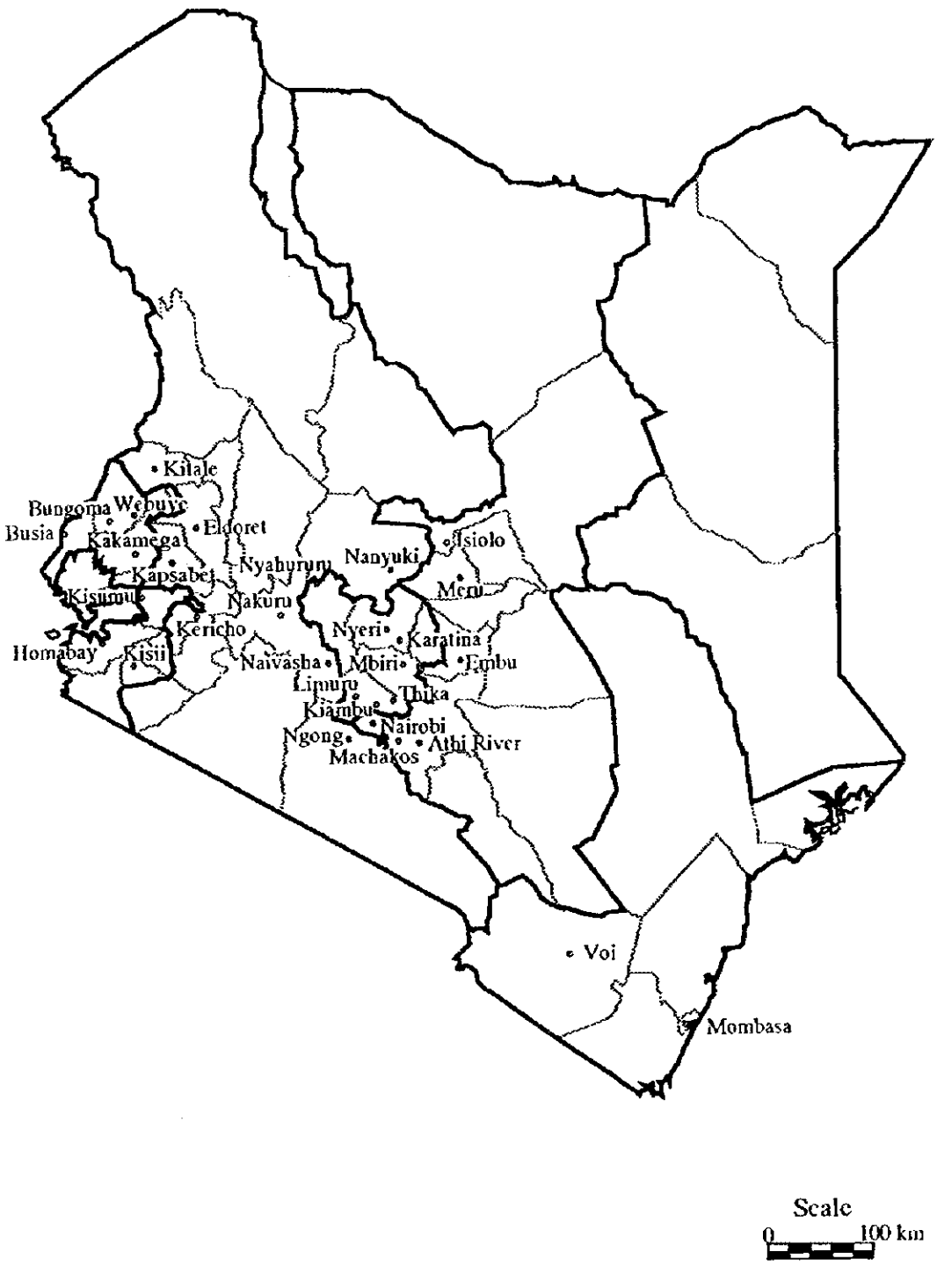
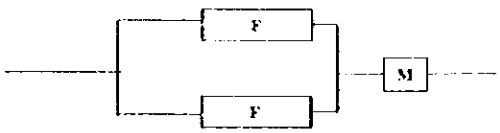


THE AFTERCARE STUDY ON THE NATIONAL WATER MASTER PLAN	Location of Urban Centers
JAPAN INTERNATIONAL COOPERATION AGENCY	

Name of Urban Center	Bungoma			x	y
District	Bungoma		Coordinates		
Province	Western		Elevation	1,405m	
Mean Annual Precipitation (mm)		Temperature max & min °C			
	1995	1998	2000	2005	2010
Population Projections		70,000			
Urban Area (ha)		5,500.0			
Population Density (ppha)		12.7			
Water Supply	1995	1998	2000	2005	2010
Domestic water demand (m3/d)					
Total water consumption (m3/d)		2,620			
Area served (estimated net (ha))					
Raw water Source	Borehole				
Sewerage Facilities	1995	1998	2000	2005	2010
Population Served		12,600			
Service coverage ratio %		5%			
Area served (estimated net (ha))		275.0			
Population Density (ppha)		45.8			
Wastewater volumes (m3/d)					
Sewerage connections		260			

Treatment process



F, Facultative
M, Maturation

Description & dimensions	Size		Area	Depth	Volume
Facultative pond 1	30.0	30.0	900.0		-
Facultative pond 2	30.0	80.0	2,400.0		-
Maturation Pond 1	30.0	30.0	900.0		-

	Design Capacity		Actual flow		
	Dry weather	Population	Min	Max	Avg
BOD Loading					
Hydraulic loading	-		-		
	BOD	COD	SS	N,P	FC
influent	550	1936	700	-	-
effluent	-	-	-	-	-
receiving water body u/s	-	-	-	-	-
receiving water body d/s	-	-	-	-	-
Receiving water body	Khalaba River				

	Treatment Method	Disposal
Sludge Processing	No treatment	Municipal garbage dump

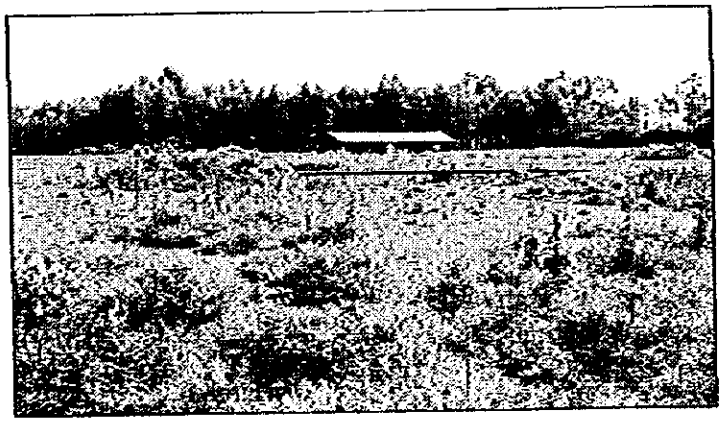
Operation & Maintenance — **Treatment Works**

