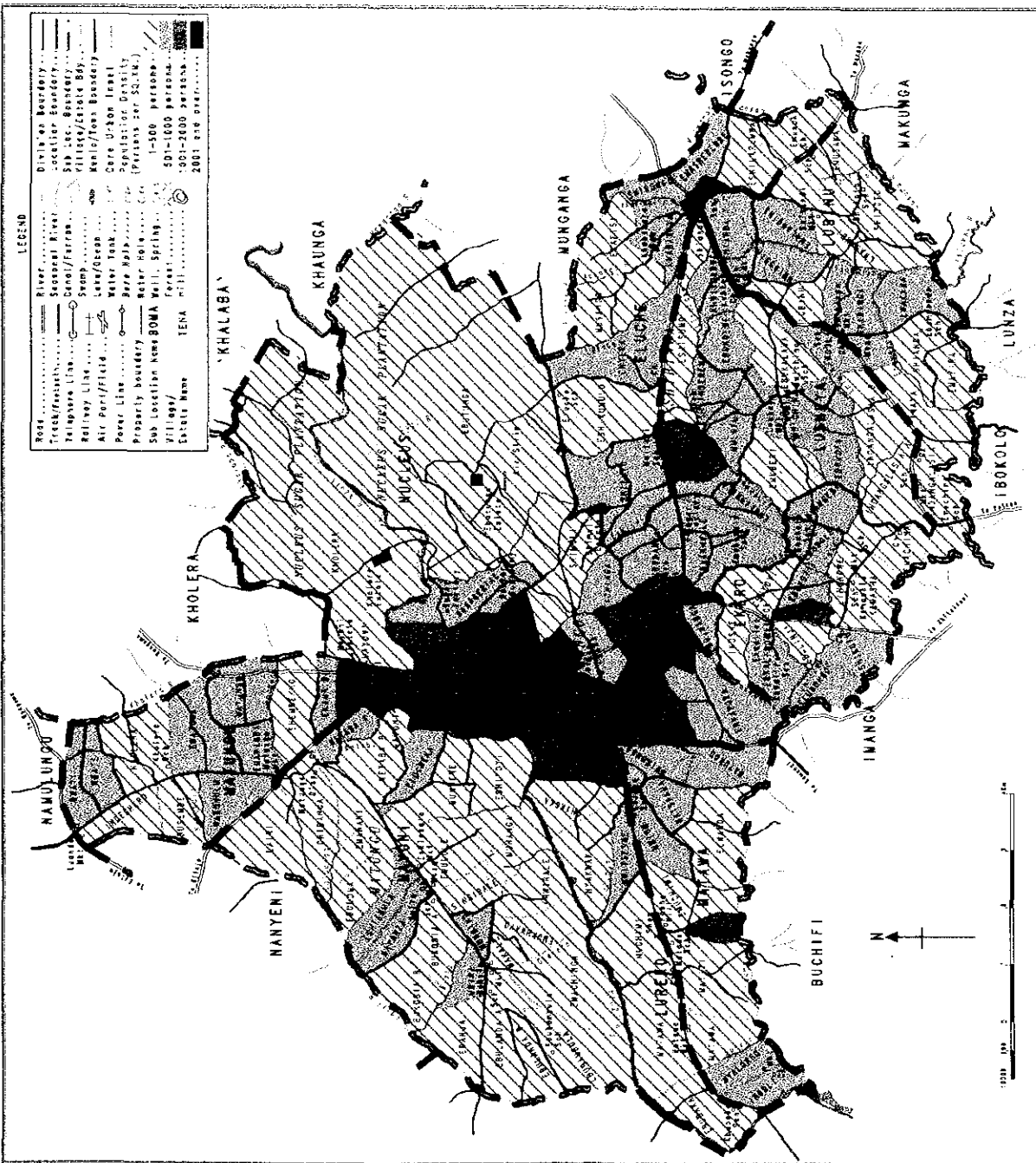


**APPENDIX J1**  
**MUMIAS**  
**TOWN**

# NUMIAS MUNICIPALITY (POPULATION DENSITY)



Prepared by: DEVELOPMENT IMPACT CONSULTING  
P.O. BOX 16894  
NAIROBI



J1-3 1999 POPULATION DATA FOR MUMIAS TOWN

LOCATION	SUB-LOCATION	AREA	NO. OF HOUSEHOLDS	MALE	FEMALE	TOTAL
NABONGO	LUREKO	EBUBAKA	73	164	194	358
		MATAWA	108	258	310	568
		MUCHIMI	100	235	296	531
		MWITSESHE	102	212	244	456
		NYAKWAKA	105	220	247	467
		SHIKOKA	108	229	225	454
		ITOKHO	132	293	274	567
	TOWNSHIP	ANGOLA	867	1405	1104	2509
		SHIBALE	1068	1451	1815	3266
		LUKOYE 'A'	475	766	712	1630
		ESHITUKHUMI	820	1384	1694	3878
		MANYATTA	150	255	285	540
		NUBIAN	466	746	773	1519
		LUMINO	372	692	666	1,358
		MJINI	464	647	819	1466
		MISSION	413	982	797	1779
	ENYAPOLA	314	858	761	1619	
	NUCLEUS	MAYONI ESTATE	1419	2398	1760	4158
		BUMANYI	41	88	87	175
		EMASANGA	386	644	723	1367
		EKAMA	205	544	591	1135
		LUKOYE 'B'	550	959	828	1787
		LOWER CENTRAL	656	1323	1238	2561
		UPPER CENTRAL	632	1383	1336	2719
		ARTISAN MANAGERIAL	524 258	1100 540	923 518	2023 1058
	EKERO	EKERO	289	413	439	852
		ESHIKWENYI	101	242	244	486
		EBUYONI	99	194	217	411
		EBUBOLE	100	257	241	498
		NYANGERA	152	308	383	691
		EMACHINA	177	388	429	817
		MASHIA	114	261	245	506
		LIHONAWA	77	137	174	311
EMAHANGA		76	198	189	387	
EBULINJI		71	126	153	279	
ESHIKUFU		110	248	277	525	
ELUBONGA		128	267	294	561	
EBWALIRO		150	338	374	712	
IKOSHE		65	154	162	316	
EBUTWANGA		125	261	305	566	

SHIBINGA	LUSHEYA	EMAKHWALE	409	910	971	1881
		EMALISHA	177	399	459	858
		EMUBERI	134	306	327	633
		MALUFU	138	339	369	708
		EBUTUNYI	280	622	642	1264
		ESHANDEREMA	178	378	392	770
		ESHISUMO	131	375	324	699
		KHWIYONDWE	237	435	482	917
		EBUKOLWE	107	277	257	534
		EBUKALAMA	156	420	404	824
		INDOLI	118	263	276	539
		MWICHINA	265	572	692	1264
		EBUYOFU	129	266	295	561
		INDANGALASIA 'B'	80	156	196	352
		INDANGALASIA 'A'	124	281	291	572
	ELUCHE	ISHIFUYO	356	805	899	1704
		ESHIKUMULO	203	462	530	992
		ENYERA	255	627	631	1258
		MUSANGO	142	340	345	695
		EKAFISI	152	350	371	721
		KHABAKAYA	194	456	451	907
		SHIRONGO	107	219	269	488
		SHIANDA	261	353	485	838
		EMASHEBEBWE	174	359	428	787
		ESHILARUMWA	194	448	529	977
		MAYONI	-	-	-	14463
		MUSAMBA	-	-	-	6721
	MATUNGU	-	-	-	7621	
	MATAWA	-	-	-	7032	

**APPENDIX J2**  
**MUMIAS**  
**TOWN**

MUMIAS



TEMPORARY SEWAGE POND



ALUM DOSING

## APPENDIX A2 - ENGINEERING PRINCIPAL DESIGN CRITERIA

The following principal design criteria are used, with reference to the appropriate sections of the 1986 Design Manual prepared by the Ministry of Water.

### (a) Water quality

#### (i) Bacteriological quality of water

No faecal coliforms (1986 Design Manual, section 5.2.2, subsection A.1). Following the 1994 WHO guidelines for drinking water quality, this can be achieved by disinfection:

- with a free chlorine residual of 0.5 mg/l (8.12.4 of the 1986 Manual gives 0.3 mg/l to 0.5 mg/l);
- at a pH less than 8, and
- a turbidity less than 1 NTU;
- for at least 30 minutes.

Section 138 of the draft Water Act states:

"All water undertakers must ensure that any water for human consumption shall be disinfected using approved disinfectants and the required residual levels maintained at the reservoirs, distribution lines and end points."

The word "any" means that all potable water must be disinfected, even groundwater. The word "residual" implies that the approved disinfectants will be limited to chlorine compounds or other halogens. It would not cover UV radiation, ozone, etc.

#### (ii) Chemical quality of water

- Fluoride to be less than 1.5 mg/l, or 3 mg/l in exceptional cases (1986 manual, section 5.3.1).
- Colour to be less than 15 TCU (5.3.2) or up to 50 TCU in exceptional cases (5.3.3).
- Turbidity to be less than 1 NTU for disinfection (1994 WHO guidelines).
- pH to be between 6.5 and 8.5 (5.3.2) or up to 9.2 in exceptional cases (5.3.3), but less than 8.0 during disinfection (1994 WHO guidelines).



- Iron to be less than 0.3 mg/l (5.3.2), or 1.0 mg/l in exceptional cases (5.3.3).
- Manganese to be less than 0.1 mg/l (5.3.2), or 0.5 mg/l in exceptional cases (5.3.3).
- Water should not attack concrete or ferrous products (5.3.4). This requirement imposes further limitations on pH.

**(b) Treatment**

**(i) General**

The works should be designed for continuous operation (8.1.4).

**(ii) Pre-settlement**

Section 8.4.1 of the 1986 Design Manual recommends pre-settlement ahead of slow sand filters when raw water turbidity is between 20 and 100 NTU. Pre-settlement tanks may also be used ahead of clarifiers when the turbidity exceeds 1,000 NTU.

**(iii) Aeration**

Not required for surface waters (Section 8.6.1). May be required for groundwater (8.6.2) to be followed by sedimentation or filtration when carried out to oxidise iron and manganese.

**(iv) Treatment chemicals**

Coagulant : aluminium sulphate (8.7.4)  
 pH correction: soda ash (8.7.4)  
 Disinfectant : tropical chloride of lime or calcium hypochlorite (8.12.2)

**(v) Sedimentation**

Section 8.9.3 of the 1986 Design manual requires horizontal flow tanks with a design surface loading of 1 m/hr.

Section 8.9.4 states that the operational requirements of vertical-flow, sludge blanket clarifiers are so strict that they should not be used except under very exceptional circumstances.

**(vi) Rapid gravity filtration**

The principal criteria for rapid gravity filters are:

- design surface loading to be 5 m/hr (8.10.1);

- filter bed thickness 0.7 m to 1.0 m (8.10.2);
- filter media to be quartz sand, 0.5 mm to 1.0 mm, with a uniformity coefficient less than 1.5 (8.10.2);
- backwash rate to be 50 m/hr minimum (8.10.4);
- air scour only in exceptional cases (8.10.4).

**(vii) Chemical dosing for disinfection**

The World Health Organisation recommends that water intended for potable use should be disinfected with 0.5 mg/l of free available chlorine for at least thirty minutes at a pH less than 8. This recognises that germicidal efficiency is dependent on both the free chlorine concentration and the time of contact.

To achieve a free chlorine residual, sufficient chlorine must be dosed to react with any dissolved ammonia, iron, manganese, etc. The required doses are:

- 7.6 g of chlorine to react with 1 g of ammonia;
- 0.54 g of chlorine to react with 1 g of ferrous iron, and
- 1.5 g of chlorine to react with 1 g of manganese.

**(c) Transmission systems**

Transmission systems should be designed for:

- twenty-four hour operation (implied in 12.7.1 for clear water pumps, explicit in 12.7.2 for raw water pumps and 12.7.3 for borehole pumps);
- one standby pump (12.8.1);
- diesel generators to provide 50% cover (12.8.2);
- a minimum head of 4 m in the transmission main (9.3.7).

**(d) Storage**

Section 11.3.1 of the 1986 Design Manual requires balancing storage to be fifty per cent of the daily demand. Section 11.3.2 requires the following emergency storage:

- 12 hours for gravity supply to storage;
- 18 hours for pumped supply;
- 8 hours for supplies from more than one independent system.

**(e) Distribution**

The principal criteria are as follows:

Minimum head at consumer connections to be 10 m;

Maximum head generally not greater than 60 m.

**(f) Water demand in urban areas**

People with individual connections	high class housing	250lcd
	medium	150
	low	75
People without connections	low	20

**APPENDIX J3**  
**MUMIAS**  
**TOWN**

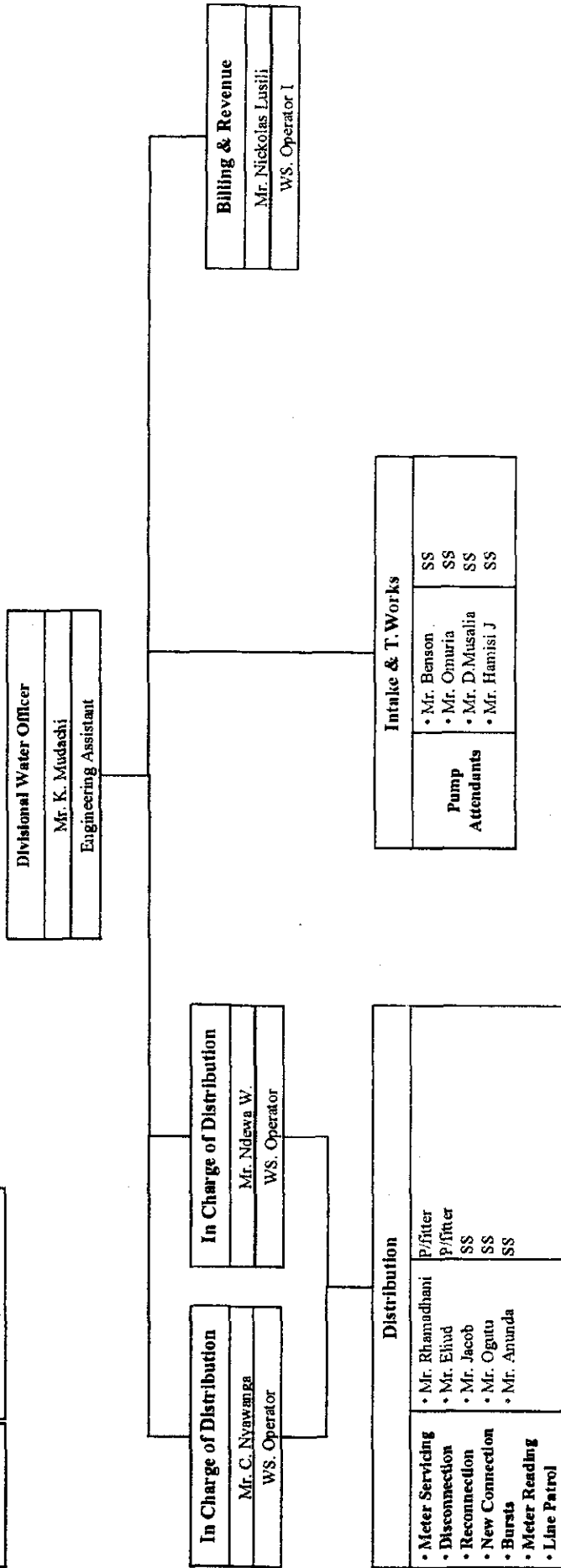


**MUMIAS WATER SCHEME ORGANISATION CHART**  
**STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION**  
**OF WATER SUPPLY SYSTEMS FOR TEN(10) LOCAL TOWNS IN KENYA**

**MUMIAS**

**FIGURE: 8.1.10**

Total Staff:	13
Total Accounts:	1,439





Development Impact Consulting



Engineering and Utility Management Ltd.

**GIBB** Eastern Africa  
LAWGIBB Group Member

Gibb Eastern Africa Ltd.

