

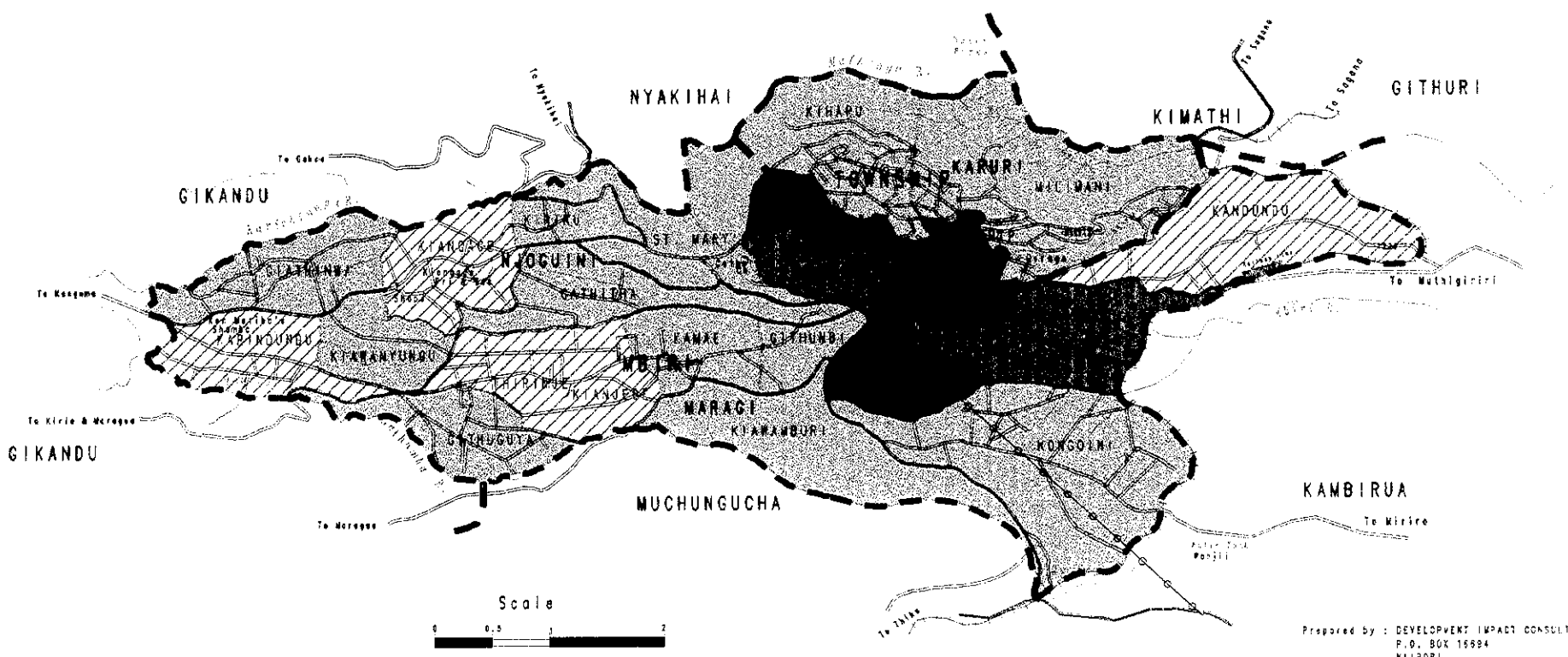
APPENDIX C1 MURANG'A TOWN

MURANG'A TOWN

(Population Density)

LEGEND

Road /Track	River	Division Boundary ..
Footpath	Seasonal River	Location Boundary ..
Railway Line	Canal/Furrow	Sub Loc. Boundary ..
Air Port/Field	Swamp	Village/Estate Bdy. ..
Power Line	Lake/Ocean ...	Munic/Town Boundary ..
Property boundary	Water Tank	Core Urban Inset
Sub Location Name BOMA	Bore Hole	Population Density
Village/ Estate Name	Water Hole	(Persons per SQ.KM.)
	Well, Spring	0-500 persons
	Forest	501-1000 persons
	Hill	1001-2000 persons
		2001 and over

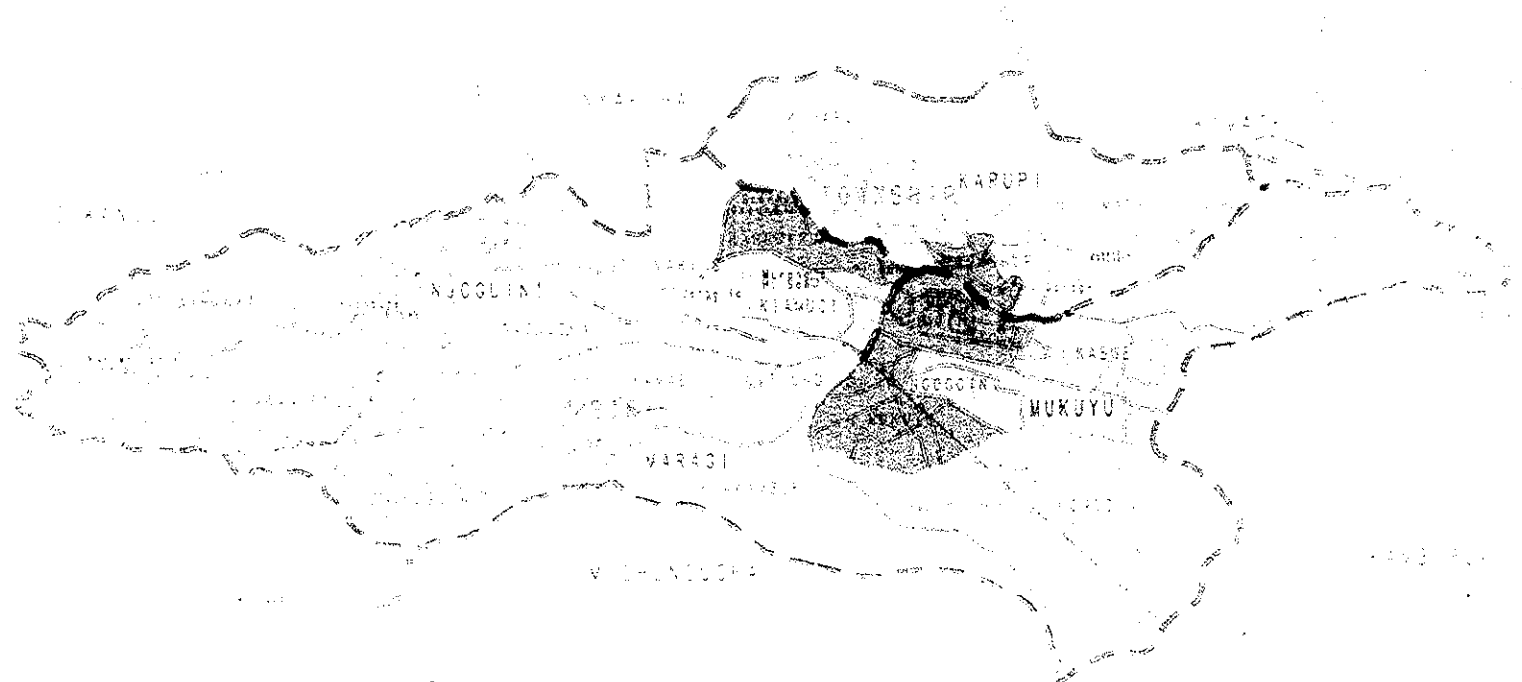


MUPANGA TOWN

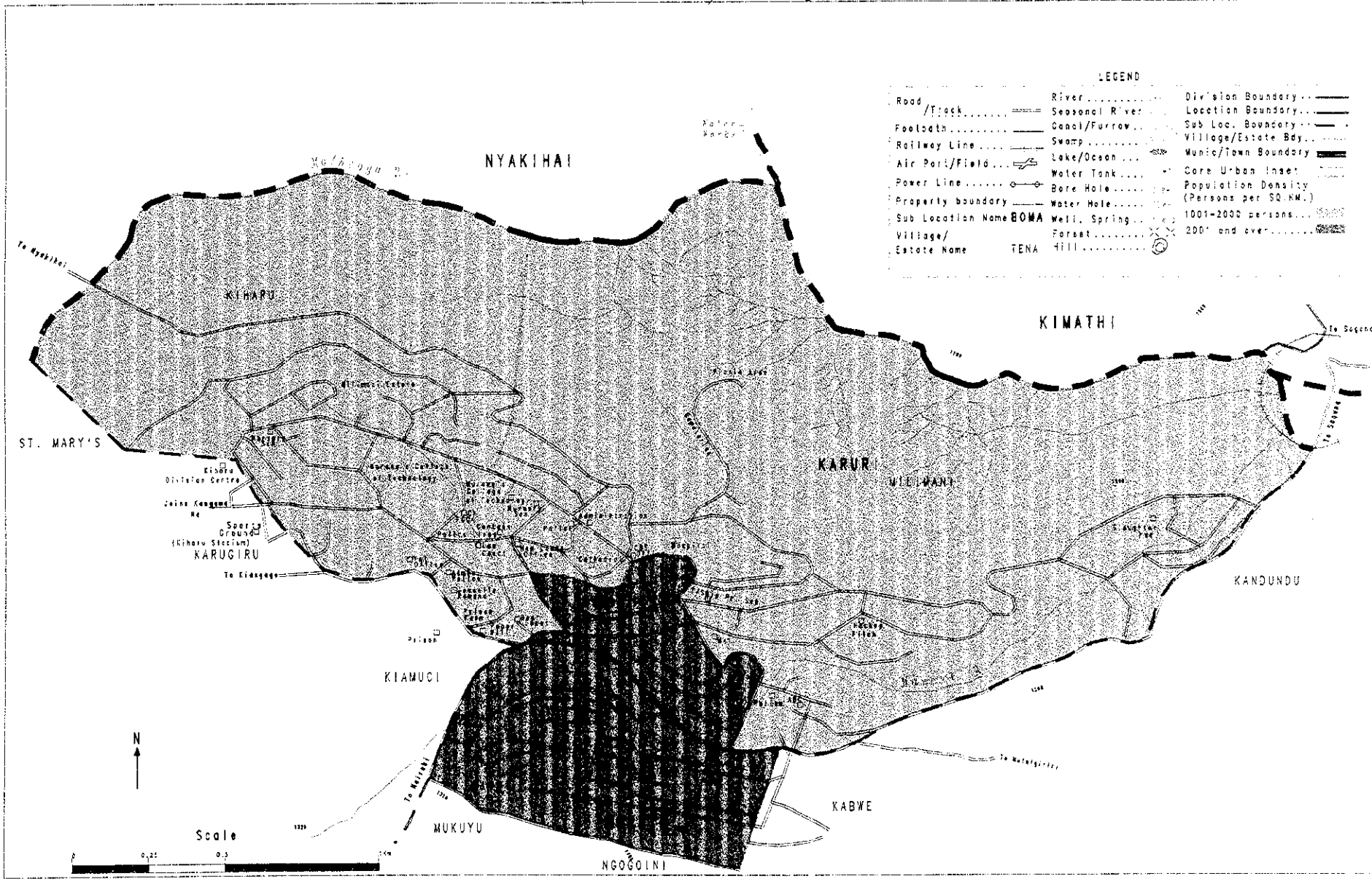
Map of the Town of Mupanga



Legend	
Water	Blue
Highway	Thick black line
Other roads	Thin black line
Boundaries	Dashed line
Properties	Stippled area
Public buildings	Shaded area
Other buildings	White area
Vegetation	Diagonal lines
Open land	White area
Swamp	Wavy lines
Marsh	Horizontal lines
Grassland	Vertical lines
Woodland	Stippled area
Shrubland	Diagonal lines
Barren land	White area
Water	Blue
Highway	Thick black line
Other roads	Thin black line
Boundaries	Dashed line
Properties	Stippled area
Public buildings	Shaded area
Other buildings	White area
Vegetation	Diagonal lines
Open land	White area
Swamp	Wavy lines
Marsh	Horizontal lines
Grassland	Vertical lines
Woodland	Stippled area
Shrubland	Diagonal lines
Barren land	White area



MURANG'A TOWN (INSET) POPULATION DENSITY



Road / Track	River	Division Boundary ..
Footpath	Seasonal River	Location Boundary ..
Railway Line	Canal/Furrow	Sub Loc. Boundary ..
Air Port/Field	Swamp	Village/Estate Bdy ..
Power Line	Lake/Ocean	Munic./Town Boundary
Property boundary ..	Water Tank	Core Urban Inset
Sub Location Name BOMA	Bore Hole	Population Density
Village/ Estate Name	Water Hole	(Persons per SQ. KM.)
TENA	Well, Spring	1001-2000 persons
	Forest	2001 and over
	Fill	