1. Maintenance has been neglected: the first pond is full of sludge and grass
2. Due to the persisting water shortage in the town all the sewage is directed to the smaller falcultative pond. There is no overflow from this pond. The other two ponds are dry and are fully covered with vegetation.
3. The inlet to the first pond has clogged and the sewage overflows overland to the smaller falcultative pond
4. Interponds connections, outlet from the maturation pond and outfall are covered with soil and grass.
5. About 2/3rd of the site has been fenced out for a school and it was planned that the new sewage works would have been in operation by now. However the contractor abondoned the site in 1996 and the council is doing appraisal for retender.
6. Only pond excavation in the new ponds site has been carried out.

Sewers

1. Most of the 100mm diameter sewers are permanently blocked due to size and prolonged water shortage in town.
2. Most trunk sewers are small 150mm diameter which are prone to frequent blockage resulting in overflows onto the streets. 83% of the total sewers in the town are 150 and 100 mm dia. in size. About one blockage per day has been reported.
3. 70 % of the planned 7km long new sewers under the 1996 project have been laid without manholes.
4. Most sewers discharge into open drains or nearby fields creating a significant health hazard.

Waste stabilization Pond: note sludge accumulation near outlet pipe



Waste stabilization Pond: pond is dry and area is used for cattle grazing.

On-going projects
Construction of a new treatment works was started in 1992 under ADB but stalled because of non-performance by contractor. Arrangements for re-tendering are underway.

Management

Staffing

	Skilled	*Unskilled*
Sewage works	1	2
Sewer maintenance	1	5
Bye-law enforcement	-	
Other	-	

Resources Available

	Comments
1No. rodding machine	In good condition
1 set of sewer rods	In good condition
Wheelbarrow/Jembes etc.	In good condition

Sources of Revenue

Sewer charges
Connection fees

Annual Cash Flow, kshs.

Year	*Revenue*	*Expenditure*	*Surplus*
1995	200,000	562,240	(362,240)
1996	211,000	571,040	(360,040)
1997	232,500	607,840	(375,340)

Financial Problems

The sewer charges are corrected by NWCPC and are based on flat rate
Consumer failure to pay bills
Lack of other sources of revenue

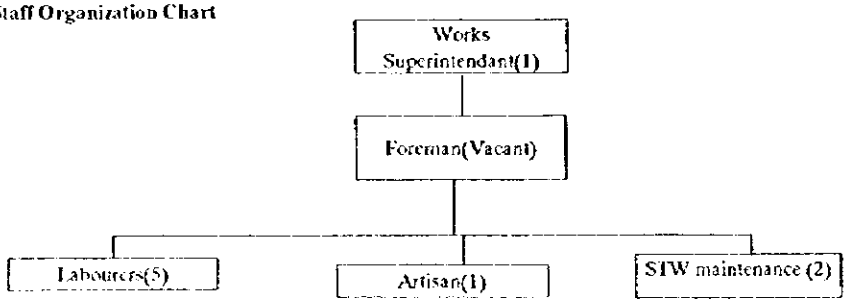
Investment Budget Plan

Type of activity	*Target Year*
Complete the work on the new sewage works	

On - Plot Sanitation

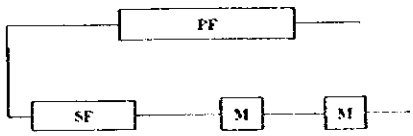
% Population with on plot sanitation	75%
Method of desludging facility	Exhauster from Ministry of Public works
Quantity of sludge m^3/year	not known
Location of disposal point	Solid waste dumping site

Staff Organization Chart



Name of Urban Center	Busia (South Iteso)			x	y
District	Busia		Coordinates	34° 07'	00° 29'
Province	Western		Elevation	approx. 1,200m	
Mean Annual Precipitation (mm)			Temperature max & min °C		
	1995	1998	2000	2005	2010
Population Projections	32,441	45,600	60,049	89,110	102,635
Municipal Area (ha)	110	250.0			
Population Density (pph)		190.0			
Water Supply	1995	1998	2000	2005	2010
Domestic water demand (m3/d)		2,680			14,038
Total water consumption (m3/d)	3,637	2,030			
Area served (estimated net (ha))	16.0	300.0	40.0		60.0
Raw water source	Boreholes				
Sewerage Facilities	1995	1998	2000	2005	2010
Population Served	2,607	9,600	9,007	22,278	41,454
Service coverage ratio %	8%	10%	15%	25%	40%
Area served (estimated net (ha))		25.0			
Population Density (pph)		390.0			
Wastewater volumes (m3/d)		600			
No. of connections		473			

Treatment process



PF, Primary facultative
SF, Secondary facultative
M, Maturation
TF, Trickling filter
OD, Oxidation ditch

Description & dimensions	Retention time (days)		Area	Depth	Volume
Primary Facultative Pond		40.0	14,725.0	1.75	23875.0
Secondary Facultative Pond		7.0	5,600.0	1.75	8400.0
Maturation Pond 1		7.0	6,300.0	1.50	8300.0
Maturation Pond 2		7.0	6,300.0	1.50	8300.0

	Design Capacity		Actual flow		
	Dry weather	Population	Min	Max	Avg
Hydraulic loading	600	9,600	400	1,200	600
BOD loading					
	BOD	COD	SS	TN / TP	FC
influent	200	250	60		
effluent	85	105	20	14.4 / 1.9	Nil
receiving water body u/s	8.5	40	20		
receiving water body d/s	12.5	85	20		
Receiving water body	Sio River				

	Treatment Method	Disposal
Sludge Processing	No treatment	Municipal garbage dump

Operation & Maintenance	**Treatment Works**
1. Screens are not attended to and there is no grit removal facility. The inlet chamber is full of grit and grass.	
2. A section of the embankment between the first and third pond is seeping and needs attention.	
3. Slabs lining the second maturation have collapsed	
4. All chambers are full of grit and grass. Most chambers do not have covers	
5. Scum floating in the ponds. No evidence of removal.	
6. Grass is not regularly cut around the ponds	
	Sewers
1. Trunk sewer through Zone G has a gentle slope thus causing frequent blockages	
2. Approximately 200 blockages per year and 50 overflows lasting 3 days each	
3. Most manhole covers missing due to vandalism (approx. 150 stolen)	
4	
5	

No Picture Available

On-going projects	None

Management

Staffing

	Skilled	*Unskilled*
Sewage works	-	2
Sewer maintenance	4	4
Bye-law enforcement	-	1
Other (watchmen)	-	2

Resources Available

	Comments
1 No. Exhauster lorry	Good condition
1 No. Hand Rachet	Good condition
38 No. Sewer rods	Good condition
1 No. Rodding machine	Good condition

Sources of Revenue

Sewer charges
Exhauster fees
Connection fees
Blockages charges

Annual Cash Flow, Kshs.

