5 EXISTING WASTE WATER DISPOSAL & SANITATION CONDITIONS

5.1 SANITATION SYSTEM

5.1.1 The Municipal Sewerage System

About 20% of the town area is served by the existing municipal sewerage system. The area served is mainly residential and the central business district. The CBD covers the town centre and the market area south-east of the centre. The existing sewerage system is shown on Figure 5.1.

The sewerage system was constructed in 1974 with gravity flow to a central sewage treatment plant. Most of the existing sewers are 6 inch concrete pipes. There is a short section of 9 inch and closer to the sewage treatment works the sewer size is 15 inch and finally 18 inch. One section of sewer passes underneath the Telkom building.

The manholes originally had cast iron covers, a significant number of which have been vandalised. Although the council has replaced some of the covers with concrete ones, there are still a significant number of manholes without covers. The public uses these manholes as solid waste receptacles leading to frequent blocking of the system.

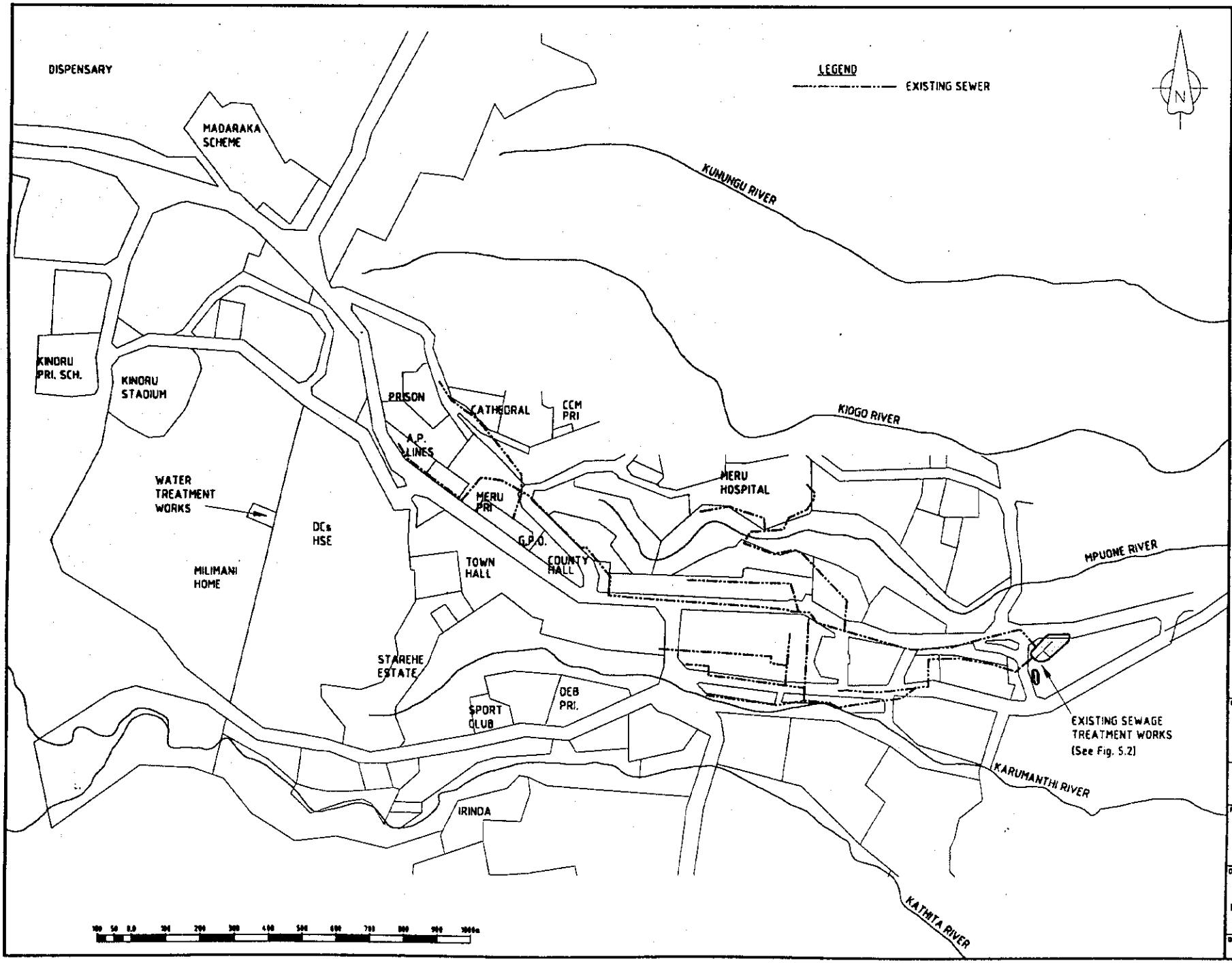
5.1.2 Sewage Treatment Works (STW)

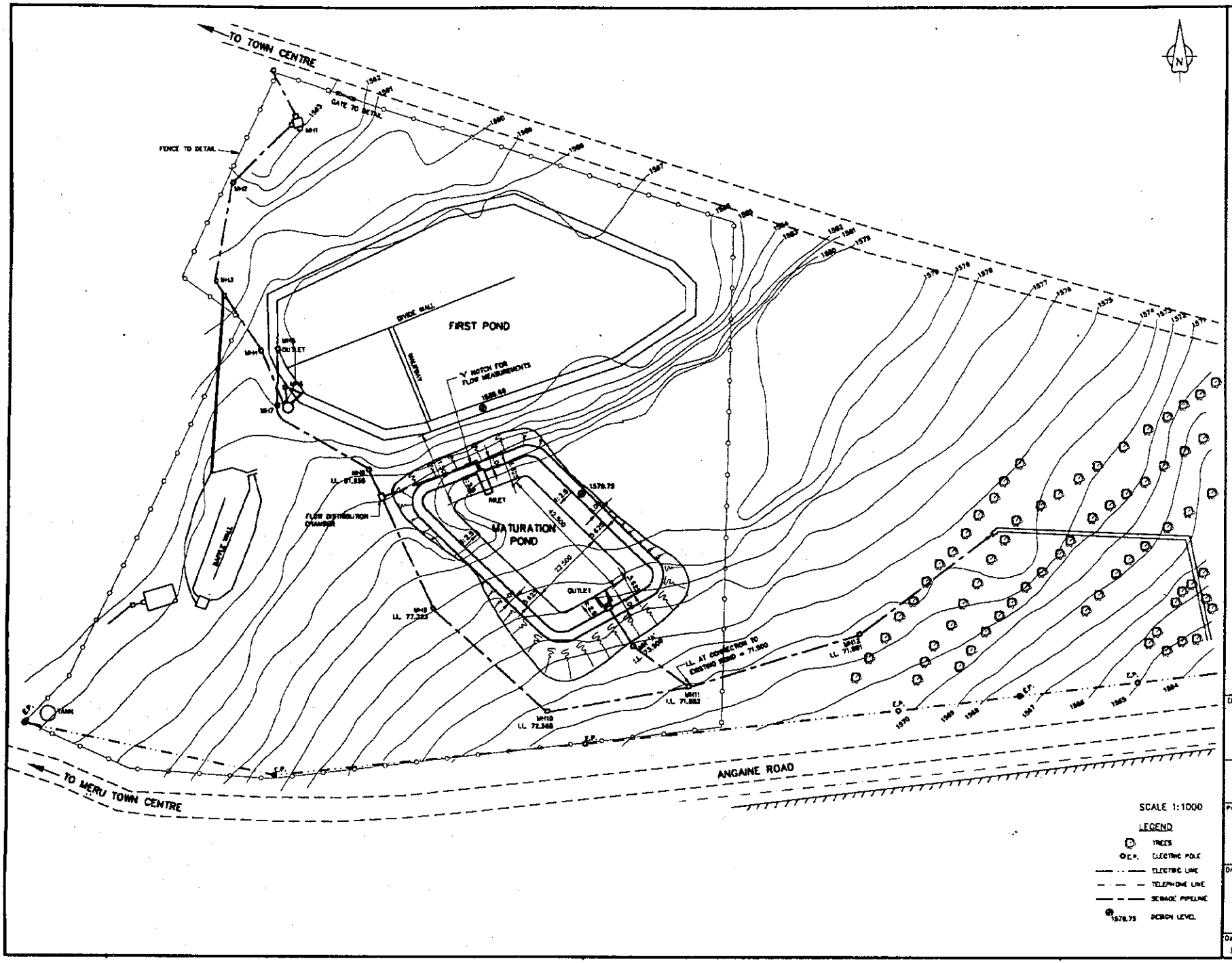
The existing sewage treatment plant comprising of a waste stabilisation pond system has been constructed in two phases. In 1994 the an inlet works and a single pond with a division wall which separated the anaerobic and facultative sections were constructed. A second maturation pond was constructed in 1997 to improve the effluent quality. The existing sewage treatment plant layout is shown in Figure 5.2.

Effluent from the second pond was disposed by percolation through a series of pipes branching from a central open concrete channel. Eucalyptus trees planted in the disposal area have grown into very large specimens. The system is not operational at present, most of the pipe disposal network having been blocked.

The first pond is nearly full of sludge at the inlet end and is in need of desludging. The council has constructed a temporary holding pond, which at the time of the site inspection was almost full of with sewage.

The screening facility at the inlet works does not function and solid waste in the incoming sewage reaches the ponds.


DISPENSARY
MADARAKA SCHEME
KINORU PRI. SCH.
KINORU STADIUM
WATER TREATMENT WORKS
DCs HSE
MILIMANI HOME
PRISON
CATHEDRAL
CCM PRI
A.P. LINES
MERU PRI
G.P.O.
TOWN HALL
COUNTY HALL
MERU HOSPITAL
STAREHE ESTATE
SPORT CLUB
OEB PRI.
IRINDA
KUNUNGU RIVER
KIOGO RIVER
MPUONE RIVER
KARUMANTHI RIVER
KATHITA RIVER
EXISTING SEWAGE TREATMENT WORKS
(See Fig. 5.2)
LEGEND
EXISTING SEWER
N
NOTE
INFORMATION EXTRACTED FROM MERU SEWERAGE PROJECT DRAWINGS BY WAHLIBI CONSULTING ENGINEERS DATED APRIL 1983.
Client
JAPAN INTERNATIONAL CO-OPERATION AGENCY
GIBB Eastern Africa
LAWGIBB Group Member
Project Title
TEN TOWNS WATER SUPPLY & SANITATION STUDY
Drawing Title
MERU TOWN EXISTING SEWERAGE NETWORK AND TREATMENT WORKS
Date
JAN 2001
Fig. No.
5.1



Client
JAPAN INTERNATIONAL CO-OPERATION AGENCY

GIBB Eastern Africa
LAWGIBB Group Member

Project Title
TEN TOWNS WATER SUPPLY & SANITATION STUDY

Drawing Title
MERU TOWN
EXISTING SEWAGE TREATMENT PONDS

Date
FEB. 2001

Fig. No.
5.2

5.2 SEWERAGE SYSTEM (O&M)

The Town Engineer's department of Meru Municipal Council is responsible for the operation and maintenance of the municipal sewerage system. The O&M staff have limited equipment (only manual rodding equipment) for un-blocking and cleaning the sewers. They also lack transport and normally go on foot.

5.3 SEWAGE TREATMENT WORKS (O&M)

The Town Engineer's department of Meru Municipal Council is responsible for the operation and maintenance of the sewage treatment works. They do not have access to basic equipment for the operation and maintenance of the treatment works. They would therefore not be able to carry out any desludging of the ponds or un-blocking of the percolation system.

There is no flow measuring device at the treatment works. The most recent sewage analysis dates back to 14 May 1996 before the implementation of the second pond. The results of the analysis are given in Table 5.1.

Table 5.1 : Results of sample analysis carried out in 1996.

Parameter	Influent	Effluent
Ph	6.7	7.0
Suspended Solids (mg/l)	78	44
BOD (mg/l)	140	60
COD (mg/l)	192	64

It is evident from the results that the sewage treatment works was not capable of producing the required effluent quality. As mentioned earlier, a new maturation pond was constructed in 1997, however, no analysis is available after 1997 to ascertain current plant performance.

5.4 OTHER DISPOSAL FACILITIES

5.4.1 Non-sewered areas

Sanitation in areas not served by the sewerage system is by use of septic tanks followed by soakage into the ground, or by the use of pit latrines. The soil within the municipality is predominantly red coffee soil with little or no rock. This type of soil has good percolation characteristics and is therefore suitable for disposal of septic tank effluent and for construction of pit latrines. However these systems are recommended for areas of low population density and specifically for areas where adequate land is available for safe disposal of effluent.

A large area of the municipal area is served by septic tanks. The Council does not have a septic tank exhauster and the public relies on the one belonging to the Ministry of Public Works. This exhauster serves the whole district.

5.5 ON-GOING OR PLANNED EL NINO WORKS

There are no works planned under the El Nino Emergency Project for the sewerage system or treatment works.

5.6 OTHER WORKS AND PROJECTS

There are currently no other works planned.

5.7 SUMMARY OF SHORTCOMINGS AND PRELIMINARY RECOMMENDATIONS FOR REHABILITATION

The shortcomings of the system are summarised as follows:

- The sewers are undersized for a municipal system as the minimum size is 225mm.
- Only the central business district and nearby housing is served. The system has not been expanded to newly developed commercial and high density residential areas.
- The system is not well maintained and missing manhole covers have not been replaced thus increasing the risk of blockages and increasing the frequency of maintenance.
- The inlet / screening facility is not operational and not friendly to use.
- The existing ponds are full of sludge and require desludging.
- The existing effluent disposal system is not operational and requires an immediate solution.
- The system is not monitored to check performance.
- There is only one septic tank exhauster serving the whole district.

The recommended improvement measures for the existing system are:

- Sewer system:

  1. Provide concrete covers on all manholes without covers.
  2. Realign the sewer that is below the Telcom building.
  3. Un-block and clean all sewer lines.

- Sewage treatment works:

  1. Construct a new inlet works with flow measurement facilities and screens.

2. Excavate the existing percolation system and rehabilitate or design a new effluent disposal system.
3. Desludge the existing first pond.
4. Carry out regular sewage analysis to monitor the treatment plant performance.
5. The council should operate its own or licence private septic tank exhausters to serve in Meru as this will ensure proper functioning of the system.

6 PROPOSED STRATEGY FOR WASTEWATER DISPOSAL AND SANITATION REHABILITATION

6.1 DEMAND FOR SANITATION SERVICES

Apart from the central business district and nearby residential areas which are served by a waterborne sewerage system, the remaining area within Meru town depends on on-plot sanitation facilities which includes septic tanks with soakage pits and pit latrines. The soils in the area are suitable for on-site disposal of wastewater.