02 11 24 02

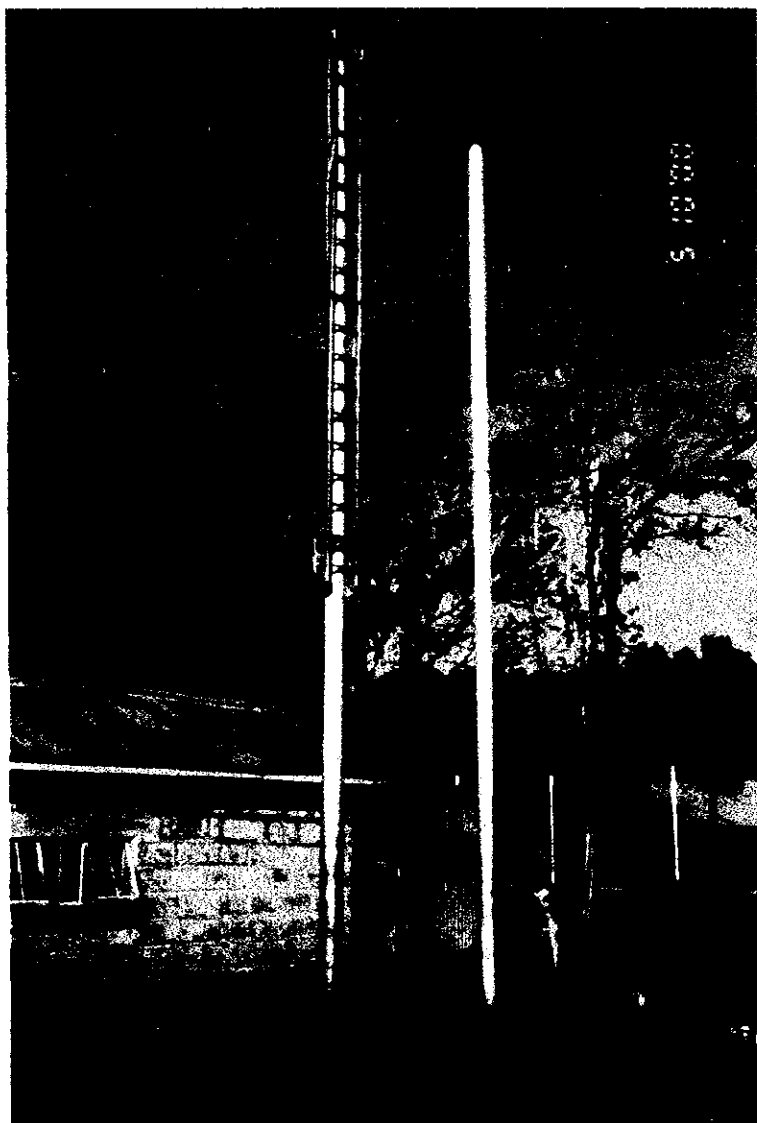
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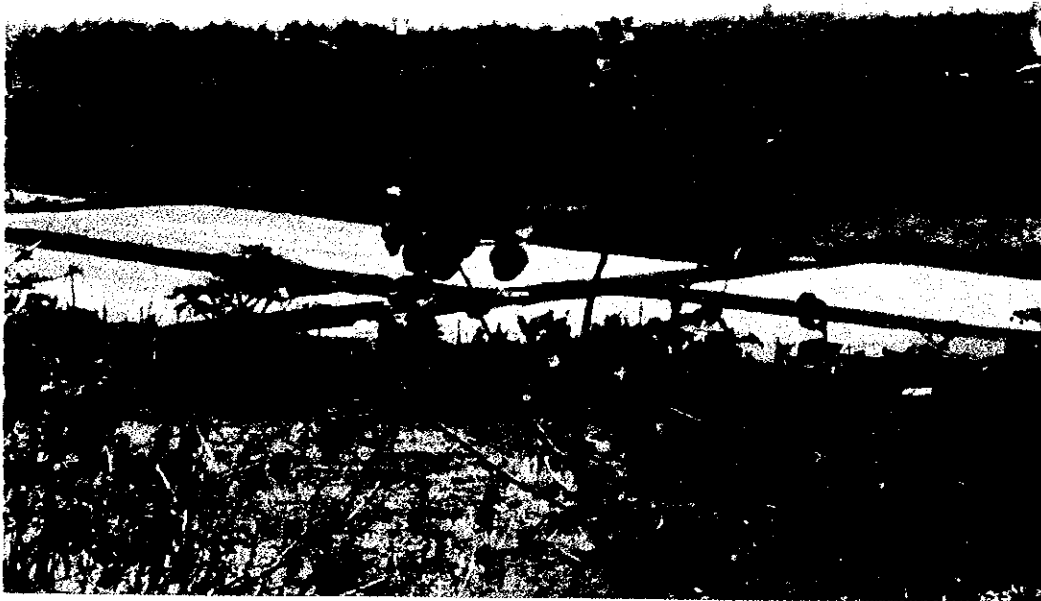
APPENDIX C2 MURANG'A TOWN



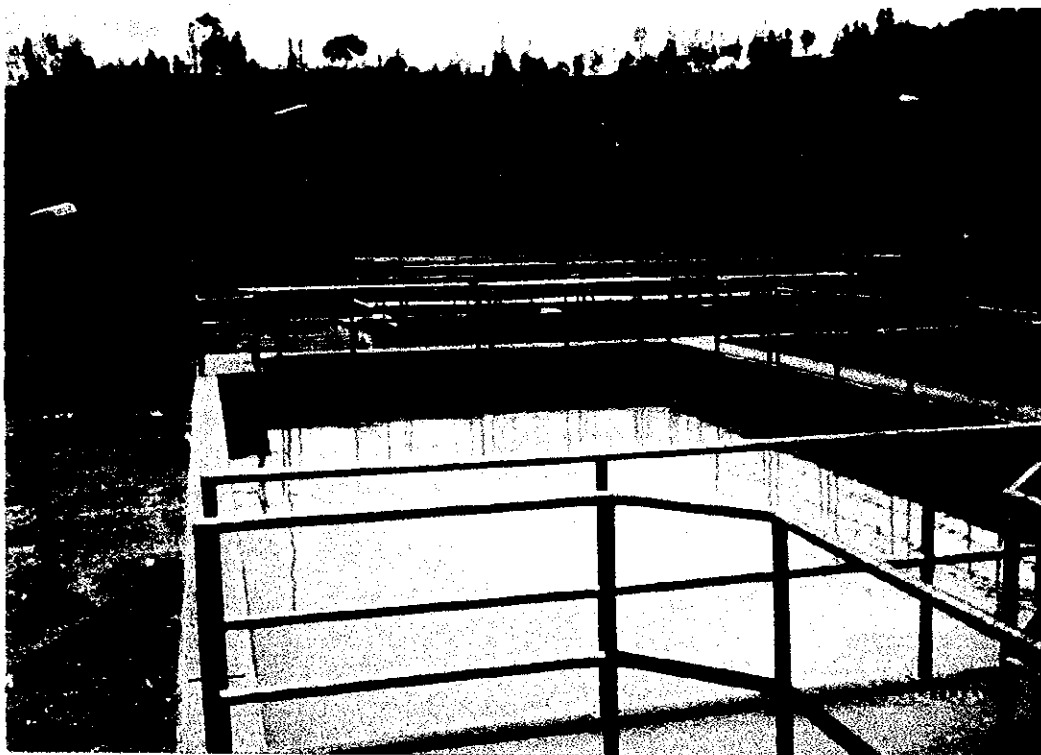
**RAW WATER INTAKE FROM CHANNEL DOWNSTREAM OF MATHIOYA RIVER
HYDRO DAM**



**ABANDONED BOREHOLE AT
DISTRICT WATER OFFICE SITE**



NEW SEWAGE TREATMENT PONDS COMPLETED RECENTLY



TREATMENT WORKS - SEDIMENTATION TANKS WITH FILTER IN THE BACKGROUND

APPENDIX C2 - 1 EXISTING BOREHOLES: REHABILITATION COSTS

RECONSTRUCTION OF BOREHOLE C - 2868 (DEPTH 122 m)

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	RATE (KSh)	AMOUNT (KSh)
1.0	RECONSTRUCTION OF BOREHOLE C-2868 (DEPTH 122 m)				
1.1	Mobilisation and set up	LS	1	120,000.00	120,000.00
1.2	Preparations				
a):	Remove drop pipes and pump	LS	1	20,000.00	20,000.00
b):	Break and cart away concrete plinth 1 x 1 x 1 m	m ³	1	8,500.00	8,500.00
1.3	Remove existing casing:- 254 mm (10") nom. diameter steel casing/ louvre screens	m	24	800.00	19,200.00
1.4	Install and remove cleaning equipment	LS	1	25,000.00	25,000.00
1.5	Clean borehole using approved method	hr	10	2,500.00	25,000.00
1.6	Supply and install casing and screen:- Supply and install permanent 254 mm (10") ID steel casing	m	24	3,600.00	86,400.00
1.7	Development:- Airlift surging using drillpipe	hr	6	3,600.00	21,600.00
1.8	Aquifer and well testing, complete	LS	1	110,400.00	110,400.00
1.9	Borehole headworks:-				
a):	Sanitary seal, complete with 1 x 1 x 1 m plinth	LS	1	15,000.00	15,000.00
1.10	Reporting	LS	1	5,000.00	5,000.00
1.11	Water analysis	LS	1	15,000.00	15,000.00
1.12	Supply and installation of submersible pump				
a):	Supply pump rated at 30 m ³ /hr against a total head of 100 m	LS	1	450,000.00	450,000.00
b):	Supply and install pump control panel, completewith volt meter, ammeter, pump start and run indicators, phase failure relay, low level and tank high level cut-out protection	LS	1	90,000.00	90,000.00
c):	Pump submersible cable and splicing kit	m	110	245.00	26,950.00
d):	Level relay cables	m	220	30.00	6,600.00
e):	Safety electrodes	pr	1	2,200.00	2,200.00
f):	75 mm GI class 'B' pipes and fittings	m	96	575.00	55,200.00
g):	25.4 mm (1") dipper line	m	110	90.00	9,900.00
h):	Install drop pipes, pump and dipper line	LS	1	15,000.00	15,000.00
j):	Clear site and restore	LS	1	5,000.00	5,000.00
TOTAL OF PAGE 1 CARRIED TO COLLECTION					1,131,950.00

APPENDIX C2 - 1 EXISTING BOREHOLES: REHABILITATION COSTS

RECONSTRUCTION OF BOREHOLE C - 3034 (DEPTH 134 m)

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	RATE (KSh)	AMOUNT (KSh)
1.0	RECONSTRUCTION OF BOREHOLE C-3034 (DEPTH 134 m)				
1.1	Mobilisation and set up	LS	1		Included in bill for C2868
1.2	Install and remove cleaning equipment	LS	1	25,000.00	25,000.00
1.3	Clean borehole using approved method	hr	10	2,500.00	25,000.00
1.4	Supply and install casing and screen:-				
(a)	Supply and install permanent 152 mm (6") ID steel casing	m	119	2,500.00	297,500.00
(b)	Supply and install 152 mm (6") ID type 304 steel wire-wound screens	m	15	12,500.00	187,500.00
1.5	Supply and install gravel pack (2-4 mm sizes)	m ³	2	16,000.00	32,000.00
1.6	Development:- Airlift surging using drillpipe	hr	6	3,600.00	21,600.00
1.7	Install backfill from drill cuttings	m ³	1	3,000.00	
1.8	Aquifer and well testing, complete	LS	1	110,400.00	110,400.00
1.9	Borehole headworks:-				
a)	Sanitary seal, complete with 1 x 1 x 1 m plinth	LS	1	15,000.00	15,000.00
1.10	Reporting	LS	1	5,000.00	5,000.00
1.11	Water analysis	LS	1	15,000.00	15,000.00
1.12	Supply and installation of submersible pump				
a)	Supply pump rated at 17 m ³ /hr against a total head of 100 m	LS	1	315,000.00	315,000.00
b)	Supply and install pump control panel, complete with volt meter, ammeter, pump start and run indicators, phase failure relay, low level and tank high level cut-out	LS	1	60,000.00	60,000.00
c)	Pump submersible cable and splicing kit	m	110	245.00	26,950.00
d)	Level relay cables	m	220	30.00	6,600.00
e)	Safety electrodes	pr	1	2,200.00	2,200.00
f)	75 mm GI class 'B' pipes and fittings	m	96	575.00	55,200.00
g)	25.4 mm (1") dipper line	m	110	90.00	9,900.00
h)	Install drop pipes, pump and dipper line	LS	1	15,000.00	15,000.00
j)	Clear site and restore	LS	1	5,000.00	5,000.00
TOTAL OF PAGE 1 CARRIED TO COLLECTION					1,229,850.00

APPENDIX C2 - 1 EXISTING BOREHOLES: REHABILITATION COSTS

BILL COLLECTION SHEET

DESCRIPTION	AMOUNT (KSh)
Total reconstruction cost of borehole C - 2868	1,131,950
Total reconstruction cost of borehole C - 3034	1,229,850
Sub total	2,361,800
<u>add</u> chlorination facilities (estimate)	225,000
Sub total	2,586,800
<u>add</u> miscellaneous pipework and borehole ancillaries (estimate)	415,000
Total	3,001,800
Say	3,000,000

Appendix C2-2 : El Nino Emergency Project

Rehabilitation works costs for Murang'a water supply

Description	Unit	Quantity	Rate	Amount (KShs)
Intake works and raw water main				
Construct 3m high and 20m long RC intake weir and intake box at a new location upstream including river training works	Sum	1	4,200,000	4,200,000
Supply and lay 300 GI pipes under the bridge for the raw water main including anchorage	m	50	8,295	414,750
Construct new 300mm dia uPVC class C raw water main	m	190	3,650	693,500
sub-total				5,308,250
Treatment works and treated water pumps & mains				
Re-line internally and plaster externally chemical mixing tanks	nr	2	45,000	90,000
Reline internally and plaster externally solution tanks	nr	4	45,000	180,000
Replace mechanical flocculators including motors in each of the flocculation chambers	nr	3	450,000	1,350,000
Repair sedimentation tank wall joints with filler and sealant	m	200	2,000	400,000
Paint 1m high guard railing	m	200	1,500	300,000
Replace filter sand media and underdrains	cu.m	100	10,000	1,000,000
Replace filter backwash air compressor and repair control panel	No.	2	430,000	860,000
Replace backwash 250mm butterfly valve	No.	2	155,000	310,000
Replace worn out floor chequered plates at the filter gallery	sq.m	20	5,000	100,000
Replace clogged 600mm concrete drainage pipes	m	150	6,000	900,000
Remove and dispose deposited soil at the site	cu.m	100	400	40,000
Relocate and reinstate the chain link fence	m	100	1,500	150,000
Supply and install 132 cu.m/hr at 110m head electric pumpsets	No.	2	800,000	1,600,000
Supply and install 132 cu.m/hr at 110m head 90 HP diesel standby engine	No.	1	700,000	700,000
Supply and install surge vessel 35 cu.m	No.	1	500,000	500,000
Supply and replace Phase 1 electric pumpset rated at 70 cu.m/hr at 140m head	No.	2	650,000	1,300,000
Replace control panel at the Phase 1 pumphouse	No.	1	150,000	150,000
Replace leaking 200mm gate valves at the filter gallery	No.	3	85,000	255,000
Refurbish pumphouse and office civil works	Sum	1	250,000	250,000
sub-total				10,435,000
Rising main and distribution mains				
Replace and reroute sections of 200 GI pipes for the rising main	m	3,800	5,415	20,577,000
Replace and reroute sections of 150 GI pipes for the rising main	m	1,700	4,080	6,936,000
Reconstruct pipeline valve chambers at various locations	No.	15	40,000	600,000
Replace and reroute sections of distribution mains with 3" uPVC Class D	m	7,000	1,044	7,308,000
sub-total				35,421,000
TOTAL				51,164,250

APPENDIX C2-3: PRINCIPAL ENGINEERING 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.