Year	*Revenue*	*Expenditure*	*Surplus*
1995	281,166	702,580	(421,414)
1996	372,434	1,016,760	(644,326)
1997	323,753	1,127,500	(803,747)

Financial Problems

Inaccurate billing due to lack of service to meters
Consumer failure to pay bills
Insufficient funding to complete sewer extensions

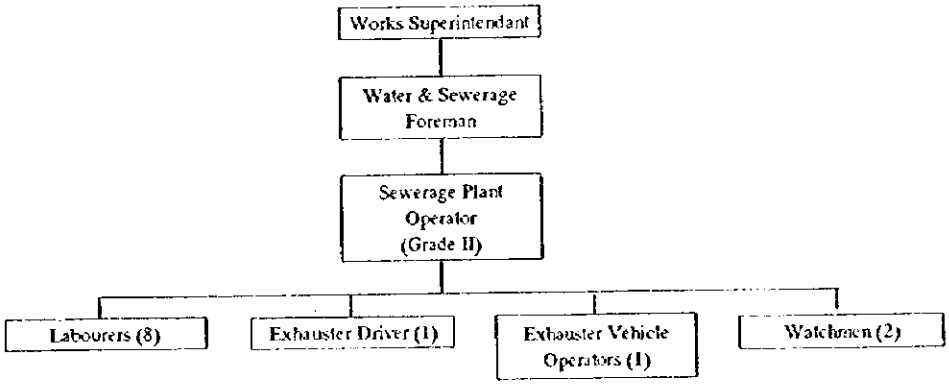
Investment Budget Plan

Type of activity	*Target Year*
None	

On - Plot Sanitation

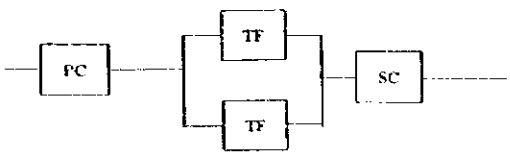
% Population with on-plot sanitation	80%
Method of desludging facility	Municipal Council Exhauster
Estimated Quantity of sludge m^3/year	700
Location of disposal point	Sewage treatment works

Staff Organization Chart



Name of Urban Center	Eldoret			x	y
District	Uasin Gishu		Coordinates	35° 14'	0° 33'
Province	Rift Valley		Elevation	approx. 2,090m	
Mean Annual Precipitation (mm)			Temperature max & min °C		
	1995	1998	2000	2005	2010
Population Projections	148,204	220,000	247,489	378,415	450,629
Municipal Area (ha)	858	14700			
Population Density (ppha)		15.0			
Water Supply	1995	1998	2000	2005	2010
Domestic water demand (m3/d)					61,096
Total water consumption (m3/d)	35506	25,600			
Area served (estimated net (ha))	843.0		2,035.0		3,635.0
Raw water source	Twin River dam, Elgiriin dam, Boreholes				
Sewerage Facilities	1995	1998	2000	2005	2010
Population Served	16,907	20,400	49,497	113,524	180,252
Service coverage ratio %	11%		20%	30%	40%
Area served (estimated net (ha))					
Population Density (ppha)					
Wastewater volumes (m3/d)		6,000			
No. of sewer connections		5886			

Treatment process



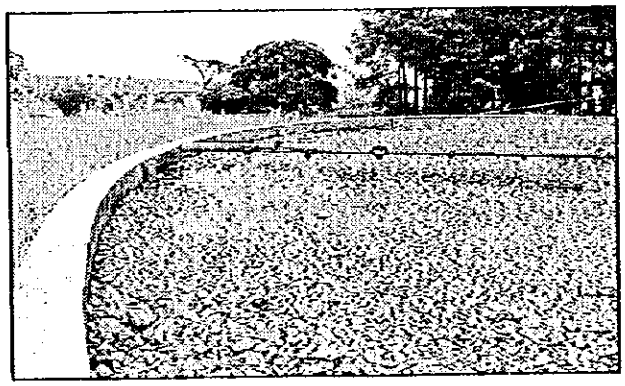
PC, Primary clarifier
SC, Secondary clarifier
TF, Trickling filter

Description & dimensions	Size		Area	Depth	Volume
Primary clarifier 1	dia=	12.2	117	3.00	351
Trickling filter 1	dia=	30.5	731	1.75	1279
Trickling filter 2	dia=	30.5	731	1.75	1279
Secondary Clarifier	dia=	12.2	117	1.80	210
Sludge Digester	dia=	16.5	214	1.80	385
Sludge drying beds - 5 No.	18.0	12.0	216		

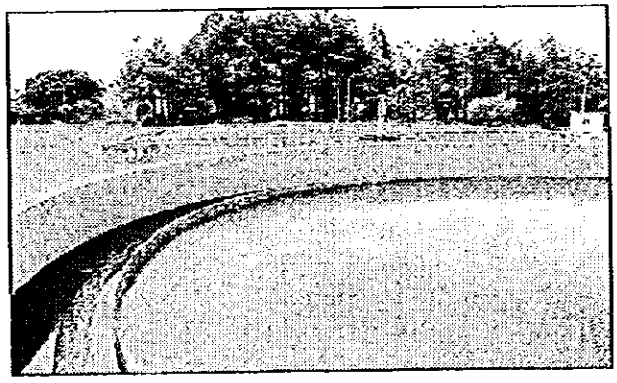
	Design Capacity		Actual flow		
	Dry weather	Population	Min	Max	Avg
Hydraulic loading	1,575	11,000	3,150	3,000	3,075
BOD loading	435				
	BOD	COD	SS	N/P	FC
influent	300	800	140		
effluent	115	80	20	8.0/3.4	800
receiving water body u/s	5	35	10		
receiving water body d/s	12.5	41	50		
Receiving water body	Sosiard River				

	Treatment Method	Disposal
Sludge Processing	Sludge digestion tank & drying beds	Sold at 15shs/ton