However it was reported that in the current high density commercial and residential areas developed around the central business district area, these on plot sanitation systems are overloaded and are beginning to overflow. This may be as a result of not emptying the septic tanks regularly. Lack of availability of exhausters or public awareness could be contributing to the problems.

The existing 150 mm diameter sewers are undersize and are subject to frequent blockages. It is therefore necessary to replace the undersize sewers with adequate pipes. In addition it is necessary to expand the town sewerage system to the high density commercial and residential areas to alleviate the current problem of overflowing soakage pits in order to safeguard public health.

6.2 DEMAND FOR WASTE WATER DISPOSAL SERVICES

Once the sewerage system is expanded, it will be necessary to expand the sewage treatment plant to cater for the anticipated future sewage flows. The sewage treatment works should be relocated to the site recommended under the 1983 Meru Sewerage Project carried out by Wanjohi Consulting Engineers.

6.3 REHABILITATION REQUIREMENTS

The existing sewer system and sewage treatment works must be rehabilitated in order to serve the existing served areas and abate the pollution of the environment. The proposed rehabilitation works are:

- Replace manhole covers,
- Unblock and clean sewer lines,
- Desludge the existing ponds,
- Construct a new inlet works,
- Rehabilitate the effluent percolation system.

6.4 PRELIMINARY DESIGN OF RECOMMENDED REHABILITATION OPTIONS

6.4.1 Inlet Works

The existing inlet works and screen is too deep to be manually operated and is thus neglected with the result that gross solids enter the ponds and increase the volume of sludge accumulation. It is recommended that the new inlet works be designed for manually operated screens and cater for comfortable access for the operators. There should be a by-pass to the screen in the event that the screen is left unattended for long periods of time. It is also recommended that a flow-recording device such as an ultrasonic flow recorder, be incorporated in the inlet works.

6.4.2 Effluent Disposal System

The existing effluent system needs rehabilitation. The existing percolation pipes should be manually excavated, cleaned, and re-laid with a new gravel pack around it before backfilling with suitable material. The trench feeding the percolation pipes should be covered in order to prevent the entry of vegetation, which compounds the problem of blockage. The existing system will work in the short term for the existing flows.

6.4.3 Manhole Covers

It is recommended that the new manhole covers be made of concrete which will be less prone to vandalism.

6.4.4 Other Works

The other works include un-blocking sewers and desludging of the ponds, which are routine operations. In the contract for implementation of the works, the procurement of sewer maintenance equipment should be included.

6.5 COSTING OF RECOMMENDED REHABILITATION PLAN

An indicative cost estimate for the immediate rehabilitation works for Meru sewerage system is given in Table 6.1.

Table 6.1 Cost estimate for the rehabilitation works

Item No.	Item description	Unit	Quantity	Rate Kshs	Cost Kshs
1	Desludging of the existing ponds	Item			2,400,000
2	New inlet works	Item			1,500,000
3	Rehabilitate effluent percolation system.	**Item**			1,600,000
4	Replace manhole covers	Item			800,000
5	Unblock and clean sewer lines	Item			1,500,000
6	Maintenance equipment	Item			250,000
	Subtotal				**8,050,000**
	Add 20% P&G				1,610,000
	Subtotal				9,660,000
	Add 15% contingencies				1,449,000
	Total				9,499,000
	Add 20% consultancy				1,899,800
	Grand total				**11,398,800**

6.6 FUTURE EXPANSION NEEDS OF THE MUNICIPALITY

It will be necessary to expand the sewerage network to covers new areas designated as high and medium density residential areas as well as the commercial section. The expansion of the sewerage system and the sewage treatment plant should be in line with the recommendations under the 1983 Meru Sewerage Project carried out by Wanjohi Consulting Engineer's. The layout of the proposed expansion is shown in Figure 6.1.

6.7 COST ESTIMATES FOR THE FUTURE EXPANSION NEEDS

An indicative cost estimate for the recommended sewerage and sewage treatment plant extensions are given in Table 6.2 below. The quantities are based on the 1983 sewerage project and costs projected to current market rates.

Table 6.2 : Cost estimate for future extensions of the sewerage system

Item No.	Item description	Unit	Quantity	Rate Kshs	Cost Kshs
1	Construction of sewers in the town centre	M	38,000	8,000	304,000,000
2	Construction of a new sewage treatment plant	Item			280,000,000
	Subtotal				**584,000,000**
	Add 20% P&G				116,800,000
	Subtotal				700,800,000
	Add 15% contigencies				105,120,000
	Total				805,920,000
	Add 20% consultancy				161,184,000
	Grand total				**967,104,000**

6.8 OPERATION AND MAINTENANCE COST FOR THE REHABILITATED SYSTEM

It will be necessary to increase the current number of the operation and maintenance staff in order to ensure effective performance of the sewers and sewage treatment plant. The proposed staffing and the estimated operation and maintenance cost for the rehabilitated system are given in Table 6.3.

Table 6.3 : Estimated operation and maintenance cost

Item description	Number of staff	Annual cost per person, (Kshs)	Total annual cost (Kshs)
Labourers for sewer maintenance	5	144,000	720,000
Labourers for sewage treatment plant	6	144,000	864,000
Foremen for both sewerage and sewage treatment plant	2	180,000	360,000
Superintendent	1	204,000	204,000
Total staff cost			**2,148,000**
Add 10% for protective garments and maintenance equipment			**214,800**
Grand total			**2,363,000**

7.0 LAWS AND REGULATIONS OF ENVIRONMENTAL IMPACT

7.1 GENERAL

The current Government of Kenya policy requirement stipulates that before any major development project is undertaken in the public or private sector, there is need to carry out Environmental Impact Assessment (EIA) on the project in order to ensure that each component conforms to good environmental management. This study involves mainly the identification of laws and regulations that govern the environmental impact assessment of water supply and sanitation projects.

7.2 LEGISLATION/REGULATIONS GOVERNING ENVIRONMENTAL IMPACT ASSESSMENT

7.2.1 General

A large number of Acts and organizations deal with issues of pollution, environmental degradation and conservation. These include among others:

- Constitution of Kenya (especially Section 71)
- Water Act (Cap 372)
- Agriculture Act (Cap 318)
- Irrigation Act (Cap 347)
- Forests Act (Cap 385)
- Lakes and Rivers Act (Cap 409)
- Maritime Zone Act (Cap 371)
- River Basin Development Authorities Act (e.g. Cap 443)
- Land Tenure and Land Use Legislation
- Wildlife (Conservation and Management) Act (1976 and 1989 Amendment)
- Public Health Act (Cap 242)
- Local Government Act (Cap 265)
- Environmental Management and Co-ordination Act (1999)

Effectiveness in enforcement has not been commensurate with the many acts and regulations; in some instances there have been contradictions when an institution has evoked its act at the expense of proper operation of facilities belonging to another institution. The reason for the foregoing situation is that each sector utilizing water, apart from the water authority, has different objectives; their primary focus is not water development. The need to harmonize the application of the various Acts and Regulations, for effective protection of the environment, has been felt and expressed for a long time; hence the birth of the Environmental Management and Co-ordination Act of 1999.

7.2.2 Environmental Management and Co-ordination Act (1999)

The most significant Act that specifically addresses environmental impact is the newly enacted Environmental Management and Co-ordination Act, 1999. Among the specific issues related to EIA procedures are stipulated in the Act as follows:

- Establishment of Environmental Management Authority (NEMA) to administer the Act.
- Submission of an EIA Report to NEMA by developers before undertaking any new project specified in the Act.
- Issue of an Environmental Impact License by NEMA if it is satisfied with the EIA Report.
- Environmental Impact Assessment to be conducted in accordance with the EIA guidelines and procedures provided in the 4th schedule of the Act.

7.2.3 Laws Relating Specifically to Water Supply and Sanitation

Within the Environmental Management and coordination Act, a number of sections dealing specifically with water and sanitation can be identified as follows:

- Part V Section 42 dealing with protection of rivers, lakes and wetlands,
- Part VIII Section 72 dealing with water pollution prohibition,
- Part VIII Section 74 dealing with effluents to be discharged into the sewerage system,
- Part VIII Section 86 dealing with standards for waste,
- Part VIII Section 87 dealing with prohibition against dangerous handling and disposal of wastes,
- Part VIII Sections 88 and 89 dealing with waste licenses and licensing of waste disposal sites,
- Part VIII Sections 91 – 93 dealing with hazardous wastes and their disposal,
- Part XIII dealing with environmental offences and related penalties.

In order to minimize the conflicts in enforcement (due to the many different Acts and Regulations) as mentioned before, the Environmental Management and Coordination Act stipulates that where the provisions of any existing law conflicts with the provisions of this Act, then the provisions of this Act shall prevail. The foregoing proviso, in conjunction with the multi-disciplinary or composition of the Environmental Committees will hopefully enhance the effectiveness of administration and enforcement of the Act.

7.2.4 Environmental Impact Assessment (Guidelines and Administrative Procedures)

The format of the EIA Report has been set out in the guidelines and should include the following sections:

- Introduction
- Title of the Project
- Project Initiator
- Statement of Need
- Project Description
- Project Options
- Description of Existing Environment
- Results of Preliminary Assessment
- Detailed Examination of Impacts
- Suggested Mitigation and Abatement measures
- Residual Impacts
- Project Evaluation
- Summary Conclusions

In addition, the EIA guidelines and procedures describe procedures to be used in environmental planning and management in Kenya. It also gives a checklist of sectors, which can provide guidance to the public and private sector agencies involved in initiating development projects.

7.2.5 Objectives of Environmental Impact Assessment

The objectives of Environmental Impact Assessment Study for this project are identified as follows:

- To identify the existing environmental concerns which need to be taken into account in the proposals for rehabilitation of water supply and sanitation system.
- To evaluate the environmental impacts of the proposed rehabilitation works.
- To propose the counter measures to mitigate the impacts.
- To make recommendations for environmental conservation.

7.3 INITIAL ENVIRONMENTAL EXAMINATION

7.3.1 Water Quality of Existing Supplies

The programme for monitoring water quality both at source and within the distribution systems is in place in Meru town, however, implementation is generally poor because of lack of appropriate and adequate laboratory equipment and reagents. Water quality analysis results were available for pH, residual chlorine and turbidity. Meru obtains its water from river and spring sources. Both the spring and surface sources in Meru are of fairly high quality requiring minimal treatment.

7.3.2 Existing Sanitation Situation

Meru has a sewerage system for management of wastewater. It was not found useful to determine the amounts of wastewater generated for Meru because even for the limited area served by the system the sewage works are overflowing and grossly inadequate. In summary the sewerage system has contributed to environmental degradation. The larger part of the town depends on on-site sanitation systems comprising mainly pit latrines, cess-pits and septic tanks. The on-site systems generally provide inadequate service especially in public places like markets, institutions and bus parks.

7.3.3 Screening and Scoping for Environmental Impact Assessment

Many guidelines have been used in Kenya for EIA but especially those of the World Bank. Often, the sponsor of a development has stipulated the standards to be met, because in the past Kenya did not have specific guidelines. However, as mentioned before, the Environmental Management and Coordination Act (1999) has set out the guidelines for EIA in its 4th Schedule. The guidelines propose the checklist method for screening and scoping for EIA.

The general environmental concerns and a checklist for the town have been noted and documented herein. A comprehensive EIA will be undertaken at the feasibility stage, however, the main issues for further study have been identified as listed in Section 7.7. At the rehabilitation stage it is envisaged that almost all the project components will be of such small scale that their impacts will not be serious. Impacts arising from construction activities will mainly affect the human environment but can be minimized by proper construction methods.

7.4 EXPERIENCES IN APPLICATION OF EXISTING LEGISLATION AND REGULATIONS IN WATER AND ENVIRONMENTAL MANAGEMENT IN MERU TOWN.

The officers in charge of enforcement of legislation and regulations governing water and environmental management were interviewed to assess their effectiveness in discharging their responsibilities. The following issues emerged:

- The Water Act provides control diversions illegal abstractions but it is not possible to execute because of lack of transport.

- When illegal abstractions are discovered then offenders are asked to legalize or regularize them.

- Absence of a legal officer at the MENR headquarters to deal with issues creates delays in dealing with cases.

- The Water Act gives power to the Bailiffs to arrest and charge but most Bailiffs can only refer cases to their seniors for prosecution. If there was a gazetted water prosecutor in the province he/she could deal with such cases faster.

- Penalties are too low to deter offences. There should be cases of no options for fines and/or fines increased to be deterrent.

- The officers were aware of the new Environmental Management and co-ordination Act but they are not conversant with its provisions and how they can implement it.

- The District Environmental Committee had been formed but it had not started its work of implementing the Environmental Act.

- Many coffee factories are extracting more than the permissible 5000 gal/tan of clean coffee produced but there is no mechanism to force charges for the extra abstractions.

- There is frequent political interference in the prosecution of offenders according to he Water Act.

- The Public Health Act, Cap 242 is used only after nuisance has persisted for a long time, e.g. if an offender does not comply with notice to rectify a problem.

7.5 ENVIRONMENTAL CONCERNS IN MERU TOWN

7.5.1 Pollution Potential from Sewerage System:

1. The current coverage of the sewerage network is 30% of the town and mainly confined to the Central Business District. The system was put up in late 1960's when the population to be served was about 30,000. The current population requiring sewerage service is now over 100,000, and the network has only 200 official connections.

2. The sewerage treatment works is grossly overloaded even without expansion of the sewerage network.

3. Sewerage is overflowing the ponds as a result of (2) above; at least 2 additional ponds are required to cope with current flow. The primary pond is heavily clogged at the inlet and requires de-sludging.

4. The council, which runs the sewerage system, is aware of the problem but is unable to take any action because of lack of funds.

5. The revenue collected is not adequate to meet the operation and maintenance of the system, which is currently employing 13 full time personnel.

6. The council has difficulties improving revenue collection because it cannot disconnect service consumers.

7. Service consumers cannot be disconnected because the council does not operate the water supply.

8. The council finds the system of seeking out water bills from the MENR Water Department to use for preparing sewerage bills cumbersome and inefficient.

9. There are areas that the council feels are prime for sewerage coverage e.g. Makutano area that would boost the number of sewerage accounts, but it is unable to extend the service to these areas because of lack of funds and also limitation of sewage treatment capacity.