P. O. Box 16694, NAIROBI Tel: 713741, 712649 Fax: 712720 E-mail: dic@insightkenya.com

**CONSORTIUM**

**Study of Institutional Improvement and Rehabilitation of Water Supply Systems for Local Towns in the Republic of Kenya**

**Location: Mumias WSS DIVISION, SINCE 2 YEARS UNDER BUTERE DISTRICT**  
**Date: 23.-24.11.2000**

**Interviewer: LEK and CK**

\*\*\*\*\*

**Discussion/Interview held with: Divisional WO: Mr Kioaira Mudachi (since 3 months in Mumias)**  
**Revenue Clerk: Mr. Nickolas**

**Send message through DO's office, ring 0333-41011**

**Mailing Contact:**  
**P.O.Box 265**  
**Mumias**

**District Water Office in Butere: Talked to Deputy DWO: Mr. Joseph Singoei**  
**Tel.: 0333-20160**  
**DWO (Mr. Jeremiah Kiruyae) was in monthly PMT meeting in Kakamega**

No.	Question:	Answer:
A.	Utility System	
1.	<b>Office Set-up</b> <b>Office space?</b>  <b>Office equipment?</b> <b>Tel.lines?</b> <b>Fax?</b> <b>E-mail?</b> <b>Reliable Power supply?</b> <b>Rationing?</b> <b>Other comments?</b> <b>Hardware, Software and skill:</b> <b>separate questionnaire !!</b>	<i>1 room, 1 room shared at DC's office with other revenue collectors, store at T-works for chemicals</i> <i>1 calculator for Revenue Clerk, nothing else</i> <i>No</i> <i>No</i> <i>No</i> <i>Not connected, but power at the intake</i>  <i>Situation below</i> <i>Nothing</i>
2.	<b>Staffing Set-up</b> <b>Total number of staff?</b> <b>Male/Femal ratio?</b> <b>Fluctuation? Due to?</b> <b>Average years within the system?</b> <b>Orga chart in place?</b> <b>Job description available?</b> <b>Level of skill?</b>  <b>Overdue staff promotion?</b> <b>Training facilities offered?</b> <b>Used facilities?</b> <b>Technical Administration Management</b> <b>Qualification Station Manager</b> <b>Recruitment statistics</b> <b>Remuneration and benefits</b>	<i>13 (1 retrenched)</i> <i>No women</i> <i>Only transfers</i> <i>??</i> <i>No</i> <i>No</i> <i>Low</i> <i>Revenue Clerk since 5 yrs in the system, actually a WS Operator, but since 2 yrs Revenue Clerk. Tried proficiency test in Kakamega, but failed. Does Billing and consumer ledgers, collects money and deals with Butere. Prepares the diconnection instruction</i> <i>??</i> <i>?? no records</i> <i>N/A</i>  <i>Assistant Engineer from Kenya Polytechnic</i> <i>??</i> <i>HQ, only knows total approx 65,000.00</i>
3.	<b>Transport and Logistics</b> <b>Cars? Which? Number:</b> <b>Motorbike? Which? Number:</b> <b>Bicycle? Number:</b>	<i>Nil</i> <i>1 (new) through FINCO project for community projects</i> <i>Nil</i>
4.	<b>Institutional Frame</b> <b>MENR: Line of command</b>	<i>DWO Butere</i>
B.	Utility Indices	
1.	<b>Billing</b> <b>Consumption Actual vs Estimate</b>	<i>Not known, but according to Table 8.2.10 it can be calculated</i>

	<p><b>Consumption Billed per month</b>  <b>Consumption Billed for the last 3 years</b></p> <p><b>Billing Efficiency: Water billed/ Water supplied</b></p> <p><b>Billing Effectiveness: How many out of 100 bills are wrong or returned for reason</b></p>	<p><i>Can be calculated with Table 8.2.10</i>  <i>Not available</i></p> <p><i>Refer to Table 8.2.10</i></p>
2.	<p><b>Revenue &amp; Collection</b>  <b>Revenue Billed vs Revenue Collected per month</b></p> <p><b>For the last 3 years monthly and annual figures</b></p> <p><b>Collection efficiency: Total billed/ Total collected</b></p>	<p><i>Refer to Table 8.3.10</i></p> <p><i>Not readily available</i></p> <p><i>Refer to Table 8.3.10</i></p>
3.	<p><b>UfW</b>  <b>1 - Recorded consumption/Production (supply efficiency) per month</b>  <b>Or production vs billed consumption</b></p> <p><b>For the last 3 years, monthly and annually</b></p> <p><b>Value of UfW: loss x average tariff rate of system per month</b></p>	<p><i>Refer to Table 8.3.10. but arithmetical errors in there</i></p> <p><i>Not readily available</i></p> <p><i>Average Tariff?</i></p>
4.	<p><b>Tariff</b>  <b>What is the average tariff rate per cbm?</b>  <b>Total billed water/Total water supplied</b>  <b>Tariff structure? Current</b>  <b>Last 3 years:</b>  <b>Additional charges?</b>  <b>Additional sources of income?</b></p>	<p><i>Not known</i></p> <p><i>As gazetted</i>  <i>??</i>  <i>Labour for new connection and deposit. No re-connection charge reflected anywhere</i></p>
5.	<p><b>Funding</b>  <b>Required Funding per month?</b>  <b>Salary</b>  <b>Procurements</b>  <b>Power</b>  <b>Chemicals</b>  <b>Others</b></p>	<p><i>A.I.E. %???</i></p>
6.	<p><b>Cost</b>  <b>Total per month</b></p>	<p><i>??</i></p>



	Salary Power O&M Administration Others	Approx. 65,000 Kshs Approx 150,000 Kshs Approx. 140,000 Kshs for Chemicals
7.		
8.	Debt Arrears Debt Arrears Situation in Kshs Increase per month Total FY 99/00 98/99 97/98 Debtors Totals/Billed Revenue Debtors Totals/Collected Revenue	Kshs 1,570,066.00 at the end of June 2000 Not readily available Not readily available Not readily available Not readily available Not readily available
C.	Utility Procedures	
1.	Staff Recruitment	They get from Butere, new man has not yet done anything
2.	Defaulters Handling	Only disconnection, but effort by new Div.WO to arrange for installment arrangements to reduce those who have defaulted payment
3.	Administration Are debtors maintained monthly?  Is an aging analysis available?  Debtors lists for different Consumer categories?  Accounting Manual or computerised? If manual elaborate: Double Book keeping done Ledger cards	No  No  No  Manual, but there is nothing but the consumer ledgers  No No
4.	Funding	Everything paid and arranged for through the District office Butere
5.	Installment Payment	Not done Currently planned bby Div.WO to make an effort and get old disconnected accounts back into the system, by offering installment payment arrangement. Letter drafted but not yet sent/given to these old consumers
6.	Meter Reading & Billing	4 zones and 4 MRs and 4 MR books MR starts from 24 <sup>th</sup> of every month for 2 days, then books are brought back to the Revenue Clerk and transferred into 6 consumer ledgers Billing is then done by the Revenue Clerk and consumers come to collect the bill from him or it is dropped by the MR. New tariff was effective November 1999, but adjustment done when they were informed in February 2000. As there was no instruction to bill for the lapsed months retro-actively, no adjustments for the months of

		<p>November to January were done.  <i>Receipting is done by Revenue Clerk with copy to the DC's office and triplicate to the DWO's office.</i>  <i>Div.WO makes the monthly return, information on collection and what was billed</i>  <i>When Nickolas on leave, the Clerk from the DC's office takes over the collection. Leave taken such that no billing has to be done during that time.</i>  <i>Billing stationery provided through DWO's office and when there is a shortage, they photocopy. There is no shortage on other stationery.</i>  <i>Only institutions: Schools and Hospital</i>  <i>Major Consumer: Munias Sugar plant have their own borehole since end of 1998 (they had an average bill of 250,000.00 per month)</i></p>														
7.	<b>Disconnection</b>	<p><i>Prepared by the Revenue Clerk, who sends the MR for disconnection</i>  <i>No records of monthly instructions or disconnected accounts.</i>  <i>Information can only be abstracted from the consumer ledger</i></p>														
	<b>New Connection</b>	<p><i>Done by the Div.WO, forms sent to Revenue Clerk, Consumer pays all the charges, 1 receipt is issued for all charges (since early 80s), but weekly collection record splits between Water charges, Labour and deposit. No re-connection or other charges were reflected there. Records taken for the FY 99/00</i></p>														
8.	<b>Meter Servicing</b>	<p><i>Nothing in place and Div.WO says he is very busy on community projects, no other technical staff could be traced. All said to be in the field</i></p>														
9.	<b>HQ Reporting</b>	<p><i>Div.WO to Butere, mainly the returns</i>  <b>Collection Targets:</b>  <i>The target given to Butere was 650,000.00 Kshs before and reduced to 330,000.00 Kshs only w.e.f September. Target is forwarded by the DWO.</i>  <i>Nothing adjusted when Mumias sugar moved out ?!</i>  <i>Control seems to come from Nairobi, whereby production and stalled pump information did not reach the same table!</i></p>														
10.	<b>Procedure Manuals</b>	<p><i>Nothing available</i></p>														
11.	<b>Financial Control</b>	<p><i>Once a year auditors from the DC's office come to do the Audit. Last Audit outstandings as at 30.06.99:</i></p> <table> <tr> <td><i>GOK:</i></td> <td><i>553.888.00</i></td> </tr> <tr> <td><i>Town:</i></td> <td><i>62.989.00</i></td> </tr> <tr> <td><i>Mission II:</i></td> <td><i>131.100.00</i></td> </tr> <tr> <td><i>Site &amp; Service:</i></td> <td><i>144.076.00</i></td> </tr> <tr> <td><i>Mission I:</i></td> <td><i>176.334.00</i></td> </tr> <tr> <td><i>Shivale:</i></td> <td><i>75.318.00</i></td> </tr> <tr> <td><b><i>TOTAL:</i></b></td> <td><b><i>1.143.705.00</i></b></td> </tr> </table>	<i>GOK:</i>	<i>553.888.00</i>	<i>Town:</i>	<i>62.989.00</i>	<i>Mission II:</i>	<i>131.100.00</i>	<i>Site &amp; Service:</i>	<i>144.076.00</i>	<i>Mission I:</i>	<i>176.334.00</i>	<i>Shivale:</i>	<i>75.318.00</i>	<b><i>TOTAL:</i></b>	<b><i>1.143.705.00</i></b>
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<b><i>TOTAL:</i></b>	<b><i>1.143.705.00</i></b>															
12.	<b>Cash/Cheque Un-accounted for cash advances?</b>	<p><i>Not possible</i></p>														

	<p>Consumer payments into consumer accounts?</p> <p>Cash/Bank book maintained and up to date?</p>	<p><i>Done by Revenue Clerk, whenever money is received it is straight away recorded in the consumer ledger</i></p> <p><i>No, N/A</i></p>
13.	<p><b>Reconciliation</b></p> <p>For Cash?</p> <p>For Bank?</p>	<p><i>N/A</i></p> <p><i>N/A</i></p>
D.	<p><b>Discussions</b></p>	
1.	<p><b>Staff</b></p> <p>Awareness of operation and financing cost vs turnover?</p> <p>Job satisfaction and expectation?</p> <p>Existing constraints?</p> <p>Physical</p> <p>Financial</p> <p>Institutional</p> <p>Political</p> <p>Personnel</p> <p>Efforts made to overcome the constraints?</p> <p>Consumer relationship?</p> <p>Relationship with PWE?</p> <p>Relationship with Ministry?</p> <p>Relationship with LA? Planning Department?</p> <p>With other utility providers?</p> <p>External influence affecting the performance?</p> <p>Working environment?</p> <p>What is the opinion about PSP?</p>	<p><i>No, only Div.WO knows: approx. 140' chemicals, 150' on Power,65' on salaries, but no bills or records are ever seen</i></p> <p><i>Div. WO only since 3 months in the system and other staff not in a position to communicate well on the issue, therefore no questioning was performed</i></p> <p><i>Revenue Clerk says: Consumers are good, they pay</i></p> <p><i>No</i></p> <p><i>Only with District Office</i></p> <p><i>No</i></p> <p><i>No</i></p> <p><i>Ok</i></p> <p><i>Div.WO: welcome</i> <i>Others: no opinion</i></p>
2.	<p><b>Consumers</b></p> <p>Comments on:</p> <p>Reliability</p> <p>Quality</p> <p>Billing</p> <p>Price</p> <p>Consumer requests on:</p> <p>Coverage</p>	<p><i>No discussions with consumers</i></p>

	<p>Reaction Time Proposed changes Service rating Cost in relation to service provided? Tapped vs kiosk? View and understanding of PSP? What does the consumer expect? What does the consumer propose? What is his/her situation on rationing?</p>	
3.	Stakeholders	<i>No discussions held</i>
4.	Community Projects	<p><i>2 projects under KIFINCO, whereby they now follow the demand driven approach, i.e. communities have to come forward with the request and they have to be prepared to foot 50% of the cost</i></p> <p><i>Projects are 1 spring and 1 pump installation</i></p> <p><i>Div. Water Officer involved in the technical support, therefore motorbike and imprest, which is collected through the DWO and accounts are done directly with KIFINCO</i></p>
5.	KIFINCO	<p><i>KIFINCO project started in 1981 and covered the whole Western Province. A total of approx. 4000 community WS projects were done until 1995. Annual project value 5 Million US\$</i></p> <p><i>There were originally 217 projects within Mumias Division, financed and set up by KIFINCO</i></p> <p><i>The project then moved into the second phase, which now has 4 main components under the overall objective of "increasing access to safe water for improved health and well being of the communities in western province, by increasing community management skills for maintenance, operation, improvement and replication of water facilities and for the protection of water resources":</i></p> <ul style="list-style-type: none"> <li><i>• Monitoring and evaluation whether systems are functioning</i></li> <li><i>• Support to those communities that approach the project and are prepared to contribute</i></li> <li><i>• Provincial/District capacity building</i></li> <li><i>• Water Resource Management</i></li> </ul> <p><i>Implementation of new or rehabilitation projects are done through external contractors, while MENR staff is involved in the technical SV.</i></p> <p><i>During Phase I all was done through external staff, which led to frictions between MENR staff and those employed from outside.</i></p> <p><i>Phase II concentrated at the onset on awareness creation amongst all District and Divisional Offices, using the ToT approach (Train the Trainer), then other leaders and representatives of communities, to</i></p>

		<i>deseminate the new approach. Webuye Div.WO did not seem to be one of those ?? as he knew hardly anything, nor did the message seem to have been passed on to the community, as the Treasurer did not know anything, neither was there an attempt made to revive the system!!</i>
<b>E.</b>	<b>Consumers</b>	
1.	<b>Consumer Portfolio</b> Total number? Ratio Major/minor consumers?  Consumer classification Consumer categories?  No. of new connect. Applied? No of new connect. Done?  Percentage of suspected illegal connections? Coverage water? How many Kiosks are in operation? Coverage Sanitation?	<i>Approx. 800 consumers ??  Not there As gazetted  ?? Approx. 1 or 2  ?? ?? No water kiosks N/A</i>
2.	<b>Consumer Indices</b>	
3.	<b>Consumer Procedures</b> Open account?  Close account? Get a credit into the next bill? Change address? Transfer account?	<i>DWO has the forms and does survey for the consumer, connection done by the MR ? ? ? ?</i>
<b>F.</b>	<b>Technical System</b>	
1.	<b>System Components?</b>       Is pumping necessary?	<i>1973 built Intake from Lusumu River, T-Works and pumphouse 1 master meter, not working 1 non-return valve, not working 1 sluice valve, not working Borehole near St. Mary's Hospital, No treatment done 1 master meter, not working Yes, 3 pumps, 2 not working since more then 1 year Since July 1999: 2 pumps for 12 h/day working in series Whole system rehabilitated by KIFINCO in 1990</i>
2.	<b>Zonal Meters</b> How many are in the system? Are they controlling areas?  Are they functioning?	<i>2, both not working 6" at the T-works control pumping  No</i>
3.	<b>Network</b> Transmission lines?	<i>9" raising main with 8 air valves to the storage tank</i>

	Distribution lines? Consumer lines? Whole system coverage? Fully utilised?	<i>from storage 6" supply line for consumer off-takes back to the pump house 6" UpvC into Mumias town, 3" towards Mumias Sugar company ??</i>
4.	Coverage	?
G.	Technical Indices	
1.	Production Capacity per day  Actual per day  Production Efficiency?	<i>Pump design not clear  Operator says: 1.230 cbm/day Borehole: 10 cbm/hr ???? Hospital is supposed to consume 150 cbm/day ??</i>
2.	Pumping Efficiency	??
3.	Supply Efficiency Recorded consumption/actual production	<i>Refer to Table 8.2.10</i>
4.	Service Efficiency How many days to attend to the problem?  No. of total meters/number of operational meters?  Total zonal meters/operational zonal meters?	<i>Depends on the availability of parts  ??  2 meters not working</i>
5.	Sanitation Treatment Capacity Actual	?
H.	Technical Procedures	
1.	O&M	<i>Nothing in place</i>
2.	Rationing	<i>Since 12/99</i>
3.	Stock&Procurement Itemised stock list? Stock value Repair workshop Meter test bench Meter repairs/month/year Meter calibration Meter test request by consumers? List of tools and repair equipment available?	<i>No There is nothing, apart from chemical store No No ?? No No Not available</i>
4.	Meter Test Procedures	<i>Not available</i>
5.	Requisition Procedures	<i>Material requested for comes from Butere office, normally ex stock, if they do not have stock, A.I.E. has to be awaited, happens that they do not have either</i>

STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION  
OF WATER SUPPLY SYSTEMS FOR TEN (10) LOCAL TOWNS IN KENYA

Total connection Nos.	ARREARS (Kshs.)	JUNE BILL (Kshs.)	ACTUAL CONSUMPTION (JUNE 2000) M <sup>3</sup>	AVE CON.M <sup>3</sup>	DEAD A/C SINCE	METERED	FLAT RATE	WORKING	NON-WORKING	NO WATER	CUT OFF	LAST PAYMENT (Kshs.)
1,760	2,020,145.95	721,750.00	245	34,705	321	1,464	282	8	1,427	400	722	843,374.50
No. Of Actual Bills		4	Total Of Active & Inactive									
No. Of Estimate Bills		650	1,439									
Assumed In-Active		785										
Dead Accounts		321										
Total		1,760										
Minimum Charge Bills		16.97%										

ADJUSTMENTS

Adjustment Label	A	B	C	D	E	F	G	H	I	J	K	L
Adjustment	0.00	0	0	(3,394)	0	(139)	(178)	0	(143)	(264)	(194)	0

SUMMARY BASED ON FILTERED RAW DATA

ARREARS (Kshs.)	JUNE BILL (Kshs.)	ACTUAL CONSUMPTION (JUNE 2000) M <sup>3</sup>	ESTIMATE CON.M <sup>3</sup>	DEAD A/C SINCE	METERED	FLAT RATE	WORKING	NON-WORKING	NO WATER	CUT OFF	LAST PAYMENT (Kshs.)
2,020,145.95	721,750.00	245	31,311	321	1,603	104	8	1,284	136	528	843,374.50
		Total m3 Billed									
		31,556									

NOTE:

- 1) Arrears  
The total arrears hold Kshs. 337,644.00 relating to 277 "dead accounts"
- 2) Estimate Consumption  
The total consumption is reduced by 3,394 m<sup>3</sup>, which were stated as relating to "dead accounts"
- 3) Metered  
Flat Rate  
Working  
Non-working  
No Water  
All connection related information given for "dead accounts" is filtered out and removed for analysis purposes
- 4) 194 accounts stated as cut off reflect consumption and bills therefore are filtered out.  
While last payment column was supposed to reflect payments prior to 30<sup>th</sup> June 2000, payments are reflected upto 6<sup>th</sup> November 2000

STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION OF WATER SUPPLY SYSTEMS FOR TEN (10) LOCAL TOWNS IN KENYA

CONN. NUMBER	ARREARS (Kshs.)	JUNE BILL (Kshs.)	ACTUAL CONSUMPTION (JUNE 2000) M <sup>3</sup>	AVE CON.M <sup>3</sup>	DEAD A/C SINCE	METERED	FLAT RATE	WORKING	NON-WORKING	NO WATER	CUT OFF	CUT OFF DATE	LAST PAYMENT (Kshs.)	DATE OF LAST PAYMENT
1	2,522.00			70		1			1		1	15/6/99	3,600.00	24/12/99
2	1,082.00										1	99		
3	1,525.00			20		1			1		1	15/8/99	713.00	27/1/99
4	1,000.00	500.00		20		1			1				500.00	26/9/00
5	560.00	500.00		10		1			1				250.00	28/9/00
6	440.00				15/3/93	1			1		1	15/3/93	500.00	3/8/98
7	1,169.50				24/10/90	1			1		1	24/10/90		
8	1,000.00	1,000.00		20		1			1				500.00	5/10/00
9	220.00			20		1			1		1	15/11/98	200.00	2/2/99
10	1,000.00	500.00		20		1			1				500.00	16/10/00
11	500.00	250.00		10		1			1				735.00	10/5/00
12		500.00		20		1			1				500.00	18/10/00
13	550.00	1,000.00		20		1			1				1,340.00	18/10/00
14	10.00			20		1			1				600.00	1/9/00
15	700.00	900.00		20		1			1				700.00	5/10/00
16	950.00	950.00		20		1			1				950.00	11/10/00
17	1,835.00			40		1			1				1,835.00	22/7/99
18	1,835.00			40		1			1				1,820.00	22/7/99
19	3,860.00			40		1			1				3,860.00	22/7/99
20	4,060.00			40		1			1				4,060.00	22/7/99
21		250.00		10		1			1				500.00	29/9/00
22	215.00	715.00		20		1			1				1,815.00	6/9/00
23	5.00	505.00		20		1			1				1,000.00	6/9/00
24		500.00		20		1			1				500.00	28/9/00
25	1,000.00	1,000.00		20		1			1				500.00	17/6/98
26	819.00			20		1			1		1	15/4/98	1,100.00	17/6/98
27	25.00	275.00		10		1			1				400.00	4/9/00
28	1,680.00			4		1			1		1	15/1/99	500.00	6/4/98
29	1,030.00	1,030.00		20		1			1				500.00	12/10/00
30	750.00	1,250.00		20		1			1				500.00	12/10/00
31	1,000.00	1,500.00		20		1			1				1,220.00	22/5/00
32	200.00	450.00		20		1			1				250.00	3/10/00
33	925.00	1,425.00		20		1			1				1,000.00	15/9/00
34	1,375.00	250.00		10		1			1				1,875.00	9/8/00
35	1,000.00	1,500.00		10		1			1				500.00	2/10/00
36	500.00	750.00		10		1			1				1,725.00	4/4/00
37	1,630.00	2,130.00		20		1			1				1,500.00	4/9/00
38	1,000.00	300.00		20		1			1				300.00	15/9/00
39		500.00		20		1			1				500.00	27/9/00
40	1,025.00			20		1			1		1	15/1/99	500.00	2/19/00
Total	38,997.50	20,430.00	0	784	2	38	0	0	39	0	1	15/1/99	39,848.00	
CONN. NUMBER	ARREARS (Kshs.)	JUNE BILL (Kshs.)	ACTUAL CONSUMPTION (JUNE 2000) M <sup>3</sup>	AVE CON.M <sup>3</sup>	DEAD A/C SINCE	METERED	FLAT RATE	WORKING	NON-WORKING	NO WATER	CUT OFF	CUT OFF DATE	LAST PAYMENT (Kshs.)	DATE OF LAST PAYMENT



STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION  
OF WATER SUPPLY SYSTEMS FOR TEN (10) LOCAL TOWNS IN KENYA

CONN. NUMBER	ARREARS (Kshs.)	JUNE BILL (Kshs.)	ACTUAL CONSUMPTION (JUNE 2000) M <sup>3</sup>	AVE CON.M <sup>3</sup>	DEAD A/C SINCE	METERED	FLAT RATE	WORKING	NON-WORKING	NO WATER	CUT OFF	CUT OFF DATE	LAST PAYMENT (Kshs.)	DATE OF LAST PAYMENT
1721	792.00	792.00		18	1991		1			1				
1722	900.00	900.00		18	1991		1			1				
1723	900.00	900.00		18	1991		1			1				
1724														
1725				18	1999		1			1			305.00	14/4/99
1726	700.00	700.00		18	199		1			1			300.00	10/9/97
1727	490.00	490.00		20			1						450.00	8/9/00
1728									1					
1729	700.00	450.00		20			1			1			500.00	12/10/00
1730	340.00			20			1			1			600.00	18/1/00
1731	1,805.00			20			1			1			1,500.00	18/9/98
1732	1,550.00			20			1			1			500.00	1/7/98
1733	330.00			15			1			1				
1734	462.00			20			1			1		24/10/91		
1735		650.00		25			1			1			650.00	5/9/00
1736	2,400.00	450.00		20			1			1				
1737	600.00			20			1			1				
1738	1,270.00			20			1			1		24/4/94		
1739				25			1			1			400.00	19/11/98
1740	1,015.00			30			1			1			800.00	4/10/00
1741	3,640.00			20			1			1			600.00	18/3/99
1742	540.00			20			1			1		15/4/94		
1743	1,200.00			20			1			1		15/7/99		
1744	180.00			20			1			1				
1745	756.00			20			1			1				
1746	1,190.00			20			1			1			310.00	15/4/99
1747	686.00			20			1			1				
1748	934.00						1			1				
1749	245.00			20			1			1				
1750	1,680.00			20			1			1			450.00	16/3/98
1751	1,320.00			20			1			1			500.00	10/7/98
1752	2,920.00			25			1			1			1,000.00	30/8/00
1753	1,725.00			20			1			1		15/3/98	225.00	14/10/97
1754	6,795.00	1,400.00		50			1			1			10,795.00	6/9/00
1755		1,840.00		60			1			1			2,555.00	5/9/00
1756	1,255.00			20			1			1			300.00	1/2/00
1757	396.00						1			1				
1758	1,260.00			25			1			1			315.00	23/2/98
1759	1,180.00			20			1			1		15/5/97		
1760	1,120.00			20			1			1			200.00	28/12/98
Total	43,256.00	8,572.00	0	805	5	33	6	0	33	17	6		23,255.00	

**STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION  
OF WATER SUPPLY SYSTEMS FOR TEN (10) LOCAL TOWNS IN KENYA**

Year 1999	July	August	September	October	November	December
Total Prod. M <sup>3</sup>	41,880	37,020	41,940	33,660	36,060	36,760
Water Sold M <sup>3</sup> (metered conn.)	18,500	15,000	18,100	8,618	15,568	16,000
Fiat rate M <sup>3</sup>	14,400	14,400	14,400	14,400	11,400	11,400
Average M <sup>3</sup>	7,460	840	7,800	7,800	6,885	6,885
Kiosk m <sup>3</sup>						
Unaccounted for W.	156	5,592	320	1,000	555	155
No. of Metered Conn.	599	603	609	611	614	618
No. of Fiat rate Conn.	192	195	195	195	195	195
Pumping hrs.(2 pumps)	385 + 307	322 + 293	518 + 168	330 + 241	541 + 48	613
No production days						
No. of Disconnections						
No. of Reconnections						
KWH Consumed						
<b>Revenue</b>						
New connections						
Reconnections						
Metered						
Fiat						
Kiosks						
<b>Total Revenue</b>	<b>250,000.00</b>	<b>250,000.00</b>	<b>250,000.00</b>	<b>250,000.00</b>	<b>250,000.00</b>	<b>250,000.00</b>
<b>Expenditure</b>						
Fuel	11,999.50	2,257.00	11,927.40	11,288.80	12,200.00	10,696.55
Chemicals	158,755.00	128,830.00	143,133.30	113,490.00	116,910.00	129,010.00
Repairs,spares						
Workshop,uniform						
Replacement of Equip						
Tel.Stationery,Transport						
Allowances + Salaries	74,417.00	74,227.00	74,327.00	74,327.00	74,327.00	74,327.00
<b>Total Expenditure</b>						
<b>Revenue Collected</b>						

Pumping = 60m<sup>3</sup> per hr.

**STUDY OF INSTITUTION IMPROVEMENT AND REHABILITATION OF WATER SUPPLY SYSTEMS  
FOR TEN (10) LOCAL TOWNS IN KENYA**

	YEAR 2000									
	JUNE	MAY	APRIL	MARCH	FEBRUARY	JANUARY				
Accumulated Debt	1,552,762.00	1,539,208.00	1,541,101.00	1,595,575.00	1,579,822.00	1,606,224.00				
Current month billed revenue	150,000.00	58,644.00	88,644.00	135,060.00	88,650.00	159,766.00				
Total revenue collectable	1,702,762.00	1,597,852.00	1,629,745.00	1,730,635.00	1,668,472.00	1,765,990.00				
Accumulated FY collection	1,530,006.00	1,397,310.00	1,352,220.00	1,261,683.00	1,072,149.00	999,252.00				
Total outstanding revenue	1,570,066.00	1,552,762.00	1,539,208.00	1,541,101.00	1,595,575.00	1,579,822.00				

	YEAR 1999						
	DECEMBER	NOVEMBER	OCTOBER	SEPTEMBER	AUGUST	JULY	
Accumulated Debt	1,552,454.00	1,560,878.00	1,559,171.00	1,425,087.00	1,430,595.00	1,245,847.00	
Current month billed revenue	103,460.00	100,000.00	220,000.00	250,000.00	250,000.00	250,000.00	
Total revenue collectable	1,655,914.00	1,660,878.00	1,779,171.00	1,675,087.00	1,680,595.00	1,495,847.00	
Accumulated FY collection	1,530,006.00	1,406,423.00	1,352,220.00	1,261,683.00	1,072,149.00	999,252.00	
Total outstanding revenue	1,606,224.00	1,552,454.00	1,560,878.00	1,559,171.00	1,425,087.00	1,430,595.00	

Note: While the Tariff was adjusted in November 1999, the information reached the Divisional Office Mumias only in February. While no retro-active charging for the 3 months was done, the February 2000 billing shows neither an increment nor does the collection

- 1) The information has been absorbed from the District Water Office Butere, a form called "Monthly Revenue Returns" District Accountants office
- 2) The monthly billed is estimated and not clear how
- 3) The other accumulated figures are therefore based on adding monthly estimates to the already brought forward figures and errors are carried forward from one month to another

**STUDY OF INSTITUTION IMPROVEMENT AND REHABILITATION OF WATER SUPPLY SYSTEMS  
FOR TEN (10) LOCAL TOWNS IN KENYA**

	YEAR 2000					
	JUNE	MAY	APRIL	MARCH	FEBRUARY	JANUARY
Accumulated Debt	1,552,762.00	1,539,208.00	1,541,101.00	1,595,575.00	1,579,822.00	1,606,224.00
Current month billed revenue	150,000.00	58,644.00	88,644.00	135,060.00	88,650.00	159,766.00
Total revenue collectable	1,702,762.00	1,597,852.00	1,629,745.00	1,730,635.00	1,668,472.00	1,765,990.00
Actual collection	132,696.00	45,090.00	90,537.00	189,534.00	72,897.00	186,168.00
Accumulated FY collection	1,530,066.00	1,397,310.00	1,352,220.00	1,261,683.00	1,072,149.00	999,252.00
Total outstanding revenue	1,570,066.00	1,552,762.00	1,539,208.00	1,541,101.00	1,595,575.00	1,579,822.00

## YEAR 1999

	DECEMBER	NOVEMBER	OCTOBER	SEPTEMBER	AUGUST	JULY
Accumulated Debt	1,552,454.00	1,560,878.00	1,559,171.00	1,425,087.00	1,430,595.00	1,245,847.00
Current month billed revenue	103,460.00	100,000.00	220,000.00	250,000.00	250,000.00	250,000.00
Total revenue collectable	1,655,914.00	1,660,878.00	1,779,171.00	1,675,087.00	1,680,595.00	1,495,847.00
Actual collection	49,690.00	108,424.00	218,293.00	115,916.00	255,508.00	65,253.00
Accumulated FY collection	813,084.00	763,394.00	654,970.00	436,677.00	320,761.00	65,253.00
Total outstanding revenue	1,606,224.00	1,552,454.00	1,560,878.00	1,559,171.00	1,425,087.00	1,430,595.00

Note: While the Tariff was adjusted in November 1999, the information reached the Divisional Office Mumias only in February. While no retro-active charging for the 3 months was done, the February 2000 billing shows neither an increment nor does the collection

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**STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION  
OF WATER SUPPLY SYSTEMS FOR TEN (10) LOCAL TOWNS IN KENYA**

Month	WS Kshs.	Labour	Deposit	Date	comment
Jul-99	3,985.00				
	10,902.00	215	200.00	6/7/99	New connection
	7,167.00		200.00	9/7/99	Transferred
	555.00	215	200.00	12/7/99	New connection
	1,159.00				
	14,236.00				
	3,762.00				
	17,340.00				
<b>Sub - Total</b>	<b>70,196.00</b>	<b>645</b>	<b>800.00</b>	30/7/99	New connection
Aug-99	19,786.00				
	18,628.00				
	22,905.00	215	200.00	9/8/99	New connection
	9,342.00	430	400.00	11/8 + 13/8	New connection
	8,806.00	215	200.00	20/8/99	New connection
	7,493.00				
4,370.00	215	200.00	31/8/99	New connection	
<b>Sub - Total</b>	<b>91,330.00</b>	<b>1,075</b>	<b>1,000.00</b>		
Sep-99	119,750.00				
	16,254.00				
	15,210.00	215	200.00	17/9/99	New connection
	10,800.00	215	200.00	17/9/99	New connection
	38,336.00				
	810.00				
	12,757.00				
	1,470.00				
	5,217.00				
	1,470.00				
4,217.00					
15,032.00					
911.00					
<b>Sub - Total</b>	<b>242,234.00</b>	<b>430.00</b>	<b>400.00</b>		
Oct-99	2,101.00		200.00	6/10/99	Transferred
	10,961.00	215	200.00	6/10/99	New connection
	90,873.00				
	1,450.00				
	20,787.00	215	200.00	14/10/99	New connection
	7,216.00				
	83,870.00				
125.00					
<b>Sub - Total</b>	<b>217,383.00</b>	<b>430.00</b>	<b>600.00</b>		
Nov-99	12,514.00		200.00	5/11/99	Transferred
	23,506.00				
	26,149.00		200.00	12/11/99	Transferred
	16,878.00	215	200.00	15/11/99	New connection
	9,063.00				
	11,236.00	215	200.00	22/11/99	New connection
	2,750.00	215	200.00	23/11/99	New connection
3,324.00	215	200.00	30/11/99	New connection	
<b>Sub - Total</b>	<b>105,420.00</b>	<b>860.00</b>	<b>1,200.00</b>		
Dec-99	3,000.00		200.00	1/12/99	Transferred
	13,728.00	215	200.00	8/12/99	New connection
	1,606.00	215	200.00	8/12/99	New connection
	10,593.00	215	200.00	14/12/99	New connection
	4,618.00		200.00	14/12/99	Transferred
	11,734.00		200.00	16/12/99	Transferred
	2,137.00				
4,665.00					
<b>Sub - Total</b>	<b>52,081.00</b>	<b>645.00</b>	<b>1,200.00</b>		

**STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION  
OF WATER SUPPLY SYSTEMS FOR TEN (10) LOCAL TOWNS IN KENYA**

Month	WS Kshs.	Labour	Deposit	Date	comment
Jan-00	5,578.00	215	200.00	18/1/00	New connection
	67,628.00	215	200.00	18/1/00	New connection
	17,606.00	215	200.00	18/1/00	New connection
	17,128.00	215	200.00	26/1/00	New connection
	2,085.00	215	200.00	28/1/00	New connection
<b>Sub - Total</b>	<b>110,025.00</b>	<b>1,075.00</b>	<b>1,000.00</b>		
Feb-00	79,043.00		200.00	2/2/00	Transferred
	2,277.00		200.00	2/2/00	Transferred
	9,823.00		200.00	9/2/00	Transferred
	15,800.00	210	200.00	9/2/00	New connection
	15,907.00	215	200.00	10/2/00	New connection
	15,522.00		200.00	14/2/00	Transferred
	450.00				
	8,587.00				
1,655.00					
2,370.00					
<b>Sub - Total</b>	<b>28,584.00</b>	<b>-</b>	<b>200.00</b>		
Mar-00	400.00		200.00	13/3/00	Transferred
	11,046.00				
	85,277.00				
	1,026.00				
	72,035.00				
	11,155.00				
700.00					
<b>Sub - Total</b>	<b>181,639.00</b>	<b>-</b>	<b>200.00</b>		
Apr-00	70,728.00				
	37,573.00				
	400.00				
	16,717.00				
	9,310.00				
	5,395.00				
10,414.00					
<b>Sub - Total</b>	<b>150,537.00</b>	<b>-</b>	<b>-</b>		
May-00	5,820.00				
	10,000.00				
	48,775.00				
	7,915.00				
	15,640.00				
14,445.00					
<b>Sub - Total</b>	<b>102,595.00</b>	<b>-</b>	<b>-</b>		
Jun-00	7,280.00				
	13,845.00				
	16,521.00				
	14,610.00				
	4,370.00				
	10,775.00				
7,590.00					
<b>Sub - Total</b>	<b>74,991.00</b>	<b>-</b>	<b>-</b>		