Operation & Maintenance	Treatment Works
1. Facility treats mostly domestic waste	
2. The facility receives far in excess of its design flow (6000 m^3/d as compared to design flow of 1575 m^3/d)	
3. The inlet works are well maintained, raked manually	
4. Flow is recorded hourly at the partial flume by the operator	
5. Replacement of distribution arms in the two filters is required	
6. Replacement of filter media in the sludge drying beds	
	Sewers
1. Existing sewers are in good operation	
2	
3	
4	
5	



Trickling Filter: note rotating arm stalled in one location, rock media is saturated with silt & debris



Primary clarifier: note floating chunks of dark scum indicating anaerobic activity and process overloading

On-going projects
New treatment facility proposed at new site, currently under design. Funded by KFW (Germany)
Existing works will be rehabilitated and kept in operation

Management

Staffing

	Skilled	*Unskilled*
Sewage works	8	9
Sewer maintenance	5	9
Bye-law enforcement	6	1
Other	-	

Resources Available

3 No. Exhausters - 9000 litres	Comments
Winching machine	In good condition
Sludge pump	In good condition
Wheelbarrow/Jembes/ lawn mowers etc.	In good condition

Sources of Revenue

Sewer charges
Connection fees
Water charges

Annual Cash Flow, kshs.

(Revenue and expenditure figures same for both systems)

Year	*Revenue*	*Expenditure*	*Surplus*
1995	61,175,834	656,927,281	(595,751,447)
1996	145,843,260	42,241,768	103,601,492
1997	155,340,595	67,605,203	87,735,392

Financial Problems

Only where connections are not covered in the block mapping

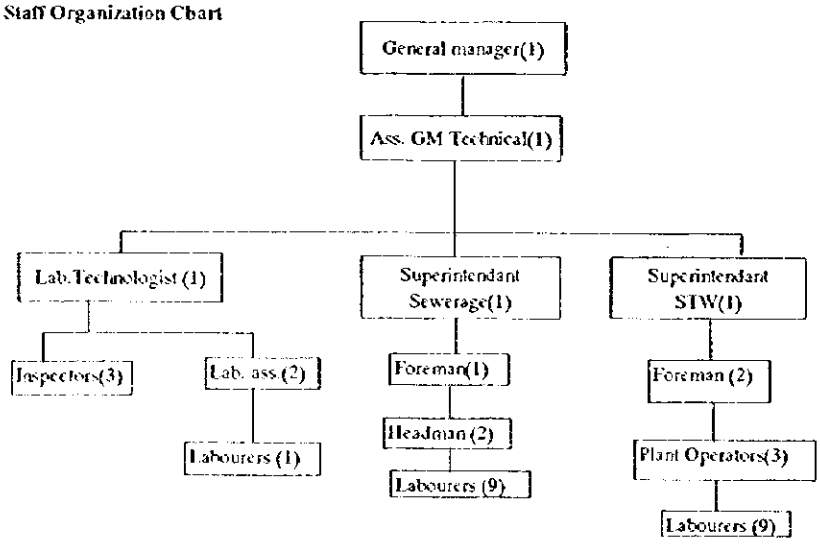
Investment Budget Plan

Type of activity	*Target Year*
Design and implementation of a new	
sewage works	

On - Plot Sanitation

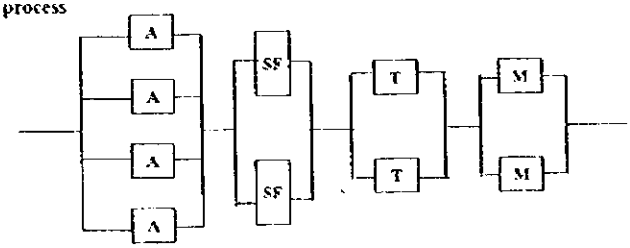
% Population with on plot sanitation	68%
Method of desludging facility	Council exhausters
Quantity of sludge m^3/year	7605 (485 trips /year)
Location of disposal point	Nearest manhole or at sewage works

Staff Organization Chart



Name of Urban Center	Eldoret			x	y
District	Uasin Gishu		Coordinates	35° 14'	0° 33'
Province	Rift Valley		Elevation	approx. 2,084m	
Mean Annual Precipitation (mm)			Temperature max & min °C		
	1995	1998	2000	2005	2010
Population Projections	148,204	220,000	247,286	378,415	450,629
Municipal Area (ha)	858	14,700.0			
Population Density (ppha)		15.0			
Water Supply	1995	1998	2000	2005	2010
Domestic water demand (m3/d)					61,096
Total water consumption (m3/d)	25,000	25,000			
Area served (estimated net (ha))	843.0		2,035.0		3,635.0
Raw water source	Twin River dam Ellgunji Dam Boreholes				
Sewerage Facilities	1995	1998	2000	2005	2010
Population Served	16,907	70,400	49,497	113,524	180,252
Service coverage ratio %	11%		20%	30%	40%
Area served (estimated net (ha))					
Population Density (ppha)					
Wastewater volumes (m3/d)					
No. of sewer Connections					

Treatment process



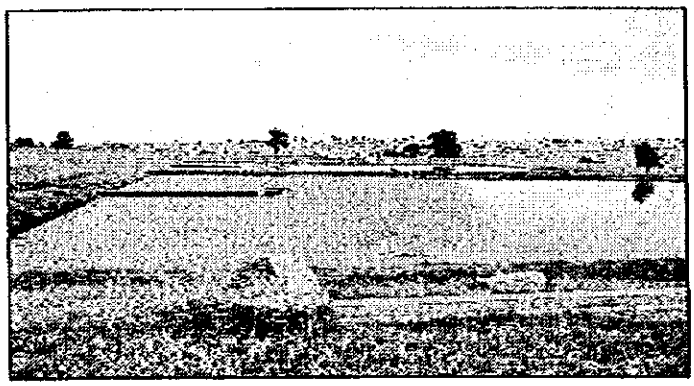
A, Anaerobic
SF, Secondary facultative
T, Tertiary Pond
M, Maturation

Description & dimensions	Size		Area	Depth	Volume
Anaerobic pond 1	61.0	61.0	3,750.0	3.00	11250.0
Anaerobic pond 2	61.0	61.0	3,750.0	3.00	11250.0
Anaerobic pond 3	61.0	61.0	3,750.0	3.00	11250.0
Anaerobic pond 4	61.0	61.0	3,750.0	3.00	11250.0
Facultative pond 1			26,500.0	1.75	46375.0
Facultative pond 2			26,500.0	1.75	46375.0
Tertiary Pond 1			11,840.0	1.75	20720.0
Tertiary Pond 2			11,840.0	1.75	20720.0
Maturation pond 1			14,290.0	1.30	18577.0
Maturation pond 2			14,290.0	1.30	18577.0