10. The council is willing and ready to surrender sewerage service management to the organization running the water supply service because it is not viable for the council to continue providing this service without the water supply service portfolio.

7.5.2 Solid Waste Management

1. The Municipal Council has the portfolio of collecting and disposing of solid wastes. It employs 23 people to provide this service. This number includes street sweepers, truck loaders and drivers. The collection and disposal fleet is composed of three lorries and no earth-mover to spread the waste at the dumping site. The council practices open and uncontrolled dumping of refuse, which is then indiscriminately scattered by wind and animals thus polluting the environment. The dumping site is in the forest along the Meru – Nanyuki road. The waste is currently spilling into the road reserve.

2. Domestic refuse is combined together with hospital wastes that contain potentially hazardous materials e.g. used syringes, medicine bottles and vials, sanitary towels, used bandages, etc.

3. The dumping site is open and accessible to anyone passing by and hence presents a public health hazard.

4. The council is not able to do anything about this despite frequent notices from the public health officer and the pollution control officer from MENR, because it is unable to collect adequate revenue to run this service. Again this is a service which could easily be billed through the water service which is outside the jurisdiction of the council.

5. The milk plant discharges waste generated from washings of the milk receiving floor into the Baibotu river. This discharge by-passes the waste treatment plant installed by the milk plant.

7.6 RESULTS OF INITIAL ENVIRONMENTAL EXAMINATION

Meru Town has a sewerage system that covers only one third of the town and is mainly concentrated in the Central Business District. The rest of the town is served by onsite sanitation systems comprising of septic tanks and pit latrines. The MENR water supply network covers 70% of the area but serves only about 23% of the population. The rest of the population gets its water from community water projects or from the springs and rivers in the area. Table 7.1 gives the checklist of initial environmental examination for the water supply component while Table 7.2 covers sewerage component.

Table 7.1 IEE Checklist - Water Supply Component

ITEM	EVALUATION	COMMENT
1. Human Settlement	3	No negative impact expected
2. Economic activities	5	Increased water supply service will have a positive impact
3. Transport	3	During construction this will need attention especially pipelines crossing the main roads. Many distribution lines are lying on the surface or close to the surface and are prone to breakage by traffic as evidenced by leaks.
4. Water and Common Rights	2	This may be affected, e.g. the water level at the Gatabora (2) intake has been dropping drastically compared to 1987 when it was constructed. Further abstraction will decrease flow further as the same intakes will continue to be used.
5. Sanitation	4	Improved safe water supply shall improve sanitation in areas currently not served or using untreated water
6. Waste	4	Will need control during construction
7. Dangers / Hazards	4	Will need attention during Construction
8. Topography and Geology	5	Whereas rehabilitation may not include any huge structures to give a significant impact, the hilly terrain may be subject to landslides, attention is needed during construction.
9. Soil Erosion	1	Disturbance of steep slopes may lead to significant soil erosion, attention needed during construction.
10. Groundwater	5	Project does not involve ground-water.

11. River and Wetlands	2	3 sources of water are natural springs whose catchments need protection No effect on river Kathita is expected
12. Coastline and Sea	5	No such areas exist in the study area.
13. Flora and Fauna	5	No impact expected
14. Weather	5	No components of the proposed project will affect weather
15. View	5	The project does not contain components that will influence the natural view.
16. Air pollution	5	Control will be needed during construction as a result of dust, particularly during the dry season.
17. Water pollution	3	Overflow of ponds due to overloading of current STW may lead to water pollution unless sewage works are rehabilitated.
18. Soil contamination	1	No impact expected from water supply but current uncontrolled waste dumping needs attention.
19. Noise and Vibration	4	Will need attention during construction
20. Ground subsidence	4	Disturbance of steep slopes need attention during rainy
21. Noxious Odours	4	No impact expected.
22. Cultural Assets & Archeology	5	The project does not affect these
23. Conflict with community Aspirations	5	Not clear because community water lines run parallel to existing ministry lines, in some areas.

Table 7.2 IEE Checklist - Sewerage Component

ITEM	EVALUATION	COMMENT
1. Human Settlement	3	Expansion or relocation of existing STW may have an impact on settlement.
2. Economic Activities	5	No negative impacts expected
3. Transport	4	Needs attention during construction
4. Water and Common Rights	3	Uncertain, discharge of wastes into streams perhaps degrading water quality for downstream users.
5. Sanitation	5	Sanitation shall be improved by proper wastewater treatment.
6. Waste	2	De-sludging wastes from existing waste stabilization ponds need proper management.
7. Hazards / Dangers	4	Need attention during construction
8. Topography and Geology	5	No impact expected
9. Soil Erosion	4	No impact expected with proper construction procedures.
10. Groundwater	5	No impact expected
11. River and Wetlands	5	Water quality in rivers will protected by improvement in waste management.
12. Coastline and Sea	5	No such areas exist
13. Flora and Fauna	5	No impact expected
14. Weather	5	No impact expected
15. View	5	No impact expected
16. Air Pollution	4	No impact expected with proper construction procedures.

17. Water Pollution	5	Waste management will protect water sources from pollution.
18. Soil Contamination	3	Rain sewage and exhausted sludges may cause contamination during transportation.
19. Noise and Vibration	4	No impact expected with proper construction procedures
20. Ground Subsidence	4	Attention during construction needed because of steep slopes in the project area
21. Noxious Odours	5	Sewage treatment works emit noxious odours if not managed well.
22. Cultural and Archeological Assets	5	No such assets exist in the project area
23. Conflict with Community Aspirations	5	No impact expected

KEY:

1. Serious impact expected
2. Minor impact expected
3. Uncertain (investigation may clarify)
4. Almost no impact expected if construction undertaken properly
5. Almost no impact expected (no need for EIA).

7.7 INITIAL ENVIRONMENTAL IMPACT ASSESSMENT

By and large, the proposed rehabilitation project will have positive impacts by providing improved sanitation, reducing incidence of disease, and general improvement of the environment. However, from the results of IEE, four main items of potential impacts of the proposed rehabilitation works are be identified for study as listed below:

(i) Impacts resulting from abstraction of water from river or groundwater sources during operation.

(ii) Impacts arising from the increase in wastewater generation that would result from the improved water supply.

(iii) Impacts resulting from the operation of wastewater management and sanitation facilities.

(iv) Impacts resulting from construction activities during implementation of rehabilitation works.

7.7.1 Impacts Resulting from Water Abstraction

The 2010 demand for water in the existing developed area of Meru town is much less than the available sources, however, the Gatabora II intake has been dwindling over the years probably as a result of deforestation of the catchment area. Future expansion of the water supply from this source is therefore doubtful.

7.7.2 Impacts from Increased Wastewater Generation

Improved water service to be wrought by the rehabilitation will definitely make more water available to the consumers. The resulting increased wastewater flow will present disposal problems by putting additional pressure on the capacity of the existing STW and on-site sanitation systems.

Increased wastewater flow may also have a negative impact on groundwater quality because of poorly functioning on-site sanitation facilities. Installation of a sewerage system, coupled with intensified public education on proper waste management is needed for protection of the environment.

7.7.3 Impacts from Operation of Sanitation Facilities

Operation of the on-site sanitation facilities with increased wastewater flow will worsen environmental degradation and probably contribute waste load into the rivers. There is need to rehabilitate and possibly expand the sewerage system to forestall this possibility. There is also a need to monitor operation of the on-site sanitation facilities by invoking the Public Health Act.

7.7.4 Impacts from Construction

At the rehabilitation stage construction will be concentrated in the areas of existing treatment works and along the pipelines and these constructions will not be of any large scale as to adversely affect human settlements. However the area has very steep slopes, which may slide or be badly eroded; extreme care is needed during construction to mitigate this. Excavations for pipelines may also cause interruption to traffic flow but this will be on a temporary scale. Serious traffic inconveniences will be avoided by appropriate construction methods.

Disturbance of the soil during construction may also give rise to soil erosion but this will be minimal because no large-scale earthworks are anticipated in the rehabilitation phase. The noise and vibrations are common features of

most construction works and there are no unusual works that need special attention with respect to noise and vibration.

7.8 ISSUES FOR FURTHER INVESTIGATION

1. The control of deforestation in the catchment area to ensure reliability of the sources of water. Reason for dwindling of the Gatabora II source is a case in point.

2. A substantial section of the population (77%) is not served by the current water supply scheme and therefore draws water from traditional sources, the full impact of on-site sanitation systems on the degradation of water quality in such sources needs to be studied.

8. PROPOSED UTILITY MANAGEMENT PLAN

The 10 study towns visited can be grouped into three different institutional categories or groups under the Ministry of Environment and Natural Resources. District water offices: Narok, Meru, Muranga, Wundanyi, Migori and Lamu report to the Ministry directly, Division water offices: Makindu, Webuye and Mumias are included in the respective District reporting, and Kabarnet Sub Area office reports to the Regional area office, which falls under the jurisdiction of the National Water Conservation & Pipeline Corporation, which again operates as a State Corporation under the same Parent Ministry, the Ministry of Environment and Natural Resources.

8.0. GENERAL APPROACH

The approach for the analysis of the 10 towns was to work with a comprehensive base questionnaire that covers the commercial, financial and technical aspects of a water utility system. Interviews and discussions were held with those staff members that are either in charge or responsible for certain aspects of the day to day operation.
For the commercialised systems in Kenya, three sample towns were chosen: Malindi which is operated under a management contract for the NWC&PC, and Nyeri and Kitale Water Company, which are operated on the basis of an agency agreement for and on behalf of the respective municipal councils. Different questionnaires were used in order to obtain information about the problems that they have experienced since commencement of their operation.

The current system of Government reporting and record keeping has made it very difficult to obtain reliable and meaningful data within the given timeframe. The prevailing situation in all systems is that details are available, but neither instantly ready, nor summed up. Consequently numerous figures had to be compiled and abstracted from various ledgers and folders, in order to draw a picture of the current situation. At system level, the consumer ledger was found to be the most resourceful book of information concerning number of accounts, their condition (metered, non-metered, active, in-active), monthly consumption, arrears and payments received. It was therefore decided to use the consumer ledger information and take a snapshot picture of the situation for the month of June 2000. Where annual figures and records were available, those were absorbed for the Financial Year 99/00 in order to calculate monthly averages for comparison with the snapshot month June 2000. To substantiate procedures in place, it was considered essential, to question the figures and details that are routinely forwarded to the Head Quarter.

As procedures do continue at Head Quarter level it was as well attempted to find out, what procedures have to be undergone and is the information that is provided from Divisional or District Offices analysed in order to make planning assignments possible.

The details and procedures representing the NWC&PC area office in Kabarnet have been analysed upto the Regional Office level only. Operational decision making, funding and most personnel related issues are vested in the powers of

the Regional Manager. Instructions and procedural requirements, retained by the Head Office or vested in the State Corporation Act , are however considered for the analysis.

8.1. EXISTING WATER SUPPLY& SANITATION SYSTEMS

8.1.0. Overview Of All Systems Visited

All records and details abstracted in or compiled for the ten towns visited, are compiled in Appendices: A3 for Narok Town, B3 for Meru Town, C3 for Muranga Town, D3 for Kabarnet Town, E3 for Makindu Town, F3 for Wundanyi Town, G3 for Migori Town, H3 for Lamu Town, I3 for Webuye Town and J3 for Mumias Town. System situation description has been prepared for every town visited. Appendix K 3 holds questionnaires used for the commercialised systems and all summary statistics. Summary Table ST 8.2. contains the verified statistics for all 10 towns, using the month of June 2000 as the month for which verification could be done, based on the information abstracted from the various consumer ledgers. Comparisons between the towns are drawn from the same overview called "verified statistics summary" on details considered most relevant.

8.1.0.1.Utility Systems Organisation

8.1.0.1.1. Staffing:
All systems have a high number of unskilled Subordinate Staff being employed with different responsibilities. The O&M department integrates not only the source, treatment and distribution aspect of the water systems, but it is also responsible for billing and revenue collection. Within the billing and revenue collection department, majority of all staff have a technical background. Training, if offered, is within the technical field, financial or commercial training is not really considered. The staff assigned to the distribution system do as well undertake meter reading for which no schedules are available. Control over staff activities and where abouts becomes very difficult. The number of consumer accounts per staff ranges from 23 in Migori to 110 in Mumias. Organisation Charts have been drawn for all 10 towns, based on the information collected and are to be found under the Appendix of the respective town.

The managers responsible for the various systems have no commercial or managerial, but technical background. There is no training offered to prepare officers into their managerial responsibilities, even though the assignment described in The "Schedule of Duties for the Ministry of Water Resources" – January 1999, issued by the Permanent Secretary, describes the duties of every District Water Officer as:

Representative of the MWR in the District and responsible to the PWO/Central for the following duties and responsibilities:

- Overall planning, control and management of all water related matters in the District, including financial management thereof
- Any other duties as may be assigned

8.1.0.1.2. Office Set-up, Facilities and Transport:
While some District offices have adequate space, Division offices visited are in dire need of a decent working- and consumer-receiving-environment. Hard funishing can be termed as basic, but storage facilities for keeping and archiving documents reflect additional requirements in all places visited. Shortage of stationary or calculators is common everywhere.
The new NWC&PC office in Kabarnet has been taken over from the contractor just recently and basic requirements are still in very good condition.
The transport situation of all systems visited is below requirement. Water systems that are shared with the District water operation do have the advantage that transport can at least be shared in case of an emergency. All other systems do depend on well wishers, public transport or they walk.

8.1.0.1.3. Consumer and Meter Information:
The existing level of information concerning the status of the meters, dis-connection/ re-connection or new connection statistics or their operationality, must be termed as low. In a number of towns, the available though estimated figures are not diverting too much from the snapshot situation taken for the month of June 2000, but others are completely "off-track" and reflect that the value of information has to be more emphasized.

Ad hoc information was difficult to obtain anywhere. The statement that everything is available somewhere, somehow, but not in a comprehensive and meaningful format, easy to analyse, applies to all systems. As an example can be taken that the cost for maintaining a vehicle cannot be abstracted from one ledger card, but different kind of items are reflected on different ledger cards for certain expenditure categories. This means, that the cost determination could only be made by going through a number of ledger cards and then compiling the same information.

8.1.0.1.4. Production and Consumption:
For a number of systems, neither production nor consumption figures can be determined with certainty.