**Total: 1,427,015.00 5,160.00 6,600.00**

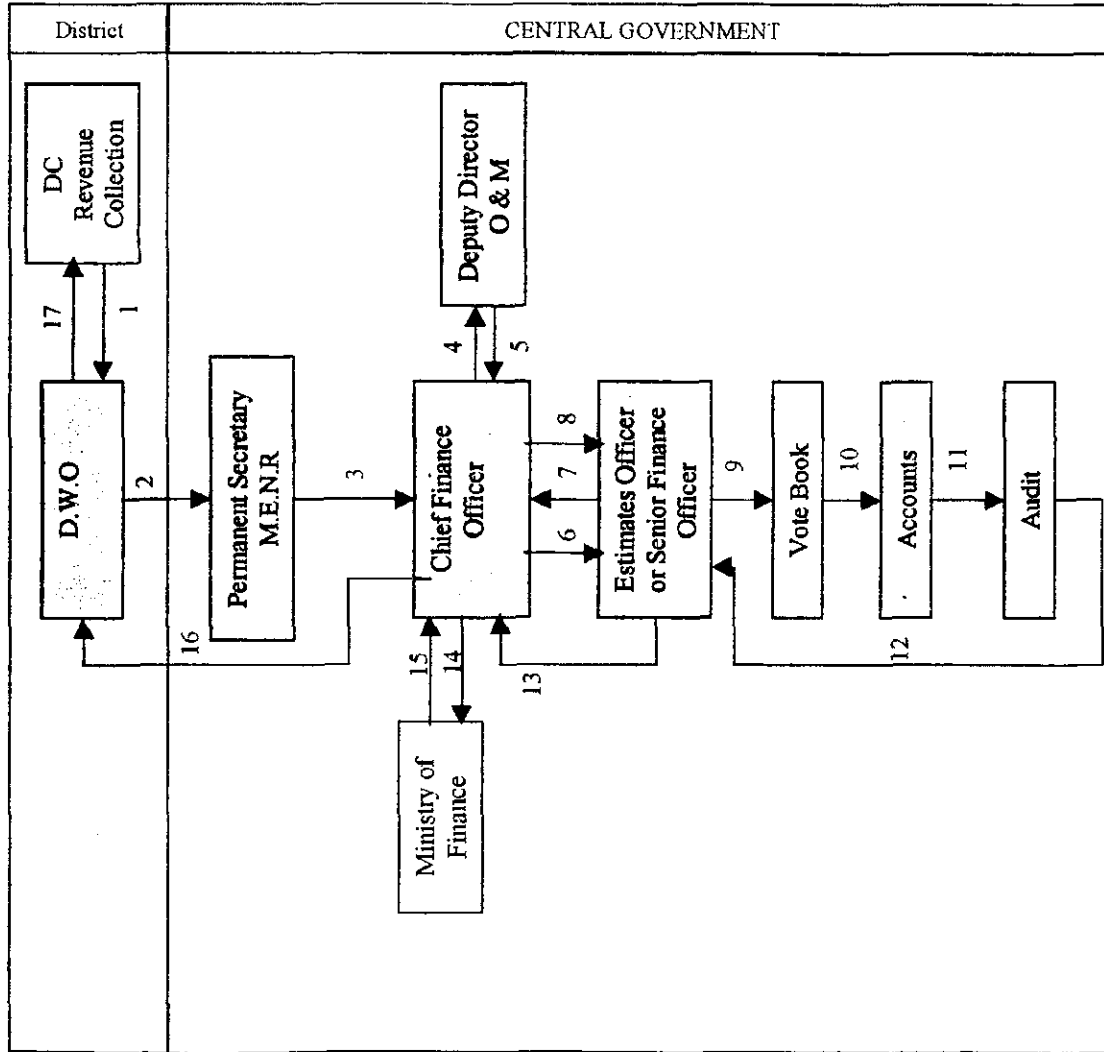
No. Of New Connection	26
No. Of Transferred:	12

# **APPENDIX K3**

# **GENERAL**



**FIGURE: 8.2**  
**A.I.E PROCESSING CHART**  
**STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION OF WATER SUPPLY SYSTEMS**  
**FOR TEN (10) LOCAL TOWNS IN KENYA**



A.I.E = Authority to Incur Expenditure

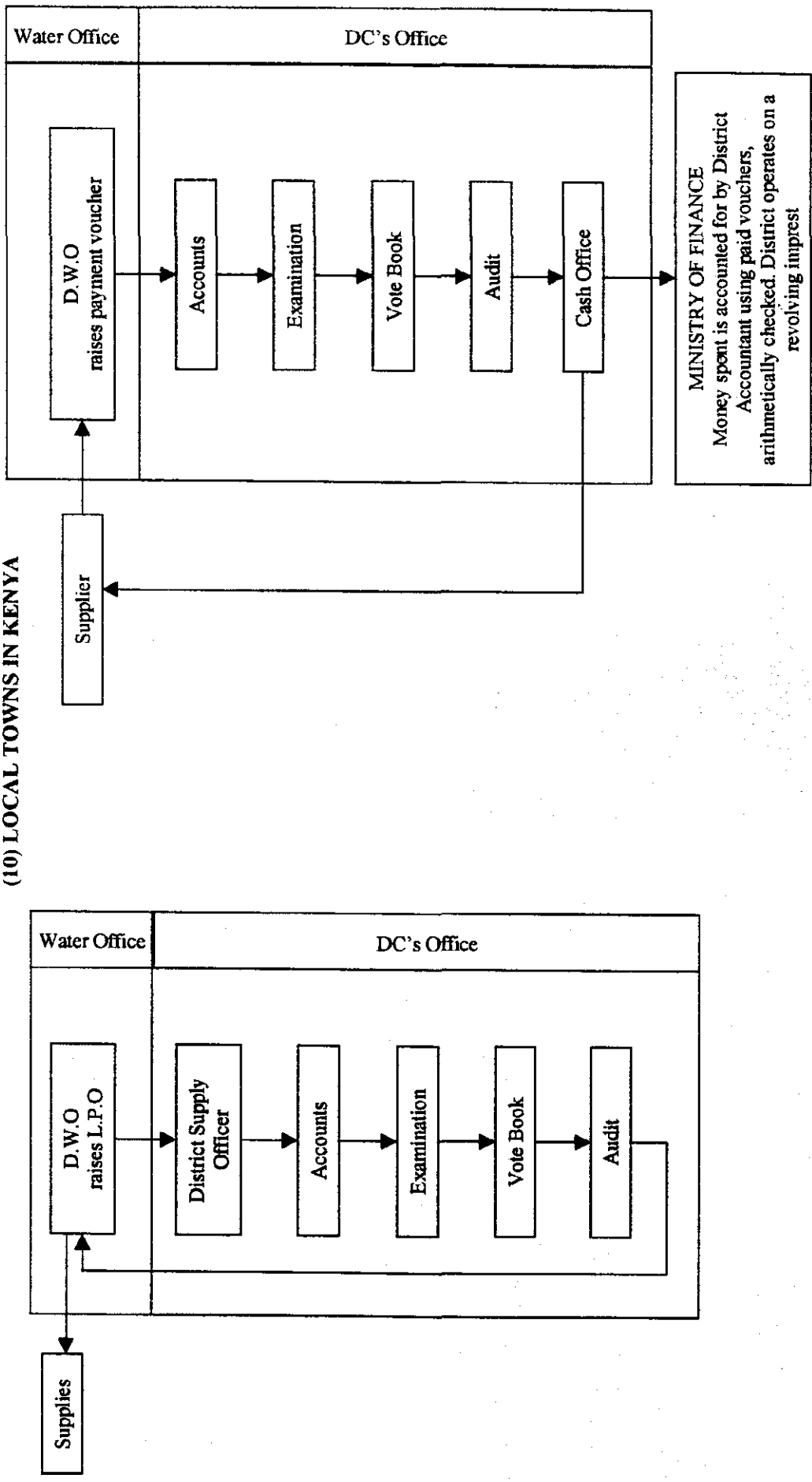
- 1) DC forwards Form F.O. 17 to the DWO containing the total monthly collection made on behalf of the water department.
- 2) DWO requests for A.I.E based on form F. O. 17 collection and A.I.E percentage and forwards to P. S. The A.I.E percentage depends on the district and is determined by MENR. The percentage for the towns covered varies from 63% to 90%.
- 3) Permanent Secretary forwards request to Chief Finance Officer
- 4) Chief Finance Officer forwards to Deputy Director O & M for recommendation.
- 5) Deputy Director O & M recommends and returns request to Chief Finance Officer.
- 6) Chief Finance Officer forwards request to Estimates Officer or Senior Finance Officer department.
  - Checks the records and confirms the amounts
  - Compares with district allocation budget and
  - Drafts A.I.E for Chief Finance Officer to sign.
- 7) Estimate Officer forwards documents to Chief Finance Officer.
- 8) Chief Finance Officer signs and returns documents to Estimates Officer.
- 9) Estimate Officer forwards documents to Vote Book for entry against the budget provision.
- 10) Vote Book Officers forwards documents to Accounts for checking
- 11) Accounts forwards documents to Audit for checking.
- 12) Audit forwards documents to Estimate Officer.
- 13) Estimates Officer seals the A.I.E and drafts for signature of Chief Finance Officer
- 14) Chief Finance Officer forwards request to Ministry of Finance Att: Paymaster General
- 15) Ministry of Finance / Treasury returns A.I.E to the Chief Finance Officer
- 16) Chief Finance Officer forwards the A.I.E to the DWO
- 17) DWO forwards A.I.E to the District Accountant from where cheque now can be issued provided the district has:
  - Liquidity and
  - Procurement formalities have been complied with.



# L.P.O & PAYMENT PROCESSING CHART

FIGURE: 8.3

STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION OF WATER SUPPLY SYSTEMS FOR TEN (10) LOCAL TOWNS IN KENYA





**Development Impact Consulting**



Engineering and Utility Management Ltd.

Gibb Eastern Africa Ltd.

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## CONSORTIUM

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**Study of Institutional Improvement and Rehabilitation of Water Supply Systems for Local Towns in the Republic of Kenya**

**Location: MALINDI  
10.11.2000**

**Sub-Area Office NWCPC**

**Management Contract H.P.Gauff in association with Gauff Utility**

**Interviewer: LEK and CK**

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**Discussion held with: Manager Mr. Donald Pumfrey  
Mr. Eng. Moses Kinya  
Project Manager Nairobi Office: Mr. David Baker**

**Tel.: 0123-31037, 30923**

**Meeting with the manager in Malindi had to be termed in-official, as H.P.Gauff was not informed by the project management. No indices or financial details could be obtained, therefore only general discussion. Clearance was to be obtained from NWCPC head office in Nairobi, but nothing has been received so far.**

**MALINDI MANAGEMENT CONTRACT**

<b>QUESTIONS:</b>	<i>Answers:</i>
<p><b>GENERAL:</b></p> <p><b>Contract in place?</b></p> <p><b>Line of Command?</b></p> <p><b>Any comments on current situation?</b></p> <p><b>Problems experienced?</b></p> <p><b>Any recommendation on changes to improve the situation?</b></p> <p><b>Cause of the problem if any?</b></p> <p><b>Any problems on Fee payments?</b></p>	<p><i>Yes</i></p> <p><i>NWCPC Manager (Chief Sub-Area Manager) in Malindi -&gt; Regional Manager Mombasa -&gt; MD NWCPC -&gt;HQ Liaison officer-&gt; Head O&amp;M HeadOffice Nairobi -&gt; MD of NWCPC -&gt; Board of Directors (for certain issues only)</i></p> <p><i>Management consultant still trying to catch up with the gap left between the first and the second contract. Offices are set up, even though not yet final, as O&amp;M separate from administration and store. Trying to re-instate procedures that were in place before</i></p> <p><i>Only in relation to the procurement because of delay and additional requirements, as well as writing off of debts that cannot be collected. Water Act not really supporting the effort and should be dealt with soonest.</i></p> <p><i>Procurement issues should be simplified Write-off procedure on consumer outstandings that cannot be collected, should be simplified within GOK / NWCPC framework Tariff: The Consultant's suggested social Tariff structure(leave rural kiosk tariffs low) should have been considered when Tariff policy was made, because these payments are very difficult to collect and often result in illegal action as a consequence; and approval period should be much shorter as it is currently</i></p> <p><i>Government and Parastatal guidelines and procedures and the Water Act (Criminal case first, Civil case second...)</i></p> <p><i>No, standing order to cover fee and O&amp;M is paid from the collection account, balance at end month goes to NWCPC</i></p>
<p><b>FINANCES:</b></p> <p><b>Is the management financially independent?</b></p> <p><b>Can collected revenue sustain the operation?</b></p>	<p><i>In principle yes, but with limitations on procurements.</i></p> <p><i>Cannot be commented on at the moment as source cost are not known to the Manager. But it is clear that electricity tariff adjusted three times while water is not over the same period in</i></p>

<p><b>How is revenue collected?</b></p>	<p><i>time. Neither is the the authority of the Client to comment on actual figures. Can only comment on the trend which is as expected going up. Project since 8 months in operation and initial setting up accounts for considerable time.</i></p> <p><i>At the office, as KCB was not willing to continue with the collection. Revenue is collected on behalf of the Client and banked in Malindi twice daily, then transferred to Mombasa.</i></p>
<p><b>OPERATION:</b></p> <p><b>Any interference in the day to day operation?</b></p> <p><b>Procedures manifested already ?</b></p>	<p><i>No, but biggest impediment is the procurement which has to follow the standard Government procedures</i></p> <p><i>No, but best practice in the circumstances is applied for O&amp;M and Financial issues. Later on these will be pu into user manuals</i></p>
<p><b>STAFF:</b></p> <p><b>Relationship with the NWCPC/Management staff?</b></p> <p><b>Are any incentives offered to improve the output?</b></p>	<p><i>Staff mixed between NWCPC and management. Staff then seconded to the management consultant.</i></p> <p><i>Total: approx. 70 with ratio: 50 Consultant / 20 NWCPC</i></p> <p><i>Yes</i></p>
<p><b>RECOMMENDATIONS:</b></p> <p><b>For other management contracts?</b></p>	<p><i>1. Operator/Manager to have sufficient autonomy.</i></p> <p><i>2. There should be a mode of speedy decision making, i.e. shorten the institutional framework to go through for the purpose of increased efficiency.</i></p>



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## CONSORTIUM

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**Study of Institutional Improvement and Rehabilitation of Water Supply Systems for Local Towns in the Republic of Kenya**

**Location: NYERI Water Company  
NYEWASCO**

**P.O.Box**

**Date: 20.12.00**

**Tel.: 0171-4548/4617/4623 Dir. Line 2684**

**Fax: 0171-2734**

**Interviewer: LEK**

.....

**Telephone Interview held with: MD : Eng. Nguiguti**

**NYERI WATER COMPANY NYEWASCO**

<p><b>Any comments on current situation?</b></p> <p><b>Any recommendation on changes to improve the situation?</b></p> <p><b>Cause of the problem if any?</b></p> <p><b>Agency agreement between company and Council finalised?</b></p> <p><b>Ownership of the company clear?</b></p> <p><b>Any advice for other water companies to integrate into their agency agreement?</b></p>	<p><i>Staff still not happy with their remuneration and also other terms and conditions of service.</i></p> <p><i>The company is registering as a member of F.K.E and hopes to seek for advice to resolve outstanding issues.</i></p> <p><i>Misunderstandings between union officials</i></p> <p><i>This was signed on 19<sup>th</sup> March 1999 and ammended on 7<sup>th</sup> April 2000.</i></p> <p><i>Yes, owner is Nyeri Municipal Council.</i></p> <p><i>User changes for use of assets needs to be established before commencement of operation</i></p>
<p><b>Does the company have an Opening Balance Sheet?</b></p> <p><b>How were assets handeled?</b></p> <p><b>How were Consumer outstanding balances handeled?</b></p> <p><b>How were liabilities handeled? (Power, Creditors)</b></p> <p><b>Is the company financially independent?</b></p> <p><b>Can collected revenue sustain the operation?</b></p>	<p><i>?</i></p> <p><i>All assets remain in the ownership of Nyeri Municipal Council.</i></p> <p><i>These were taken over by the company. ? at what level, as they were or audited?</i></p> <p><i>These were taken over by the company.</i></p> <p><i>Yes.</i></p> <p><i>Collected revenue not enough to cater for O &amp; M, debt servicing (council's), depreciation of used asstes</i></p>

<p><b>Any other problems encountered?</b></p>	<p><i>and new works</i></p> <p><i>Interference of running of the company by the council, however this is now decreasing.??????</i></p>
<p><b>Relationship between CMT and Board?</b></p> <p><b>Relationship CMT/Board/ Council?</b></p> <p><b>Any interference in the day to day operation?</b></p> <p><b>Is day to day operation autonomous as far as CMT is concerned?</b></p> <p><b>How is the relationship with the consumers? Has the situation improved?</b></p>	<p><i>Government ??????</i></p> <p><i>There has been a problem as the council has tried to interfere with the work of the board however, the council has not succeeded.</i></p> <p><i>No.</i></p> <p><i>Yes.</i></p> <p><i>Customers are much happier with the service rendering by the company.</i></p>
<p><b>Relationship with the staff? All former staff absorbed?</b></p> <p><b>Conditions under which staff were absorbed?</b></p> <p><b>Retired on the Council side?</b></p> <p><b>Have staff salaries changed since take over? How?</b></p>	<p><i>All former staff were absorbed however, their salary expectations have not been met</i></p> <p><i>All had to be absorbed. Their retention then by the company depends on their performance.</i></p> <p><i>No.</i></p> <p><i>The minimum salary increase given with effect of 1<sup>st</sup> Sept. 1999 was 15%. Since then the staff have had 7.5% increase with effect from 1<sup>st</sup> Jan. 2000.</i></p>

<b>Are any incentives offered to improve the output?</b>	<i>Incentives are being worked out.</i>
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## CONSORTIUM

**Study of Institutional Improvement and Rehabilitation of Water Supply Systems for Local Towns in the Republic of Kenya**

**Location: KITALE Water Company  
P.O.Box 2248**

**Tel.: 0325-30074**

**Date: 24.11.00**

**Interviewer: LEK and CK**

**Discussion held with: Act MD (actually TM): Patrick Wambulwa  
CM Kibet Torut**

**Fin. Advisor to Kitale , Eldoret: Mr. Langer**

**KITALE WATER COMPANY**

**KIWACO**

<p><b>Any comments on current situation?</b></p> <p><b>Any recommendation on changes to improve the situation?</b></p> <p><b>Cause of the problem if any?</b></p> <p><b>Agency agreement between company and Council finalised?</b></p> <p><b>Ownership of the company clear?</b></p> <p><b>Any advice for other water companies to integrate into their agency agreement?</b></p>	<p><i>Very difficult</i></p> <p><i>There are other models, whereby 3 yrs are given to gradually rehabilitate and build capacity. Amounts/Funding necessary is determined by a consultant, partly loan partly grant through the Central Government, (a model from Philipines)</i></p> <p><i>Lacking start up help. A a centralised advise through the regulatory body, which helps you first and then controlls and regulates as soon as you stand</i></p> <p><i>No access to loan facilities and burden of honouring liabilities taken over from the former operator (Council)</i></p> <p><i>No</i></p> <p><i>Yes</i></p> <p><i>Agency agreement should be finalised prior to commencement of the new company, reconciliation of personell issues of absorbed staff, consumer accounts, power liabilities and investment loans as they cause a lot of problems when confronted with it afterwards</i></p>
<p><b>Does the company have an Opening Balance Sheet?</b></p> <p><b>How were assets handeled?</b></p> <p><b>How were Consumer outstanding balances handeled?</b></p> <p><b>How were liabilities handeled? (Power, Creditors)</b></p> <p><b>Is the company financially independent?</b></p> <p><b>Can collected revenue sustain the operation?</b></p>	<p><i>Working on it</i></p> <p><i>Proposed all retained by the Council. Proposal from UWASAM for lease amount for the assets, not discussed with Council yet</i></p> <p><i>Taken over as they were</i></p> <p><i>Worked on at the moment. Forced into power payments, current and past. Problem is that no credits are reflected on the KP&amp;L account, as the Council made payments which were then applied by KP&amp;L to various accounts but not clear. Everything needs reconciliation. Working on it since February</i></p> <p><i>Yes, in so far as own bank a/c, and Council is not involved at all.</i></p> <p><i>No, because majority of meters not working and billing way beyond production. Procured out of revenue 450 new meters from collection, placed in certain zones to improve billing and revenue collection.,</i></p> <p><i>Applied to CIM grant f or new meters, additional funds</i></p>