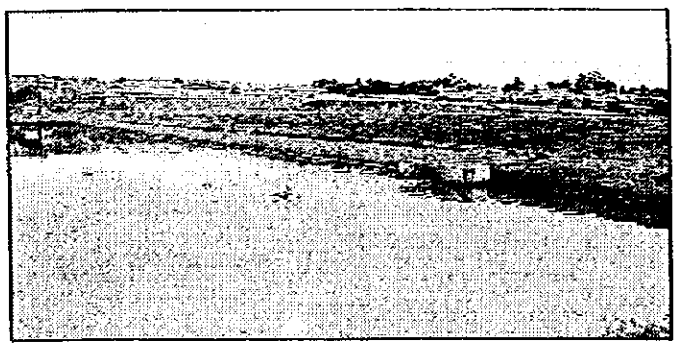
	Design Capacity		Actual flow		
	Dry weather	Population	Min	Max	Avg
Hydraulic loading	4,800		6,544	8,096	7,320
BOD loading	2,160				
	BOD	COD	SS	N.P	FC
influent	370	670	800		
effluent	85	296	650	8/3.4	500
receiving water body u/s	4	40	240		
receiving water body d's	10.5	40	250		
Receiving water body	Sosiani river				

	Treatment Method	Disposal
Sludge Processing	No treatment	Municipal garbage dump

Operation & Maintenance
1. Flows into the pond are far in excess of design capacity, and ponds are hydraulically and organically overloaded.
2. Peak flows are diverted at the inlet works to one of the secondary facultative ponds, by-passing anaerobic ponds.
3. Peak flows are frequently caused by industrial discharges and since pre-treatment in the anaerobic ponds is by-passed the first facultative pond is severely overloaded.
4. Inlet channel and screens are too small resulting in frequent by-pass of anaerobic ponds.
5. The ponds occasionally receive large amounts of petroleum oil creating scum problems, fouling channels, inlets & outlets.
6. The absence of a grit removal system has resulted in sludge accumulation in the anaerobic ponds.
Sewers
1. Sewers are operating satisfactorily
2
3
4
5



Anaerobic Pond: note heavy scum and accumulation of sludge & debris at inlet structure



Maturation Pond: note accumulation of debris at inlet & and oily appearance of surface

On-going projects

New treatment facility proposed at new site, currently under design. Funded by KFW (Germany)

Existing works will be rehabilitated and kept in operation

Management

Staffing

	Skilled	*Unskilled*
Sewage works	8	9
Sewer maintenance	5	9
Bye-law enforcement	6	1
Other	-	

Resources Available

	Comments
3 No. Exhausters - 9000 litres	
Winching machine	In good condition
Sludge pump	In good condition
Wheelborrow/Jembes/ lawn mowers etc.	In good condition

Sources of Revenue

Sewer charges
Connection fees
Water charges

Annual Cash Flow, kshs.

(Revenue and expenditure figures same for both systems)

Year	*Revenue*	*Expenditure*	*Surplus*
1995	61,175,834	656,927,281	(595,751,447)
1996	145,843,260	42,241,768	103,601,492
1997	155,340,595	67,605,203	87,735,392

Financial Problems

Only where connections are not covered in the block mapping

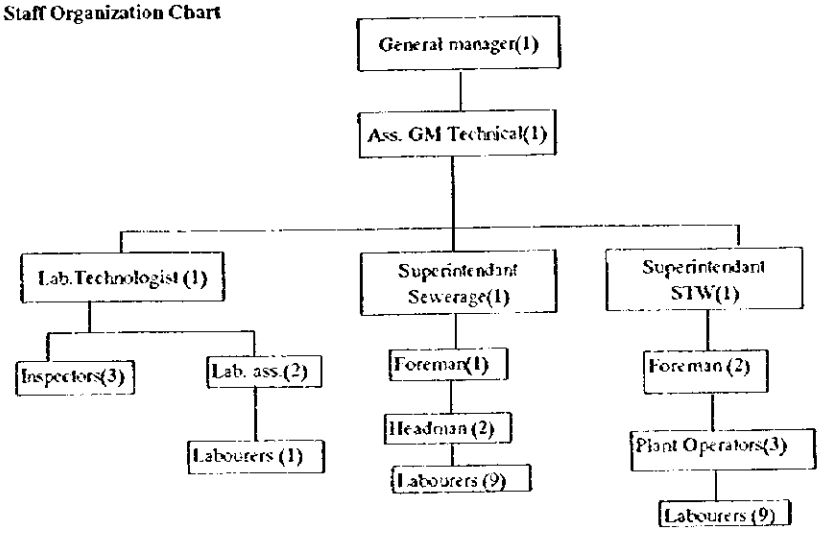
Investment Budget Plan

Type of activity	*Target Year*
Design and implementation of a new sewage works	

On - Plot Sanitation

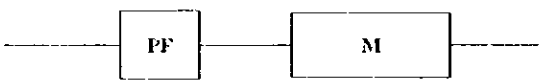
% Population with on plot sanitation	68%
Method of desludging facility	Council exhausters
Quantity of sludge m^3/year	7605 (485 trips /year)
Location of disposal point	Nearest manhole or at sewage works

Staff Organization Chart



Name of Urban Center	Embu			x	y
District	Embu		Coordinates	37° 27'	0° 31'
Province	Eastern		Elevation	1,400m	
Mean Annual Precipitation (mm)			Temperature max & min °C		
	1995	1998	2000	2005	2010
Population Projections	34,309	45,000	55,102	79,735	92,214
Municipal Area (ha)	95	8,000.0			
Population Density (ppha)		5.6			
Water Supply	1995	1998	2000	2005	2010
Domestic water demand (m3/d)					12,511
Total water consumption (m3/d)	3,730	7,305			
Area served (estimated net (ha))	137.0		332.0		544.0
Raw water source	Kapingazi River, Rupingazi River				
Sewerage Facilities	1995	1998	2000	2005	2010
Population Served	5,052	9,000	8,265	15,947	23,053
Service coverage ratio %	15%	5%	15%	20%	25%
Area served (estimated net (ha))		400.0			
Population Density (ppha)		22.5			
Wastewater volumes (m3/d)					
No. of connections		1400			

Treatment process



PF, Primary facultative

M, Maturation

Description & dimensions	Size		Area	Depth	Volume
Primary Facultative Pond	diameter	200.0	31,400.0	1.20	37680.0
Maturation Pond	100.0	84.0	8,400.0	40.00	triangular