Where master meters were either not working or simply lacking, pumping hours were used to calculate the production; where gravity flow does not provide meter information, the situation was reflected, based on the assessment offered by the staff of the respective water system and then compared with the engineer's information. All systems operate well below their capacity, which can be related to:

- Limited use of power, because more pumping cannot be justified with equally increasing billed consumption
- Weak distribution systems, which cannot take the increased pressure and result in higher UfW
- Faulty pumps
- Reduced source capacity

To confirm consumption details is even more difficult, as the majority of consumer meters are not operational. The number of estimated accounts range from 31% in Wundanyi to 99% in Mumias. The verification of consumption details was only

possible for the month of June 2000, by abstracting consumer ledger information in a uniform format for all systems. While the information still reflects a number of discrepancies, it was considered the closest one can get, within the scopes and limited timeframe of the study.

While Migori, Webuye and Mumias have a very high estimated number of accounts (88% - 99%), the consumption abstracted exceeds the production considerably or is almost the same and raises the question of: what is the assessment tool for estimating accounts, or better their consumption?

8.1.0.1.5. Un-accounted for Water (UfW):
Where production and consumption details are not very reliable, the determination of UfW is difficult and equally unreliable. While most systems do fill monthly returns with arithmetical calculations on the UfW, the verified information reflects differences. Where a calculation of UfW was possible, the percentages range from 1% for Webuye town to 77% for Kabarnet town (excluding Mumias and Migori towns which reflect a higher consumption than production).

The overall calculated loss, expressed in Kenya Shillings is considerable. The verified month of June 2000 calculates for 8 out of the 10 towns, for which UfW calculation was done, a total of approximately Kshs 6,374 million per month, or extrapolated: Kshs 76,492 million per calendar year.

As the calculation is based on water lost and the average tariff calculated for every town, this calculation should serve as a guiding figure only, as the figures used for the calculation are based on the month of June 2000 information and might vary, when a deeper analysis is carried out. The loss furthermore does not yet capture the full cost of the loss, because the current tariff is considered as not cost covering.

The determination of cost represents one of the most basic problems again applying to all systems, which starts by trying to establish the actual expenditure. With the current level of information cost can only be assessed but not established.

8.1.0.1.6. Billing and Revenue Collection:
Many monthly billing records and returns were found to be estimated. Various explanations were offered, but all centered around the fact, that the information has to be monthly and manually abstracted from all consumer ledgers after the billing has been completed. The time available between completion of billing and submission of the monthly return is considered too short to complete the time consuming exercise. As monthly returns do not seem to be returned by the Head Quarter, the estimation is seen as an accepted practice. While the practice of estimation could be accepted for the given reason, the reconciliation at the end of the FY is missing, and annual details for the Head Quarter are simply wrong. Only Muranga town and possibly Makindu seem to be reporting actual monthly records. The tariff increment effective November 1999 could not be seen in many of the estimated billing figures for most systems, neither was it apparent for some of the revenue officers, that delayed implementation of the tariff increment should be captured with a retro-active adjustment.

The issue of estimation of monthly billing returns was not applicable for Kabarnet, as the water system only obtains meter readings and the Regional Office prepares computer generated bills. Monthly information about what was billed to the consumer should be correct.

For the verification exercise of June 2000 bills, the consultant filtered out consumers with the same actual consumption and noted, that different billing amounts seem to be calculated for the same consumption. As the majority of the billing officers do not have a calculator, this can be seen as a possible explanation for the variations. Appendix K 3 – ST 1.1. shows the analysis and reflects the situation for a few sample towns. The same bill variation seems to be the case for Kabarnet however limited in number, explanation for which should relate to the billing program.

Revenue collection records and returns are based on records obtained from the District Commissioner's office. Only minor discrepancies were noted, which can be explained by the fact, that report preparation does not necessarily fall together with calendar end month.

The attempt, to verify consumer payments against reported revenue collection, failed. The payment situation abstracted from the consumer ledgers for the month of June, 2000 was explained to reflect the situation as at 30.06.00. Unfortunately ALL the 9 water systems (excluding Kabarnet) involved in the exercise, misunderstood the information requested for and reflected last payments up to December,2000.

The billing efficiency for the various towns ranges between 22% in Kabarnet town and 64% in Narok town, while the collection efficiency ranges between 22% and 87% for Muranga. It should be noted that Migori and Mumias have not been considered for this comparison, as their billing efficiency is exceeding 100 % and unrealistic, as consumption should not be higher than the production.
The combined billing and collection efficiency ranges between 15% and 49% and is suggested to be used as one of the criteria for selecting priority projects.

Muranga is the only town where consumers voluntarily come to the DC's office to ask for the amount due for payment, which they then pay, without even having received the bill. Bills are only issued for GOK institutions, schools or companies on request. While Lamu operates in a similar way, it must be noted that Muranga merges this fact with a high billing and collection efficiency.

8.1.0.1.7. Average Tariff:
The average tariff had not been calculated in any of the towns visited, because it is not required for any of the GOK returns, hence not a commonly used term. The calculation of the average tariff, where possible, was prepared for the month of June 2000. It ranges between 16.57 Kshs for Migori and 42.31 Kshs for Wundanyi.

The June 2000 average tariff read in conjunction with the percentage of consumers billed on 10 cbm minimum charge, indicates which towns have a substantial base of minimum consumers. The minimum charged consumers

range from 12.37 % in Webuye to 78.14 % in Lamu. An analysis for the number of consumers falling into the various consumption brackets is commented on in the report for the various systems and gives an indication of the revenue base and the consumer portfolio.

8.1.0.1.8. Debt Situation:
The monthly debt situation is reported to the Head Quarter, whereby brought forward balances are increased by the monthly ("averaged or estimated") billed revenue less revenue collected. For all towns it was therefore found, that balances abstracted from the consumer ledgers did not correspond with the reported information. Discrepancies reflected are substantial in some cases. It can however not be established where or when those differences slipped into the system. An analysis was undertaken to split between GOK, major and minor consumers where possible. The one consumer taking the biggest share of unpaid bills in District towns, is the Government of Kenya. While the debt situation increases on a monthly basis, no effective measures seem to be in place to improve on the prevailing situation. Collection targets are set for the WS systems, but collection of GOK debt must be termed as very difficult and the possibility of involving the MENR Head Quarter should be considered after verification and substantiation of existing GOK debts.

Verified debt , as abstracted from the consumer ledgers, for all the towns visited amounts to: Kshs 61,899 million as at the end of May, 2000 and Kshs 64,678 million as at the end of the Financial Year 99/00. This can be interpreted such that the debt outstanding, increases by approximately 3 million per month for all the ten towns. Even though this information has been abstracted from the respective consumer ledgers, it must be pointed out, that a much more intensive analysis will have to be done, to confirm the collectable debt, as it includes disputed bills relating to wrong billing calculation, wrong meter reading or no water situations. The abstracted figure can however be used as an indicator. When comparing the total outstanding at the end of the Financial Year with the value of the annual water loss of approximately Kshs 64,8 million, the need for intervention concerning UfW, becomes even more apparent. Remedial efforts should concentrate and start with the attempt to reduce this aspect of water lost.

8.1.0.1.9. Funding:
Salaries, power and chemical expenses are paid through MENR Head Quarter. All other expenses at District level are funded through A.I.E. (Authority to Incur Expenses).

The A.I.E. earned during the FY is not automatically the A.I.E received. Any application, pending approval at the end of the FY, is not returned for resubmission in the new year, but null and void. It appears, that the 10 towns have earned a total of Kshs 17,930 million in A.I.E., but only received and incurred expenditure amounting to Kshs. 17,182 million. When a comparison is drawn between A.I.E. earned and A.I.E. received on a town by town basis, it shows that some towns managed to receive more A.I.E. then they have actually earned while others received considerably less. It could not be established with certainty how the procedure of "receiving more" operates.

8.1.0.2. Utility System Procedures

Existing procedures were analysed against the facts, figures and details obtained. Statements were questioned against the background of facts established.

8.1.0.2.1. Administration:

8.1.0.2.1.1. Staff:
No personnel management, training or recruitment procedures are in place and the approach of utilising staff where and when needed, results in a situation of no control over staff movements. Moving the technical staff into billing and revenue, instead of recruiting qualified and trained staff for the commercial aspect of the utility operation reflects on the system efficiency. The staff morale is equally affected and the low salary structure and delayed promotions attribute to the often understandable "not really concerned" situation. Sanctioning within the civil service structure has not been very effective in the past. The worst to happen was a transfer with no financial repercussions. At the same time positive efforts are not appreciated which often leads to the above indifference.

The recent retrenchment exercise has however changed the prevailing opinion concerning job security. The criteria for the recent retrenchment has not been understood by the staff, as in a number of systems, important and knowledged staff members were removed.

8.1.0.2.1.2. Consumer Accounts:
Clear guidelines on new connection, dis-connection, re-connection and any other routine procedure, are not in place. Especially for cases of recently gazetted changes, the gazette notice seems not sufficiently explained with the consequence, that every system handles the issue differently. Concerning new meters, deposit levels or delayed tariff implementation, wrong implementation of the gazetted notice translates into loss of revenue. If for example the tariff adjustment information and implementation instruction reaches the systems with a certain delay, the gap between gazettment and implementation should be closed. Some systems did so, others did not.
The maintenance of consumer and connection records must be considered as vital for any utility system. All systems lack however clear guidelines and control at system level. The ever prevailing shortage of stationary or operating material is the excuse and/or explanation for messy filing or files and books not found or records not kept. Clear guidelines on consumer record keeping were not found and the recording varies from application form to meter reading book to consumer ledger, depending on the WS system.

8.1.0.2.1.3. Meter Reading, Billing and Revenue Collection:
Meter reading schedules and procedures are not in place and there is no control over the process, neither the staff entrusted the exercise. Wrong or no meter reading affects the billing efficiency and eventually revenue collection, as consumers dispute by simply not paying. When wrong or over estimated bills go along with no supply and service, the payment morale drops and illegal activities increase. While all District water offices have water bailiffs on their staff list, they

are not used to handle cases of illegal water consumption, but only deal with water rights and granting permits for water abstraction.
All systems operated by the MENR issue manual bills and varying bill formats are used. Formats of the system have not been improved for years and some reflect for example consumption stated in gallons, while almost all consumer meters are read in cbm. This increases the risk of error calculations. Majority of consumer bills are hand delivered or collected from the water office, as no funds are available for mailing.
Systematic dis-connection and control procedures were not found to be in place. Explanations given relate always to shortage of funds and/or lacking plugging material, no transport or shortage of staff. Once an account is dis-connected, the consumer retains this status, unless he comes forward to regularise his/her account. Routine checks on long dis-connected accounts, are not practiced or not really possible, because the transport or staff necessary, is not available. This fact bears a high risk of undetected illegal re-connections and contributes into the high UfW.

8.1.0.2.1.4. A.I.E. and Procurements:
An A.I.E. is calculated based on the monthly revenue collection and a certain A.I.E. percentage, determined by MENR, and varying from town to town. In the case of the towns visited, the percentage ranges between 60 % and 90 %. The basis for the different percentages could not be established.
The receipt of an A.I.E. is affected by many factors and in all cases causing delays for procurements and the day to day operation. Appendix K 3 – Figure 8.2. illustrates the 17 steps between revenue collected at the DC's office and the approved authority to spend. The approved A.I.E. can only be used for procurement, if the Local Purchase Order (L.P.O.) processing procedure has been complied with. Suppliers often reject to supply against an L.P.O., because the payment processing procedure is another lengthy procedure to follow. Appendix K 3 – Figure 8.3. illustrates the path a pro-forma invoice has to take, before a cheque can be issued. Supplies are limited to listed suppliers within the District and the District Tender Board has to approve such suppliers.
The issuance of a cheque to a supplier is furthermore dependant on District Office liquidity and priorities set by the District Administration. As the District Administration is not only responsible for A.I.E. of the water department, but all the other GOK departments represented within the District, priorities might be given to other departments, depending on the situation. Collection efforts from the water department can be frustrated by such factors, which are beyond their control.
As long as quotations are obtained as required, and vouchers are signed by the respective signatories, expenditure seems the responsibility of the respective District Water Officer. It must only be ensured that it can be booked against votes that have been budgeted for. Finally, the District Administration has to account for the expenditure incurred, while the Ministry concerned is no longer involved. The complicated and lengthy procedures do not seem to relate to Financial Control at the end of the process.

Transport and staff related expenditure absorb a relatively high percentage of the approved and received A.I.E., while stationary or other inexpensive items are said to be lacking. It could not be established based on which criteria approved A.I.E. are spent and whether quotations obtained, reflect a realistic market price, when

compared. The process shows that Water department requirements are not only at the discretion of the water department through its representative the District Water Officer, but mainly depend on the District Administration, which is answerable to the Office of the President and the Treasury/Ministry of Finance.

Divisional Offices are affected by the same procedure, but their requirements have to undergo an additional step in order to be incorporated into the District requirements.

The Kabarnet area office submits all its requirements through the Regional Office, which in turn still has to follow the same or similar GOK procurement procedures.

8.1.0.2.2. Operation & Maintenance:
No preventive maintenance is in place, neither are technical manuals available. There is no guidance on standards and no procedure control over quality of water. Consumer meter servicing is neither scheduled, nor controlled or guided. Master meter preventive or routine maintenance is not covered by any procedure, and servicing lacks skill and the necessary tools. While some provincial water offices do have the necessary equipment, they lack spares. The reason for all shortcomings is said to be the lack of funding.

Chronically empty stores are explained by the same lack of funding. Only Lamu town had stock balance records available, which could relate to its location and island status. In most cases it was explained that procurements mainly relate to a technical problem that has to be attended to and parts are used as soon as they are available.

The WS Operators Handbook was found in the Webuye WS system, but the available version seemed very old (without any printing date) and not reflecting any system specific information or guidance.

8.1.2. Meru Water Supply & Sanitation System

Meru is the District Head Office under the Provincial Water Office Embu (Eastern Province) and serves at the same time the urban water supply for Meru town with a population of approximately 130.100 people.
The Meru WS system does not require any pumping and the 4 water sources are of a water quality that requires limited chemical treatment to achieve potable water quality. Meru WS also sells very good quality raw water, which is to a certain extent used for irrigation, but equally substitutes, where potable water is not available. Certain high potential areas of town are not reached by current pressure. Consumers have access to small streams flowing, when no water is provided by the undertaker, which means that there is a substitute, even though of lower quality.
Rationing is experienced in Meru, whereby certain areas of town only receive 4 to 5 hours supply per day. No information could be obtained for a fixed rationing schedule.