APPENDIX C2-4

LABORATORY ANALYSIS OF TREATED WATER SAMPLES

Made
Checked

Analysis of treated water by CTL, MUR/01

pH 6.2

Temperature (°C) 21

Cations					Anions				
	mg/l	weight	mol/l	meq/l		mg/l	weight	mol/l	meq/l
NH ₄ ⁺		18.03858	0.00E+00	0.000	Cl ⁻	2.99	34.453	8.68E-05	0.087
Na ⁺	8.65	22.9898	3.76E-04	0.376	NO ₂ ⁻	0.9	46.0055	1.96E-05	0.020
K ⁺	0.896	39.098	2.29E-05	0.023	NO ₃ ⁻	1	62.0049	1.61E-05	0.016
Ca ²⁺	1.24	40.078	3.09E-05	0.062	F ⁻	0.3	18.9984	1.58E-05	0.016
Mg ²⁺	1.6	24.305	6.58E-05	0.132	HCO ₃ ⁻		61.01717	0.00E+00	0.000
Fe ²⁺		55.847	0.00E+00	0.000	CO ₃ ²⁻		60.0092	0.00E+00	0.000
Fe ³⁺	0.11	55.847	1.97E-06	0.006	SO ₄ ²⁻	50	96.0636	5.20E-04	1.041
Mn ²⁺	0.12	54.938	2.18E-06	0.004	PO ₄ ³⁻	1.8	30.9738	5.81E-05	0.174
			sum	0.603				sum	1.354

Calculated hardness (meq/l) 0.204

Calculated hardness (mg/l as CaCO₃) 10.2

Ammonia was not determined, but is likely to be small.

Alkalinity, bicarbonate and carbonate were not determined, but bicarbonate will be significant.

Anions, excluding bicarbonate, exceed cations

Analysis of treated water by CICU, MUR/02

pH 6.65

Temperature (°C) ND

Nitrite and nitrate reported as N

Cations					Anions				
	mg/l	weight	mol/l	meq/l		mg/l	weight	mol/l	meq/l
NH ₄ ⁺		14.0067	0.00E+00	0.000	Cl ⁻	2.5	34.453	7.26E-05	0.073
Na ⁺	14.04	22.9898	6.11E-04	0.611	NO ₂ ⁻	0.01	14.0067	7.14E-07	0.001
K ⁺	0.89	39.098	2.28E-05	0.023	NO ₃ ⁻	2.66	14.0067	1.90E-04	0.190
Ca ²⁺	4.3	40.078	1.07E-04	0.215	F ⁻	0.24	18.9984	1.26E-05	0.013
Mg ²⁺	1.71	24.305	7.04E-05	0.141	HCO ₃ ⁻		61.01717	0.00E+00	0.000
Fe ²⁺	0.11	55.847	1.97E-06	0.004	CO ₃ ²⁻		60.0092	0.00E+00	0.000
Fe ³⁺	0.3	55.847	5.37E-06	0.016	SO ₄ ²⁻	39.65	96.0636	4.13E-04	0.825
Mn ²⁺	0.01	54.938	1.82E-07	0.000	PO ₄ ³⁻	0.1	30.9738	3.23E-06	0.010
			sum	1.009				sum	1.111

Calculated hardness (meq/l) 0.376

Calculated hardness (mg/l as CaCO₃) 18.8

Ammonia was not determined, but is likely to be small.

Alkalinity, bicarbonate and carbonate were not determined, but bicarbonate will be significant.

Anions, excluding bicarbonate, exceed cations

AKK B JKT

(ND)

CENTRAL TESTING LABORATORIES LTD.

INDEPENDENT SOILS AND MATERIALS TESTING



Komorock Road
P.O. Box 18507
NAIROBI KENYA
Telephone: 784562

OUR REFERENCE: 01/GEA/MWT-R/30/1/KJW
YOUR REFERENCE:
ATTENTION:

GIBB (EASTERN AFRICA) LTD.	
RECEIVED	
30th January, 2001	
ATTN:	SERIAL No.
DEPT:	FILE No.

Gibb East Africa Ltd.,
P.O. Box 30020,
NAIROBI.

Dear Sir;

MURANGA WATER SUPPLY - QUALITY TEST:

We would inform you that the results of test carried out on samples from the above site in accordance with your instructions are now available upon payment of the enclosed invoice.

Please note that the samples referred to therein will be retained for fourteen days and, unless they are collected from our premises during this time they will automatically be disposed of at the end of the period.

We would also draw your attention to the fact that no member of our staff was, in any way, responsible for the location and/or the taking of the said samples.

Yours faithfully,

G.K. WAMBUGU.

For: CENTRAL TESTING LABORATORIES LTD

Encls.

Invoice No:- 0214

AEF JKT
~~STP~~

CENTRAL TESTING LABORATORIES LTD.

INDEPENDENT SOILS AND MATERIALS TESTING



Komorock Road
P.O. Box 18507
NAIROBI KENYA
Telephone: 784562

OUR REFERENCE: 01/G-M-TR/30/1/Kgw
YOUR REFERENCE:
ATTENTION: AEF

GIBB (EASTERN AFRICA) LTD.	
RECEIVED 30th January, 2001	
05 FEB 2001	
ATTN: STP	SERIAL No. L.
DEPT:	FILE No.

Gibb East Africa Limited,
P.O. Box 30020,
Fax No. 210694
NAIROBI.

Dear Sir,

MURANGA WATER SUPPLY - TW/MUR/01 TREATED WATER QUALITY TEST RESULT:

Please find herewith test results for water sample ref. TW/MUR/01 treated sampled on 12/01/2001.

<u>Lab. Ref.:</u>	<u>Parameters:</u>	<u>Units:</u>	<u>Determined Value:</u>
01	pH Value at 21°C	mg/L	6.2
02	Residual Chlorine	mg/L	<0.1
03	Sulphate	mg/L	50.0
04	Nitrite	mg/L	0.9
05	Magnesium	mg/L	1.60
06	Iron II	mg/L	Not determined
07	Iron III	mg/L	0.11
08	Manganese	mg/L	0.12
09	Chloride	mg/L	2.99
10	Nitrate	mg/L	1.0
11	Flouride	mg/L	0.3
12	Phosphate	mg/L	1.80
13	Calcium	mg/L	1.24
14	Sodium	mg/L	8.65
15	Potassium	mg/L	0.896
<i>Physical tests:</i>			
16	Turbidity	mg/L	12.0
17	Colour	Hazen units	15.0

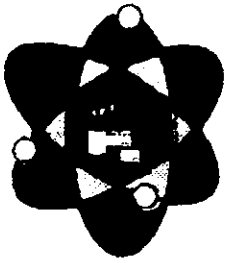
Physical tests:

Yours faithfully,

20/1/01

G.K. WAMBUGU

Director: CENTRAL TESTING LABORATORIES LTD



GIBB (EASTERN AFRICA) LTD.	
RECEIVED	
17 FEB 2001	
ATTN: KEF ACCS	SERIAL No. L.
DEPT:	FILE No.

KEF
SJE
DND
SJE
CICU (1085)

CHEMICAL & INDUSTRIAL CONSULTANCY UNIT

Department of Chemistry, University of Nairobi

Chiromo Campus, P.O. Box 30197, Tel: 440042, 442014, 446001 Fax 446138, Nairobi.

29th January, 2001

GIBB (EASTERN AFRICA) LTD
P.O. BOX 30020
NAIROBI

ATTN: MR. J. KARANJA

Dear Sir,

RE: WATER QUALITY ANALYSIS REPORT

Please find herein attached the full report of the water quality analysis for the samples delivered on 19-01-2001.

Thank you for your cooperation.

Yours truly,

Dr. D. K. Kariuki

PARAMETER	UNIT	SAMPLES		
		NAR/01	NAR/02	MUR/02
Residual Chlorine	mgCl/l	<0.01	<0.01	<0.01
Sulphate	mgSO ₄ /l	56.85	15.65	39.65
Nitrite	mgN/l	<0.01	<0.01	<0.01
Magnesium	mgMg/l	1.40	0.95	1.71
Iron (II)	mgFe/l	0.09	0.07	0.11
Iron (III)	mgFe/l	0.08	1.12	0.30
Manganese	mgMn/l	<0.01	<0.01	<0.01
Chloride	mgCl/l	6.50	8.50	2.50
Nitrate	mgN/l	0.22	0.55	2.66
Fluoride	mgF/l	1.07	1.70	0.24
Phosphate	mgP/l	<0.10	<0.10	<0.10
Calcium	mgCa/l	8.40	7.40	4.30
Sodium	mgNa/l	33.85	33.46	14.04
Potassium	mgK/l	13.53	13.29	0.89
pH	pH scale	7.30	7.85	6.65
Turbidity	N.T.U	9	27	11
Colour	mg pt/l	<5	70	<5

Note

Residual chlorine samples should be delivered to the laboratory immediately after sampling and should not be exposed to sunlight.

Metal samples should be acidified on sampling, particularly if at higher pH.

APPENDIX C3
MURANGA
TOWN



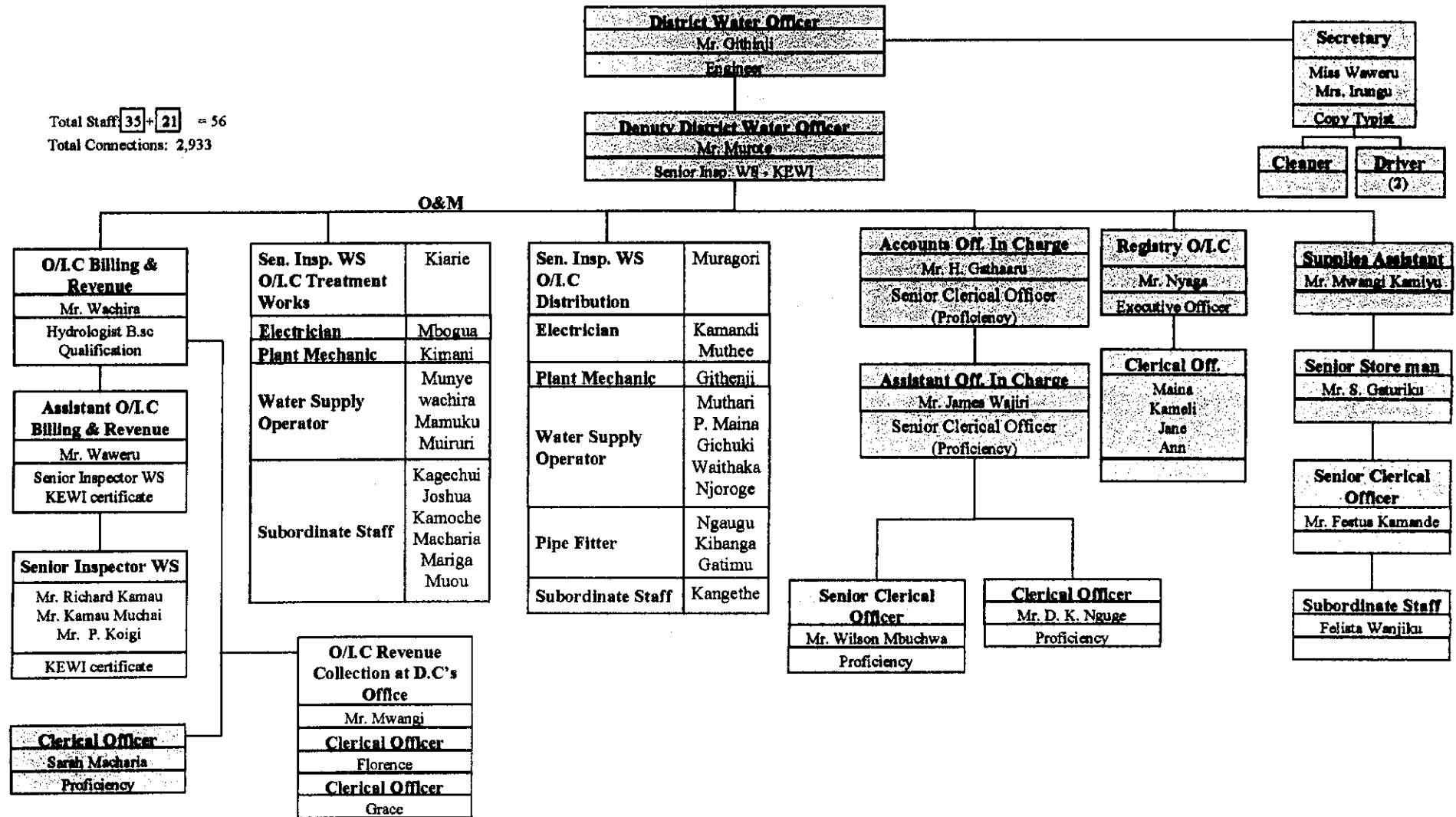
MURANGA WATER SCHEME ORGANISATION CHART

FIGURE: 8.1.3

MURANGA

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

Total Staff: 35 + 21 = 56
Total Connections: 2,933



Staff members shared between district and Muranga Water Supply.