	Design Capacity		Actual flow		
	Dry weather	Population	Min	Max	Avg
Hydraulic loading	682		556	1,800	1,178
BOD loading					
	BOD	COD	SS	TN / TP	FC
influent	700	1100	900		
effluent	140	240	410	18.5 / 6.5	400
receiving water body u/s	41	100	810		
receiving water body d/s	55	100	825		
Receiving water body	Rupingasi River				

	Treatment Method	Disposal
Sludge Processing	Drying on the ground	Disposed on site

Operation & Maintenance	**Treatment Works**
1. Sludge accumulation in facultative pond	
2. Overloaded	
3. New outlet constructed for maturation pond due to problems with effluent quality	
4. Removal of grit from grit chamber required	
5. All chambers require minor rehabilitation	
6. Screens at inlet in poor condition and are not regularly cleaned.	
7. General lack of maintenance at the treatment works and evidence of vandalism.	
	Sewers
1. No cleaning operations	
2. Frequent blockages on the network	
3. 18m concrete pipes collapsed in 1997	
4	
5	

No Picture Available

On-going projects

Project for new treatment works has been designed and tender documents are ready

JICA was approached for funding but no commitments.

Management

Staffing

	Skilled	*Unskilled*
Sewage works and sewer maintenance	5	2
Bye-law enforcement	-	-
Other (watchmen)	-	-

Resources Available

	Comments
1 No. Exhauster lorry	Good condition
1 No. Council pick-up	Good condition
Sewer rods	Good condition
Tools	Good condition

Sources of Revenue

Sewer charges
Connection fees

Annual Cash Flow, Kshs.

Year	*Revenue*	*Expenditure*	*Surplus*
1995			-
1996			-
1997			-

Financial Problems

Inaccurate billing due to lack of service to meters
Consumer failure to pay bills
Insufficient funding to repair customer meters

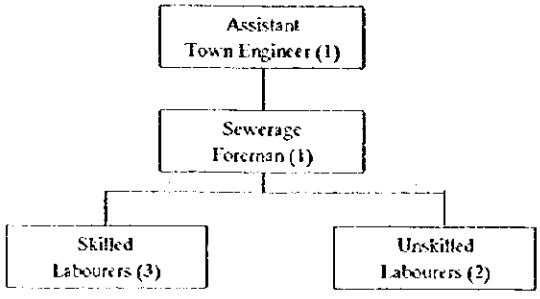
Investment Budget Plan

Type of activity	*Target Year*
Embu Sewerage Project - Ministry of local	Looking for
Government (Runji & Partners, 1994)	funding agency

On - Plot Sanitation

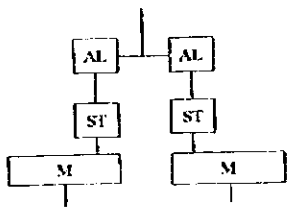
% Population with on-plot sanitation	85%
Method of desludging facility	Municipal Council Exhauster
Estimated Quantity of sludge m^3/year	450
Location of disposal point	Sewage treatment works

Staff Organization Chart



Name of Urban Center	Homabay			x	y
District	Homabay		Coordinates	34° 28'	0° 31'
Province	Nyanza		Elevation		1135m
Mean Annual Precipitation (mm)			Temperature max & min °C		
	1995	1998	2000	2005	2010
Population Projections	30,995	75,000	46,428	64,065	71,860
Municipal Area (ha)	115	19,700.0			
Population Density (ppha)		3.8			
Water Supply	1995	1998	2000	2005	2010
Domestic water demand (m3/d)					9,740
Total water consumption (m3/d)	819	1,230			
Area served (estimated net (ha))	172.0	4,000.0	363.0		552.0
Raw water source	Lake Victoria				
Sewerage Facilities	1995	1998	2000	2005	2010
Population Served	2,912	15,000	6,964	12,813	17,965
Service coverage ratio %	9%	19%	15%	20%	25%
Area served (estimated net (ha))		1,950.0			
Population Density (ppha)		7.7			
Wastewater volumes (m3/d)		1,043			
No. of conections		2500			

Treatment process



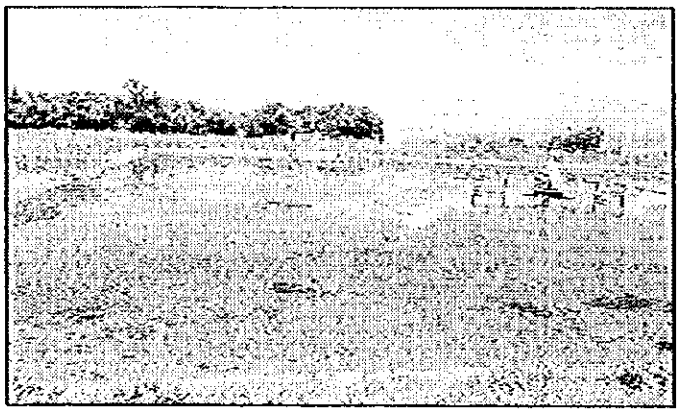
AL, Aerated lagoon
ST, Sedimentation tank
M, Maturation

Description & dimensions	Size		Surface Area	Depth	Volume
Oxidation lagoon 1	46.0	36.0	1,650.0	3.00	2800.0
Oxidation lagoon 2	46.0	36.0	1,650.0	3.00	2800.0
Sedimentation Tank	Dia = 9.0		63.6	2.25	143.1
Sedimentation Tank	Dia = 9.0		63.6	2.25	143.1
Maturation Pond 1	136.0	36.0	4,900.0	1.80	7500.0
Maturation Pond 2	135.5	36.0	4,900.0	1.40	5800.0
Sludge thickening tank	4.0	4.0	16.0	3.65	58.4
Sludge drying beds - 12 No.	6.0	1.0	72.0	-	-

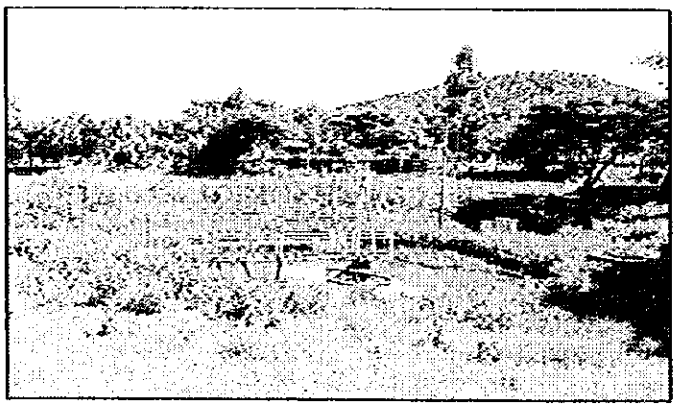
	Design Capacity		Actual flow		
	Dry weather	Population	Min	Max	Avg
Hydraulic loading	750			450	370
BOD loading					
	BOD	COD	SS	TN / TP	FC
influent	250	675	400		
effluent	40	168	40	36.4 / 13.0	25600
receiving water body u/s	-	-	-		
receiving water body d/s	-	-	-		
Receiving water body	Lake Victoria				