8.1.2.1. Utility System Organisation:

8.1.2.1.1. Staffing:
Total number of staff is 48, of which 10 staff members including the District Water Officer are shared between District and Meru Water Supply activities. Refer to Appendix B3 Figure 8.1.2. – Organisation Chart Meru. A clear delineation between District and Meru WS staff has been difficult and is reflected and prepared to the best understanding of the consultant. The "draft final" comment from DWO is, that the picture is wrongly presented. Reference to the "JICA study report", which however is not clear which report the DWO is referring to was not supported by the "correct" picture of the situation. It was therefore decided to leave the current chart in place and additional information chould then be provided for further reference.
The Head of O&M has comprehensive knowledge of the technical set-up as well as Billing/Revenue information. His involvement stretches from consumer queries, approving dis-connection lists and delegating field assignments to personally attending to bursts etc.
Accounts, which deals with A.I.E. and procurement related issues and Personnel, are reporting to the Deputy DWO directly.
Staff are all skilled (limited number of SS), but skills are lacking on the commercial or managerial side. Clerical Officers are employed on the Accounts and Personnel side, but Billing and Revenue Collection is in technical hands, supported by SS. Job descriptions are said to be available, but they were not found. 29 staff members from production and distribution are allocated work where it arises and when it arises, including meter reading for those staff assigned to certain areas of the distribution system.
Training requests are forwarded annually, but staff think that their applications are simply filed away.
The index number of accounts per staff member is:

Staff	Consumer Accounts	Accounts/Staff
48	3.225	67.19

indicators for Meru as to what percentage is supplied. No pumping is involved, which leaves no alternative but to assess the situation by comparing the provided information with engineering information provided:

Detail	Estimate provided	Table as verified
Design Capacity / Month	Approx. 150,000 cbm	150,000 cbm as provided
Production / Month	144,000cbm	132,000cbm
Production / Day	4,800 cbm	4,400cbm*

- *:Based on the Gibb EA assessment incl. the estimate of Gatabora springs and ASK raw water

The verified **Production Efficiency** is therefore calculated as **88%**

Consumption:
Consumption records are not available and verified details from Appendix B3-Table 8.1.2. are the only source of information, however limited to the month of June 2000:

Detail	%	June 2000 as provided	%	Average as provided	%	June 2000 verified
Actual Consumption		Not available		Not available	26	2,270cbm
Estimate & Flat Rate		Not available		Not available	74	42,786 cbm*
TOTAL:	100	Not available	100	Not available	100	45,056 cbm

- *: For a total of 666 accounts the actual and estimate consumption entries were reflected in both columns. Where ever these double entries were reflected the consumption was assumed as estimated. Information needs to be re-confirmed

Consumption records can only be compiled by adding, on a monthly basis, the consumer ledger information. This exercise is not done on a monthly basis in Meru. The expected approximate figures, which are reported to the Head Office monthly, could not be found, as the file was missing at the time of the visit.
The June 2000 consumer portfolio compiled here below, reflects that Meru claims for 15.43% of their consumers the minimum charge, and the majority of accounts consume between 11 and 20 cbm of water. While approximately 95% of the consumption information has to be considered as estimated, the issue needs re-confirmation from Meru to establish whether estimates are based on former actual consumption records, or whether they are based on a generally assessed information.

Consumption Steps	Number of Bills		Revenue Earned (June 2000)	
	Actual	Estimate	Actual Kshs	Estimate Kshs
0 to 10 cbm	50	271	10,400	16,485
11 to 20 cbm	25	1.499	6,950	305,098
21 to 40 cbm	27	295	13,005	217,662
41 to 60 cbm	5	77	5,344	115,460
61 to 100 cbm	1	31	2,570	113,459
> 100 cbm	2	23	27,600	310,570
TOTAL:	**110**	**2,196**	**65,869**	**1,078,734**

8.1.2.1.5. Un-accounted for Water (UfW):
Meru WS does not have information on monthly losses available. The estimated daily production of 4,400 cbm is therefore used to compare the same with the verified month of June 2000 consumption, which translates into 65.87 % UfW or 86,944 cbm of water lost per month.
The value of UfW is calculated for June 2000, using the average tariff of Kshs 25.40 for the water lost, amounting to Kshs 2,208,726.10 per month.

8.1.2.1.6. Billing and Revenue Collection:
The billed and collected revenue is reflected in Appendix B3 Table 8.3.2. and abstracted from monthly returns to the PWO and MENR. The billed revenue seems to reflect an average figure every month. The month of June, being the last month of the FY does not reconcile the picture, hence the total billed revenue does not reflect what is recorded in the consumer ledgers.

The tariff increment effective November 1999, is reflected from January 2000 onwards, as the average used during the first 6 months of the FY is Kshs 827,652.80 and Kshs 1,237,723.50 during the second 6 months. It cannot be established whether the increased bills for the month of November and December are calculated into the following months.

The verified billed revenue for the month of June is calculated in Annex B3 Table 8.1.2., as Kshs 1,144,603.00, while Table 8.3.2. states the June figure as Kshs 1,203,181.00.
The verified **Billing Efficiency** is calculated as **34.13%.**

The reported revenue collected is reflected in Appendix B3 -Table 8.3.2. and confirmed by the District Treasury. The total FY amounts to Kshs 6,771,976.00, resulting in an average of Kshs 564,331.30 per month.

Detail	June 2000 as provided	Average FY 99/00 As provided	June 2000 Verified
Billed Revenue:	1,203,181.00	1,032,687.50	1,144,603.00
Collected Revenue:	428,315.00	564,331.30	428,315.00

The attempt to verify payments with Appendix B3 Table 8.1.2. information, must be termed as futile, because the officers abstracting the information from the consumer ledgers, did not consider payments up to 30.06.00 only, but any payment that was in their records by the time the exercise was undertaken. Neither selection of payment details for June only, nor the expected aging analysis was possible.
Based on the verified billing details for June and considering the actual collection through the District Treasury, the
Verified **Collection Efficiency June** stands at **37.42 %**

8.1.2.1.7. Average Tariff:
As no reliable summarised consumption or billing details are available, the average tariff is suggested to be based on June 2000 records from Appendix B3 Table 8.1.2.
Billed Revenue Kshs 1,144,603.00 / billed consumption of 45.056 cbm =
verified **Average Tariff June 25.40 Kshs/ cbm**

8.1.2.1.8. Debt Situation:
The reported debt arrears situation is made in the format of Appendix B3 Table 8.3.2.
The Meru WS basis of calculation reflects 3 main problems:
a. Monthly bills are estimated, and
b. Outstanding balance from last FY carries forward the same problem.
c. The monthly estimation is not reconciled at the end of the FY
Using Appendix B3 Table 8.1.2.and 8.4.2. information, the situation **prior to the June 2000 bill** (end of May 2000) compares with the reported figure as follows:

Detail	Debtors as reported in Table 8.3.2.	%	Verified Debtors from June 2000 Consumer Ledger Information	%
Total Debtors	40,094,320.50	100	20,412,091.50	100
Major Consumers				
GOK Others	Not readily available		Information not comprehensive, refer to Table 8.4.2. *	
Total Major	Not readily available		10,805,830.00	52.94
Minor Consumers	Not readily available		9,606,261.50	47.06

- * the available consumer ledger information referring to GOK accounts was lacking the zonal ref. Number and available connection numbers do repeat in the various zones. Hence a clear determination was not possible

The monthly reported total debt does not tally with the quarter yearly letter to the Permanent Secretary MENR, with information about the Up-Date on outstanding Revenue. As at March 2000 the difference between the two returns amounts to Kshs 17,753518.50

A definite splitting of the outstanding figure as at the end of June 2000 could not be established, as the GOK accounts provided to the consultant, only reflected the connection and not connection and zone number, which would have determined the accounts clearly. Above details do therefore require more reconfirmation concerning the GOK accounts.

The debtor situation as of the end of May 2000, increased by the June 2000 revenue billed of Kshs 1,144,603.00 less the revenue collected during the same month amounting to Kshs 428,315.00, results in an overall outstanding balance of Kshs 21,128,379.50 as at the end of the FY.

8.1.2.1.9. Funding:

The total revenue collected for Meru WS for the FY 99/00 was Kshs 6,771,976.00. The A.I.E. earned of 60%, amounts to Kshs 4,063,185.60

The A.I.E. expenditure incurred could however not be split or determined between the Meru WS and the Divisions. Using the same ratio as collections received for the Meru WS, which is 80.11%, the A.I.E. received amounts to Kshs 3,956,986.00, which would result in A.I.E. expenditure for Meru WS of Kshs 3,853,067.00 if the same percentage of 80.11 were applied.

8.1.2.2. Utility System Procedures:

8.1.2.2.1. Administration:

8.1.2.2.1.1. Staffing:

Staff members are transferred or promoted from HQ level. Transfers just happen by receipt of an instruction letter either from PWO or the Head Quarter. Where staff members are retrenched, people are recruited from within the District.

Transfer into the Division seems to be a mode of punishment while at the same time the work load at District level is considered as being much higher. Transfer into the Division does not reflect in the salary, as the job category remains the same. Therefore sanctioning by way of transfer has no financial implications. Majority of the staff have been working within the Meru WS for many years.

While there are annual forms filled for promotion and training requests, such are felt to be simply filed away. Many staff members are overdue for promotion.

The constraints experienced in every level of operation contribute towards a staff morale which is generally not too high. Salary levels are considered as being much too low.
All staff working at the Billing and Revenue Department have technical backgrounds and were placed in positions that bear no relation to the job category in which they are employed and paid for. When placed into these non-technical positions, staff do not get training, but are placed and learn from the others. The majority of staff members in the Billing and Revenue are however SS, who are trained on the job with no further qualification.

8.1.2.2.1.2. Consumer Accounts:
Consumer information is held in the **application** form and the consumer ledger, which is up-dated with the monthly meter reading, bills issued and payments received. Stationery for a new application is always short. Form G.P.255 WDD3 (Revised) is used and consumers have to copy and return the form. Meru WS uses Account and Connection numbers, which do relate to the area in which the connection is located. There are 10 zones within the town area.
There are no forms to close a consumer account, but pending bills have to be cleared before the account is closed in the consumer ledger. For **refund of a consumer deposit,** the consumer is sent to the DC's office after having cleared the old bill. No information available, as to how consumers are refunded, as deposits used to be held by the DC's office. Meru WS staff assume that consumers receive their money. It is not possible to off-set the deposit against the final balance.
To **transfer an account** to another consumer, the transfer is only recorded in the consumer ledger on condition that all outstanding bills have been cleared. Civil Servants have to clear at least part of the old bill. Attempts are made to involve the landlords in the transfer of tenant accounts, as many problems have been experienced with getting such accounts cleared. For any transfer, the account number changes, while the connection number remains the same.
Change of address is not done for Meru consumers, as all bills are hand delivered or collected from the office.

8.1.2.2.1.3. Meter Reading, Billing & Revenue Collection:

Meter Reading:
Meter reading is done by the same staff, that attends to a particular zone within the distribution system. Approximately 90 % of the meters are said to be read every month. While there are no meter reading books in place, the records are done on a plain paper and immediately transferred by the revenue staff into the consumer ledgers. Bills are then calculated immediately and hand delivered.

Billing:
The Billing section calculates with personal calculators, as the office does not provide the same. The billing process requires billing stationery, which in case of non-availability causes a delay. Even though the bills are calculated in the consumer ledger monthly, the actual bill might be issued later, when the stationery is available. It seems therefore difficult to establish whether a bill has been physically issued or not. The information is only within the knowledge of the billing clerks.
In case of a wrong bill issued, it is possible to get a book credit into the consumer ledger.

Disconnection:
The revenue department provides the disconnection list and the Officer in Charge authorises the list for field action. The meter is removed and stored in the office and the connection is plugged. No follow up on disconnected accounts is done due to the ever prevailing shortage of transport. As neither disconnection nor reconnection records were available, the 263 accounts recorded as disconnected in the consumer ledgers as at 30.06.00, cannot allow for any conclusion to be drawn concerning the collection efficiency of 37.42 %

New Connection:
After forms have been filled by the consumer, the zonal officer undertakes the survey and reports back to the office with all field requirements for the connection. The consumer provides the required connection material and pays at the DC's office. He is then given a connection and account number. Since 1/2000 all consumers are expected to bring a new meter for a new connection. The same zonal officer fits the new meter.

Revenue Collection:
All consumer payments are made at the District Treasury. One of the revenue officers makes daily visits to the District Office and consumers bring their receipts to the revenue office. The payment information is entered into the payment ledger and then absorbed into the consumer ledger.

8.1.2.2.1.4. A.I.E. and Procurement:

A.I.E. procedures are based on revenue collected, and procurements follow the standard prescribed procedure, based on the requirement prepared by the officer in charge and then approved by the DWO.

8.1.2.2.2. Operation & Maintenance:

Intake and T-Works
No procedure laid down, staff attend to a problem when there is a problem.

Lines and Appurtenances
No routine or preventive maintenance procedures are in place. Line patrol is said to be there but no schedule, records or control system in place. The distribution team attends to bursts, if they occur. As no stock is in the store, parts are looked for, when required. Some suppliers help to provide material or parts before the procurement procedure is completed. This however happens only in case of emergency.

Master Meters
One master meter in place, however not functioning.

Consumer Meters:
No procedures or records for field activities are in place. The consumer reports a problem and the service team can only go and flush the meter. Any other problem cannot be solved as no parts are available to carry out repairs.

Stock
No stock balances were readily available, but any receipt is entered into the ledger cards and recorded when given out. An analysis of all the ledger cards would give a clearer picture of what has been received and given out for system repairs, which was however under the given timeframe not possible.

General Observation :
The recent retrenchment exercise has left considerable frustration amongst the staff members. The criteria for retrenchment have not been made clear. The staff feel insecure, in that anybody could receive a retrenchment letter tomorrow, with no reasons given.
PSP is seen as a machinery for discipline. If it comes with the right salary (expectation 200 – 300 %), it has support from those interviewed. Our general impression was, that staff members are willing, and some even very much dedicated to work, but eventually give in to the system. They equally seem to be aware of the hire and fire possibilities that are attached to PSP and seem to accept.

8.1.2.3. Community Projects:

No information was obtained on possibly existing community projects within the Meru Water Supply system, even though they do exist, especially concerning supply of raw water. It is however understood, that a clear delineation between Meru WS and community supply overlaps, making illegal connections difficult to determine.

8.1.2.4. ElNino Project:

The ElNino Project is ongoing, but the involvement from the Meru WS seems very limited. It is understood that the consultant doing the assessment involved the WS staff, when obtaining information about the damages caused by ElNino, but when the contractor arrived, they did not involve the WS staff. There seems to be a lack of co-ordination and slight confusion concerning the integration of the on-going repairs into the existing WS.