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: Muranga WS&S System
Date: 06.-09.10.2000

Interviewer: LEK and CK

Discussion/Interview with: District Water Officer: Eng. Githinji
Deputy DWO:

Mr. David Waweru Mwangi (Revenue)

Telephone: 0156-31110
P.O.Box 460
Muranga

CC: Mr. Obondo Kajumbi
Telephone: 0156-22593 or 22590
DO: Mr. Gakuo

		<p><i>Meter reading books show many meters stalled for a year or more. However when meter is read it shows a moving meter, i.e. most likely NOT READ in the past or While MR entry shows average, the reading is then less than the average and credit to be calculated for such a case is then NOT entered as a credit. Other cases seen have reflected a credit, which means that it depends on the officer that enters the information (3 –4 officers doing the calculation)!!!and only handwriting tells who it was.</i></p> <p><i>If meter not moving or better not read and then disconnected after 3 yrs, the meter reading taken then is not considered and entered as a final debit to the consumer account.</i></p> <p><i>No meter rent charged as not known who has his own meter and who was once provided with a meter through Ministry. No comment on the application form, who provided the meter.</i></p> <p><i>Bills are only issued for GOK bodies and other consumers on request</i></p> <p>MURANGA RESIDENTS GO TO THE DC'S OFFICE, ASK WHAT IS DUE AND PAY!!!!!!</p>
7.	Disconnection	<p><i>Not targetting Major consumers, but list prepared by B&R when going for information to the collection office(at the DC's), where consumer ledgers are kept. Information then simply taken from the ledgers. 3 – 4 zones are selected. Then 2-3 MRs are assigned to do them 50 – 60 disconnections done per month</i></p> <p><i>No warning procedures</i></p> <p><i>Re-organisation attempts under way, intention to decentralise to Sen. Inspectors (4)</i></p>
8.	Meter Servicing	<i>Not done</i>
9.	HQ Reporting	<i>Only forms and requisitions, otherwise only DWO</i>
10.	Procedure Manuals	<i>No</i>
11.	Financial Control	<i>Nothing in place</i>
12.	Cash/Cheque Un-accounted for cash advances? Revenue Collection: Consumer payments into consumer accounts? Cash/Bank book maintained and up to date?	<p><i>N/A</i></p> <p><i>Consumer pays through Office DC, but with DWO personnell, 3 staff sitting at the DC's office</i></p> <p><i>Note: 200,00 Kshs charged for any cheque as clearance fee!!</i></p> <p><i>No, not required by Government procedures</i></p>
13.	Reconciliation For Cash? For Bank?	<p><i>No, N/A</i></p> <p><i>No, N/A</i></p>
D.	Discussions	
1.	Staff Awareness of operation and	<i>No</i>

	<p>financing cost vs turnover? Job satisfaction and expectation?</p> <p>Existing constraints? Physical Financial Institutional Political 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? Working environment? What is the opinion about PSP?</p>	<p><i>It is ok, but difficult at times</i></p> <p><i>Yes</i> <i>Transport, no computer for consumer data and billing</i> <i>Cash flow always a problem</i> <i>Major problem, Delay in District Treasury</i> <i>No</i> <i>Not enough staff</i></p> <p><i>Only DWO</i></p> <p><i>Only DWO</i></p> <p><i>No</i> <i>No</i></p> <p><i>No</i></p> <p><i>No</i></p> <p><i>Ok as long as service is provided, no objection (DDWO was not really interested in assisting to provide information, valuable time was wasted, while it could have been obtained from another officer)</i></p>
<p>2.</p>	<p>Consumers Comments on: Reliability Quality Billing Price Consumer requests on: Coverage 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?</p> <p>What does the consumer propose? What is his/her situation on rationing?</p>	<p><i>No time to visit consumers</i> <i>But for example Hospital consumes 200 cbm and even though pointed out, no action taken, as neither O&M hospital nor anybody else interested</i></p>

3.	Stakeholders	<i>No time to discuss</i>
E.	Consumers	
1.	Consumer Portfolio 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>2851accounts, 1112 inactive, 1739 active, out of which approx. 1000 not working</i> <i>Not known</i> <i>N/A</i> <i>As gazetted</i> <i>Not known</i> <i>June: 42, July: 3, August: 11, September: 20</i> <i>Average: 19 per month</i> <i>DWO says: No old meters to be used for new connections</i> <i>??</i> <i>Approx. 50 %</i> <i>No Kiosks</i> <i>Under Municipality</i>
2.	Consumer Indices	
3.	Consumer Procedures Open account? Close account? Get a credit into the next bill? Change address? Transfer account?	<i>Consumer expresses interest in a connection. A field person is sent to investigate whether it is possible to provide a connection, and make an estimated cost. If water is available at that spot, an application form is filled at the water office. Consumer pays labour Kshs. 172.50 and deposit. There is no control on quality of materials used</i> <i>Application forms contain hardly any information, difficult to follow, especially Civil Servants.</i> <i>??</i> <i>??</i> <i>??</i>

F.	Technical System	
1.	System Components? Is pumping necessary?	<i>2 In-takes Kayahwe and Mathioya For Kayahwe gravity to treatment works and then pumping to reservoir and then distribute. For Mathioya pump to treatment works at Kiharu then distribute.</i> <i>Yes</i>
2.	Zonal Meters How many are in the system? Are they controlling areas? Are they functioning?	<i>1, but non-operational, dia. 8"</i> <i>No</i> <i>No</i>
3.	Network Transmission lines? Distribution lines? Consumer lines? Whole system coverage? Fully utilised?	<i>?</i> <i>?</i> <i>?</i>
4.	Coverage	<i>50%</i>
G.	Technical Indices	
1.	Production Capacity per day Actual per day Production Efficiency?	<i>140 cbm x 24 hrs = 3,360 cbm</i> <i>125 cbm x 22 hrs = 2,750 cbm</i> <i>But not really known as not metered</i>
2.	Pumping Efficiency	<i>?</i>
3.	Supply Efficiency Recorded consumption/actual production	<i>?</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 repair material</i> <i>Approx. 8 major bursts per month</i> <i>1 zonal meter not operational</i>
5.	Sanitation Treatment Capacity Actual	<i>Under Municipality</i>
H.	Technical Procedures	
1.	O&M	<i>No procedures in place</i>
2.	Rationing	<i>Schedule in place for Higher and Lower areas: either Monday, Wednesday, Saturday or the other days</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</i> <i>No stock</i> <i>No</i> <i>No</i> <i>N/A</i> <i>Not possible</i> <i>No</i> <i>No</i>
4.	Meter Test Procedures	<i>N/A</i>
5.	Requisition Procedures	<i>Current system encourages corruption, because you are sometimes forced to twist application in order to proceed, call an itemXx, because there is no provision for Y, but X is required</i> <i>Any officer to stores prepares requirement as informed by the i.Charge, forward through DWO, or DDWO, back to supply assistant for processing</i>

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

TOTAL NUMBER OF CONNECTIONS	ARREARS (Kshs.)	JULY BILL (Kshs.)	NEVER CONNECTED	METERED	FLAT RATE	WORKING	NON-WORKING	NO WATER	CUT OFF	ACTUAL CONSUMPTION (JUNE 2000) M ³	AVERAGE CONSUMPTION M ³	LAST PAYMENT (Kshs.)
3,489	12,841,260.80	1,275,044.00	556	2,930	2	1,449	1,441	-	585	21,154	20,173	3,459,698.00
No. Of Actual Bills	1,433	Total Of Active & Inactive										
No. Of Estimate Bills	1,453	2,933										
Assumed In-Active	47											
Never Connected	556											
Total	3,489											
Minimum Charge Bills	63.77%											

ADJUSTMENTS

Adjustment Label	A	B	C	D	E	F	G	H	I	J	K	L
Adjustment	(3,287,230.35)	-	0	(3)	0	(2)	(4)	0	(549)	(40)	(259)	

SUMMARY BASED ON FILTERED RAW DATA

ARREARS (Kshs.)	JULY BILL (Kshs.)	NEVER CONNECTED	METERED	FLAT RATE	WORKING	NON-WORKING	NO WATER	CUT OFF	ACTUAL CONSUMPTION (JUNE 2000) M ³	AVERAGE CONSUMPTION M ³	LAST PAYMENT (Kshs.)
9,554,030.45	1,275,044.00	556	2,927	2	1,447	1,437	0	36	21,114	19,914	3,459,698

Arrears

The total arrears hold Kshs. 3,287,230.35 relating to "account never connected"

Total m3 Billed

41,028

NOTE:

Estimate Consumption

1) The total consumption is reduced by 299 m³, which were stated as relating to "account never connected"

- 2) Metered
- Flat Rate
- Working
- Non-working
- 3) No Water

All connection related information given for "account never connected" is filtered out and removed for analysis purposes

NOTE: While last payment column was supposed to reflect payments prior to 30th June 2000, payments are reflected upto 22nd December 2000

**OF WATER SUPPLY SYSTEMS
FOR TEN (10) LOCAL TOWNS IN KENYA**

ACCOUNT NUMBER	CONNECTIO N No.	ARREARS (Kshs.)	JULY BILL (Kshs.)	NEVER CONNECTED	METERED	FLAT RATE	WORKING	NON-WORKING	NO WATER	CUT OFF	CUT OFF DATE	ACTUAL CONSUMPTION (JUNE 2000) M ³	AVERAGE CONS M ³	LAST PAYMENT (Kshs.)	LAST PAYMENT DATE
ZONE: KIHARU "A"															
45/1	45	14,798.00	1,260.00		1			1					47	14,798.00	26/9/00
6981/2	69	4,660.00		1						1	21/7/99			130.00	4/12/95
138/3	138	505,865.00		1						1	22/7/99			30,000.00	9/9/97
161/4	161	(330.00)		1						1	11/11/99			630.00	14/1/98
171/5	171	5,147.00		1						1	18/9/99			444.00	22/12/98
9015/6	177	3,001.00		1						1	17/9/98			200.00	2/12/97
7675/7	183	800.00		1				1					10	800.00	31/5/00
6924/8	193	1,500.00	200.00		1			1					10	1,800.00	10/6/00
241/9	195	400.00	200.00		1			1					10	200.00	28/9/00
8803/10	213	1,842.00	200.00		1			1					10	380.00	4/8/99
6902/11	214	2,326.00		1						1	13/6/00			540.00	24/4/96
8801/12	215	(500.00)	200.00		1			1					10	200.00	1/9/00
9843/13	216	1,483.00		1						1	9/9/98			200.00	5/3/95
7119/14	217	200.00	400.00		1								10	1,400.00	13/6/00
7175/15	218	400.00	200.00		1			1					10	200.00	13/10/00
5376/16	219	(2,330.00)	200.00		1			1					10	2,430.00	12/5/00
10089/17	220	2,602.00	200.00		1			1					10	120.00	11/6/99
8256/18	221	(3,040.00)	200.00		1			1					10	2,880.00	12/5/00
5533/19	222	1,295.00	200.00		1			1					10	2,120.00	19/6/98
6508/20	223	2,000.00	200.00		1			1					10	200.00	18/1/00
8142/21	224	1,420.00	200.00		1			1					10	1,420.00	13/8/00
10767/22	225	3,448.00	200.00		1			1		1	12/10/00		10	120.00	12/3/98
5950/24	234	1,195.00		1						1	16/9/98			200.00	27/8/97
9025/25	235	6,681.00	200.00		1			1					10	600.00	10/3/96
6898/26	243	3,461.00	200.00		1			1					10	2,000.00	11/5/98
8847/27	245	1,270.00	200.00		1			1					10	350.00	23/5/00
9145/28	246	2,176.00		1						1	12/8/97			200.00	17/3/95
6370/29	247	2,720.00	200.00		1			1					10	500.00	20/4/99
697/30	248	2,100.00	200.00		1			1					10	500.00	28/4/99
7092/31	249	754.00		1						1	22/9/98			600.00	13/7/99
8840/32	250	(1,612.00)	200.00		1			1					10	980.00	12/5/00
8750/33	251	2,280.00		1						1	8/6/97			400.00	5/7/86
7364/34	252	240.00		1						1	22/10/97			1,401.80	18/9/97
8787/35	253	2,220.00	200.00		1			1					10	1,000.00	12/5/99
8100/36	254	1,930.00	200.00		1		1					7		600.00	10/8/99
431/37	257	655,490.00		1						1	11/8/98			20,000.00	11/11/97
757/38	291	136.00	200.00		1			1					10	500.00	2/6/00
6976/39	310	400.00	200.00		1			1					10	760.00	6/2/00
8352/40	313	1,066.00	200.00		1		1					23		300.00	6/7/00
6077/41	314	3,360.00	300.00		1		1					62		300.00	9/6/00
Sub-Total		1,232,854.00	6,560.00	14	26	0	3	23	0	14		92	277	92,403.80	

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

YEAR 2000

	JUNE	MAY	APRIL	MARCH	FEBRUARY	JANUARY
Accumulated Debt	13,808,023.90	13,282,657.90	12,536,459.90	12,019,458.90	11,534,118.90	11,420,183.90
Current month billed revenue	1,211,226.00	1,497,525.00	1,311,685.00	1,305,295.00	1,459,455.00	776,333.00
Total revenue collectable	15,019,249.90	14,780,182.90	13,848,144.90	13,324,753.90	12,993,573.90	12,196,516.90
Actual collection						
Accumulated FY collection	9,247,457.50	8,139,131.50	7,166,972.50	6,601,485.30	5,813,191.50	4,839,116.50
Total outstanding revenue	13,910,923.90	13,808,023.90	13,282,657.90	12,536,459.90	12,019,498.90	11,534,118.90

YEAR 1999

	DECEMBER	NOVEMBER	OCTOBER	SEPTEMBER	AUGUST	JULY
Accumulated Debt	11,135,419.90	10,861,068.40	10,462,643.40	10,333,970.40	10,306,855.40	10,121,951.40
Current month billed revenue	905,930.00	876,412.50	869,469.00	877,068.00	947,274.00	998,707.50
Total revenue collectable	12,041,349.90	11,737,480.90	11,332,112.40	11,211,038.40	11,254,129.40	11,120,748.00
Actual collection						
Accumulated FY collection	4,176,718.50	3,555,552.50	2,953,491.50	2,482,447.50	1,734,052.50	
Total outstanding revenue	11,420,183.90	11,135,419.90	10,861,068.40	10,462,643.40	10,333,970.40	10,306,855.40