<p>Any other problems encountered?</p>	<p><i>hoped for from KfW loan – but earliest 2 nd half of next year. Fitting of meters for non- metered accounts into priority one.</i></p> <p><i>Loan had been given to the Council (through LGLA)????</i>  <i>From mid 1970s KfW, before could be from different sources</i>  <i>Accountant from KIWACO at Council, to speed up the analysis</i>  <i>Portfolio: mainly domestic, apart from prison and police</i>  <i>All GOK bodies have a payment problem, delays</i>  <i>Supply:</i>  <i>Water shortage, cut off power (1 mio current 600 arrears), then used diesel, diesel from collection 10 hours pumping</i>  <i>For 3800 cbm/day</i>  <i>Agricultural consumers, i.e. seasonal payments like the month of March, which requires money for planting, no payment of water.</i>  <i>KCC closed one of the major consumers</i>  <i>If 80 % is collected</i>  <i>Network rehabilitated in 1992</i></p>
<p>Relationship between CMT and Board?</p> <p>Relationship CMT/Board/ Council?</p> <p>Any interference in the day to day operation?</p> <p>Is day to day operation autonomous as far as CMT is concerned?</p> <p>How is the relationship with the consumers? Has the situation improved?</p>	<p><i>MD on the Board, on interference</i>  <i>Goodwill to be improved further, involve chairman into building good will</i></p> <p><i>Consolitative meeting, Board and Councillors, frequent</i>  <i>Like AGM to explain such that everybody understands</i>  <i>What has been discussed and decided, then has to go the Board / Council, because Agency agreement not yet done, and KfW conditions involve the Council.</i></p> <p><i>No</i></p> <p><i>Yes</i></p> <p><i>Company started in Nov, but officially in January. Consumer did not really get better service since, but consumeris attended to friendly, illegal connections are reported by consumers, because they suffer themselves under the current rationing,</i>  <i>Technically: in the network immediate attendance to a problem, but at production it is a problem.</i>  <i>There are 5 pumping stations and power is the main problem</i></p>
<p>Relationship with the staff? All former staff absorbed?</p> <p>Conditions under which staff were</p>	<p><i>Initially yes, but later 2 staff were taken back to the council, 3 additional employed. Total Staff : 93</i>  <i>(Billing and Connection details as at 30.06.00 refer)</i></p> <p><i>Letter of release from the Council however never formalised</i></p>

<p>absorbed?</p>	<p><i>with PSC and signing of the agency agreement and letter of employment from the company. But agreed to take back to council he who cannot perform.</i></p>
<p>Retired on the Council side?</p>	<p><i>Provident Fund ? suggested to continue to pay into it, but needs to be checked whether possible or not. Again an issue that</i></p>
<p>Have staff salaries changed since take over? How?</p>	<p><i>No for those from council, company paid full new salaries that had not been implemented by the council. KIWACO agreed to pay even arrears back to 1.1.99</i></p>
<p>Are any incentives offered to improve the output?</p>	<p><i>MR and plumbers got bicycles and the labourers ( bicycles are theirs to use, but given as loan, whereby 50 Kshs /day paid when used for KIWACO and this is off-set. against loan)</i></p>

**ACTUAL CONSUMER BILLS CALCULATION ANALYSIS SUMMARY TABLE: ST 1.1**

**STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION OF WATER SUPPLY SYSTEMS  
FOR TEN (10) LOCAL TOWNS IN KENYA**

Only calculated for actual meter reading information and billing obtained from the respective consumer ledger.

**LAMU**

	No Of Bills	Correct Bill	No. Of Wrongly Calculated Bills	No. Of Connections without bill and Consp. > 0	Amount Charged	No. Of Different Charges (Kshs.)	No. Of Different Consp. (m <sup>3</sup> .)
Between 0m <sup>3</sup> and 10m <sup>2</sup>	56	250.00	0	0	2 amounts of 280/= and 480/=	2	10
Between 11m <sup>3</sup> and 20m <sup>3</sup>	27		2	0	Range from 280/= to 580/= with intervals of 25/= and 50/=	12	10
Between 21m <sup>3</sup> and 40m <sup>3</sup>	8		0	0	Range from 590/= to 1,040/= with intervals of 30/=, 60/=, 90/= and 120/=	8	8
Between 41m <sup>3</sup> and 60m <sup>3</sup>	2		0	0	2 amounts of 1,190/= and 1,860/=	2	2
Between 61m <sup>3</sup> and 100m <sup>3</sup>	1		0	0	1 amount of 26,95/=	1	1
Over 100m <sup>3</sup>	1		0	0	1 amount of 4,285/=	1	1
<b>Totals:</b>	<b>95</b>		<b>2</b>				

**NAROK**

	No Of Bills	Correct Bill	No. Of Wrongly Calculated Bills	No. Of Connections without bill and Consp. > 0	Amount Charged	No. Of Different Charges (Kshs.)	No. Of Different Consp. (m <sup>3</sup> .)
Between 0m <sup>3</sup> and 10m <sup>2</sup>	211		12	16	Range from 200/= to 2,570/=	14	10
Between 11m <sup>3</sup> and 20m <sup>3</sup>	76		6	5	Range from 250/= to 1,130/=	16	10
Between 21m <sup>3</sup> and 40m <sup>3</sup>	69		15	2	Range from 250/= to 2,570/=	33	18
Between 41m <sup>3</sup> and 60m <sup>3</sup>	20		5	0	Range from 570/= to 7,625/=	18	13
Between 61m <sup>3</sup> and 100m <sup>3</sup>	7		1	1	Range from 200/= to 11,100/=	7	6
Over 100m <sup>3</sup>	16		1	2	Range from 1,235/= to 30,150/=	16	15
<b>Totals:</b>	<b>425</b>		<b>40</b>				

**MERU**

	No Of Bills	Correct Bill	No. Of Wrongly Calculated Bills	No. Of Connections without bill and Consp. > 0	Amount Charged	No. Of Different Charges (Kshs.)	No. Of Different Consp. (m <sup>3</sup> .)
Between 0m <sup>3</sup> and 10m <sup>2</sup>	25		2	12	Range from 125/= to 300/=	4	10
Between 11m <sup>3</sup> and 20m <sup>3</sup>	426		17	44	Range from 161/= to 1,300/=	26	9
Between 21m <sup>3</sup> and 40m <sup>3</sup>	105		20	18	Range from 200/= to 1,800/=	38	18
Between 41m <sup>3</sup> and 60m <sup>3</sup>	31		4	6	Range from 853/= to 2,435/=	15	11
Between 61m <sup>3</sup> and 100m <sup>3</sup>	13		5	0	Range from 1,490/= to 7,070/=	11	6
Over 100m <sup>3</sup>	8		0	4	Range from 5,100/= to 18,025/=	8	8
<b>Totals:</b>	<b>692</b>		<b>48</b>				

**KABARNET**

	No Of Bills	Correct Bill	No. Of Wrongly Calculated Bills	No. Of Connections without bill and Consp. > 0	Amount Charged	No. Of Different Charges (Kshs.)	No. Of Different Consp. (m <sup>3</sup> .)
Between 0m <sup>3</sup> and 10m <sup>2</sup>	138		0	0	2 amounts of 200/= and 250/=	2	10
Between 11m <sup>3</sup> and 20m <sup>3</sup>	35		1	1	Range from 275/= to 475/=	9	8
Between 21m <sup>3</sup> and 40m <sup>3</sup>	15		0	0	Range from 560/= to 1,070/=	10	10
Between 41m <sup>3</sup> and 60m <sup>3</sup>	6		1	0	Range from 1,190/= to 1,850/=	6	5
Between 61m <sup>3</sup> and 100m <sup>3</sup>	2		0	0	2 amounts of 2,165/= and 2,635/=	2	2
Over 100m <sup>3</sup>	10		0	0	Range from 4,600/= to 76,650/=	10	10
<b>Totals:</b>	<b>207</b>		<b>2</b>				

VERIFIED STATISTICS SUMMARY

STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION OF WATER SUPPLY SYSTEMS FOR TEN (10) LOCAL TOWNS IN KENYA

DETAILS	UNITS	NAROK	MERU	MURANGA	KABARNET	MAKINDU	WUNDANYI	MIGORI	LAMU	WEBUYE	MUMIAS
Total Population	No.	43,000	130,100	60,000	17,500	8,400	7,200	99,700	12,000	73,000	110,400
Total Staff	No.	34	48	56	28	10	35	28	17	28	13
Total Active + In-active Accounts	No.	1,333	3,225	2,933	768	438	1,136	669	837	1,862	1,439
Ratio (Accounts per staff)	No.	39.21	67.19	52.38	26.48	43.80	32.46	23.07	48.24	66.14	110.69
No of AC transferred to community	No.	-	-	-	-	136	-	133	-	Not available	-
Miscellaneous Accounts	No.	869	2,644	2,830	470	422	1,114	213	800	1,646	1,603
Working	No.	371	272	1,469	208	116	493	104	104	7	8
Non-working	No.	498	2,225	1,441	261	104	290	136	697	1,609	1,284
Unmetered Accounts	No.	289	463	2	-	23	-	456	35	-	104
Actual Billed Accounts	No.	399	110	1,433	206	107	427	26	95	4	4
Estimated Billed Accounts	No.	539	2,198	1,433	363	117	192	188	638	729	650
Dis-connected Accounts	No.	221	283	36	199	198	357	220	95	767	528
Major / Minor Consumers	No.	20818	262281	282858	12657	14210	8611	3211	2701	3730	91597
Minimum charged bill	%	67.27%	15.43%	63.77%	34.84%	18.93%	67.04%	53.01%	78.14%	12.37%	18.41%
Production capacity per month	m <sup>3</sup>	72,000	150,000	100,800	420,000	14,400	46,080	14,400	90,000	54,000	42,900
Actual Production June 2000	m <sup>3</sup>	36,431	132,000	82,500	81,800	12,800	21,600	5,400	22,833	21,120	21,800
Production efficiency	%	50.60%	88.00%	81.80%	Capacity not used	84.88%	46.88%	37.50%	25.37%	50.22%	49.37%
Total consumption June 00	m <sup>3</sup>	23,418	49,058	41,078	11,500	7,182	10,020	5,992	7,904	27,013	31,556
Actual	m <sup>3</sup>	10,843	2270	21,114	2,652	392	5,710	392	245	245	245
Estimate	m <sup>3</sup>	12,673	42786	19,914	8,058	4,530	4,310	5,200	6,510	26,768	31,311
UPW June 2000	m <sup>3</sup>	19,016	86,944	41,472	39,900	4,998	11,580	consumed - produced	16,029	107	consumed > produced
UPW	%	36.73%	86.87%	77.45%	41.00%	60.27%	63.81%	66.82%	69.2%	0.38%	
Value of water lost	Kshs.	313,892.84	2,208,728.10	1,288,842.97	1,313,853.91	193,022.76	431,117.74	563,136.63	3,214.49	3,214.49	
Billed Revenue June 2000	Kshs.	384,742.00	1,144,503.00	1,275,044.00	392,430.00	277,416.00	423,887.00	92,666.00	292,360.00	811,523.00	721,790.00
2000	Kshs.	296,000.00	1,203,181.00	1,211,228.00	382,430.00	276,286.00	385,672.00	40,000.00	336,122.00	150,000.00	150,000.00
Billing Efficiency June 2000	%	64.27%	34.13%	22.85%	68.99%	68.99%	48.58%	> 100%	34.18%	28.81%	> 100%
Collected revenue June 2000	Kshs.	427,020.00	426,318.00	1,108,318.00	328,113.00	228,201.00	228,201.00	32,268.00	100,915.00	178,228.00	132,886.00
Collection efficiency June 2000	%	78.91%	37.42%	88.92%	86.92%	24.12%	53.95%	34.81%	34.81%	21.96%	18.39%
Average tariff June 2000 / m <sup>3</sup>	Kshs.	24.12	28.40	33.26	38.93	42.31	42.31	18.67	37.47	30.94	22.87
Total Debtors and May 2000	Kshs.	8,664,102.50	20,412,091.50	12,841,260.80	1,638,828.00	6,497,732.65	3,289,084.15	940,349.00	3,137,731.00	2,357,699.95	2,020,145.95
HQ Reporting and May 2000	Kshs.	4,239,072.00	40,094,320.50	13,808,023.90	1,639,669.00	7,317,723.10	3,716,960.00	609,915.30	2,436,478.00	355,421.00	1,592,762.00
Major consumers:	%			61.42%	Not available	N/A	46.08%	Not available	Not available	0.64%	Not available
G.O.K.	%	3.26%	52.84%	10.98%	60.35%	91.60%	2.04%	15.98%	43.20%	1.40%	5.37%
(Others Consumption > 10m <sup>3</sup> or more)	%	56.74%	47.06%	27.60%	49.65%	8.40%	51.88%	84.02%	56.80%	97.95%	94.63%
Minor Consumers	%	64%	60%	85%	N/A	N/A	65%	65%	90%	63%	Not available
A/E percentage	%	3.827,478.00	6,771,976.00	9,247,457.50	2,319,895.20	2,319,895.20	2,173,736.00	730,954.00	1,295,717.00	2,163,140.00	1,382,778.20
AY Collection	Kshs.	2,449,695.92	4,063,186.80	6,010,847.38	N/A	N/A	1,412,628.70	475,120.10	1,166,146.30	Not available	Not available
A/E estimated FY 2000	Kshs.	1,288,842.97	3,993,988.00	6,022,650.00	N/A	N/A	2,635,300.00	623,460.00	1,269,860.00	Not available	Not available
A/E received FY 2000	Kshs.	497,238.00	765,095.70	1,910,296.66	217,863.95	26,644	344,413.26	399,484.00	377,921.60	29,835	Not available
Transport & staff related expenses	Kshs.	634,042.00	2,420,092.50	2,490,248.26	200,470.00	24,426	1,119,560.65	320,280.80	854,179.50	87,535	Not available
GA/M	Kshs.	9,922.00	31,963.20	22,736.00	3,537.40	0.43%	84,960.00	4,365	15,400.00	1,455	Not available
Postage	Kshs.	152,208.00	3,965	55,000.00	1.11%	235,643.25	89,200.00	4,104	18,400.00	1,455	Not available
Telephone	Kshs.	63,927.80	1,868	99,000.00	2.00%	34,999.00	34,999.00	1,614	-	-	-
Surveys of Meters	Kshs.	45,000.00	3,906	104,138.50	6,260.00	0.77%	85,000.00	3,906	14,945.00	1.16%	-
Staffing	Kshs.	189,715.70	16,633	316,690.50	6,169	197,032.00	409,947.20	18,82%	14,945.00	1.16%	-
Fuel & Gas	Kshs.	1,255,917.70	3,853,067.10	4,847,421.40	820,638.00	3	2,178,100.10	2	1,284,846.10	2	4
A/E Expenses:	Kshs.	1,255,917.70	3,853,067.10	4,847,421.40	820,638.00	3	2,178,100.10	2	1,284,846.10	2	4

x Verified Figures (Extracted from the consumer information raw data)  
 x Provided figures (Extracted from O&M, Billing and revenue data and A/E data as provided and production figures from Gibb)  
 x Calculated figures (Arrived at using provided figures)  
 x Splitting between GOK and other consumers not possible due to the recurrent connection nos. in different zones or not adequate information thereto. Further verification of data required from field  
 1 A/E expenditure relating to water supply only  
 2 A/E expenditure relating to District  
 3 Details relating to 6 months only  
 4 Details not readily available  
 Information obtained from vote book and grouped

**PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX**

SUMMARY TABLE: ST 8.3

**STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION FOR WATER SUPPLY SYSTEMS FOR 10 TEN (10) LOCAL TOWNS IN KENYA**

Problems	Symptoms	Cause	Recommended Change
<b>1. Organization Structure</b>			
<p><b>Office Set-up</b></p> <p>Lack of decent or sufficient office space, Lacking equipment, Lacking or delayed stationery, No calculators, No computers.</p>	<ul style="list-style-type: none"> <li>Messy office environment, lost files, limited communication.</li> <li>Low staff morale.</li> <li>Reduced efficiency.</li> <li>Delayed billing, wrong billing calculation.</li> <li>Delayed consumer problem attendance.</li> <li>No data base.</li> </ul>	<ul style="list-style-type: none"> <li>Insufficient funding.</li> <li>Delays in A.I.E. processing.</li> <li>Centralised GOK printing.</li> <li>Centralised decision-making.</li> </ul>	<ul style="list-style-type: none"> <li>Decentralise decision-making process.</li> <li>Change funding procedure.</li> <li>Arrange for decent office space</li> </ul>
<p><b>Staffing Set-up</b></p> <p>Delayed promotion, No training opportunities No skill in commercial field / management, Lacking recruitment by qualification, Low remuneration, No O/T payments or compensation, Limited personnel management and control, "Technical" attendance to work.</p>	<ul style="list-style-type: none"> <li>Reduced efficiency.</li> <li>Low staff morale.</li> <li>No commercial approach.</li> <li>Lacking understanding of commercial operations.</li> </ul>	<ul style="list-style-type: none"> <li>Inefficient / delayed personnel management at HQ.</li> <li>Insufficient funding.</li> <li>GOK recruit practice concerning commercial or managerial skill.</li> <li>GOK salary scales.</li> <li>Lacking organisation chart.</li> <li>Lacking job description.</li> <li>Favourism at HQ level.</li> <li>Inefficient system of staff discipline.</li> <li>Lacking personnel management and control.</li> </ul>	<ul style="list-style-type: none"> <li>Decentralise decision-making.</li> <li>Change funding procedure.</li> <li>Set up organisation charts with detailed job description and skill requirements</li> <li>Arrange for intensive management training for Engineers or recruit well-qualified managers.</li> <li>Set up positive and negative staff sanctioning system.</li> <li>Use negative sanctioning as retrenchment criteria.</li> <li>Limit recruitment to the system requirement, based on skill and merit.</li> </ul>
<p><b>Transport</b></p> <p>No or limited transport</p>	<ul style="list-style-type: none"> <li>Certain field operations not possible.</li> <li>Delayed reaction time to field operations</li> <li>Reduced control over field activities</li> </ul>	<ul style="list-style-type: none"> <li>Insufficient funding</li> <li>Lack of planning on Asset Maintenance i.e. grounded vehicles.</li> <li>No planning on transport requirement.</li> </ul>	<ul style="list-style-type: none"> <li>Change funding procedure</li> <li>Prepare criteria for transport requirements based on size of system coverage, pipe network, number of consumer e.t.c.</li> <li>Decentralise decision making</li> </ul>

**PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX**

Problems	Symptoms	Cause	Recommended Change
<p><b>Consumer Management</b></p> <p>No application forms available, different forms used, No conditions of supply (back page not copied), Out dated format or no agreement form filled, just connected All consumer information held in consumer ledgers, No control system over new connections in the field, Different interpretation of gazette notice on new meters, No quality control on connection material and meter, semi-illegal connections</p>	<p><b>2. Organization Activities and Procedures</b></p> <ul style="list-style-type: none"> <li>• Insufficient consumer information</li> <li>• Connections not included in consumer ledger</li> <li>• High UfW</li> <li>• No legal agreement as basis for supply</li> <li>• Information not in compiled format</li> <li>• No comprehensive data base</li> <li>• New Flat Rate consumers.</li> <li>• Meters still provided through the water undertaker.</li> <li>• Issues kept pending due to lack of clear guidance</li> <li>• High rate of meter malfunction</li> </ul>	<ul style="list-style-type: none"> <li>• No control of new applications</li> <li>• Centralised GOK printing</li> <li>• Delays in AIE processing</li> <li>• Insufficient funding</li> <li>• No control over consumer applications and connections / illegal staff consumer co-operation</li> <li>• No regular review of GOK formats</li> <li>• Insufficient operating and / or outdated implementation guidelines</li> <li>• No guidelines and control on quality standards</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce administration fee for new connection application</li> <li>• Increase connection charges to commercial rates</li> <li>• Decentralise procurement of stationary</li> <li>• Change funding procedure</li> <li>• Redesign application format and other formats</li> <li>• Computerise consumer data base and obtain field information from all existing consumer using the re-designed application format</li> <li>• Design meaningful recording formats and reports.</li> <li>• Prepare implementation guidelines related to gazette notices and relating procedures.</li> <li>• Prepare guidelines on control of new connections</li> <li>• Stop installation of unmetered new connections</li> <li>• Use negative sanctioning as refrenchment criteria.</li> </ul>



**PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX**

Problems	Symptoms	Cause	Recommended Change
<p><b>Meter Reading</b></p> <p>No routing for MR, On Minimum charge and still "read" monthly, Involvement of a single MR in several steps of the meter reading up to billing process, Lack of stationary, Lack of transport, unmotivated staff, Wrong meter reading</p>	<ul style="list-style-type: none"> <li>• Low reliability of information found</li> <li>• High % of all connections are estimated.</li> <li>• High number of connections on minimum</li> <li>• Wrong billing</li> </ul>	<ul style="list-style-type: none"> <li>• No meter reading procedure</li> <li>• No logic MR reading routing</li> <li>• No MR control in place</li> <li>• Unskilled staff</li> <li>• GOK salary scale</li> <li>• Insufficient funding</li> <li>• No motivation to boost efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Design a controlled meter reading and routing process</li> <li>• Design zoning where necessary</li> <li>• Design meaningful connection referencing.</li> <li>• Replace meters that serve Minimum charge consumers with Flow Restriction Meters (Devices to avoid waste)</li> <li>• Concentrate reading meters A/C's &gt; 10 cbm consumption and control the Meter Reading in to a meaningful effort.</li> <li>• Prepare staff re-organisation plan</li> <li>• Use negative sanctioning as retraining criteria.</li> </ul>
<p><b>Billing</b></p> <p>Wrong billing, Delayed tariff implementation not retroactively implemented, Delayed stationary, Unskilled staff and no calculators, High number of estimated bills</p>	<ul style="list-style-type: none"> <li>• Low billing efficiency</li> <li>• Increased UFW.</li> <li>• Wrongly calculated bills</li> <li>• Reduced collection efficiency due to consumer disputes and complaints</li> <li>• Inconsistent calculations</li> <li>• Delayed billing</li> </ul>	<ul style="list-style-type: none"> <li>• No calculators</li> <li>• No clear instruction from HQ on gazette implementation like New deposit, Delayed tariff adjustments New meter handling</li> <li>• Monthly returns to HQ are never checked.</li> <li>• No sanctioning for inefficient and dishonest staff</li> <li>• Delays in AIE processing</li> <li>• High percentage of defective and not serviced meters</li> </ul>	<ul style="list-style-type: none"> <li>• Change funding procedure</li> <li>• Prepare implementation instructions for gazetted changes</li> <li>• Consider billing software for stations with consumers &gt; 1,000</li> <li>• Control reporting procedure</li> <li>• Use negative sanctioning as retraining criteria.</li> </ul>
<p><b>Dis-connection</b></p> <p>No disconnection material, No set disconnection criteria system, wrongly organised staff, no transport, Consumer / staff collaboration, No record maintenance, Low disconnection efforts, bills lack due date remark</p>	<ul style="list-style-type: none"> <li>• Low collection</li> </ul>	<ul style="list-style-type: none"> <li>• Delays in AIE processing</li> <li>• Insufficient funding</li> <li>• No control on disconnection / reconnection records</li> <li>• No follow up for years, (those consumers are simply forgotten)</li> <li>• No motivation to boost efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Design organised disconnection program.</li> <li>• Design implementation and control program.</li> <li>• Increase deposits to the latest requirement level.</li> <li>• Investigate into simplified disconnection method.</li> <li>• Computerise for systems &gt; 1000 consumers</li> </ul>

**PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX**

Problems	Symptoms	Cause	Recommended Change
<p>Illegal Connection / Illegal re-connection</p> <p>Suspected high rate of illegal connection and re-connection, no transport</p>	<ul style="list-style-type: none"> <li>• High U/W</li> <li>• Low rate of re-connection statistics.</li> </ul>	<ul style="list-style-type: none"> <li>• Illegal staff / consumer collaboration</li> <li>• No suitable technical approach to disconnect such that no illegal re-connection possible (low income estates)</li> <li>• No spot checks on disconnected accounts for years, disconnected consumers are forgotten</li> <li>• No legal action, where consumers caught with illegal connections</li> <li>• Legal action difficult as case difficult to substantiate and knowledge of staff inadequate.</li> <li>• Police / judiciary not supportive.</li> <li>• Weak Water Act, penalties low and legal system open for corruption.</li> <li>• No clear guidance on how to deal with illegal consumers</li> </ul>	<ul style="list-style-type: none"> <li>• Amend Water Act to impose stiff penalties</li> <li>• Amend water act to include debt recovery, including additional cost incurred.</li> <li>• Investigate into flow restriction meters to consumers with illegal re-connection tendencies. If account cannot be legalised, find technical approach to seal permanently.</li> <li>• Set clear guidelines on how to handle illegal activities</li> <li>• Introduce penalties for illegal consumers through the water undertaker</li> <li>• Use of District Bailiffs</li> </ul>
<p><b>Debt Arrears</b></p> <p>Very high debt arrears Unreliable Records, Lacking debt substantiation, GOK the biggest debtor</p>	<ul style="list-style-type: none"> <li>• Monthly increasing debt while no systematic disconnection</li> <li>• Unrealistically high monthly consumption of GOK institutions (hospital, police, prison)</li> </ul>	<ul style="list-style-type: none"> <li>• No efficient and timely disconnection system</li> <li>• No clear HQ guidelines</li> <li>• Weak Water Act with no provision for debt collection.</li> <li>• Civil proceedings expensive on the onset to file suite.</li> <li>• Preferential treatment of GOK bodies</li> <li>• Legal action difficult as records difficult to substantiate</li> <li>• No motivation to boost efficiency</li> <li>• Old and leaking system (taps, tanks, pipes) in GOK institutions</li> </ul>	<ul style="list-style-type: none"> <li>• Treat GOK bodies like any other consumer</li> <li>• Undertake analysis to substantiate and confirm old debts</li> <li>• Determine which old debtors should be written off (dead accounts, e.t.c.)</li> <li>• Amend GOK write off procedure (Old community accounts)</li> <li>• Introduce late payment penalties</li> <li>• Overhaul internal plumbing, piping and storage system of GOK institutions</li> </ul>

**PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX**

Problems	Symptoms	Cause	Recommended Change
<p>Revenue Collection</p> <p>Wrong bills, bills lack due date remark, consumers have no payment moral</p>	<ul style="list-style-type: none"> <li>• Low collection efficiency</li> <li>• High consumer complaints</li> </ul>	<ul style="list-style-type: none"> <li>• Incorrect meter reading</li> <li>• No motivation to boost efficiency</li> <li>• Insufficient disconnection</li> <li>• No priority given to major consumers.</li> <li>• Weak or no debt collection systems</li> <li>• No efficient collection monitoring</li> <li>• Lacking information on cost of production and distribution of water</li> </ul>	<ul style="list-style-type: none"> <li>• Control organised disconnection program.</li> <li>• Set up positive and negative staff sanctioning system.</li> <li>• Create staff and stake holder awareness on cost of production and distribution of water</li> <li>• Use negative sanctioning as retraining criteria</li> <li>• Design a major consumer monitoring and control system</li> <li>• Computerise for systems &gt; 1000 consumers</li> <li>• Design a suitable, safe and consumer friendly cash collection system</li> </ul>
<p>URW</p> <p>Unreliable or no records on production and consumption and no information where water is lost (physical loss, wrong or no MR, illegal consumption), No transport, No materials, No tools, Poor reticulation design, Poor workmanship when laying pipe network, No quality control on material used for consumer lines, Poor installation of consumer meters, wrong and high estimated meter reading, illegal connections</p>	<ul style="list-style-type: none"> <li>• High URW.</li> <li>• Estimated unaccounted for water, as no production figures details available</li> <li>• Limited supply, as high percentage of water lost</li> </ul>	<ul style="list-style-type: none"> <li>• Master meters defunct or non-existent</li> <li>• Majority of consumer meters defunct</li> <li>• Poor maintenance of the reticulation system</li> </ul>	<ul style="list-style-type: none"> <li>• Arrange for servicing facilities for master meters (outsourcing)</li> <li>• Install flow restriction meters</li> <li>• Set up servicing facility and program for consumer meters</li> <li>• Rehabilitate the existing network</li> <li>• Consider leak detection exercise, depending on the extent of project rehabilitation of the existing network</li> </ul>

**PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX**

Problems	Symptoms	Cause	Recommended Change
<p>Funding</p> <p>Delay in A.I.E.</p> <p>Shortage of funds available</p>	<ul style="list-style-type: none"> <li>Chronic shortage of everything required for office and field operation</li> </ul>	<ul style="list-style-type: none"> <li>AIE earned is not equal AIE received</li> <li>Lengthy and delayed AIE processing procedure. With involvement of District Administration</li> <li>Limited liquidity at the DC's office</li> <li>Centralized procurement through HQ</li> <li>GOK procurement procedures</li> <li>Low billing and collection efficiency</li> <li>Reporting to the HQ does not depict the actual status quo</li> <li>Information received by the HQ is not used as a management tool for concerned planning and control</li> <li>Receipt of extra AIE depends on political interests and efforts / stamina of DWO</li> </ul>	<ul style="list-style-type: none"> <li>Decentralise AIE procedures to district level and transfer efficient and stringent control to the provincial level</li> <li>Cash retainer out of revenue collections to remain at the water supply system</li> <li>Simplify AIE procedures</li> <li>Decentralise procurement to system level</li> <li>Simplify GOK procurement procedures</li> <li>Involve an external consultant/ market price analyst to give annual pricing guidelines and limitations</li> <li>Setup positive and negative staff sanctioning system</li> <li>Use mismanagement of funds as a retrenchment criteria</li> </ul>

**PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX**

Problems	Symptoms	Cause	Recommended Change
<p><b>Costs</b></p> <p>No or limited information about cost at system level, No cost consciousness at system or HQ level, Lengthy district administration payment processing on vouchers issued by the DWO, Centralised tendering, High power bills depending on system design, inadequate tariff not cost related, but politically justifiable</p>	<ul style="list-style-type: none"> <li>• Costs &gt; collected revenue</li> <li>• Inflated tenders</li> <li>• Inflated costs</li> <li>• Very high power bills</li> </ul>	<ul style="list-style-type: none"> <li>• Low billing and collection efficiency</li> <li>• No meaningful cost control</li> <li>• Vested interest in the District Tender Board and district administration</li> <li>• No planning, never preventive always reactive operation</li> <li>• Water tariff is fixed where as power tariff has a variable cost component incorporating external factors of the economy (oil price, Kshs. exchange rate)</li> <li>• At the time of investment operating cost were given a lesser priority than investment cost.</li> <li>• There is no basis for information to calculate a cost covering tariff</li> <li>• Water tariffs are politically sensitive, as water has no substitute</li> </ul>	<ul style="list-style-type: none"> <li>• Decentralise planning and control of cost to create cost consciousness</li> <li>• Involve an external consultant/ market price analyst to give annual pricing guidelines and limitations</li> <li>• Decentralise procurement procedure to system level</li> <li>• Outsource certain activities to provincial level where economies of scale are of advantage to the system</li> <li>• Decentralise system control to the provincial level with independent external annual auditors</li> <li>• Decentralise chemical procurement to system level</li> <li>• Negotiate reduced power tariff used for production of water</li> </ul>
<p><b>Financial Control</b></p> <p>No HQ control over AIE is spending, No HQ control over billing.</p>	<ul style="list-style-type: none"> <li>• AIE spending not O&amp;M demand driven.</li> <li>• Priorities left to DWO's decision with control or substantiation.</li> <li>• No compiled information everything OK as long as procurement procedure complied with</li> </ul>	<ul style="list-style-type: none"> <li>• GOK procurement procedure (district tender board) (counter productive control)</li> <li>• GOK reporting and control procedures not effective</li> <li>• Occasional internal audit checks by colleagues of the system and not effective</li> <li>• Disciplinary (GOK) system only transfers therefore inefficient</li> <li>• District Administration accounts for the AIE spent to Treasury</li> <li>• MENR only receives the expenditure information from treasury against the respective votes</li> </ul>	<ul style="list-style-type: none"> <li>• Design a transparent reporting and accounting system within the MENR for AIE expenditure</li> <li>• Decentralise control to provincial level and additional independent external auditor</li> <li>• DWO to prepare financial plans</li> <li>• Use mismanagement of funds as retrenchment criteria</li> <li>• Use price guideline of an external consultant/ market price analyst as a control instrument</li> <li>• Assess and set up benchmarks for adequate use of chemicals</li> </ul>

**PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX**

<b>Problems</b>	<b>Symptoms</b>	<b>Cause</b>	<b>Recommended Change</b>
<p><b>Stock</b></p> <p>Procurement procedure, shortage level, no stock management, no summarised stock movement records</p>	<ul style="list-style-type: none"> <li>• Chronic shortage</li> <li>• High UFW</li> <li>• Questionable Water quality</li> <li>• Delayed attendance to source and network problems</li> <li>• Assistance of well-wishers (donor agencies and consumers)</li> <li>• Delay in all aspects of operation</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient funding</li> <li>• GOK procurement procedure</li> <li>• Centralized procurement</li> <li>• Neglect of divisional systems</li> </ul>	<ul style="list-style-type: none"> <li>• Set up stock management system and controls</li> <li>• Decentralise AIE procurement procedures</li> <li>• Decentralise procurement of chemicals to system level</li> <li>• Decentralise AIE funding</li> </ul>
<p><b>3. O&amp;M Field Activities and Procedures</b></p> <p><b>Consumer Meter servicing</b></p> <p>Lacking materials, tools and skill, No meter servicing facilities, No transport, buried meters</p>	<ul style="list-style-type: none"> <li>• High UFW</li> <li>• Majority of meters estimated for billing</li> <li>• Low billing efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• No servicing schedule</li> <li>• No field control</li> <li>• Wrong priorities and AIE spending not controlled</li> <li>• Low staff moral</li> <li>• No staff planning</li> <li>• No technical guidance available</li> </ul>	<ul style="list-style-type: none"> <li>• Improve on funding procedures</li> <li>• Design a routine meter servicing schedule</li> <li>• Arrange for staff training</li> <li>• Decentralise AIE funding</li> <li>• Decentralise procurement procedures without the District Administration</li> <li>• Undertake survey on servicing capacity within the province</li> <li>• Setup consumer meter repair workshop</li> <li>• Arrange for simple meter volumetric test facility.</li> <li>• Prepare standard consumer meter installation manual</li> <li>• Gradual consumer meter installation rehabilitation in line with proposed installation manual</li> </ul>

**PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX**

<b>Problems</b>	<b>Symptoms</b>	<b>Cause</b>	<b>Recommended Change</b>
<p>Master Meter servicing</p> <p>Lacking materials, tools and skill, Insufficient information about the existing network</p>	<ul style="list-style-type: none"> <li>Lack of reliable production details</li> </ul>	<ul style="list-style-type: none"> <li>No system level skill</li> <li>No parts at provincial level</li> <li>No efforts made by staff</li> <li>Insufficient funding</li> </ul>	<ul style="list-style-type: none"> <li>Improve on funding procedure</li> <li>Outsource servicing, pegged to supply / tenders of the master meters</li> <li>Look into economies of scale under provincial officer</li> </ul>
<p>Pipe Network servicing</p> <p>No transport</p> <p>No tools</p> <p>No materials, skill, "Spaghetti" consumer lines, No location information and network plans</p>	<ul style="list-style-type: none"> <li>Delayed attendance to burst and leaks</li> <li>High UFW</li> </ul>	<ul style="list-style-type: none"> <li>Mixed network piping material</li> <li>No planned network design</li> <li>No technical guidance available / manual</li> <li>No preventive maintenance on network appurtenances</li> <li>Insufficient funding</li> <li>No stock management</li> </ul>	<ul style="list-style-type: none"> <li>Prepare a planned pipeline network with standardised materials</li> <li>Ensure rehabilitation on high and controlled standard</li> <li>Introduce retainer security on contracted work</li> <li>Clarify and document water wayleaves</li> <li>Include consumer lines into the planned network</li> <li>Amend the Water Act, Transfer responsibility of the consumer line connections up to the meter from the consumer to the water undertaker.</li> <li>Prepare preventive maintenance schedule and manuals</li> </ul>
<p>Source &amp; T-Works</p> <p>High power consumption, Power rationing, damage caused by uncontrolled power surges, system neglect</p>	<ul style="list-style-type: none"> <li>Pumps not working</li> <li>Laboratory not operational</li> <li>Water quality questionable</li> <li>Dosing system not functioning</li> <li>Reduced production / pumping hours</li> </ul>	<ul style="list-style-type: none"> <li>Lacking preventive maintenance</li> <li>No financial planning on replacement of assets</li> <li>Insufficient funding</li> <li>Power tariff too high in comparison to the water tariff</li> <li>No technical guidance / manual</li> <li>No preventive maintenance</li> <li>No funds to repair of defective pumps</li> </ul>	<ul style="list-style-type: none"> <li>Negotiate a reduced power tariff used for water production and distribution</li> <li>Investigate into the possibilities of water used to create power before it is treated and distributed</li> <li>Exclude water production from power rationing</li> <li>Prepare preventive maintenance schedule and manuals</li> <li>Update WWS operators handbook</li> <li>Out-source pump maintenance</li> <li>Improve funding procedure</li> </ul>

**PROBLEM -- SYMPTOM -- CAUSE -- RECOMMENDATION MATRIX**

Problems	Symptoms	Cause	Recommended Change
<p>Data is copied from one month to the next and from one year to the next, No adequate filing system for returns</p>	<p>4. Reporting</p> <ul style="list-style-type: none"> <li>• No control nor planning tool</li> <li>• Information not readily available.</li> </ul>	<ul style="list-style-type: none"> <li>• Outdated report format (quantity not quality)</li> </ul>	<ul style="list-style-type: none"> <li>• Decentralise to provincial level</li> <li>• Set up a meaningful M.I.S reporting system.</li> <li>• Redesign current reporting system and format with filtered information for HQ</li> </ul>



**ACTION PLAN**

SUMMARY TABLE: ST 8.4

**STUDY OF INSTITUTIONAL IMPROVEMENT ON REHABILITATION OF WATER SUPPLY SYSTEMS  
FOR TEN (10) LOCAL TOWNS IN KENYA**

No.	Action	Narok	Meru	Muranga	Kabarnet	Makindu	Wundanyi	Migori	Lamu	Webuye	Mumias	Utility Management Plan	Action to be taken by	Donor Involvement recommended	Phase I	Phase II	Phase III
1.	Arrange for decent office space	x						x		x	x		MENR		↑		
2.	Set up organisation charts with detailed job description and skill requirements.	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
3.	Arrange for intensive management training for Engineers or recruit well-qualified managers.	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
4.	Arrange for commercial and technical staff training	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
5.	Set up positive and negative staff sanctioning system.	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
6.	Use negative sanctioning as retrenchment criteria.	x	x	x	x	x	x	x	x	x	x		MENR		↑	↑	
7.	Decentralise personnel management to provincial / regional level												MENR		↑	↑	
8.	Limit recruitment to the system requirement, based on skill and merit.	x	x	x	x	x	x	x	x	x	x	x	Consultant & MENR		↑		
9.	Prepare criteria for transport requirements based on size of system coverage, pipe network, number of consumer e.t.c.	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
10.	Redesign consumer recording and reporting formats	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
11.	Computerise consumer data base and consider billing software	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
12.	Obtain field information from all existing consumer using the re-designed application format	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		

## ACTION PLAN

SUMMARY TABLE: ST 8.4

No.	Action	Narok	Meru	Muranga	Kabarnet	Makindu	Wundanyi	Migori	Lamu	Webuye	Mumias	Utility Management Plan	Action to be taken by	Donor Involvement recommended	Phase I	Phase II	Phase III
13.	Prepare implementation guidelines related to gazette notices and relating procedures	x	x	x	x	x	x	x	x	x	x	x	Consultant & MENR		↑		
14.	Prepare consumer and connection management guidelines	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
15.	Investigate replacement of Minimum charge consumer meters with Flow Restriction Meters (Devices to avoid waste)	x	x	x	x	x	x	x	x	x	x		MENR		↑		
16.	Design consumer / connection management guidelines	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
17.	Design meter reading / servicing / disconnection schedules and guidelines.	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
18.	Amend the Water Act to impose stiff penalties, debt recovery including additional costs incurred												MENR	x			↑
19.	Introduce penalties for illegal consumers through the water under taker												MENR				↑
20.	Treat GOK bodies like any other consumer.	x	x	x	x	x	x	x	x	x	x		MENR		↑		
21.	Undertake analysis to substantiate and confirm old debts	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
22.	Propose write off procedure for old debtors	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR				↑
23.	Recommend commercial charges and penalties	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR		↑		
24.	Create staff, consumer and stake holder awareness on cost of production and distribution of water	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		

**ACTION PLAN**

SUMMARY TABLE: ST 8.4

No.	Action	Narok	Meru	Muranga	Kabarnet	Makindu	Wundanyi	Migori	Lamu	Webuye	Mumias	Utility Management Plan	Action to be taken by	Donor Involvement	Phase I	Phase II	Phase III
25.	Outsource the servicing for master meters and condition future supply / tenders to procurement with service backup	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR		↑		
26.	Decentralise AIE funding and procurement procedures to system level and transfer efficient and stringent control to the provincial / regional office level	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR			↑	
27.	Decentralise decision making process to station level	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR			↑	
28.	Decentralise planning and control of cost	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR			↑	
29.	Design efficient and stringent control system for the provincial / regional office level (Price analyst, independent external auditors, adequate use of chemicals )	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR			↑	
30.	Negotiate reduced power tariff used for production of water												MENR	x	↑		
31.	Investigate into the possibilities of water used to create power before it is treated and distributed.												MENR	x	↑		
32.	Design MIS reporting system for Provincial to HQ reporting (investment planning, policy making)	x	x	x	x	x	x	x	x	x	x	x	Consultant			↑	
33.	Set up stock management system and controls	x	x	x	x	x	x	x	x	x	x	x	Consultant			↑	
34.	Set up consumer meter workshop (with volumetric test facilities)	x	x	x	x	x	x	x	x	x	x	x	Consultant			↑	

**ACTION PLAN**

SUMMARY TABLE: ST 8.4

No.	Action	Narok	Meru	Muranga	Kabarnet	Makindu	Wundanyi	Migori	Lamu	Webuye	Mumias	Utility Management Plan	Action to be taken by	Donor involvement recommended	Phase I	Phase II	Phase III
35.	Prepare / update O&M guidelines / manuals	x	x	x	x	x	x	x	x	x	x	x	Consultant		↑		
36.	Propose outsourcing criteria for pump maintenance depending on the pump capacity.											x	Consultant		↑		
37.	Include consumer lines into the planned network	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR	x	↑		
38.	Clarify and document water wayleaves	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR				
39.	Introduce retainer security on contracted civil works and quality control	x	x	x	x	x	x	x	x	x	x	x	Consultant and MENR	x			

**APPENDIX J4**  
**MUMIAS**  
**TOWN**

Table JA-1: Water Demand projection for Mumias Town Water Supply

TableC4-1 Demand

Year	Population	Income brackets		Population	Demand rate lcd	Demand m <sup>3</sup> /d	Institutional demand m <sup>3</sup> /d	Total demand m <sup>3</sup> /d	Production capacity m <sup>3</sup> /d	Transmission capacity m <sup>3</sup> /d	Equivalent storage capacity m <sup>3</sup> /d
		Status	%								
1999	105,466	High	19	20,039	250	5,010	286	14,234	1,670	1,470	560
		Middle	32	33,749	150	5,062					
		Low	49	51,678	75	3,876					
2000	110,400	High	19	20,976	250	5,244	295	14,895	1,670	1,470	560
		Middle	32	35,328	150	5,299					
		Low	49	54,096	75	4,057					
2001	115,600	High	19	21,964	250	5,491	304	15,692	1,670	1,470	560
		Middle	32	36,992	150	5,549					
		Low	49	56,644	75	4,248					
2002	121,000	High	19	22,990	250	5,748	313	16,315	1,670	1,470	560
		Middle	32	38,720	150	5,808					
		Low	49	59,290	75	4,447					
2003	126,700	High	19	24,073	250	6,018	322	17,078	1,670	1,470	560
		Middle	32	40,544	150	6,062					
		Low	49	62,083	75	4,656					
2004	132,700	High	19	25,213	250	6,303	332	17,882	1,670	1,470	560
		Middle	32	42,464	150	6,370					
		Low	49	65,023	75	4,877					
2005	138,900	High	19	26,391	250	6,598	342	18,712	1,670	1,470	560
		Middle	32	44,448	150	6,667					
		Low	49	68,061	75	5,105					
2006	145,500	High	19	27,645	250	6,911	352	19,594	1,670	1,470	560
		Middle	32	46,560	150	6,984					
		Low	49	71,295	75	5,347					
2007	152,300	High	19	28,937	250	7,234	363	20,505	1,670	1,470	560
		Middle	32	48,736	150	7,310					
		Low	49	74,627	75	5,597					
2008	159,500	High	19	30,305	250	7,576	374	21,468	1,670	1,470	560
		Middle	32	51,040	150	7,656					
		Low	49	78,155	75	5,862					
2009	166,900	High	19	31,711	250	7,928	385	22,468	1,670	1,470	560
		Middle	32	53,408	150	8,011					
		Low	49	81,781	75	6,134					
2010	174,800	High	19	33,212	250	8,303	397	23,514	1,670	1,470	560
		Middle	32	55,936	150	8,390					
		Low	49	85,652	75	6,424					

Table J4-2: BUSINESS PLANS FOR MUMIAS TOWN WATER SUPPLY

CASH FLOWS										
Year	1	2	3	4	5	6	7	8	9	10
<b>REVENUE GENERATED</b>										
Revenue from Extra Water Sold	1,001,706	1,168,657	1,669,510	1,669,510	1,669,510	1,669,510	1,669,510	1,669,510	1,669,510	1,669,510
Revenue from Unaccounted for Water	9,203,174	9,203,174	9,816,719	9,816,719	9,816,719	9,816,719	9,816,719	10,430,264	10,430,264	10,430,264
Savings from Collection Efficiency	-	24,716,111	28,483,811	28,483,811	28,483,811	28,483,811	28,483,811	28,483,811	28,483,811	28,483,811
Revenue from Sewerage Charges	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>10,204,880</b>	<b>35,087,942</b>	<b>39,970,040</b>	<b>39,970,040</b>	<b>39,970,040</b>	<b>39,970,040</b>	<b>39,970,040</b>	<b>40,583,584</b>	<b>40,583,584</b>	<b>40,583,584</b>
<b>Expenditures (Kenya Shilling)</b>										
<b>Transport &amp; Staff Related Expenses</b>	1,836,878	6,315,830	7,194,607	7,194,607	7,194,607	7,194,607	7,194,607	7,305,045	7,305,045	7,305,045
O&M	2,040,976	7,017,588	7,994,008	7,994,008	7,994,008	7,994,008	7,994,008	8,116,717	8,116,717	8,116,717
Postage	38,779	133,334	151,886	151,886	151,886	151,886	151,886	154,218	154,218	154,218
Telephone	92,864	319,300	363,727	363,727	363,727	363,727	363,727	369,311	369,311	369,311
Purchase of meters	167,360	575,442	655,509	655,509	655,509	655,509	655,509	665,571	665,571	665,571
Stationery	111,233	382,459	435,673	435,673	435,673	435,673	435,673	442,361	442,361	442,361
Fuel & Gas	515,346	1,771,941	2,018,487	2,018,487	2,018,487	2,018,487	2,018,487	2,049,471	2,049,471	2,049,471
<b>Current O&amp;M Costs</b>	<b>(1,264,846)</b>	<b>(1,264,846)</b>	<b>(1,264,846)</b>	<b>(1,264,846)</b>	<b>(1,264,846)</b>	<b>(1,264,846)</b>	<b>(1,264,846)</b>	<b>(1,264,846)</b>	<b>(1,264,846)</b>	<b>(1,264,846)</b>
<b>Incremental O&amp;M Costs</b>	<b>3,538,891</b>	<b>15,251,048</b>	<b>17,549,052</b>	<b>17,549,052</b>	<b>17,549,052</b>	<b>17,549,052</b>	<b>17,549,052</b>	<b>17,837,847</b>	<b>17,837,847</b>	<b>17,837,847</b>
<b>Surplus/Deficit</b>	<b>6,666,289</b>	<b>19,836,894</b>	<b>22,420,988</b>	<b>22,420,988</b>	<b>22,420,988</b>	<b>22,420,988</b>	<b>22,420,988</b>	<b>22,745,737</b>	<b>22,745,737</b>	<b>22,745,737</b>
Average Tariff (Kshs/m3)	22.87	22.87	22.87	22.87	22.87	22.87	22.87	22.87	22.87	22.87
<b>Investment Costs</b>										
<b>Net Cash Flow</b>	<b>6,666,289</b>	<b>19,836,894</b>	<b>22,420,988</b>	<b>22,420,988</b>	<b>22,420,988</b>	<b>22,420,988</b>	<b>22,420,988</b>	<b>22,745,737</b>	<b>22,745,737</b>	<b>22,745,737</b>
<b>Cumulative Cash Flow</b>	<b>6,666,289</b>	<b>26,503,183</b>	<b>48,924,170</b>	<b>71,345,158</b>	<b>93,766,146</b>	<b>116,187,134</b>	<b>138,608,122</b>	<b>161,353,859</b>	<b>184,099,597</b>	<b>206,845,334</b>

Table C4-3 Financial Cashflow

Table J4-3: Financial Cash Flow for Mumias Town Water Supply

Year	Investment Cost	O&M Cost	Total Cost	Water Revenue	Net Revenue
1	59,191,284	3,538,591	62,729,875	10,204,880	(52,524,995.08)
2	82,916,940	15,251,048	98,167,988	35,087,942	(63,080,046)
3	41,878,776	17,549,052	59,427,828	39,970,040	(19,457,788)
4	22,766,880	17,549,052	40,315,932	39,970,040	(345,892)
5		17,549,052	17,549,052	39,970,040	22,420,988
6	-	17,549,052	17,549,052	39,970,040	22,420,988
7	-	17,549,052	17,549,052	39,970,040	22,420,988
8	-	17,837,847	17,837,847	40,583,584	22,745,737
9	-	17,837,847	17,837,847	40,583,584	22,745,737
10	-	17,837,847	17,837,847	40,583,584	22,745,737
<b>Total</b>	<b>206,753,880</b>	<b>160,048,439</b>	<b>366,802,319</b>	<b>366,893,773</b>	<b>91,454</b>

Average Tariff Rate (Ksh/m<sup>3</sup>) 22.87

FIRR	0%
NPV	(25,266,120)
RER	1.000



Table C4-4 Economic Cashflow

Table J4-4: Economic Cash Flow for Mumias Town Water Supply

Year	Economic Investment Cost	O&M Cost	Total Cost	Economic Benefit	Net Revenue
1	62,941,284	3,538,591	66,479,875	43,487,201	(22,992,674)
2	82,916,940	15,251,048	98,167,988	47,224,364	(50,943,624)
3	41,878,776	17,549,052	59,427,828	51,169,147	(8,258,680)
4	22,766,880	17,549,052	40,315,932	55,321,551	15,005,619
5		17,549,052	17,549,052	59,612,368	42,063,316
6		17,549,052	17,549,052	64,110,805	46,561,754
7		17,549,052	17,549,052	68,886,069	51,337,018
8		17,837,847	17,837,847	73,799,747	55,961,900
9		17,837,847	17,837,847	78,990,252	61,152,404
10		17,837,847	17,837,847	84,457,583	66,619,736
<b>Total</b>	<b>210,503,880</b>	<b>160,048,439</b>	<b>370,552,319</b>	<b>627,059,087</b>	<b>256,506,768</b>

Current Tariff Rate (Ksh/m3) 22.87

EIRR	30%
NPV	175,521,255
CBR	0.591

Table C4-5 Economic Benefits

**Mumias TOWN WATER SUPPLY**  
**Table J4-5: Estimated Benefit of time saved through water carrying.**

Year	Population served	Number of		Current Households Served	Projected Households Served	Additional Households Served	Water Carriage		Health		Health Costs		Total
		Household	Household				Benefit	Benefit	Benefit	Saved	Benefits		
2001	115,600	21,018	1439	1439	3153	1714	29,398,991	12,852,955	1,235,255	43,487,201			
2002	121,000	22,000	1439	1439	3300	1861	31,925,455	13,957,500	1,341,409	47,224,364			
2003	126,700	23,036	1439	1439	3455	2016	34,592,278	15,123,409	1,453,460	51,169,147			
2004	132,700	24,127	1439	1439	3619	2180	37,399,460	16,350,682	1,571,410	55,321,551			
2005	138,900	25,255	1439	1439	3788	2349	40,300,214	17,618,864	1,693,290	59,612,368			
2006	145,400	26,436	1439	1439	3965	2526	43,341,328	18,948,409	1,821,068	64,110,805			
2007	152,300	27,691	1439	1439	4154	2715	46,569,587	20,359,773	1,956,710	68,886,069			
2008	159,400	28,982	1439	1439	4347	2908	49,891,419	21,812,045	2,096,283	73,799,747			
2009	166,900	30,345	1439	1439	4552	3113	53,400,396	23,346,136	2,243,719	78,990,252			
2010	174,800	31,782	1439	1439	4767	3328	57,096,519	24,962,045	2,399,019	84,457,583			
<b>Total</b>	<b>1,433,700</b>						<b>423,915,645</b>	<b>185,331,818</b>	<b>17,811,623</b>	<b>627,059,087</b>			

<b>Current Tariff Rate</b>	<b>Kshs.</b>	22.87		22.87
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Note:

The benefits increase with increase in population

Table C4-6 Est Water Revenue

Table J4-6: ESTIMATED WATER REVENUE - Mumias

	YEAR											
	0	1	2	3	4	5	6	7	8	9	10	11
Design production capacity (m <sup>3</sup> /day)	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670
ditto (million m <sup>3</sup> /year)	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610
Expected daily production ( m <sup>3</sup> /day)	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470
Current daily production		706	706	706	706	706	706	706	706	706	706	706
Projected population	105,466	110,400	115,600	121,000	126,700	132,700	138,900	145,400	152,300	159,400	166,900	174,800
Projected daily demand (m <sup>3</sup> /day)	14,234	14,895	15,592	16,315	17,078	17,882	18,712	19,594	20,505	21,468	22,456	23,514
<b>Average Tariff</b>		Kshs	22.87	22.87	22.87	22.87	22.87	22.87	22.87	22.87	22.87	22.87
Revenue from Extra Water Sold		Kshs	1,001,706	1,168,657	1,669,510	1,669,510	1,669,510	1,669,510	1,669,510	1,669,510	1,669,510	1,669,510
Revenue from Unaccounted for Water		Kshs	9,203,174	9,203,174	9,816,719	9,816,719	9,816,719	9,816,719	9,816,719	10,430,264	10,430,264	10,430,264
Savings from Collection Efficiency		Kshs	-	24,716,111	28,483,811	28,483,811	28,483,811	28,483,811	28,483,811	28,483,811	28,483,811	28,483,811
Revenue from Sewerage Charges		Kshs	-	-	-	-	-	-	-	-	-	-
<b>Total Financial Benefits</b>		Kshs	10,204,880	36,087,942	39,970,040	39,970,040	39,970,040	39,970,040	39,970,040	40,583,584	40,583,584	40,583,584

**Table J4-7: Mean Household Size and Income by Region and Poverty**

District	Town	Mean Household Size			Total Household Income (Kshs)
		Non-Poor	Poor	Mean	
Narok	Narok	5.3	6.6	5.6	9,263.74
Meru	Meru	5.6	7.1	6	4,753.56
Murang'a	Murang'a	5.3	7.2	5.9	5,871.58
Baringo	Kabarnet	4.5	6.5	5.1	4,861.78
Makueni	Makindu	4.7	7	6.2	2,815.25
Taita-Taveta	Wundanyi	3.5	5.3	4.2	1,798.31
Migori	Migori	4.9	6.4	5.3	3,387.01
Lamu	Lamu	4.3	6.3	4.7	5,263.86
Bungoma	Webuye	6.2	7.1	6.6	4,070.67
Butere-Mumia	Mumias	4.8	6.3	5.5	3,707.80

Source: Welfare Monitoring Survey II, 1994

**Table J4-8: Mumias Institutional Development Costs**

<b>No.</b>	<b>Activity</b>	<b>Bases of cost estimate</b>	<b>Estimated cost (Ksh.)</b>
1	Hold consensus building workshop	(a) Travel refreshments and honorarium for 50 participants at SH. 5,000 /≈ per participant	250,000
		(b) Consultants facilitation costs and travel	700,000
		(c) Transport and related expenses for ministry staff	200,000
2	Develop and register the trust instrument	Legal and follow up effort	50,000
3	Management Contract	Appoint local expert to support the institutional rehabilitation process for the 3 year period	52,800,000
4	(a) Identify water supply and sewerage infrastructure and estimate cost	Standard infrastructural valuation procedures	5,000,000
	(b) Identify and value other assets.		
5	Develop staffing and financial plans for the new organisation	25 working days at Sh. 40,000 per w/day	1,000,000
6	Develop operations manual	20 working days at Sh. 30,000 per day	600,000
7	Operational Support	Vehicles, motor cycles, computers and software, office equipment	
8	Provide initial working capital to the new organisation	Average annual billings for the last 3 years	3,000,000
<b>Sub -total</b>			<b>63,600,000</b>
<b>Contingency (10%)</b>			<b>6,360,000</b>
<b>Total</b>			<b>69,960,000</b>

Table C4-9 Financial Costs

Table J4-9: Financing Plan - Mumias TOWN WATER SUPPLY

	1		2		3		4	
	Kshs	Kshs	Kshs	Kshs	Kshs	Kshs	Total Kshs	
Institutional Development Costs	26,400,000	14,520,000	14,520,000	14,520,000	14,520,000	14,520,000	69,960,000	
Consultancy Fees for Works (20% of works)	5,465,214	11,399,490	4,559,796	1,374,480	1,374,480	1,374,480	22,798,980	
Water Supply Rehabilitation	23,889,870	39,816,450	15,926,580				79,632,900	
Sanitation Rehabilitation	3,436,200	17,181,000	6,872,400	6,872,400	6,872,400	6,872,400	34,362,000	
<b>Total Overall Project Cost</b>	<b>59,191,284</b>	<b>82,916,940</b>	<b>41,878,776</b>	<b>22,766,880</b>	<b>22,766,880</b>	<b>22,766,880</b>	<b>206,753,880</b>	

Table C4-10 Economic Costs

Table J4-10: Economic Investment Costs - Mumias TOWN WATER SUPPLY

	1		2		3		4	
	Kshs		Kshs		Kshs		Kshs	Total
Institutional Development Costs	26,400,000		14,520,000		14,520,000		14,520,000	69,960,000
Household costs	3,750,000							3,750,000
Consultancy Fees for Works (20% of works)	5,465,214		11,399,490		4,559,796		1,374,480	22,798,980
Water Supply Rehabilitation	23,889,870		39,816,450		15,926,580		-	79,632,900
Sanitation Rehabilitation	3,436,200		17,181,000		6,872,400		6,872,400	34,362,000
<b>Total Overall Project Cost</b>	<b>62,941,284</b>		<b>82,916,940</b>		<b>41,878,776</b>		<b>22,766,880</b>	<b>210,503,880</b>

**Table J4-11: Financial Sensitivity Analysis - Increase Project Life to 15 years**

**Financial Cash Flow for Mumias Town Water Supply**

Year	Investment Cost	O&M Cost	Total Cost	Water Revenue	Net Revenue
1	59,191,284	3,538,591	62,729,875	10,204,880	(52,524,995)
2	82,916,940	15,251,048	98,167,988	35,087,942	(63,080,046)
3	41,878,776	17,549,052	59,427,828	39,970,040	(19,457,788)
4	22,766,880	17,549,052	40,315,932	39,970,040	(345,892)
5		17,549,052	17,549,052	39,970,040	22,420,988
6	-	17,549,052	17,549,052	39,970,040	22,420,988
7	-	17,549,052	17,549,052	39,970,040	22,420,988
8	-	17,837,847	17,837,847	40,583,584	22,745,737
9	-	17,837,847	17,837,847	40,583,584	22,745,737
10	-	17,837,847	17,837,847	40,583,584	22,745,737
11	-	17,837,847	17,837,847	40,583,584	22,745,737
12	-	17,837,847	17,837,847	40,583,584	22,745,737
13	-	17,837,847	17,837,847	40,583,584	22,745,737
14	-	17,837,847	17,837,847	40,583,584	22,745,737
15	-	17,837,847	17,837,847	40,583,584	22,745,737
<b>Total</b>	<b>206,753,880</b>	<b>249,237,675</b>	<b>455,991,555</b>	<b>569,811,695</b>	<b>113,820,140</b>

<b>Average Tariff Rate (Ksh/m3)</b>	<b>22.87</b>
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<b>FIRR</b>	<b>8%</b>
<b>NPV</b>	<b>43,141,495</b>
<b>RER</b>	<b>1.250</b>



**Table J4-12: Financial Sensitivity Analysis - Increase Project Life to 15 years + Investment Cost & O&M by 15%**

**Financial Cash Flow for Mumias Town Water Supply**

Year	Investment Cost	O&M Cost	Total Cost	Water Revenue	Net Revenue
1	68,069,977	4,069,380	72,139,356	10,204,880	(61,934,476)
2	95,354,481	17,538,705	112,893,186	35,087,942	(77,805,245)
3	48,160,592	20,181,409	68,342,002	39,970,040	(28,371,962)
4	26,181,912	20,181,409	46,363,321	39,970,040	(6,393,282)
5		20,181,409	20,181,409	39,970,040	19,788,630
6	-	20,181,409	20,181,409	39,970,040	19,788,630
7	-	20,181,409	20,181,409	39,970,040	19,788,630
8	-	20,513,524	20,513,524	40,583,584	20,070,060
9	-	20,513,524	20,513,524	40,583,584	20,070,060
10	-	20,513,524	20,513,524	40,583,584	20,070,060
11	-	20,513,524	20,513,524	40,583,584	20,070,060
12	-	20,513,524	20,513,524	40,583,584	20,070,060
13	-	20,513,524	20,513,524	40,583,584	20,070,060
14	-	20,513,524	20,513,524	40,583,584	20,070,060
15	-	20,513,524	20,513,524	40,583,584	20,070,060
<b>Total</b>	<b>237,766,962</b>	<b>286,623,326</b>	<b>524,390,288</b>	<b>569,811,695</b>	<b>45,421,407</b>

<b>Average Tariff Rate (Ksh/m3)</b>	<b>22.87</b>
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<b>FIRR</b>	<b>3%</b>
<b>NPV</b>	<b>(12,548,386)</b>
<b>RER</b>	<b>1.087</b>

**Table J4-13: Financial Sensitivity Analysis - Finance by Grant**

**Financial Cash Flow for Mumias Town Water Supply**

Year	Investment Cost	O&M Cost	Total Cost	Water Revenue	Net Revenue
1	59,191,284	3,538,591	62,729,875	10,204,880	(52,524,995)
2	82,916,940	15,251,048	98,167,988	35,087,942	(63,080,046)
3	41,878,776	17,549,052	59,427,828	39,970,040	(19,457,788)
4	22,766,880	17,549,052	40,315,932	39,970,040	(345,892)
5		17,549,052	17,549,052	39,970,040	22,420,988
6	-	17,549,052	17,549,052	39,970,040	22,420,988
7	-	17,549,052	17,549,052	39,970,040	22,420,988
8	-	17,837,847	17,837,847	40,583,584	22,745,737
9	-	17,837,847	17,837,847	40,583,584	22,745,737
10	-	17,837,847	17,837,847	40,583,584	22,745,737
11	-	17,837,847	17,837,847	40,583,584	22,745,737
12	-	17,837,847	17,837,847	40,583,584	22,745,737
13	-	17,837,847	17,837,847	40,583,584	22,745,737
14	-	17,837,847	17,837,847	40,583,584	22,745,737
15	-	17,837,847	17,837,847	40,583,584	22,745,737
<b>Total</b>	<b>206,753,880</b>	<b>249,237,675</b>	<b>455,991,555</b>	<b>569,811,695</b>	<b>113,820,140</b>

**Average Tariff Rate (Ksh/m3)** 22.87

<b>FIRR</b>		<b>8%</b>
<b>NPV</b>		<b>113,820,140</b>
<b>RER</b>		<b>1.250</b>

Table J4-14: Economic Sensitivity Analysis - Increase Economic Investment Costs by 15%

Economic Cash Flow for Mumias Town Water Supply

Year	Economic Investment Cost	O&M Cost	Total Cost	Economic Benefit	Net Revenue
1	72,382,477	3,538,591	75,921,068	43,487,201	(32,433,867)
2	95,354,481	15,251,048	110,605,529	47,224,364	(63,381,165)
3	48,160,592	17,549,052	65,709,644	51,169,147	(14,540,497)
4	26,181,912	17,549,052	43,730,964	55,321,551	11,590,587
5		17,549,052	17,549,052	59,612,368	42,063,316
6		17,549,052	17,549,052	64,110,805	46,561,754
7		17,549,052	17,549,052	68,886,069	51,337,018
8		17,837,847	17,837,847	73,799,747	55,961,900
9		17,837,847	17,837,847	78,990,252	61,152,404
10		17,837,847	17,837,847	84,457,583	66,619,736
<b>Total</b>	<b>242,079,462</b>	<b>160,048,439</b>	<b>402,127,901</b>	<b>627,059,087</b>	<b>224,931,186</b>

Current Tariff Rate (Ksh/m3)

22.87

<b>EIRR</b>	<b>22%</b>
<b>NPV</b>	<b>146,440,284</b>
<b>CBR</b>	<b>0.641</b>

Table J4-15: Economic Sensitivity Analysis - Increase O&M Costs by 15%

Economic Cash Flow for Mumias Town Water Supply

Year	Economic Investment Cost	O&M Cost	Total Cost	Economic Benefit	Net Revenue
1	62,941,284	4,069,380	67,010,664	43,487,201	(23,523,463)
2	82,916,940	17,538,705	100,455,645	47,224,364	(53,231,282)
3	41,878,776	20,181,409	62,060,185	51,169,147	(10,891,038)
4	22,766,880	20,181,409	42,948,289	55,321,551	12,373,262
5		20,181,409	20,181,409	59,612,368	39,430,959
6		20,181,409	20,181,409	64,110,805	43,929,396
7		20,181,409	20,181,409	68,886,069	48,704,660
8		20,513,524	20,513,524	73,799,747	53,286,223
9		20,513,524	20,513,524	78,990,252	58,476,727
10		20,513,524	20,513,524	84,457,583	63,944,059
<b>Total</b>	<b>210,503,880</b>	<b>184,055,705</b>	<b>394,559,585</b>	<b>627,059,087</b>	<b>232,499,502</b>

Current Tariff Rate (Ksh/m3)

22.87

EIRR	27%
NPV	156,418,557
CBR	0.629

Table J4-16: Economic Sensitivity Analysis - Increase Economic Investment Costs and O& M by 15%

Economic Cash Flow for Mumias Town Water Supply

Year	Economic Investment Cost	O&M Cost	Total Cost	Economic Benefit	Net Revenue
2001	72,382,477	4,069,380	76,451,856	43,487,201	(32,964,656)
2002	95,354,481	17,538,705	112,893,186	47,224,364	(65,668,823)
2003	48,160,592	20,181,409	68,342,002	51,169,147	(17,172,855)
2004	26,181,912	20,181,409	46,363,321	55,321,551	8,958,230
2005		20,181,409	20,181,409	59,612,368	39,430,959
2006		20,181,409	20,181,409	64,110,805	43,929,396
2007		20,181,409	20,181,409	68,886,069	48,704,660
2008		20,513,524	20,513,524	73,799,747	53,286,223
2009		20,513,524	20,513,524	78,990,252	58,476,727
2010		20,513,524	20,513,524	84,457,583	63,944,059
<b>Total</b>	<b>242,079,462</b>	<b>184,055,705</b>	<b>426,135,167</b>	<b>627,059,087</b>	<b>200,923,920</b>

Current Tariff Rate (Ksh/m3)

22.87

<b>EIRR</b>		<b>20%</b>
<b>NPV</b>		<b>127,337,586</b>
<b>CBR</b>		<b>0.680</b>

Table C4-17-rehab-costs-water

Table J4.17 : Cost estimates of rehabilitation works for Mumias Water Supply					
Description	Unit	Quantity	Rate	Amount (KShs)	
Intake weir and raw water main					
Allow for works at weir and raw water main	Sum			2,500,000	
Access to intake site	m	1,000	3,000	3,000,000	
subtotal				5,500,000	
<b>Treatment plant</b>					
Refurbish sludge bleed pipes and valves at clarifiers	Sum			500,000	
Replace air scour blowers	Sum			1,600,000	
Install duty and standby dosing pumps for aluminium sulphate	nr	2	125,000	250,000	
Install duty and standby dosing pumps for soda ash	nr	2	125,000	250,000	
Install duty and standby gravity dosers for hypochlorite	nr	2	100,000	200,000	
Provide laboratory equipment and consumables	Sum			4,500,000	
subtotal				7,300,000	
<b>Transmission</b>					
New clear water pumps	nr	2	3,750,000	7,500,000	
Replace air valves on rising main	Sum			350,000	
Replace flow meter on rising main	Sum			100,000	
subtotal				7,950,000	
<b>Storage</b>					
1,100 m <sup>3</sup> additional storage	Sum			5,250,000	
Repair leaking valves	Sum			50,000	
Refurbish elevated tank	Sum			5,000,000	
Construct new pump house	Sum			5,000,000	
New transfer pumps	nr	2	1,500,000	3,000,000	
subtotal				13,050,000	
<b>Distribution system</b>					
New consumer meters (replacement and stock)	nr	1,560	3,000	4,680,000	
subtotal				4,680,000	
<b>Logistical facilities and equipment</b>					
New office and laboratory facilities	m2	400	25,000	10,000,000	
4WD twin-cab pickups	nr	1	2,500,000	2,500,000	
Motorcycles for line patrols, meter readings, etc.	nr	3	250,000	750,000	
Multi-gear mountain bikes	nr	2	25,000	50,000	
Desk top computer setups	nr	3	200,000	600,000	
Printers	nr	2	100,000	200,000	
Licensed standard computer software	Sum			1,000,000	

Table C4-17-rehab-costs-water

Table J4.17 : Cost estimates of rehabilitation works for Mumias Water Supply				
Description	Unit	Quantity	Rate	Amount (KShs)
Standard office equipment, furniture and fittings	Sum			1,500,000
subtotal				16,600,000
Overall Total				57,705,000
Add 20% P&G				11,541,000
Sub-total				69,246,000
Add 15% Contingencies				10,386,900
Sub-total				79,632,900
Add 20% consultancy design fees				15,926,580
GRAND TOTAL				95,559,480

**Table J4.18 : Cost estimates of rehabilitation works for Mumias Sewage System**

Item No.	Item description	Unit	Quantity	Rate	Cost of item
				KShs	KShs
1	225 mm gravity sewer 1 km long	m	1,000	8,000	8,000,000
2	Screen chamber with one screen	nr	1	150,000	150,000
3	Anaerobic pond	Item			1,000,000
4	Facultative and maturation ponds	Item			10,000,000
5	Interpond connection conduits	nr	3	150,000	450,000
6	Inlet/outlet structures for ponds	nr	2	150,000	300,000
7	Sludge drying beds to serve the whole town	m <sup>2</sup>	400	5,000	2,000,000
8	Access road to site	m	1,000	3,000	3,000,000
	<b>Subtotal</b>				<b>24,900,000</b>
	<b>Add 20% P&amp;G</b>				<b>4,980,000</b>
	<b>Subtotal</b>				<b>29,880,000</b>
	<b>Add 15% contingencies</b>				<b>4,482,000</b>
	<b>Total</b>				<b>34,362,000</b>
	<b>Add 20% consultancy</b>				<b>6,872,400</b>
	<b>Grand total</b>				<b>41,234,400</b>