8.1.2.5. Recommended Priority Measures:

It is the understanding and assessment of the consultant that the unaccounted for water (UfW) in Meru is very high, and when compared with the total verified outstanding debt, reflects that the loss of one year is almost of the same magnitude as the current accumulated debt. Therefore the reduction of UfW must be given the overall priority.
Unaccounted for Water is made up of:

- Physical losses in the transmission and distribution system
- Wrong meter reading and billing, and
- Water theft.

To reduce the water losses and at the same time improve revenue collection, it is recommended to give the following priorities:

1. **Full rehabilitation of the existing distribution system, including standardised meter connections,**
2. **Replacement or repair of all faulty and flat rate consumer meters,**
3. **Setting up of a consumer data base and a reliable billing program, and**

4. Management and staff Training for the relevant staff members.

All other recommended activities under the Utility Management Plan under header 8.10., are given second priority. These second priorities are however to be considered as equally important and recommended to be implemented, because the Billing or MIS program is always only as good and reliable, as the information that the program is fed with. This means that the Billing is embedded in the activities of a fully functioning water utility system.
The very high number of non-functioning consumer meters is seen as the major contributor into the low billing efficiency. The low collection efficiency can possibly be explained by the availability of a substitute water supply at an acceptable quality level in combination with a low disconnection rate in the past. In order to enhance the consumer payment morale, it is as well recommended to start with intensive training for one or two Consumer Relation Officers, supported by a good consumer information base and the preparation of an efficient disconnection system.

8.1.2.6. Recommended Project Implementation Plan:

Based on the Action Plan Activity Phases as reflected in Appendix K3 Summary Table ST 8.4., the following Project Implementation Plan for Meru is outlined here below for the 3 different Phases mentioned.

The overall assumption under which the proposed activities will reflect in the expected results, is, that major players and stakeholders ensure that recommended reforms in the Water Sector are implemented.

Other assumptions under which the proposed activities will reflect in the expected results are:

Assumption 1:

- Funds for approx. 3,000 (2,200 not working, 463 unmetered) consumer meters are available
- Funds for setting up temporary office with computer hardware (8), printers (3), billing software, additional transport (2 x 4WD pick-up, 1 saloon vehicle, 6 motorbikes (4 meter reading, 1 line patrol, 1 new connections)) and basic office equipment are available,
- Funds for remuneration of the proposed staffing organisation is available,
- Funds for 6 months interim operation, while cash collection is re-organised such that funds remain available at system level, and
- Funds for the involvement of the management consultant

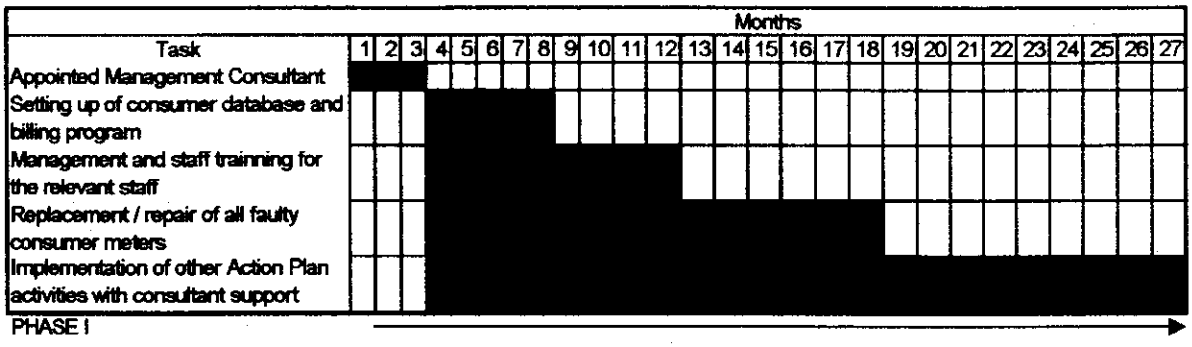
All funds must be available or planned for at the beginning of the management consultant's involvement. Refer to Table 4.4.: Cost Estimate for Rehabilitation Works for the Meru Water Supply.

Assumption 2:
Staffing re-organisation, training and selection of staff as recommended by the management consultant receives the necessary support from MENR.

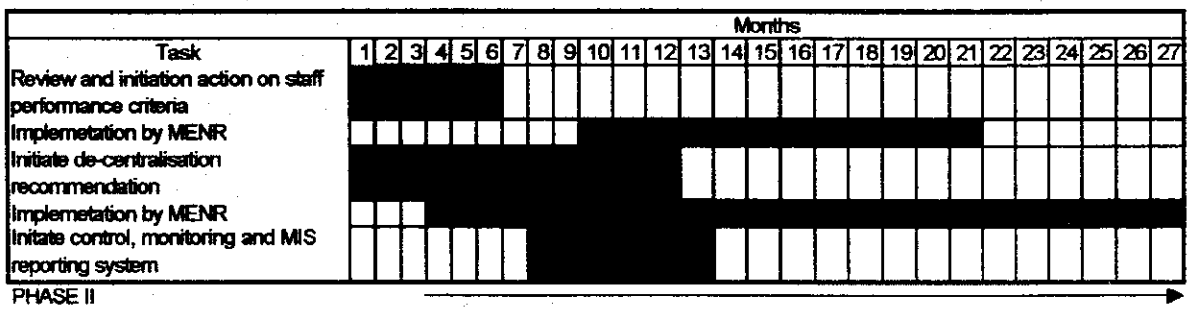
Assumption 3:

The "new body" taking over from MENR incorporates recommendations concerning staffing, organisation and operation made by the management consultant, while on contract. This would be considered as a transition period for the new management.

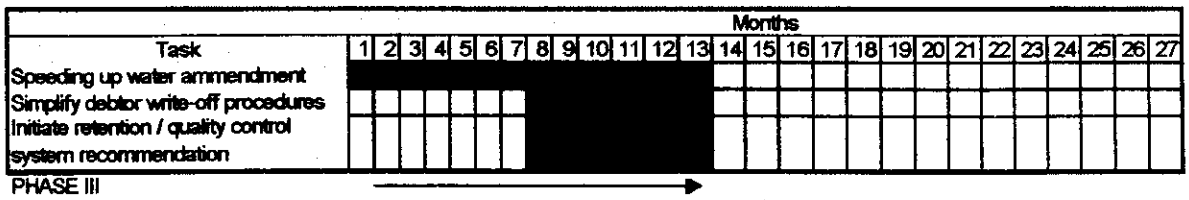
The reduction of UfW is expected as an immediate result of the meter replacement, meter reading reorganisation, billing improvement and management / training-on-the-job-support. The high number of meters to be replaced will require a period of 15 months, during which time approx. 200 meters are replaced in a standardised manner and on a monthly basis by the Meru WS staff.
The minimum time involvement of an intensive management consultant support is taken as 24 months.



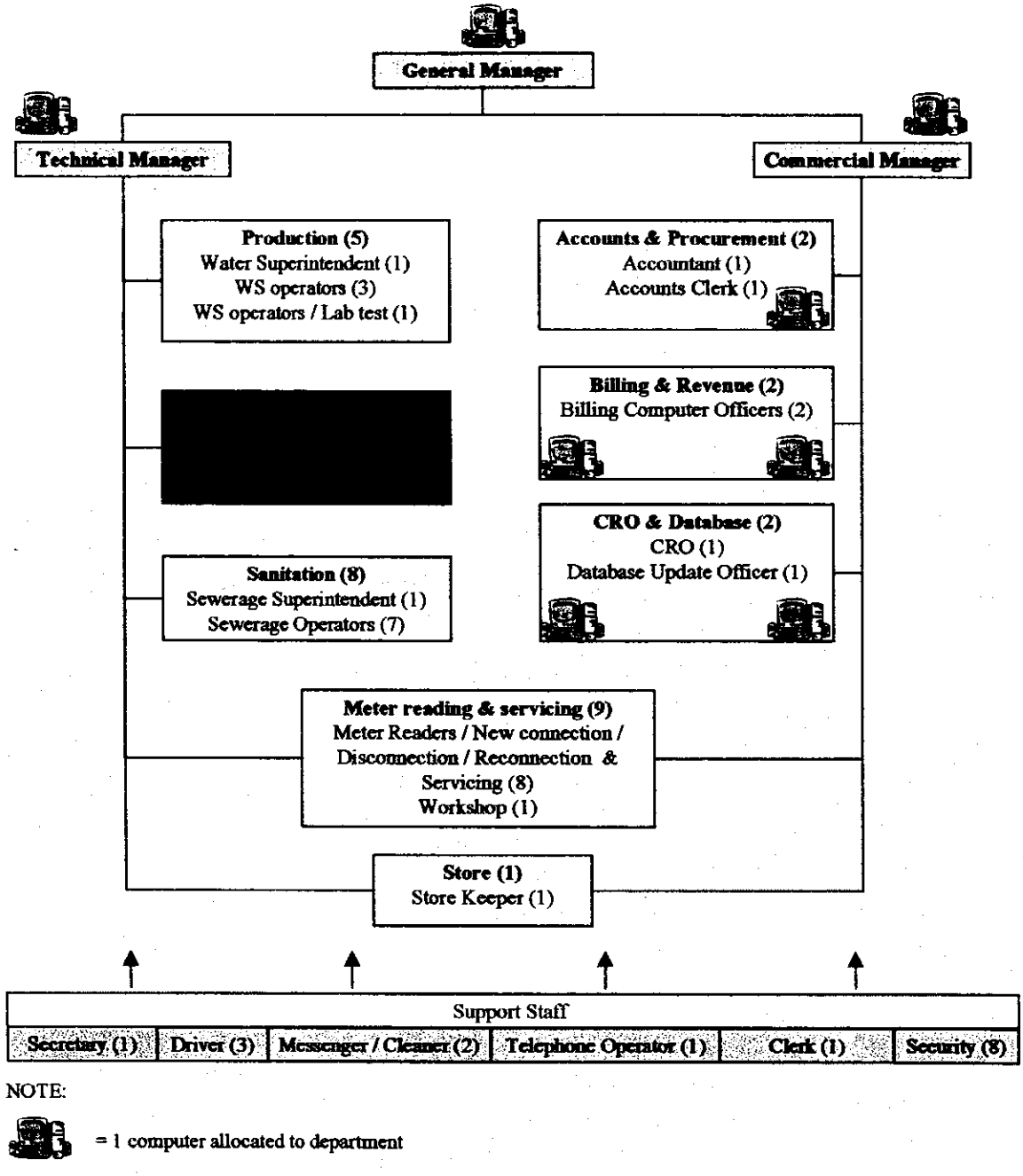
Phase 2 concentrates on decentralisation changes, for which the more detailed activities are described in the Action Plan of Appendix K3 Summary Table ST 8.4



Phase 3 relates to legal changes recommended for which the more detailed explanations are listed and described in the Action Plan of Appendix K3 Summary Table ST 8.4



8.1.2.7. Recommended Meru Organisation Chart:



NOTE:

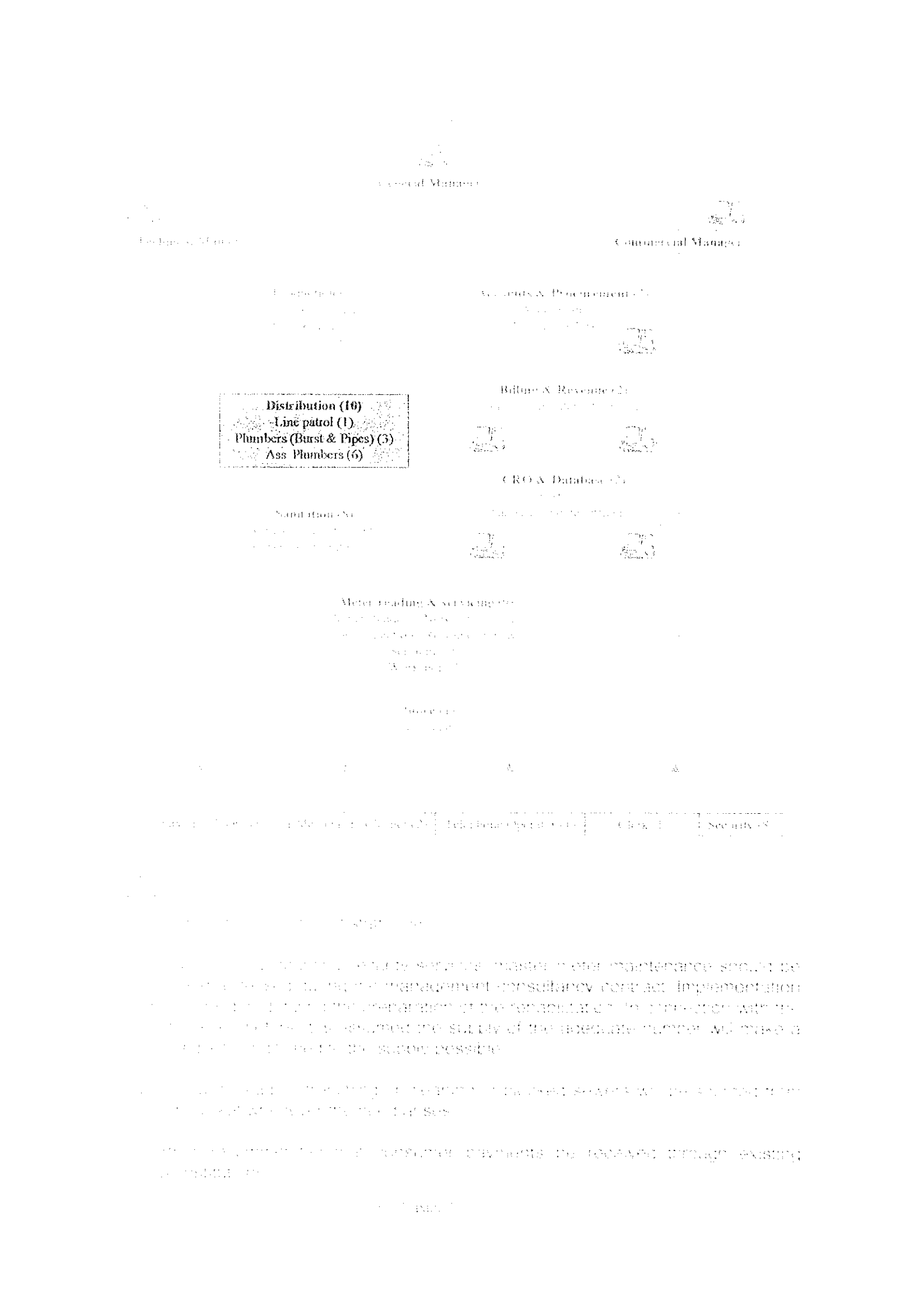
= 1 computer allocated to department

Total recommended number of staff = 58

The possibility of out-sourcing security services, master meter maintenance should be surveyed and assessed during the management consultancy contract. Implementation should be considered during the preparation of the rehabilitation. In connection with the supply of master meters, it is assumed the supply of the adequate number will make a service contract conditioned to the supply possible.