Date	Metered (m3)	Average (m3)	No. of connections	Revenue earned
14-Jul-99	22,786	17,853	2,795	869,002.00
13-Aug-99	30,607	18,436	2,795	984,300.00
14-Sep-99	27,707	18,412	2,819	925,914.00
15-Oct-99	26,190	17,914	2,829	859,908.00
12-Nov-99	26,163	18,163	2,823	858,144.00
15-Dec-99	25,344	17,172	2,839	869,275.00
20-Jan-00	27,773	17,904	2,865	899,705.00
11-Feb-00	21,571	18,401	2,867	771,563.00
20-Mar-00	27,126	18,045	2,871	1,459,455.00
18-Apr-00	23,517	18,650	2,858	1,287,000.00
18-May-00	23,021	18,949	2,852	1,294,925.00
14-Jun-00	21,334	19,178	2,850	1,480,765.00
14-Jul-00	19,913	20,171	2,885	1,193,846.00
	323,052	239,248	36,948	13,753,802.00

Information obtained from the meter reading book summary

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

YEAR 2000

	JUNE	MAY	APRIL	MARCH	FEBRUARY	JANUARY
Accumulated Debt	13,808,023.90	13,282,657.90	12,536,459.90	12,019,458.90	11,534,118.90	11,420,183.90
Current month billed revenue	1,211,226.00	1,497,525.00	1,311,685.00	1,305,295.00	1,459,455.00	776,333.00
Total revenue collectable	15,019,249.90	14,780,182.90	13,848,144.90	13,324,753.90	12,993,573.90	12,196,516.90
Actual collection	1,108,326.00	972,159.00	565,487.00	788,294.00	974,075.00	662,398.00
Accumulated FY collection	9,247,457.50	8,139,131.50	7,166,972.50	6,601,485.30	5,813,191.50	4,839,116.50
Total outstanding revenue	13,910,923.90	13,808,023.90	13,282,657.90	12,536,459.90	12,019,498.90	11,534,118.90

YEAR 1999

	DECEMBER	NOVEMBER	OCTOBER	SEPTEMBER	AUGUST	JULY
Accumulated Debt	11,135,419.90	10,861,068.40	10,462,643.40	10,333,970.40	10,306,855.40	10,121,951.40
Current month billed revenue	905,930.00	876,412.50	869,469.00	877,068.00	947,274.00	998,707.50
Total revenue collectable	12,041,349.90	11,737,480.90	11,332,112.40	11,211,038.40	11,254,129.40	11,120,748.00
Actual collection	621,166.00	602,061.00	471,044.00	748,395.00	920,159.00	813,893.50
Accumulated FY collection	4,176,718.50	3,555,552.50	2,953,491.50	2,482,447.50	1,734,052.50	
Total outstanding revenue	11,420,183.90	11,135,419.90	10,861,068.40	10,462,643.40	10,333,970.40	10,306,855.40

Date	Metered (m3)	Average (m3)	No. of connections	Revenue earned
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14-Sep-99	27,707	18,412	2,819	925,914.00
15-Oct-99	26,190	17,914	2,829	859,908.00
12-Nov-99	26,163	18,163	2,823	858,144.00
15-Dec-99	25,344	17,172	2,839	869,275.00
20-Jan-00	27,773	17,904	2,865	899,705.00
11-Feb-00	21,571	18,401	2,867	771,563.00
20-Mar-00	27,126	18,045	2,871	1,459,455.00
18-Apr-00	23,517	18,650	2,858	1,287,000.00
18-May-00	23,021	18,949	2,852	1,294,925.00
14-Jun-00	21,334	19,178	2,850	1,480,765.00
14-Jul-00	19,913	20,171	2,885	1,193,846.00
	323,052	239,248	36,948	13,753,802.00

Information obtained from the meter reading book summary

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

1. G.O.K. Accounts as Provided

CONSUMER NAME	ACCOUNT NUMBER	CONNECTION NUMBER	OUTSTANDING AS AT JUNE 2000	CONSUMER NAME	ACCOUNT NUMBER	CONNECTION NUMBER	OUTSTANDING AS AT JUNE 2000
Public Works	KHA 10949/104	3822	1,480.00	D.V.O Clinic	KHB 5600/41	835	88,090.00
D.A.O	MKT 4013/59	516B	95,870.00	D.V.O	KHB 5680/42	867	15,585.00
Livestock Office	MKT 6392/60	516C	1,386.00	Muranga C. Council	KHB 9213/65	2593	6,967.00
Muranga M. Council	MKT 5681/82	887	600.00	Public Works	KHB 9489/78	2808	2,980.00
Muranga M. Council	MKT 5682/83	888	600.00	Public Works	KHB 10236/96	3287	12,140.00
Kenya Police	STR 506/2	208	1,920.00	District Commissioner	KHA45/1	45	0.02
Public Works	STR 10305/233	3342	22,778.00	G. K. Prison	KHA 6981/2	69	4,660.00
Kenya Railways	STR 8268/135	1994	2,590.00	G. K. Prison	KHA 138/3	138	505,865.00
Kenya Railways	STR 8667/161	2284	3,131.00	Muranga C. Council	KHA 171/5	171	5,147.00
Muranga C. Council	TWA 6405/59	1138	125.00	Land Registrar	KHA 6902/11	214	2,826.00
Fisheries Dept.	TWA 7386/75B	1499	1,160.00	Physical Planning	KHA 8142/21	224	1,420.00
Muranga C. Council	TWA 8058/76	1592	9,827.00	G. K. Prison	KHA 431/32	257	655,490.00
Kenya Power	TWA 11022/202	3828	1,530.00	District Commissioner	KHA 7021/61	353	840.00
Muranga M. Council	TWB 159/29	159	400.00	Land Registrar	KHA 8611/70	362	4,569.00
Kenya Commercial Bank	TWB 539/41	260	5,628.00	D.A.O	KHA 6615/79	372	185.00
Statistics Office	MLB 76212/1	4	4,030.00	D.A.O	KHA 6694/81	374	7,575.00
District Hospital	MLB 31/5	31	4,369,702.00	G. K. Prison	KHA 9486/87	2807	10,212.00
Post Office	MLB 39/5	39	1,480.00				
Medical Officer	MLB 1368/11	51	425,755.00				7,887,342.02
Juvenile R. Home	MLB 5023/30	140	58,240.00				
District Hospital	MLB 152/31	152	399,880.00				
Muranga T. Council	MLB 154/33	154	600.00	Total outstanding minor consumers			3,544,083.78
M.O.H	MLB 7679/46	344	12,221.00	Total outstanding major consumers			9,297,177.02
Nursing	MLB 4869/58	720	15,900.00	Total outstanding as at June 2000			12,841,260.80
Kenya Red Cross	MLB 8483	2120	2,872.00				
Muranga M. Council	MLB 9257/126	2521	600.00	Number of billable connections			2,886
Nursing	MLB 10568/253	3513	5,480.00	Number of minor consumer connections			2,786
D. S. Service	KHA 9290/82	375	705.00	Number of major consumer connections			100
Kenya Post	MLB 8091/90	1532	10,384.00				
Wildlife Management	MLA6916/5	34	1,420.00	Average outstanding / minor consumer			1,272.10
Muranga C. Council	MLA521/8	46	3,460.00	Average outstanding / major consumer			92,971.77
Education Office	MLA 98/18	98	8,200.00				
Sports Club	MLA 119/21	119	39,254.00				
District Game Warden	MLA 7650/24	125	4,078.00				
District Commissioner	MLA 4638/36	156	1,902.00				
District Commissioner	MLA382/47	212	4,320.00				
Kenya Commercial Bank	MLA 538/51	240	1,120.00				
District Commissioner	MLA 4350/63	566	600.00				
Co-op. Bank	MLA 9531/83	1250	600.00				
Resident Magistrate	MLA 7433/84	1400	1,498.00				
Muranga M. Council	MLA 7487/87	1572	6,660.00				
District Surveyor	MLA 8596/97	1647	5,553.00				
Muranga C. Council	MLA 7974/101	1802	432,430.00				
O.C.P.D	MLA 9109/119	2520	588,527.00				
Barclays Bank	MLA9477/126	2789	2,070.00				
Ministry Of Commerce	MLA 10302/139	3343	1,220.00				
Muranga M. Council	MLA 10703/164	3740	1,195.00				
District Surveyor	MLA 8789/6	385	450.00				
District Commissioner	KHB 10445/19	415	1,360.00				

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

2. OTHER (With consumption > 100m3 per month or arrears >Kshs.20,000.00)

ACCOUNT NUMBER	CONNECTION NUMBER	OUTSTANDING AS AT JUNE 2000
10645/80	642	256.00
8036/155	1546	15,906.00
8293/234	2022	75,536.00
9191/257	2572	41,080.00
5238/1A	300	7,620.00
8555/34	192	Not Stated
8203/38	233	(106.00)
8533/73	1133	7,500.00
9144/99	2555	37,685.00
9169/100	2556	20,236.00
10328/147	3368	27,949.00
10704/182	3737	136,990.00
9837/9	263	2,805.00
8098/133	1858	17,220.00
9085/213	2514	8,690.00
9889/227	3028	23,505.00
6274/76	111	28,416.00
8434/108	2090	9,750.00
9652/25	391	3,675.00
1993/37	483	15,900.00
7498/108	1548	229,750.00
8595/139	2569	25,002.00
9065/37	191	22,167.00
8344/86	2039	68,665.00
10596/185	3545	10,425.00
1024/7	485	85,025.00
1368/11	51	325,755.00
5275/65	785	20,272.00
7010/81	1358	32,602.00
7786/210	3098	22,787.00
8345/74	1933A	15,935.00
7141/101	1402	17,925.00
10366/215	3391	52,912.00
		1,409,835.00

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

MONTH	REVENUE COLLECTED FY 99/00	A.I.E. APPLIED FOR	RECEIVED ALL./LIQUIDITY	EXPENDITURE INCURRED FY 99/00		
				ITEM	ALLOCATED	ACTUAL
July	813,893.50		943,000.00	887 Account		
August	920,159.00			Transport & Operating Exp.	960,000.00	918,421.35
Sept.	748,395.00	1,678,500.00	1,438,500.00	Passage & Leave Exp.	290,000.00	289,146.20
Oct.	471,044.00	750,000.00	830,500.00	Travelling & Accom. Exp	580,000.00	542,871.00
Nov.	602,061.00	5,287,000.00	752,000.00	Fuel & Gas	315,000.00	304,286.50
Dec.	621,166.00	653,700.00	653,700.00	Purchase of Stationery	60,000.00	58,710.00
Jan.	662,398.00			Postal & Telegrams	25,000.00	22,736.00
Feb.	974,075.00	1,434,850.00		Purchase of Uniforms	96,500.00	94,801.70
March	788,294.00	767,800.00	1,004,860.00	Purchase of water meters	100,000.00	99,000.00
April	565,487.00	919,200.00		Maintenance of buildings & stat.	302,000.00	238,488.30
May	972,159.00	70,457.45	400,000.00	Maintenance of Water Supplies	2,210,000.00	1,670,873.95
June	1,108,326.00			Misc. and other charges	45,560.00	45,556.40
Total	9,247,457.50	11,561,507.45	6,022,560.00	Telephone expenses	55,000.00	55,000.00
				Drawing office supplies	100,000.00	7,144.00
				886 Account		
				Purchase of supplies for prod.	863,000.00	580,886.00
				889 Account		
				Travelling & Accom. Exp	500.00	500.00
				Transport & Operating Exp.	2,000.00	1,000.00
				890 Account		
				Honorarium allowances	14,000.00	14,000.00
				Transport & Operating Exp.	4,000.00	4,000.00
				Total	6,022,560.00	4,947,421.40
				Balance		1,075,138.60

The % allocated to Muranga as A.I.E. is 65%. The revenue collected as indicated above relates to Muranga water supply only, while the A.I.E. applied for and received liquidity relates to the whole District Water Divisions including Muranga. The expenditure allocated and incurred also relates to the whole District.