	Treatment Method	Disposal
Sludge Processing	Sludge thickener +drying bed	Sold as manure

Operation & Maintenance	Treatment Works
1. Inlet pipe is blocked and an overflow of sewage noticed on site	
2. Automatic flow recorder was vandalised in 1997	
3. 1 No. aerator not working. However, aerators have not been used since 1997 due to accumulation of sludge in the sedimentation tanks. The aerated lagoons are being used as anaerobic ponds and require desludging.	
4. Both sedimentation tanks not operational due to the accumulation of sludge. Motors and cables for the scrappers have been vandalised.	
5. Slabs on one side of maturation pond 1 have collapsed	
6. Pump house for sludge not operational. 2 No. centifugal pumps not repairable.	
7. Stormwater from road nearby is flowing into the maturation ponds.	
8. Grass growing in sludge drying beds	
9. General lack of maintenance on site and vandalism rampant. Treatment works not functioning as per design.	
Sewers	
1. Frequent blockages	
2	
3	
4	
5	



Note: Oxidation lagoons are used as anaerobic ponds



Note: Sludge thickener is overgrown and has collapsed

On-going projects	None

Management

Staffing

	Skilled	*Unskilled*
Sewage works and sewer maintenance	7	4
Bye-law enforcement	-	-
Other	-	-

Resources Available

	Comments
1 No. Vehicle	Good condition
1 No. Rodding machine	Out of order
Tools	Good condition

Sources of Revenue

	KShs.
Sewer charges	
Connection fees	

Annual Cash Flow, Kshs.

Year	*Revenue*	*Expenditure*	*Surplus*
1995			-
1996			-
1997			-

Financial Problems

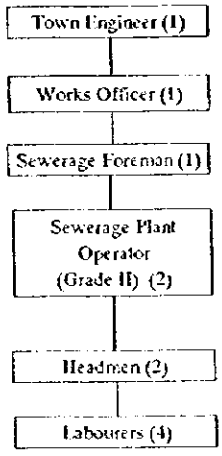
Investment Budget Plan

Type of activity	*Target Year*

On - Plot Sanitation

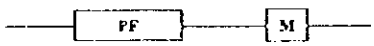
% Population with on-plot sanitation	84%
Method of desludging facility	Ministry of Public Works Exhauster
Estimated Quantity of sludge m^3/year	No information
Location of disposal point	Sewage treatment works

Staff Organization Chart



Name of Urban Center	Kakamega			x	y
District	Kakamega		Coordinates		
Province	Western		Elevation	approx. 1508	
Mean Annual Precipitation (mm)			Temperature max & min °C		
	1995	1998	2000	2005	2010
Population Projections	77,306	110,000	123,558	177,064	202,516
Municipal Area (ha)		5,100.0			
Population Density (ppha)		21.6			
Water Supply	1995	1998	2000	2005	2010
Domestic water demand (m3/d)					27,431
Total water consumption (m3/d)	2,760				
Area served (estimated net (ha))	16.0		40.0		60.0
Raw water source	Isiukhu River				
Sewerage Facilities	1995	1998	2000	2005	2010
Population Served	5,445	51,700	18,534	35,413	50,629
Service coverage ratio %	7%	11%	15%	20%	25%
Area served (estimated net (ha))		560.0			
Population Density (ppha)		92.3			
Wastewater volumes (m3/d)		2,400			
No. of connections		500			

Treatment process



PF, Primary facultative
SF, Secondary facultative
M, Maturation

Facility name: Kambi Ponds

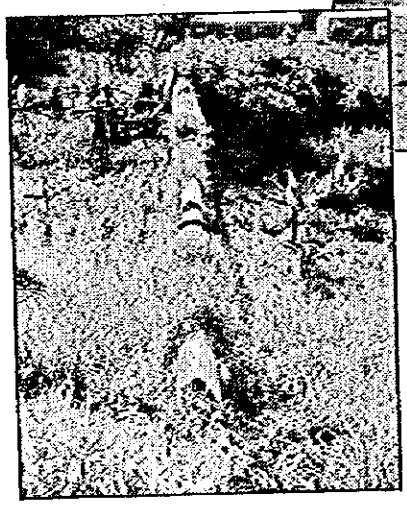
Description & dimensions	Size		Area	Depth	Volume
Primaryary Facultative Pond	36.0	55.0	1,980.0		
Maturation Pond	42.0	68.0	2,856.0		

	Design Capacity		Actual flow		
	Dry weather	Population	Min	Max	Avg
Hydraulic loading			200		
BOD loading					
	BOD	COD	SS	TN/TP	FC
influent	300	1000	200		
effluent	-	-	-	-	-
receiving water body u/s	-	-	-		
receiving water body d/s	-	-	-		
Receiving water body	Isikhu River				

	Treatment Method	Disposal
Sludge Processing	No treatment	

Operation & Maintenance Treatment Works
1. Ponds serve a small site and service housing development built by NHC
2. Screens are not cleaned and there is no grit removal facility; primary facultative pond needs desludging and is overgrown with aquatic plants
3. All chambers are full of grit and scum
3. The flow of sewage into the ponds is very low probably due to leakage or blockage of sewers. Sewage from part of the network is leaking straight into the river from the aerial crossing.
4. The maturation pond is overgrown with weeds and aquatic plants and has a huge collection of debris in the middle.
5. Maturation pond outlet chamber has totally collapsed due to embankment erosion.
6. No effluent to River.
7. No maintenance at treatment works
Sewers
1. The flow to the ponds increases substantially during storms indicating high infiltration
2. Silting of pipes due to stormwater entry is common.
3. Frequent blockages due to lack of water.
4. Manholes require raising in order to prevent storawater entry.
5. Sewer lines overloaded
6. No manhole covers due to vandalism and garbage is dumped into the manholes.
7. Slum areas using water downstream from leak.

Primary Facultative Pond: note sludge accumulation & plant growth.