Casual labour to support trenching or cleaning of blocked sewers will be sourced from the labour market whenever the need arises.

It is further recommended that consumer payments be received through existing Financial Institutions.


Distribution (10)
Line patrol (1)
Plumbers (Burst & Pipes) (3)
Ass Plumbers (6)

8.2. COMMUNITY SYSTEMS WITHIN THE EXISTING UTILITY SYSTEMS

Only three towns had community maintained systems within their supply area. Western Province, unlike any other province visited, has enjoyed massive support of community projects through Finnish Aid. Phase 1 of the KIFINCO project initiated and financed between 1981 and 1995 almost 4000 community projects. The current Phase 2 has now 4 main components under the overall objective of " increasing access to safe water for improved health and well being of the communities in Western Province, by increasing community management skills for maintenance, operation, improvement and replication of water facilities and for the protection of water resources":

- Monitoring and evaluation whether systems are functioning
- Support to those communities that approach the project and are prepared to contribute
- Provincial/District capacity building
- Water Resource Management

Implementation of new or rehabilitation projects are done through external contractors, while MENR staff is involved in the technical supervision. During Phase 1 all work was done through external staff, which led to frictions between MENR staff and those employed from outside.

Phase 2 concentrated at the onset on awareness creation amongst all District and Divisional Offices, using the ToT approach (Train the Trainer), and then involved other leaders and representatives of communities, to deseminate the new approach.

8.2.1. Makindu

There are four operational and functioning community systems within the Makindu water supply area, but information could only be obtained from three.
Kikumbuli Community took over 136 accounts in 1992, because they received water from Umani Springs. No information could be obtained on how it is managed, but community members are receiving water.

Amref financed 2 additional projects, the Kai Water Project and the Nzumi Water Project. Both systems serve approximately 7.400 people. Amref conditions were the involvement of the community in trenching and laying of the pipes and construction of the tanks. Community members were trained in the technical field and bookkeeping, and training included formulation of the By-laws.

Both systems operate smoothly and the Makindu WS system receives payment of bills promptly. Maintenance of the line is the responsibility of the community. Artisans and Kiosk attendants are from within the community and receive a salary for the work they do. The Community plans to use the money on the account for maintenance and expansion of the line.

The Mulili Water Project was financed by German Agro Action and started its operation just recently. It serves approximately 3.700 people. The approach for the project was similar to Amref's, whereby the community is actively involved in

the work during and after the completion.

Bulk supply from Makindu WSS to all communities at Kshs 15,00/cbm and no problems have been experienced so far.

8.2.2. Migori

The Nyasare Water Supply community project is registered under the Society Act and has been in operation since 1994. The project was financed by the Austrian Government and serves the rural and part of the urban population of Migori town. The community has 989 paid up members.

The management and operation of the system is paid for work done and O&M cost incurred monthly are covered out of the collected revenue. The management comprises of the Chairman, Vice chairman, Secretary, Ass. Secretary, Treasurer and Ass. Treasurer.

Since 1997, the organisation has been operating without donor funds.
Even though the community faces problems in revenue collection, there are efforts to increase the tariff. The organisation works closely with the District Water Officer Migori.

The community intends to come up with a phase 2 project, to develop other water sources and the Institute for International Co-operation (Austrian Aid) is willing to assist. They have also applied to take over Migori Water Supply under the Ministry.

8.2.3. Webuye

Webuye has one community project for which no information could be obtained. The Muchi Milo Community project, initially financed by KIFINCO, is non-operational since 1995. Electrical fittings were vandalised twice, now the project seems completely stalled. KIFINCO in Kakamega had information that chairman of the project has political ambitions and is therefore suspected to have political enemies, who could be responsible for the vandalism. The new approach of KIFINCO is the "demand driven approach", i.e. communities can come for help, if they are prepared to contribute 50% into the cost.

Muchi Milo treasurer did not seem to know, neither did the Divisional Water Officer, even though KIFINCO had informed all Districts and Divisions creating awareness down to the communities through leaders and representatives.
Consumers are now neither receiving water from the mains nor through the community project.

8.3. PROBLEMS AND SHORTCOMINGS OF THE EXISTING SYSTEMS:

All systems visited suffer from a number of problems which in turn lead to more shortcomings, ultimately translating into:

- Low efficiency on production,

- Limited supply situation,
- Billing below expectation, and
- Revenue collection, which cannot sustain the operation.

An assessment of the problems seen and experienced in the various systems visited, is represented in the Problem-Symptom-Cause Matrix under Appendix K 3 – ST 8.3. To various degrees the systems show that neither the Head Quarter nor the water systems do know what they produce, what is in place, what is outstanding, what are the actual cost for the water production and/or what is the financial position they are in.
Community systems established with the involvement and / or contribution of the community, combined with training into the management and operation, seems more successful, than those systems that have been simply handed over to the people. This equally reflects in the second phase approach of the KIFINCO project, which is demand driven and with financial involvement of the community.

8.3.1. Division Specific Problems:

Divisions operate under the District offices. The systems visited operate under even more difficult circumstances. All problems are similar to the problems experienced in the Districts, because whatever is a problem for the District results in an even bigger problem or longer delay for the Division.

The criteria for category Division or District does not relate to the population served. While Mumias is a Divisional office, with less than a decent office and the necessary skilled staff, it serves a population of 110.400 people, Wundanyi is a well equipped District office and serves a population of 7,600 people. The same applies to Webuye Division office, serving approximately 73,000 people and lacking the absolute basics.

The Division is run with no imprest at all and the most basic requirement like making a photocopy or using public transport to visit the District office, expects the staff member to pre-finance the expense and claim it from the District in due course. Refund procedures can take weeks, even months.

8.3.2. Districts Specific Problems:

The biggest problem seen at District level is the A.I.E. funding and procurement procedure. While the District Administration is involved throughout the lengthy procedures, the District Administration has to cater for all .the Government Departments and does not necessarily give the Water Department priority over other Departments. Special efforts in revenue collection may result in Nil A.I.E. received, as was the case in Narok, where the approved A.I.E. came just before the end of the Financial Year and lacking liquidity at the District Administration office resulted in an approved A.I.E. but no funds. Un-utilised A.I.E can then not be carried forward into the new FY.

8.3.3. NWC&PC Area Office Specific Problems:

The area office is totally dependant on the Regional Office and faces the same problems as the Division Offices under the Districts. Decision making does not take place on the ground and any requirement has to be organised through the

Regional Office.

Recent changes turned a small imprest previously available into a NIL cash flow. The 50% of re-connection and labour charges do not seem to come forward, Even the smallest operational requirement becomes a problem. A further problem is, that billing and consumer related issues face considerable delays as they cannot be dealt with immediately. They have to be forwarded to the Regional office and reply has to be awaited. Disputes are decided by a committee at the regional level, while the recommendation of the area manager seems to be given lesser or often no consideration.

8.4. MENR HEADQUARTER PROCEDURES, SHORTCOMINGS AND IMPEDIMENTS

Every utility system visited had the feeling that the Head Quarter receives monthly forms and returns only to file the same away. No reaction is received. Considering the meaning of reporting, facts and figures should be used for planning, control and management decisions.

As the majority of the information reflects discrepancies or plain gaps and no reaction comes from the Headquarter, it means that either the information is not used for decision making, or the discrepancies are not seen and plans are based on wrong information.

Procedures and tangible details are more difficult to obtain at Head Quarter level than at the District. Efforts by the consultant to get clear and substantiated information, were fruitless in most cases. Similar to the record keeping at District or Division level, information is available somewhere and somehow, but the magnitude of data handled at the Head Quarter makes the search even more complicated.

8.4.1. Personnel Issues and Procedures

All Division, District and Province staff salary matters are dealt with at Head Quarter. The structure seems to be such that within the personnel department at the Head Quarter, one officer is allocated a certain number of staff numbers. Following up several personnel issues for the District, can result in having to see several officers for the same problem relating to several staff members. The attempt to obtain comprehensive remuneration details for the towns visited, failed.

8.4.2. Power

Payment of power bills from the District has been changed during the last Financial Year. The processing procedure at District level had caused a number of power accounts being cut. Current practice is, that power bills for all water systems operated by the MENR, are paid for from the Head Quarter. If the bills are received at District level, they are passed on to Nairobi for settlement. As many bills are paid for many Districts with one payment, to find and obtain details for any particular WS System, requires lengthy searches. The question as to whether credits are correctly reflected on the following power bills, could not be established.

8.4.3. Chemicals

Sourcing and procurement for chemicals is done centrally for all the WS systems operated by MENR. The procedure involves an annual open tender, approved by the MTB (Ministerial Tender Board), followed by the CTB (Central Tender Board). While the District gave the information that chemicals have to be collected from the Nairobi Central store, the information at the Head Quarter was, that chemicals are delivered to the Districts and only additional requirements over and above the planned quantity have to be collected. It is to be analysed, whether the centralised procurement bears any price advantages over the system level procurement, as the existing system does not reflect any other advantages.

As chemical requirements are planned from the Head Quarter and information of chemicals from the Districts is in most cases based on estimated past experience, the question arises also, whether there is a realistic basis for actual chemical requirements, relating to actual production?

8.4.4. A.I.E. Issues and Procedures

The A.I.E. procedure originates from the District and has to be processed through MENR Head Quarter and Ministry of Finance/Treasury, before it can go back for further processes to the District. Appendix K 3 – Figure 8.2. and Figure 8.3. reflect the whole process, which is lengthy and complicated.

8.4.5. Planning and Control

Planning is based on information about the performance of a water supply system. Indices like production-, consumption-, billing- and revenue collection-efficiency or system compiled cost, are necessary tools to control the use of chemicals, calculate a cost covering tariff or determine the right transport requirements or staffing levels. As reported information from the water supply systems lack the correct information or if availed, are not translated into an efficient Management Information System, the question arises as to: Which are the tools, that the Head Quarter plans with?
While the A.I.E. process and involved procedures are lengthy and complicated, the accounting for the money spent, is done by the District Administration to Treasury. The MENR receives only the printed information, against which votes the expenditure has been booked. The question is, whether GOK procurement procedures have been complied with, but not whether the three or five quotations obtained reflected a realistic market price, hence the whole system is more procedure than financial control.

8.5. PROVINCIAL WATER OFFICE FUNCTIONALITY

The functionality of the provincial water offices could not be clearly established. However, the schedule of duties for the Provincial Water Officer is giving the following duties and responsibilities:

- Development, maintenance, control and supervision of all Ministry's operations in the Province
- Any other duties as may be assigned.

Meetings with the district water officers, receiving donors and delegations and general co-ordination, were the comments received. While all technical and

financial returns are as well copied to the Provincial Office, reminders on performance and targets do originate from the MENR Head Quarter. It therefore remains to be explored further, what role the Provincial Office plays in the context of management support, control and/or assistance, when compared with the schedule of duties? Is the Provincial Office an information and control filter for the mass of operational and financial details that are sent to the Headquarter? Is the Provincial Office used as an information dissemination medium? How is the infrastructure, which is in place at the Provincial Office, utilised?

8.6. NWC&PC SHORTCOMINGS AND IMPEDIMENTS

NWC&PC has already a partly de-centralised reporting system, as the Regional Manager only reports filtered information to Nairobi. Decision making remains however an equally lengthy procedure (experienced as well, where commercialisation is involved). AS NWC&PC has to comply with the normal GOK procurement procedures, only slightly modified, problems are of similar nature.

8.7. COMMERCIALISED SYSTEMS IN KENYA

The number of commercialised systems, evolving from former Government operated systems, is limited. Malindi, Nyeri and Kitale were chosen. All systems visited and analysed are currently operated under an agency agreement. The difference in their structure is, that the agent in Malindi is a privately owned company, while the other two companies of Nyeri and Kitale are wholly owned by the former operator, with a Board of Directors representing the stakeholders of the water and sanitation system. Assets remained in all three cases with the former operator of the system.

8.7.1. Malindi: Management Contract (NWC&PC)

The Malindi Management Contract is actually an agency agreement between the National Water Conservation and Pipeline Corporation and H.P. Gauff in association with Gauff Utility Services Kenya Ltd. The Amendment to the State Corporation Act under which NWC&PC has been incorporated, gives NWC&PC the formal mandate to enter into agency agreements, which are accepted by the Attorney General.

The agreement was signed in March 2000, covering a period of 4.5 years.
The company is given autonomy for the day to day operation and related decision making. The overall regulations guiding the NWC&PC do however relate as well to the agency agreement. This means that Government procurement regulations and procedures or writing off debt procedures have to be observed and complied with by the agent as well.

Appendix K 3-Q 8.6.1. reflects the interview with the representative(s) of the agent. While the Malindi agency agreement built on an earlier pilot project, where consumer account aspects, billing and revenue collection, Meter reading and O&M aspects had already been systematically taken up in the past, the new agency agreement took off with the experience gained before. The major task is to get procedures and schedules refreshed and close the information gap that was caused by a delay of almost two years between the old project and the new agreement.

As the project was only in operation for a period of 8 months by the time of the visit, comments on the self-sustainability could not be obtained yet. The initial setting up time required must be considered and self-sustainability should be looked at, at a later point in time.

8.7.2. Nyeri: NYEWASCO Private Water Company

Nyeri Water Company, NYEWASCO, operates under an agency agreement which was signed on 19th March, 1999 and amended on 7th April, 2000. The duration of the agency agreement is 20 years. The agreement is between the Municipal Council of Nyeri and the company.

A Core Management Team is in place and all other staff members were taken over. However it was said that the individual staff performance determines whether they will stay with the company. Salary increments of 15% and 7.5% have been effected since the operation started. An incentive scheme for the staff is being worked on.

Appendix K 3 – Q 8.6.2.reflects the interview with the Managing Director of NYEWASCO.

8.7.3. Kitale: KIWACO Private Water Company

The Kitale Water Company operates under an agency agreement drafted, but not yet finalised or signed. The agreement is between KIWACO, the new company and the Municipal Council of Kitale.