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

MONTH	ORDERED			RECEIVED		
	Alum(kg)	TCL(kg)	S/Ash(bags)	Alum(kg)	TCL(kg)	S/Ash(bags)
Jul-99				6000	1000	
Aug-99				10000	3000	
Sep-99					4000	299
Oct-99				14500		230
Nov-99				2000		100
Dec-99				3000		
Jan-00				3000		
Feb-00						
Mar-00						100
Apr-00				4000		
May-00				6000		
Jun-00				20000		
Total						

APPENDIX K3

GENERAL

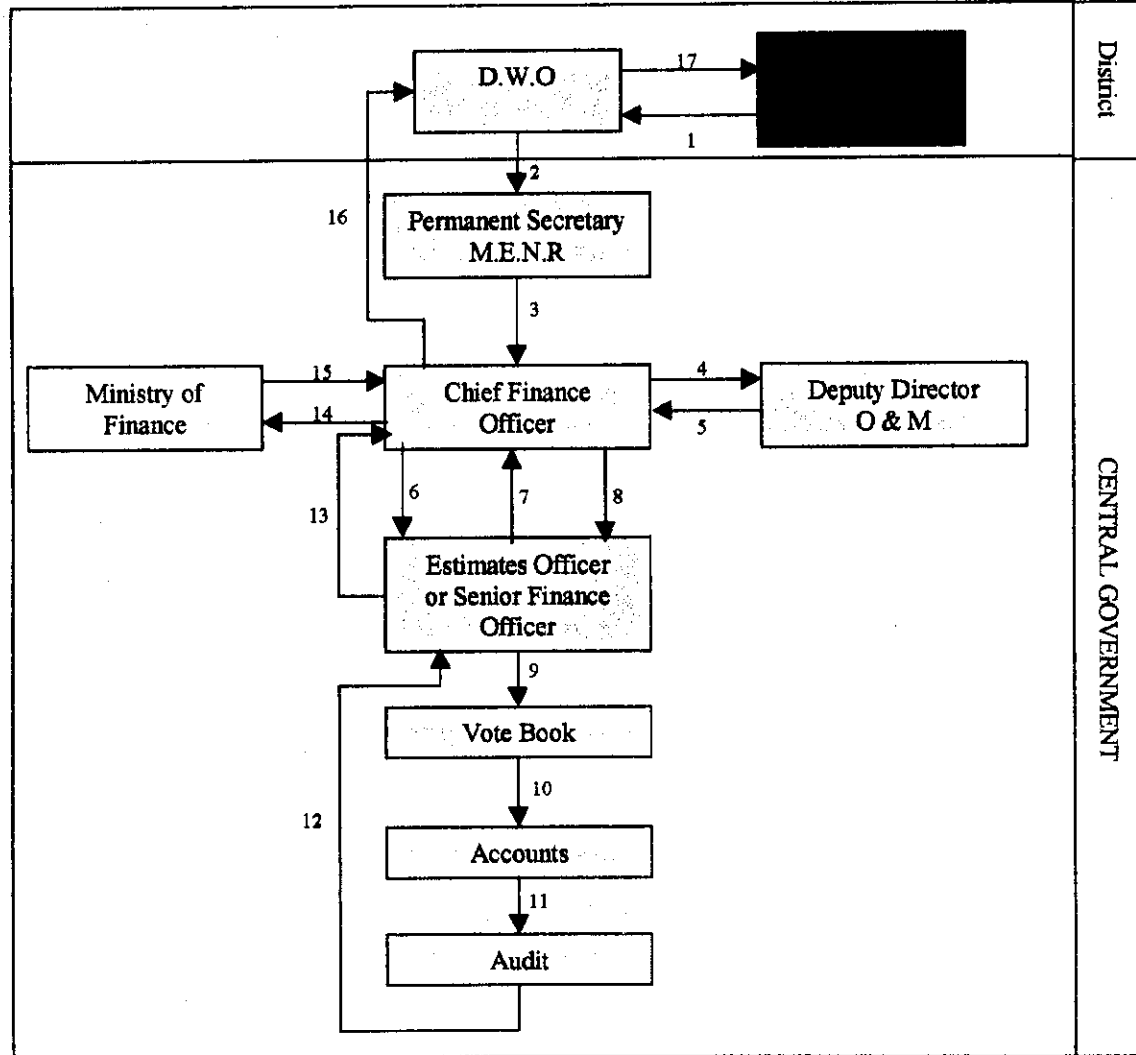


A.I.E PROCESSING CHART

FIGURE: 8.2

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

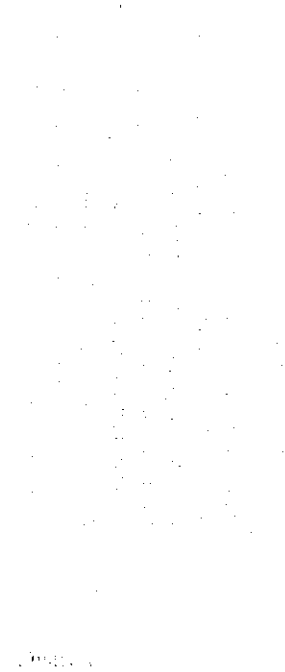
A.I.E = Authority to Incur Expenditure



- 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 request 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) Estimates Officer forwards documents to Chief Finance Officer.
- 8) Chief Finance Officer signs and returns documents to Estimates Officer
- 9) Estimates Officer forwards documents to Vote Book for entry against the budget provision.
- 10) Vote Book Officer forwards document to Accounts for checking.
- 11) Accounts forwards documents to Audit for checking.
- 12) Audit forwards documents to Estimates 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.

ASLE PROCESSING CHART

STUDY OF INSTITUTIONAL IMPROVEMENT ON REPAIRS AND MAINTENANCE OF WATER SUPPLY SYSTEMS FOR THE CITY OF FORT WORTH, TEXAS



DC Revenue Collection

Department of Public Works
Department of Engineering
Department of Finance

Public Works
Engineering
Finance

Public Works
Engineering
Finance

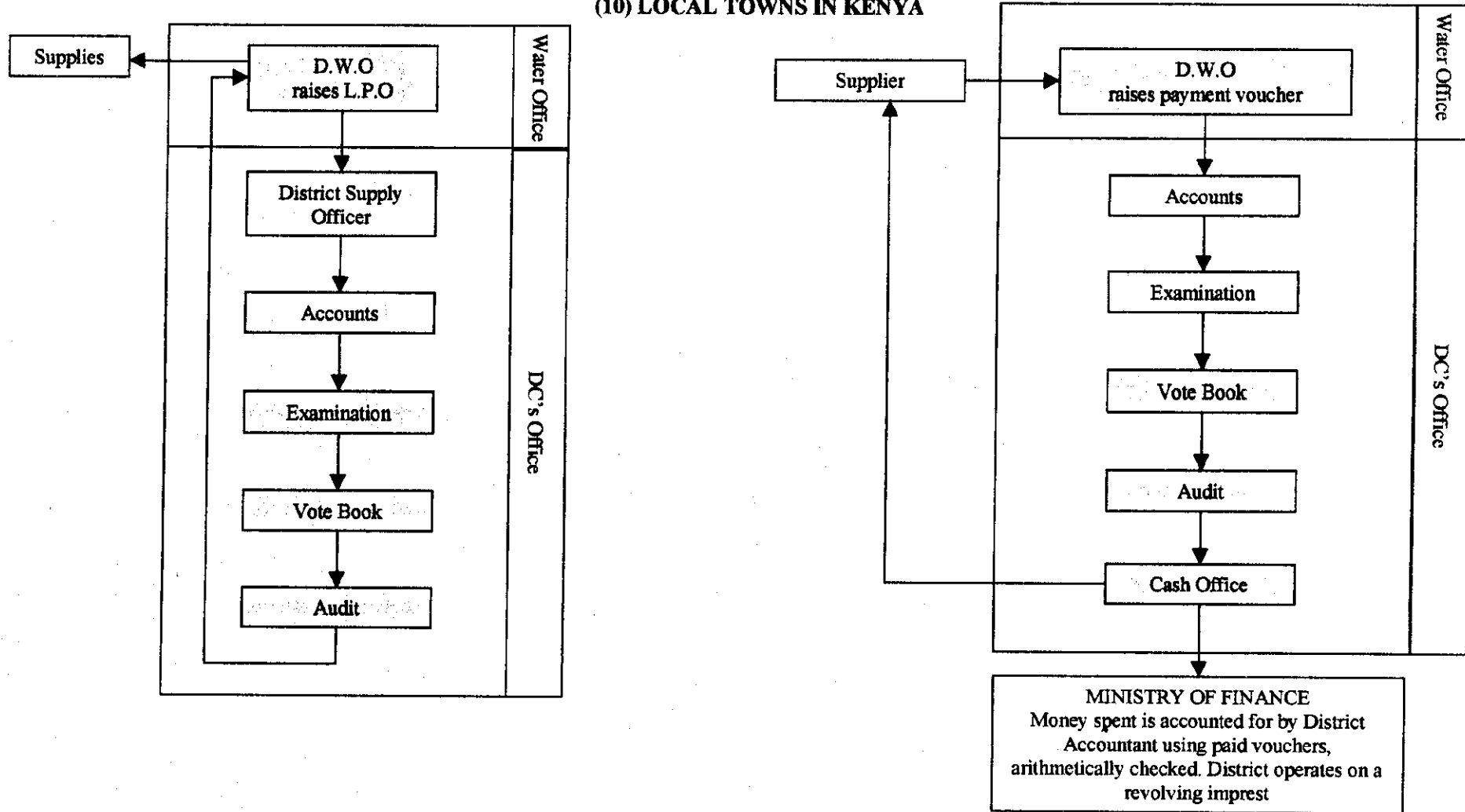
Public Works
Engineering
Finance

Public Works
Engineering
Finance

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.

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: MALINDI
10.11.2000**

Sub-Area Office NWPCP

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

Interviewer: LEK and CK
.....

**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 NWPCP head office in Nairobi, but nothing has been received so far.

MALINDI MANAGEMENT CONTRACT

QUESTIONS:	Answers:
<p>GENERAL:</p> <p>Contract in place?</p> <p>Line of Command?</p> <p>Any comments on current situation?</p> <p>Problems experienced?</p> <p>Any recommendation on changes to improve the situation?</p> <p>Cause of the problem if any?</p> <p>Any problems on Fee payments?</p>	<p><i>Yes</i></p> <p><i>NWCPC Manager (Chief Sub-Area Manager) in Malindi -> Regional Manager Mombasa -> MD NWCPC ->HQ Liaison officer-> Head O&M HeadOffice Nairobi -> MD of NWCPC -> 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&M separate from administration and store.</i></p> <p><i>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.</i></p> <p><i>Water Act not really supporting the effort and should be dealt with soonest.</i></p> <p><i>Procurement issues should be simplified</i></p> <p><i>Write-off procedure on consumer outstandings that cannot be collected, should be simplified within GOK /NWCPC framework</i></p> <p><i>Tariff: The Consultant's suggested social Tariff structure(leave rural kiosk tariffs low) should have been considered when Tariff policywais 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&M is paid from the collection account, balance at end month goes to NWCPC</i></p>
<p>FINANCES:</p> <p>Is the management financially independent?</p> <p>Can collected revenue sustain the operation?</p>	<p><i>In principle yes, but with limitations on procurements.</i></p> <p><i>Cannot be commented on at the moment at 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>How is revenue collected?</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>OPERATION:</p> <p>Any interference in the day to day operation?</p> <p>Procedures manifested already ?</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&M and Financial issues. Later on these will be pu into user manuals</i></p>
<p>STAFF:</p> <p>Relationship with the NWCPC/Management staff?</p> <p>Are any incentives offered to improve the output?</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>RECOMMENDATIONS:</p> <p>For other management contracts?</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>



Development Impact Consulting



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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: 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

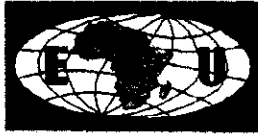
<p>Any comments on current situation?</p> <p>Any recommendation on changes to improve the situation?</p> <p>Cause of the problem if any?</p> <p>Agency agreement between company and Council finalised?</p> <p>Ownership of the company clear?</p> <p>Any advice for other water companies to integrate into their agency agreement?</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 19th March 1999 and ammended on 7th 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>Does the company have an Opening Balance Sheet?</p> <p>How were assets handeled?</p> <p>How were Consumer outstanding balances handeled?</p> <p>How were liabilities handeled? (Power, Creditors)</p> <p>Is the company financially independent?</p> <p>Can collected revenue sustain the operation?</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 & M, debt servicing (council's), depreciation of used asstes</i></p>

<p>Any other problems encountered?</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>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>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>Relationship with the staff? All former staff absorbed?</p> <p>Conditions under which staff were absorbed?</p> <p>Retired on the Council side?</p> <p>Have staff salaries changed since take over? How?</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 1st Sept. 1999 was 15%. Since then the staff have had 7.5% increase with effect from 1st Jan. 2000.</i></p>

Are any incentives offered to improve the output?	<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>Any comments on current situation?</p> <p>Any recommendation on changes to improve the situation?</p> <p>Cause of the problem if any?</p> <p>Agency agreement between company and Council finalised?</p> <p>Ownership of the company clear?</p> <p>Any advice for other water companies to integrate into their agency agreement?</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>Does the company have an Opening Balance Sheet?</p> <p>How were assets handeled?</p> <p>How were Consumer outstanding balances handeled?</p> <p>How were liabilities handeled? (Power, Creditors)</p> <p>Is the company financially independent?</p> <p>Can collected revenue sustain the operation?</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&L account, as the Council made payments which were then applied by KP&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)???? From mid 1970s KfW, before could be from different sources Accountant from KIWACO at Council, to speed up the analysis</i></p> <p><i>Portfolio: mainly domestic, apart from prison and police All GOK bodies have a payment problem, delays</i></p> <p><i>Supply:</i></p> <p><i>Water shortage, cut off power (1 mio current 600 arrears), then used diesel, diesel from collection 10 hours pumping For 3800 cbm/day</i></p> <p><i>Agricultural consumers, i.e. seasonal payments like the month of March, which requires money for planting, no payment of water.</i></p> <p><i>KCC closed one of the major consumers</i></p> <p><i>If 80 % is collected</i></p> <p><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></p> <p><i>Goodwill to be improved further, involve chairman into building good will</i></p> <p><i>Consolitative meeting, Board and Councillors, frequent Like AGM to explain such that everybody understands 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></p> <p><i>Technically: in the network immediate attendance to a problem, but at production it is a problem.</i></p> <p><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 (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 ³ .)
Between 0m ³ and 10m ³	56	250.00	0	0	2 amounts of 280/= and 480/=	2	10
Between 11m ³ and 20m ³	27		2	0	Range from 280/= to 580/= with intervals of 25/= and 50/=	12	10
Between 21m ³ and 40m ³	8		0	0	Range from 590/= to 1,040/= with intervals of 30/=, 60/=, 90/= and 120/=	8	8
Between 41m ³ and 60m ³	2		0	0	2 amounts of 1,190/= and 1,860/=	2	2
Between 61m ³ and 100m ³	1		0	0	1 amount of 26,95/=	1	1
Over 100m ³	1		0	0	1 amount of 4,285/=	1	1
Totals:	95		2				

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 ³ .)
Between 0m ³ and 10m ³	211		12	16	Range from 200/= to 2,570/=	14	10
Between 11m ³ and 20m ³	76		6	5	Range from 250/= to 1,130/=	16	10
Between 21m ³ and 40m ³	69		15	2	Range from 250/= to 2,570/=	33	18
Between 41m ³ and 60m ³	20		5	0	Range from 570/= to 7,625/=	18	13
Between 61m ³ and 100m ³	7		1	1	Range from 200/= to 11,100/=	7	6
Over 100m ³	16		1	2	Range from 1,235/= to 30,150/=	16	15
Totals:	425		40				