Trunk Sewer: cast iron main crossing river, note complete failure & discharge of sewage to river

On-going projects None

Management

Staffing

	Skilled	*Unskilled*
Sewage works	-	-
Sewer Maintenance	4	7
Bye-law enforcement	-	-
Other	-	-

Resources Available

	Comments
1 No. rodding machine	Good condition
Sewer rods	Good condition
Tools	Good condition

Sources of Revenue

Sewer charges	
Connection fees	

Annual Cash Flow, Kshs. (Includes revenue and expenditure figures for Shirere Treatment works)

Year	*Revenue*	*Expenditure*	*Surplus*
1995	Not available	659,063	-
1996	484,069	726,730	(242,661)
1997	1,430,651	674,530	756,121

Financial Problems

Inaccurate billing due to lack of service to meters
Consumer failure to pay bills
Insufficient funding for rehabilitation and maintenance
Bad Debts

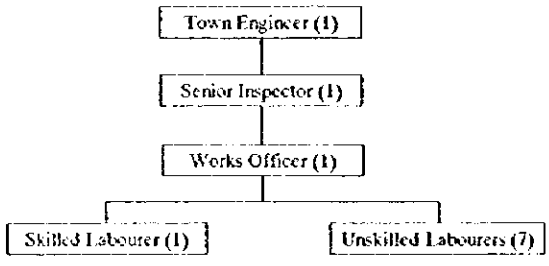
Investment Budget Plan

Type of activity	*Target Year*
None	

On - Plot Sanitation

% Population with on-plot sanitation	53%
Method of desludging facility	Ministry of Public Works Exhauster
Estimated Quantity of sludge m^3/year	Information not available
Location of disposal point	Sewage treatment works

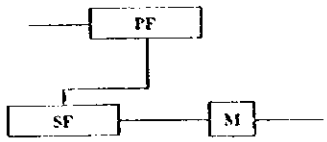
Staff Organization Chart



Note: The same staff are used for both Kambi and Shirere Treatment works

Name of Urban Center	Kakamega			x	y
District	Kakamega		Coordinates		
Province	Western		Elevation	approx. 1508	
Mean Annual Precipitation (mm)			Temperature max & min °C		
	1995	1998	2000	2005	2010
Population Projections	77,306	110,000	123,558	177,064	202,516
Municipal Area (ha)		5,100.0			
Population Density (ppha)		21.6			
Water Supply	**1995**	**1998**	**2000**	**2005**	**2010**
Domestic water demand (m3/d)					27,431
Total water consumption (m3/d)	2,760				
Area served (estimated net (ha))	16.0		40.0		60.0
Raw water source	Isiukhu River				
Sewerage Facilities	**1995**	**1998**	**2000**	**2005**	**2010**
Population Served	5,445	51,700	18,534	35,413	50,629
Service coverage ratio %	7%	11%	15%	20%	25%
Area served (estimated net (ha))		560.0			
Population Density (ppha)		92.3			
Wastewater volumes (m3/d)		2,400			
No. of connections		5000			

Treatment process



PF, Primary facultative
SF, Secondary facultative
M, Maturation

Facility name: Shirere Ponds

Description & dimensions	Size		Area	Depth	Volume
Primary Facultative Pond	80.0	193.0	15,440.0		
Secondary Facultative Pond	78.0	60.0	4,680.0		
Maturation Pond	110.0	75.0	8,250.0		

	Design Capacity		Actual flow		
	Dry weather	Population	Min	Max	Avg
Hydraulic loading			500	700	
BOD loading					
	BOD	COD	SS	TN / TP	FC
influent	500	957	200		
effluent	50	100	20	13.8 / 6.4	
receiving water body u/s	5.0	45	60		
receiving water body d/s	7.5	55	90		
Receiving water body	Isikho River				

	Treatment Method	Disposal
Sludge Processing	No treatment	

Operation & Maintenance	Treatment Works
1. Surface water enters pond due to poor site grading	
2. Screens at inlet in poor condition and grass growing in grit chamber. By-pass is blocked.	
3. The flow of sewage into the ponds is very low probably due to leakage or blockage of sewers and inlet pipe to first pond destroyed.	
4. Pond requires desludging and has grass/weeds growing in it.	
5. Slabs lining all ponds are missing due to vandalism	
6. No flow to maturation pond due to low level in the secondary facultative pond.	
7. All chambers etc. are in poor structural condition.	
8. No maintenance at treatment works.	
	Sewers
1. The flow to the ponds increases substantially during storms indicating high infiltration	
2. Main trunk lines in the town center are only 150mm and are frequently blocked and silting occurs frequently	
3. The condition of the sewer lines is questionable considering the age and lack of maintenance.	
4.One trunk line crossing a ravine has completely failed and sewage is flowing into a small stream	
5. No manhole covers due to vandalism and garbage is dumped into chambers	
6. Staffing levels of 7 for tw and sewers is insufficient to cover the operational and maintenance requirements.	

No Picture Available

On-going projects	None

Management

Staffing

	Skilled	*Unskilled*
Sewage works	-	-
Sewer Maintenace	4	7
Bye-law enforcement	-	-
Other	-	-

Resources Available

	Comments
1 No. rodding machine	Good condition
Sewer rods	Good condition
Tools	Good condition

Sources of Revenue

Sewer charges	
Connection fees	

Annual Cash Flow, Kshs. (Includes revenue and expenditure figures for Kambi Treatment works)

Year	*Revenue*	*Expenditure*	*Surplus*
1995	Not available	659,063	-
1996	484,069	726,730	(242,661)
1997	1,430,651	674,530	756,121

Financial Problems

Inaccurate billing due to lack of service to meters
Consumer failure to pay bills
Insufficient funding for rehabilitation and maintenance
Bad Debts

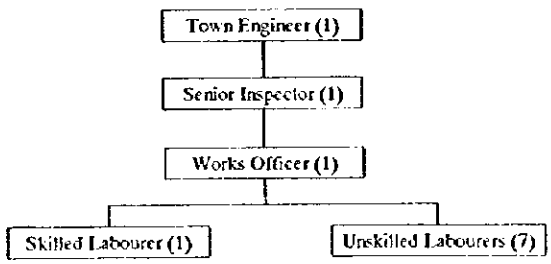
Investment Budget Plan

Type of activity	*Target Year*
None	

On - Plot Sanitation

% Population with on-plot sanitation	53%
Method of desludging facility	Ministry of Public Works Exhauster
Estimated Quantity of sludge m^3/year	Information not available
Location of disposal point	Sewage treatment works

Staff Organization Chart



Note: The same staff are used for both Kambi and Shirere Treatment works