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 ³ .)
Between 0m ³ and 10m ³	25		2	12	Range from 125/= to 300/=	4	10
Between 11m ³ and 20m ³	426		17	44	Range from 161/= to 1,300/=	26	9
Between 21m ³ and 40m ³	105		20	18	Range from 200/= to 1,800/=	38	18
Between 41m ³ and 60m ³	31		4	6	Range from 853/= to 2,435/=	15	11
Between 61m ³ and 100m ³	13		5	0	Range from 1,490/= to 7,070/=	11	6
Over 100m ³	8		0	4	Range from 5,100/= to 18,025/=	8	8
Totals:	692		48				

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 ³ .)
Between 0m ³ and 10m ³	138		0	0	2 amounts of 200/= and 250/=	2	10
Between 11m ³ and 20m ³	35		1	1	Range from 275/= to 475/=	9	8
Between 21m ³ and 40m ³	15		0	0	Range from 560/= to 1,070/=	10	10
Between 41m ³ and 60m ³	6		1	0	Range from 1,190/= to 1,850/=	6	5
Between 61m ³ and 100m ³	2		0	0	2 amounts of 2,165/= and 2,635/=	2	2
Over 100m ³	10		0	0	Range from 4,600/= to 76,650/=	10	10
Totals:	207		2				

<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 dicided, 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>

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

PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX

Problems	Symptoms	Cause	Recommended Change
2. Organization Activities and Procedures			
<p>Consumer Management</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>	<ul style="list-style-type: none"> • Insufficient consumer information • Connections not included in consumer ledger • High UfW • No legal agreement as basis for supply • Information not in compiled format • No comprehensive data base • New Flat Rate consumers. • Meters still provided through the water undertaker. • Issues kept pending due to lack of clear guidance • High rate of meter malfunction 	<ul style="list-style-type: none"> • No control of new applications • Centralised GOK printing • Delays in A/E processing • Insufficient funding • No control over consumer applications and connections / Illegal staff consumer co-operation • No regular review of GOK formats • Insufficient operating and / or outdated implementation guidelines • No guidelines and control on quality standards 	<ul style="list-style-type: none"> • Introduce administration fee for new connection application • Increase connection charges to commercial rates • Decentralise procurement of stationary • Change funding procedure • Redesign application format and other formats • Computerise consumer data base and obtain field information from all existing consumer using the re-designed application format • Design meaningful recording formats and reports. • Prepare implementation guidelines related to gazette notices and relating procedures. • Prepare guidelines on control of new connections • Stop installation of unmetered new connections • Use negative sanctioning as retrenchment criteria.

PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX

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

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

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"> • Low collection efficiency • High consumer complaints 	<ul style="list-style-type: none"> • Incorrect meter reading • No motivation to boost efficiency • Insufficient disconnection • No priority given to major consumers. • Weak or no debt collection systems • No efficient collection monitoring • Lacking information on cost of production and distribution of water 	<ul style="list-style-type: none"> • Control organised disconnection program. • Set up positive and negative staff sanctioning system. • Create staff and stake holder awareness on cost of production and distribution of water • Use negative sanctioning as retrenchment criteria • Design a major consumer monitoring and control system • Computerise for systems > 1000 consumers • Design a suitable, safe and consumer friendly cash collection system
<p>UfW</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"> • High UfW. • Estimated unaccounted for water, as no production figures details available • Limited supply, as high percentage of water lost 	<ul style="list-style-type: none"> • Master meters defunct or non-existent • Majority of consumer meters defunct • Poor maintenance of the reticulation system 	<ul style="list-style-type: none"> • Arrange for servicing facilities for master meters (outsource) • Install flow restriction meters • Set up servicing facility and program for consumer meters • Rehabilitate the existing network • Consider leak detection exercise, depending on the extent of project rehabilitation of the existing network

PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX

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

PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX

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

PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX

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

PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX

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

PROBLEM – SYMPTOM – CAUSE – RECOMMENDATION MATRIX

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

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		MENR		→		
2.	Set up organisation charts with detailed job description and skill requirements.	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		Consultant		→		
4.	Arrange for commercial and technical staff training	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		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		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		Consultant		→		
10.	Redesign consumer recording and reporting formats	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		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		Consultant		→		

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		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		Consultant & MENR		→		
14.	Prepare consumer and connection management guidelines	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		Consultant		→		
17.	Design meter reading / servicing / disconnection schedules and guidelines.	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		Consultant		→		
22.	Propose write off procedure for old debtors	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		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		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	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	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	Webuwe	Mumias	Utility Management Plan	Action to be taken by	Donor involvement recommended	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		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		Consultant and MENR			→	
27.	Decentralise decision making process to station level	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		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		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		Consultant			→	
33.	Set up stock management system and controls	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		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
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 Povincial 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		Consultant		→		
36.	Propose outsourcing criterias for pump maintenance depending on the pump capacity.												Consultant		→		
37.	Include consumer lines into the planned network	x	x	x	x	x	x	x	x	x	x		Consultant and MENR	x	→		
38.	Clarify and document water wayleafs	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		Consultant and MENR	x			→

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 criterias 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 wayleafs	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 C4
MURANG'A
TOWN**

Table C4-1: Water Demand projection for Muranga Town Water Supply

TableC4-1 Demand

Year	Population	Income brackets		Population	Demand rate l/cd	Domestic water demand m ³ /day	Institutional demand m ³ /d	Total demand m ³ /day	Production capacity m ³ /day	Transmission capacity m ³ /d	Storage capacity m ³
		Status	%								
1999	58,007	High	13	7,541	250	1,885	500	8,084	3,240	4,910	2,700
		Middle	44	25,523	150	3,828					
		Low	43	24,943	75	1,871					
2000	60,000	High	13	7,800	250	1,950	500	8,345	3,240	4,910	2,700
		Middle	44	26,400	150	3,960					
		Low	43	25,800	75	1,935					
2001	62,100	High	13	8,073	250	2,018	500	8,620	3,240	4,910	2,700
		Middle	44	27,324	150	4,099					
		Low	43	26,703	75	2,003					
2002	64,300	High	13	8,359	250	2,090	500	8,907	3,240	4,910	2,700
		Middle	44	28,292	150	4,244					
		Low	43	27,649	75	2,074					
2003	66,600	High	13	8,658	250	2,165	500	9,208	3,240	4,910	2,700
		Middle	44	29,304	150	4,396					
		Low	43	28,638	75	2,148					
2004	68,900	High	13	8,957	250	2,239	500	9,509	3,240	4,910	2,700
		Middle	44	30,316	150	4,547					
		Low	43	29,627	75	2,222					
2005	71,300	High	13	9,269	250	2,317	500	9,822	3,240	4,910	2,700
		Middle	44	31,372	150	4,706					
		Low	43	30,659	75	2,299					
2006	73,800	High	13	9,594	250	2,399	500	10,149	3,240	4,910	2,700
		Middle	44	32,472	150	4,871					
		Low	43	31,734	75	2,380					
2007	76,400	High	13	9,932	250	2,483	500	10,489	3,240	4,910	2,700
		Middle	44	33,616	150	5,042					
		Low	43	32,852	75	2,464					
2008	79,100	High	13	10,283	250	2,571	500	10,842	3,240	4,910	2,700
		Middle	44	34,804	150	5,221					
		Low	43	34,013	75	2,551					
2009	81,800	High	13	10,634	250	2,659	500	11,195	3,240	4,910	2,700
		Middle	44	35,992	150	5,399					
		Low	43	35,174	75	2,638					
2010	84,700	High	13	11,011	250	2,753	500	11,575	3,240	4,910	2,700
		Middle	44	37,268	150	5,590					
		Low	43	36,421	75	2,732					

Table C4-2: BUSINESS PLANS FOR Muranga TOWN WATER SUPPLY

CASH FLOWS

Year	1	2	3	4	5	6	7	8	9	10
REVENUE GENERATED										
Revenue from Extra Water Sold	3,335,195	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658
Revenue from Unaccounted for Water	7,883,368	7,883,368	9,443,196	9,443,196	9,443,196	9,443,196	9,443,196	11,003,023	11,003,023	11,003,023
Savings from Collection Efficiency	-	11,179,399	13,614,335	13,614,335	13,614,335	13,614,335	13,614,335	13,614,335	13,614,335	13,614,335
Revenue from Sewerage Charges	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620
Total	23,697,183	37,100,045	41,094,809	41,094,809	41,094,809	41,094,809	41,094,809	42,654,636	42,654,636	42,654,636
Expenditures (Kenya Shilling)										
Transport & Staff Related										
Expenses	4,265,493	6,678,008	7,397,066	7,397,066	7,397,066	7,397,066	7,397,066	7,677,835	7,677,835	7,677,835
O&M	4,739,437	7,420,009	8,218,962	8,218,962	8,218,962	8,218,962	8,218,962	8,530,927	8,530,927	8,530,927
Postage	90,049	140,980	156,160	156,160	156,160	156,160	156,160	162,088	162,088	162,088
Telephone	215,644	337,610	373,963	373,963	373,963	373,963	373,963	388,157	388,157	388,157
Purchase of meters	388,634	608,441	673,955	673,955	673,955	673,955	673,955	699,536	699,536	699,536
Stationery	258,299	404,390	447,933	447,933	447,933	447,933	447,933	464,936	464,936	464,936
Fuel & Gas	1,196,708	1,873,552	2,075,288	2,075,288	2,075,288	2,075,288	2,075,288	2,154,059	2,154,059	2,154,059
Current O&M Costs	(4,947,421)	(4,947,421)	(4,947,421)	(4,947,421)	(4,947,421)	(4,947,421)	(4,947,421)	(4,947,421)	(4,947,421)	(4,947,421)
Incremental O&M Costs	6,206,843	12,516,570	14,395,905	14,395,905	14,395,905	14,395,905	14,395,905	15,130,116	15,130,116	15,130,116
Surplus(Deficit)	17,490,340	24,584,475	26,698,903	26,698,903	26,698,903	26,698,903	26,698,903	27,524,520	27,524,520	27,524,520
Average Tariff (Kshs/m3)	31.08	31.08	31.08	31.08	31.08	31.08	31.08	31.08	31.08	31.08
Investment Costs										
Net Cash Flow	17,490,340	24,584,475	26,698,903	26,698,903	26,698,903	26,698,903	26,698,903	27,524,520	27,524,520	27,524,520
Cumulative Cash Flow	17,490,340	42,074,815	68,773,718	95,472,621	122,171,525	148,870,428	175,569,331	203,093,851	230,618,371	258,142,891

Table C4-3 Financial Cashflow

Table C4-3: Financial Cash Flow for Muranga Town Water Supply

Year	Investment Cost	O&M Cost	Total Cost	Water Revenue	Net Revenue
1	103,059,360	6,206,843	109,266,203	23,697,183	(85,569,020.05)
2	180,120,000	12,515,570	192,635,570	37,100,045	(155,535,525)
3	84,850,320	14,395,905	99,246,225	41,094,809	(58,151,417)
4	18,610,320	14,395,905	33,006,225	41,094,809	8,088,583
5		14,395,905	14,395,905	41,094,809	26,698,903
6	-	14,395,905	14,395,905	41,094,809	26,698,903
7	-	14,395,905	14,395,905	41,094,809	26,698,903
8	-	15,130,116	15,130,116	42,654,636	27,524,520
9	-	15,130,116	15,130,116	42,654,636	27,524,520
10	-	15,130,116	15,130,116	42,654,636	27,524,520
Total	386,640,000	136,092,289	522,732,289	394,235,180	(128,497,109)

Average Tariff Rate (Ksh/m3)	31.08
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FIRR	-10%
NPV	(149,482,588)
RER	0.754

Table C4-4 Economic Cashflow

Table C4-4: Economic Cash Flow for Muranga Town Water Supply

Year	Economic Investment Cost	O&M Cost	Total Cost	Economic Benefit	Net Revenue
1	109,809,360	6,206,843	116,016,203	62,990,620	(53,025,583)
2	180,120,000	12,515,570	192,635,570	65,979,029	(126,656,542)
3	84,850,320	14,395,905	99,246,225	69,103,275	(30,142,951)
4	18,610,320	14,395,905	33,006,225	72,227,521	39,221,295
5		14,395,905	14,395,905	75,487,603	61,091,698
6		14,395,905	14,395,905	78,883,523	64,487,617
7		14,395,905	14,395,905	82,415,279	68,019,374
8		15,130,116	15,130,116	86,082,872	70,952,756
9		15,130,116	15,130,116	89,750,465	74,620,349
10		15,130,116	15,130,116	93,689,732	78,559,616
Total	393,390,000	136,092,289	529,482,289	776,609,918	247,127,629

Current Tariff Rate (Ksh/m³)	31.08
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EIRR		16%
NPV		148,853,693
CBR		0.682

Table C4-5 Economic Benefits

Muranga TOWN WATER SUPPLY

Table C4-5: Estimated Benefit of time saved through water carrying.

Year	Population served	Number of Household	Current Households Served	Projected Households Served	Additional Households Served	Water Carriage Benefit	Health Benefit	Health Costs Saved	Total Benefits
2001	62,100	10,525	933	3684	2751	47,191,660	12,379,042	3,419,917	62,990,620
2002	64,300	10,898	933	3814	2881	49,430,533	12,966,331	3,582,165	65,979,029
2003	66,600	11,288	933	3951	3018	51,771,173	13,580,314	3,751,788	69,103,275
2004	68,900	11,678	933	4087	3154	54,111,813	14,194,297	3,921,411	72,227,521
2005	71,300	12,085	933	4230	3297	56,554,220	14,834,975	4,098,409	75,487,603
2006	73,800	12,508	933	4378	3445	59,098,393	15,502,347	4,282,782	78,883,523
2007	76,400	12,949	933	4532	3599	61,744,334	16,196,415	4,474,530	82,415,279
2008	79,100	13,407	933	4692	3759	64,492,042	16,917,178	4,673,652	86,082,872
2009	81,800	13,864	933	4853	3920	67,239,749	17,637,941	4,872,775	89,750,465
2010	84,700	14,356	933	5025	4092	70,190,991	18,412,093	5,086,648	93,689,732
Total	729,000					581,824,909	152,620,932	42,164,076	776,609,918

Current Tariff Rate	Kshs.	31.08				31.08
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Note:

The benefits increase with increase in population

Table C4-6 Est Water Revenue

Table C4-6: ESTIMATED WATER REVENUE - Muranga

YEAR	0	1	2	3	4	5	6	7	8	9	10	11
Design production capacity (m ³ /day)	3,240	3,240	3,240	3,240	3,240	3,240	3,240	3,240	3,240	3,240	3,240	3,240
ditto (million m ³ /year)	1.183	1.183	1.183	1.183	1.183	1.183	1.183	1.183	1.183	1.183	1.183	1.183
Current daily production (m3/day)	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
Current daily water sales (m3/day)		1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368
Projected population	58,007	60,000	62,100	64,300	66,600	68,900	71,300	73,800	76,400	79,100	81,800	84,700
Projected daily demand (m ³ /day)	8,084	8,345	8,620	8,907	9,208	9,509	9,822	10,149	10,489	10,842	11,195	11,575

	Kshs	31.08	31.08	31.08	31.08	31.08	31.08	31.08	31.08	31.08	31.08	31.08
Average Tariff												
Revenue from Extra Water Sold	Kshs	3,335,195	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658	5,558,658
Revenue from Unaccounted for Water	Kshs	7,883,368	7,883,368	9,443,196	9,443,196	9,443,196	9,443,196	9,443,196	9,443,196	11,003,023	11,003,023	11,003,023
Savings from Collection Efficiency	Kshs	-	11,179,399	13,614,335	13,614,335	13,614,335	13,614,335	13,614,335	13,614,335	13,614,335	13,614,335	13,614,335
Revenue from Sewerage Charges	Kshs	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620	12,478,620
Total Financial Benefits	Kshs	23,697,183	37,100,045	41,094,809	41,094,809	41,094,809	41,094,809	41,094,809	41,094,809	42,654,636	42,654,636	42,654,636

Table C4-7: 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	18,164.20
Meru	Meru	5.6	7.1	6	9,320.70
Murang'a	Murang'a	5.3	7.2	5.9	11,512.90
Baringo	Kabarnet	4.5	6.5	5.1	9,532.90
Makueni	Makindu	4.7	7	6.2	5,520.10
Taita-Taveta	Wundanyi	3.5	5.3	4.2	3,526.10
Migori	Migori	4.9	6.4	5.3	6,641.20
Lamu	Lamu	4.3	6.3	4.7	10,321.30
Bungoma	Webuye	6.2	7.1	6.6	7,981.70
Butere-Mumi	Mumias	4.8	6.3	5.5	7,270.20

Source: Welfare Monitoring Survey II, 1994

Table C4-8: Muranga Institutional Development Costs

No.	Activity	Bases of cost estimate	Estimated cost (Ksh.)
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	39,600,000
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
Sub -total			50,400,000
Contingency (10%)			5,040,000
Total			55,440,000

Table C4-9 Financial Costs

Table C4-9: Financing Plan - Muranga TOWN WATER SUPPLY

	1	2	3	4	Total
	Kshs	Kshs	Kshs	Kshs	Kshs
Institutional Development Costs	11,880,000	14,520,000	14,520,000	14,520,000	55,440,000
Consultancy Fees for Works (20% of works)	15,196,560	27,600,000	11,721,720	681,720	55,200,000
Water Supply Rehabilitation	72,574,200	120,957,000	48,382,800		241,914,000
Sanitation Rehabilitation	3,408,600	17,043,000	10,225,800	3,408,600	34,086,000
Total Overall Project Cost	103,059,360	180,120,000	84,850,320	18,610,320	386,640,000

Table C4-10 Economic Costs

Table C4-10: Economic Investment Costs - Muranga TOWN WATER SUPPLY

	1	2	3	4	Total
	Kshs	Kshs	Kshs	Kshs	Kshs
Institutional Development Costs	11,880,000	14,520,000	14,520,000	14,520,000	55,440,000
Household costs	6,750,000				6,750,000
Consultancy Fees for Works (20% of works)	15,196,560	27,600,000	11,721,720	681,720	55,200,000
Water Supply Rehabilitation	72,574,200	120,957,000	48,382,800	-	241,914,000
Sanitation Rehabilitation	3,408,600	17,043,000	10,225,800	3,408,600	34,086,000
Total Overall Project Cost	109,809,360	180,120,000	84,850,320	18,610,320	393,390,000

Table C4-11: Financial Sensitivity Analysis - Increase Project Life to 15 years

Financial Cash Flow for Muranga Town Water Supply

Year	Investment Cost	O&M Cost	Total Cost	Water Revenue	Net Revenue
1	103,059,360	6,206,843	109,266,203	23,697,183	(85,569,020)
2	180,120,000	12,515,570	192,635,570	37,100,045	(155,535,525)
3	84,850,320	14,395,905	99,246,225	41,094,809	(58,151,417)
4	18,610,320	14,395,905	33,006,225	41,094,809	8,088,583
5		14,395,905	14,395,905	41,094,809	26,698,903
6	-	14,395,905	14,395,905	41,094,809	26,698,903
7	-	14,395,905	14,395,905	41,094,809	26,698,903
8	-	15,130,116	15,130,116	42,654,636	27,524,520
9	-	15,130,116	15,130,116	42,654,636	27,524,520
10	-	15,130,116	15,130,116	42,654,636	27,524,520
11	-	15,130,116	15,130,116	42,654,636	27,524,520
12	-	15,130,116	15,130,116	42,654,636	27,524,520
13	-	15,130,116	15,130,116	42,654,636	27,524,520
14	-	15,130,116	15,130,116	42,654,636	27,524,520
15	-	15,130,116	15,130,116	42,654,636	27,524,520
Total	386,640,000	211,742,870	598,382,870	607,508,360	9,125,490

Average Tariff Rate (Ksh/m3) 31.08

FIRR		0%
NPV		(66,702,824)
RER		1.015

Table C4-12: Financial Sensitivity Analysis - Increase Project Life to 15 years + Investment Cost & O&M by 15%

Financial Cash Flow for Muranga Town Water Supply

Year	Investment Cost	O&M Cost	Total Cost	Water Revenue	Net Revenue
1	118,518,264	7,137,869	125,656,133	23,697,183	(101,958,951)
2	207,138,000	14,392,906	221,530,906	37,100,045	(184,430,861)
3	97,577,868	16,555,291	114,133,159	41,094,809	(73,038,351)
4	21,401,868	16,555,291	37,957,159	41,094,809	3,137,649
5		16,555,291	16,555,291	41,094,809	24,539,517
6	-	16,555,291	16,555,291	41,094,809	24,539,517
7	-	16,555,291	16,555,291	41,094,809	24,539,517
8	-	17,399,634	17,399,634	42,654,636	25,255,002
9	-	17,399,634	17,399,634	42,654,636	25,255,002
10	-	17,399,634	17,399,634	42,654,636	25,255,002
11	-	17,399,634	17,399,634	42,654,636	25,255,002
12	-	17,399,634	17,399,634	42,654,636	25,255,002
13	-	17,399,634	17,399,634	42,654,636	25,255,002
14	-	17,399,634	17,399,634	42,654,636	25,255,002
15	-	17,399,634	17,399,634	42,654,636	25,255,002
Total	444,636,000	243,504,301	688,140,301	607,508,360	(80,631,940)

Average Tariff Rate (Ksh/m3) 31.08

FIRR		-3%
NPV		(143,378,258)
RER		0.883

Table C4-13: Financial Sensitivity Analysis - Finance by Grant

Financial Cash Flow for Muranga Town Water Supply

Year	Investment Cost	O&M Cost	Total Cost	Water Revenue	Net Revenue
1	103,059,360	6,206,843	109,266,203	23,697,183	(85,569,020)
2	180,120,000	12,515,570	192,635,570	37,100,045	(155,535,525)
3	84,850,320	14,395,905	99,246,225	41,094,809	(58,151,417)
4	18,610,320	14,395,905	33,006,225	41,094,809	8,088,583
5		14,395,905	14,395,905	41,094,809	26,698,903
6	-	14,395,905	14,395,905	41,094,809	26,698,903
7	-	14,395,905	14,395,905	41,094,809	26,698,903
8	-	15,130,116	15,130,116	42,654,636	27,524,520
9	-	15,130,116	15,130,116	42,654,636	27,524,520
10	-	15,130,116	15,130,116	42,654,636	27,524,520
11	-	15,130,116	15,130,116	42,654,636	27,524,520
12	-	15,130,116	15,130,116	42,654,636	27,524,520
13	-	15,130,116	15,130,116	42,654,636	27,524,520
14	-	15,130,116	15,130,116	42,654,636	27,524,520
15	-	15,130,116	15,130,116	42,654,636	27,524,520
Total	386,640,000	211,742,870	598,382,870	607,508,360	9,125,490

Average Tariff Rate (Ksh/m3) 31.08

FIRR		0%
NPV		9,125,490
RER		1.015

Table C4-14: Economic Sensitivity Analysis - Increase Economic Investment Costs by 15%

Economic Cash Flow for Muranga Town Water Supply

Year	Economic Investment Cost	O&M Cost	Total Cost	Economic Benefit	Net Revenue
1	126,280,764	6,206,843	132,487,607	62,990,620	(69,496,987)
2	207,138,000	12,515,570	219,653,570	65,979,029	(153,674,542)
3	97,577,868	14,395,905	111,973,773	69,103,275	(42,870,499)
4	21,401,868	14,395,905	35,797,773	72,227,521	36,429,747
5		14,395,905	14,395,905	75,487,603	61,091,698
6		14,395,905	14,395,905	78,883,523	64,487,617
7		14,395,905	14,395,905	82,415,279	68,019,374
8		15,130,116	15,130,116	86,082,872	70,952,756
9		15,130,116	15,130,116	89,750,465	74,620,349
10		15,130,116	15,130,116	93,689,732	78,559,616
Total	452,398,500	136,092,289	588,490,789	776,609,918	188,119,129

Current Tariff Rate (Ksh/m3) 31.08

EIRR		11%
NPV		94,335,174
CBR		0.758

Table C4-15: Economic Sensitivity Analysis - Increase O&M Costs by 15%

Economic Cash Flow for Muranga Town Water Supply

Year	Economic Investment Cost	O&M Cost	Total Cost	Economic Benefit	Net Revenue
1	109,809,360	7,137,869	116,947,229	62,990,620	(53,956,610)
2	180,120,000	14,392,906	194,512,906	65,979,029	(128,533,877)
3	84,850,320	16,555,291	101,405,611	69,103,275	(32,302,337)
4	18,610,320	16,555,291	35,165,611	72,227,521	37,061,909
5		16,555,291	16,555,291	75,487,603	58,932,312
6		16,555,291	16,555,291	78,883,523	62,328,232
7		16,555,291	16,555,291	82,415,279	65,859,988
8		17,399,634	17,399,634	86,082,872	68,683,238
9		17,399,634	17,399,634	89,750,465	72,350,832
10		17,399,634	17,399,634	93,689,732	76,290,098
Total	393,390,000	156,506,132	549,896,132	776,609,918	226,713,785

Current Tariff Rate (Ksh/m3) 31.08

EIRR		15%
NPV		132,548,776
CBR		0.708

TableC4-16E- Sensitivity Case3

Table C4-16: Economic Sensitivity Analysis - Increase Economic Investment Costs and O& M by 15%

Economic Cash Flow for Muranga Town Water Supply

Year	Economic Investment Cost	O&M Cost	Total Cost	Economic Benefit	Net Revenue
2001	126,280,764	7,137,869	133,418,633	62,990,620	(70,428,014)
2002	207,138,000	14,392,906	221,530,906	65,979,029	(155,551,877)
2003	97,577,868	16,555,291	114,133,159	69,103,275	(45,029,885)
2004	21,401,868	16,555,291	37,957,159	72,227,521	34,270,361
2005		16,555,291	16,555,291	75,487,603	58,932,312
2006		16,555,291	16,555,291	78,883,523	62,328,232
2007		16,555,291	16,555,291	82,415,279	65,859,988
2008		17,399,634	17,399,634	86,082,872	68,683,238
2009		17,399,634	17,399,634	89,750,465	72,350,832
2010		17,399,634	17,399,634	93,689,732	76,290,098
Total	452,398,500	156,506,132	608,904,632	776,609,918	167,705,285

Current Tariff Rate (Ksh/m3)	31.08
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EIRR		9%
NPV		78,030,257
CBR		0.784

Table C4-17-rehab-costs-water

Table C4.17 : Cost estimates of rehabilitation works for Muranga Water Supply				
New zonal bulk meters (100/150mm diameter)	nr	12	250,000	3,000,000
New consumer meters (replacement and stock)	nr	1,500	6,000	9,000,000
Meter test bench	nr	1	3,500,000	3,500,000
O & M tool kits and equipment	nr	3	250,000	750,000
subtotal				58,250,000
ENEP Ring and distribution mains				55,421,000
Logistical facilities and equipment				
New office and laboratory facilities at MENR District water office and treatment works sites	m ²	400	25,000	10,000,000
4WD twin-cab pickups	nr	2	2,500,000	5,000,000
4WD standard vehicles	nr	2	1,500,000	3,000,000
Motorcycles for line patrols, disconnections, meter readings, etc.	nr	6	250,000	1,500,000
Multi-gear mountain bikes	nr	2	25,000	50,000
Desk top computer setups	nr	6	200,000	1,200,000
Printers	nr	2	100,000	200,000
Licensed standard computer software	Sum			1,000,000
Standard office equipment, furniture and fittings	Sum			1,500,000
subtotal				23,450,000
Overall Total				175,300,000
Add 20% P&G				35,060,000
Sub-total				210,360,000
Add 15% Contingencies				31,554,000
Sub-total				241,914,000
Add 20% consultancy design fees				48,382,800
GRAND TOTAL				290,296,800