A new Core Management Team (CMT) has been recruited and is supported by a Financial Advisor, seconded by CIM (Centre for International Migration). All other staff members were taken over from the Council Water Department, pending finalisation of the agency agreement.

Day to day operation has been transferred to the agent at the beginning of the year 2000, while numerous financial issues have not yet been sorted out with the former operator and creditors of the former operator. Much of the manager's time is therefore spent on issues relating to the past and negotiation concerning the agency agreement. The day to day operation is independent.

Appendix K 3 – Q8.6.3. reflects the interview with the CMT and the Financial Advisor.

8.8. PROBLEMS AND SHORTCOMINGS OF EXISTING COMMERCIALISED SYSTEMS

The problems or impediments experienced in Malindi and adversely affecting the efficiency, can be summarised as follows:

- The line of command is too long and decision making processes take to much time and additional effort

- Government procurement procedures

The problems or impediments experienced in Nyeri seem very limited and reduced to staff related issues. All former problems, concerning interference of some Councillors with the Board, seem no longer applicable.

- Audited Accounts from the Council to start with the Opening Balance of the company are not yet available
- Not clear how consumer balances absorbed? (audited or not)
- Not clear how old creditors to be absorbed (audited or not)

The problems and impediments experienced in Kitale and adversely affecting the current operation of the company, can be summarised as follows:

- The agency agreement should be signed prior to the commencement of the new company
- Liabilities taken over from the previous operator should be reconciled and audited, to enable the company to start of with a clear picture of the Opening Balance situation
- Financial start up help should be available
- Amount or mode of lease for the assets not yet finalised
- Loan balance of assets not yet clear with the council
- Production affected, due to power on cut off, not for current but old KP&LC debt, carried forward
- Staff issues (transfer, provident fund etc) not finalised as agency agreement still pending

8.9. OPTIONS FOR VIABLE MANAGEMENT AND OPERATION

The approach for recommended changes has focussed on the intention to offer viable approaches that can be implemented within the shortest possible timeframe. Achievements should be possible, while more substantial changes touching on the institutional and legal framework are discussed, formalised or registered.

The various degrees of implementation carry the risk that other players involved in the changes do not agree to the recommended changes. To avoid this major risk, which has been experienced in the Kenyan environment, especially in the Water Sector, a gradual approach is recommended.

While the registration of a private company, Water User Association, Trust or Trust Corporation can be done within a few months, it is seen as a very time consuming and involving exercise, to prepare a detailed network condition plan, existing asset and liability information and clarify the position on the consumer accounts. The assessment, training, selection and repeat training of existing staff into a commercial environment requires "change management" in order to build capacity.

The problems caused by not having reconciled or audited data ready, when registering the "commercial" institution, can be learned from the commercialised

systems currently already in operation. The preparation of these details can fall into the operation of the "commercial" institution, provided the mode of establishing and confirming the figures has been agreed upon, prior to commencement of the 'commercial' operation.

Recommended changes have been worked out in Appendix K3 – ST 8.3 and are used as the basis for further analysis, leading to the phased options, reflected in the Action Plan. Refer to Appendix K3 – ST 8.4

8.9.1. Recommended Changes within the current Institutional Framework

Recommended changes for Phase I of the Action Plan are those changes that can be implemented immediately, with the assistance of a consultant and jointly with the client MENR. All recommended changes are vested within the powers of the client.

8.9.2. Recommended Changes for a De-centralised Framework

The analysis of the current situation reflects that the centralised system under which all water systems are managed and operated, accounts for many of the impediments listed. Phase II of the Action Plan indicates, which steps are recommended to be taken.

The decentralisation approach is as well seen as a step-by-step movement towards bringing the systems closer to the communities, pending a gradual approach towards Private Sector Participation. No lead model has been confirmed yet and a countrywide move can only be implemented by a gradual approach, as capacity building will be a lengthy process and not just a decision or declaration.

8.9.3. Recommended Changes for a Transition Approach

It is expected that recommended changes of Phase I will lead into and continue during Phase II and III. Any changes recommended under the institutional framework management, can build on the grass root work that has commenced with the preparatory measures of Phase I, as they are seen as a requirement for any kind of improvement or change towards a commercialised operation.

8.10. RECOMMENDED UTILITY MANAGEMENT PLAN

No.	Action	Narok	Meru	Muranga	Kabarnet	Makindu	Wundanyi	Migori	Lamu	Webuye	Mumias	Utility Management Plan
1.	Arrange for decent office space							x		x	x	
2.	Set up organisation charts with detailed job description and skill requirements.	x	x	x	x	x	x	x	x	x	x	
3.	Arrange for intensive management training for Engineers or recruit well-qualified managers.	x	x	x	x	x	x	x	x	x	x	
4.	Arrange for commercial and technical staff training	x	x	x	x	x	x	x	x	x	x	
5.	Set up positive and negative staff sanctioning system.	x	x	x	x	x	x	x	x	x	x	
6.	Limit recruitment to the system requirement, based on skill and merit.	x	x	x	x	x	x	x	x	x	x	
7.	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	
8.	Redesign consumer recording and reporting formats	x	x	x	x	x	x	x	x	x	x	
9.	Computerise consumer data base and consider billing software	x	x	x		x	x	x	x	x	x	
10.	Obtain field information from all existing consumer using the re-designed application format	x	x	x	x	x	x	x	x	x	x	
11.	Prepare implementation guidelines related to gazette notices and relating procedures	x	x	x	x	x	x	x	x	x	x	
12.	Prepare consumer and connection management guidelines	x	x	x	x	x	x	x	x	x	x	
13.	Design consumer / connection – management guidelines	x	x	x	x	x	x	x	x	x	x	
14.	Design meter reading / servicing / disconnection schedules and guidelines.	x	x	x	x	x	x	x	x	x	x	
15.	Undertake analysis to substantiate and confirm old debts	x	x	x	x	x	x	x	x	x	x	
16.	Propose write off procedure for old debtors	x	x	x	x	x	x	x	x	x	x	
17.	Recommend commercial charges and penalties	x	x	x	x	x	x	x	x	x	x	
18.	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	
19.	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	

8.10. RECOMMENDED UTILITY MANAGEMENT PLAN

No.	Action	Narok	Meru	Murranga	Kabarnet	Makindu	Wundanyi	Migori	Lamu	Webuye	Mumias	Utility Management Plan
1	Arrange for decent office space							X		X	X	
2	Set up organisation charts with detailed job description and skill requirements	X	X	X	X	X	X	X	X	X	X	X
3	Arrange for intensive management training for Engineers or recruit well qualified managers	X	X	X	X	X	X	X	X	X	X	X
4	Arrange for commercial and technical staff training	X	X	X	X	X	X	X	X	X	X	X
5	Set up positive and negative staff sanctioning system	X	X	X	X	X	X	X	X	X	X	X
6	Limit recruitment to the system requirement based on skill and merit	X	X	X	X	X	X	X	X	X	X	X
7	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
8	Redesign consumer recording and reporting formats	X	X	X	X	X	X	X	X	X	X	X
9	Computerise consumer data base and consider billing software	X	X	X		X	X	X	X	X	X	X
10	Obtain field information from all existing consumer using the re-designed application format	X	X	X	X	X	X	X	X	X	X	X
11	Prepare implementation guidelines related to gazette notices and relating procedures	X	X	X	X	X	X	X	X	X	X	X
12	Prepare consumer and connection management guidelines	X	X	X	X	X	X	X	X	X	X	X
13	Design consumer connection management guidelines	X	X	X	X	X	X	X	X	X	X	X
14	Design meter reading servicing disconnection schedules and guidelines	X	X	X	X	X	X	X	X	X	X	X
15	Undertake analysis to substantiate and confirm old debts	X	X	X	X	X	X	X	X	X	X	X
16	Propose write off procedure for old debtors	X	X	X	X	X	X	X	X	X	X	X
17	Recommend commercial charges and penalties	X	X	X	X	X	X	X	X	X	X	X
18	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
19	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

No.	Action	Narok	Meru	Muranga	Kabarnet	Makindu	Wundanyi	Migori	Lamu	Webuye	Mumias	Utility Management Plan
20.	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	
21.	Decentralise decision making process to station level	x	x	x	x	x	x	x	x	x	x	
22.	Decentralise planning and control of cost	x	x	x	x	x	x	x	x	x	x	
23.	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	
24.	Design MIS reporting system for Povincial to HQ reporting (investment planning, policy making)	x	x	x	x	x	x	x	x	x	x	
25.	Set up stock management system and controls	x	x	x	x	x	x	x	x	x	x	
26.	Set up consumer meter workshop (with volumetric test facilities)	x	x	x	x	x	x	x	x	x	x	
27.	Prepare / update O&M guidelines / manuals	x	x	x	x	x	x	x	x	x	x	
28.	Propose outsourcing criterias for pump maintenance depending on the pump capacity.											
29.	Include consumer lines into the planned network	x	x	x	x	x	x	x	x	x	x	
30.	Clarify and document water wayleafs	x	x	x	x	x	x	x	x	x	x	
31.	Introduce retainer security on contracted civil works and quality control	x	x	x	x	x	x	x	x	x	x	

No.	Action	Narok	Meru	Murang'a	Kabarnet	Makindu	Wundanyi	Migori	Lamu	Webuye	Mumias	Utility Management Plan
20	Decentralise AIE, funding and procurement procedures to system level and transfer efficient and stringent control to the provincial / regional office level	\	\	\	\	\	\	\	\	\	\	X
21	Decentralise decision making process to station level	\	\	\	\	\	\	\	\	\	\	X
22	Decentralise planning and control of cost	\	\	\	\	\	\	\	\	\	\	X
23	Design efficient and stringent control system for the provincial / regional office level (Price analyst, independent external auditors, adequate use of chemicals)	\	\	\	\	\	\	\	\	\	\	X
24	Design MIS reporting system for Provincial to HQ reporting (investment planning, policy making)	\	\	\	\	\	\	\	\	\	\	X
25	Set up stock management system and controls	\	\	\	\	\	\	\	\	\	\	X
26	Set up consumer meter workshop (with volumetric test facilities)	\	\	\	\	\	\	\	\	\	\	X
27	Prepare / update O&M guidelines / manuals	\	\	\	\	\	\	\	\	\	\	X
28	Propose outsourcing criterias for pump maintenance depending on the pump capacity											X
29	Include consumer lines into the planned network	\	\	\	\	\	\	\	\	\	\	X
30	Clarify and document water wayleafs	\	\	\	\	\	\	\	\	\	\	X
31	Introduce retainer security on contracted civil works and quality control	\	\	\	\	\	\	\	\	\	\	X

8.11. RECOMMENDED PRIORITY PROJECTS

The final choice of priority projects is recommended to be made during or as a result of the stakeholders workshop. The utility indices and figures compiled in Annex K3 – ST8.2. allow however to draw conclusions and give a basis for good comparison. There are a number of criteria offered as a selection criteria, like:

- Which town promises the fastest results?
- In which town are the highest savings expected?
- Where is the intervention most urgently needed?
- Billing and Revenue Collection Efficiency highest or lowest? or
- Which town has shown the highest effort under the prevailing circumstances?

8.12. RECOMMENDED PRIORITY MEASURES:

The reduction of Un-accounted for Water (UfW) must be considered as the overall priority measure, necessary for all the systems analysed.
Un-accounted for Water is made up of:

- Physical losses in the transmission and distribution system
- Wrong meter reading and billing, and
- Water theft

For those towns where the calculation showed no UFW, the consultant is of the opinion that the information availed needs further confirmation and more detailed field investigation, because such a situation isunrealistic.

To reduce the said water losses it is therefore recommended to give the following priorities:

1) **Full rehabilitation of the existing distribution system, including standardised meter connections,**
2) **Replacement or repair of all faulty consumer meters,**
3) **Setting up of a consumer data base and a reliable billing program, and**
4) **Management- and Staff Training for the relevant staff members**

9. INSTITUTIONAL AND LEGAL ASPECTS OF MERU URBAN WATER SUPPLY AND SEWERAGE SERVICES

9.1 Institutional Set-up of Meru Urban Water Supply and Sewerage Services.

Meru urban water supply is under the responsibility of the District Water Office (DWO), Meru District. This means that in addition to the operation and management of the Meru Urban Water Supply, the DWO has the responsibility of operating and managing other water supply systems in Meru District. The District Water Officer, Meru, is supported by a Deputy District Water Officer. The detailed organisational structure for Meru District Water Management is presented in the utility management section of this report. The functional arrangement in the District water supply system includes the following sections:

(a) Operations and maintenance.
(b) Revenue and billing.
(c) Accounts.
(d) Administration.
(e) Supplies.

The staff complement is 56. It should be noted, however, that while most staff are deployed specifically in the Meru Urban Water Supply, others are also deployed in the operation of the other water projects in Meru District.

Meru town has a limited sewerage system, which is operated and managed by the Meru Municipal Council. Revenue collection on sewerage connections and user charges are tied to the water billings accounts. The Municipal Council, therefore, relies on the District Water Officer for sewerage services related revenue collection.

In recommending a viable institutional and legal framework for Meru Urban Water Supply, it is necessary to provide details of the existing institutional and legal framework for the water sector in Kenya.

9.2 Existing Institutional Framework for the Water sector

9.2.1 Organisations Concerned with Water Supply

Water is principally now being managed under the Ministry of Environment and Natural Resources. However, there are specific institutions responsible for the development, operation and maintenance, and regulation of water supply. These institutions are analyzed below.

(a) Department of Water Development

The Department of Water Development (WDD) is the GOK agency responsible for the development, conservation and control of water. In support of this, its mission

statement is: "to ensure proper and orderly Water Resources Management, including assessment, conservation, development and protection of the environment from degradation from water development activities." In order to fulfill its mission, the functions of the department are stated as:

- Water development and water supply;
- Control of water catchments;
- Water resource management;
- Water quality and pollution control;
- Water conservation.

To execute these functions, the Director of Water Development is responsible for three branches, which together are responsible for ten Divisions, one additional Division, the Kenya Water Institute (KEWI), six provincial water offices and, through the provincial offices, 64 district offices throughout Kenya. WDD operates a total of 375 (309 rural)[3] schemes through its network of Provincial, district and Divisional offices.

The Department of Water Development manages ground and surface water resources by hydrological observation, assessing water resources, controlling water quality, planning water projects, assessing environmental and other impact of water resource management practices. There are 500 observation stations around the country providing data for this unit. The branch also manages a division for water rights ad assessment, which issues, cancels and registers water permits and maintains water resources database.

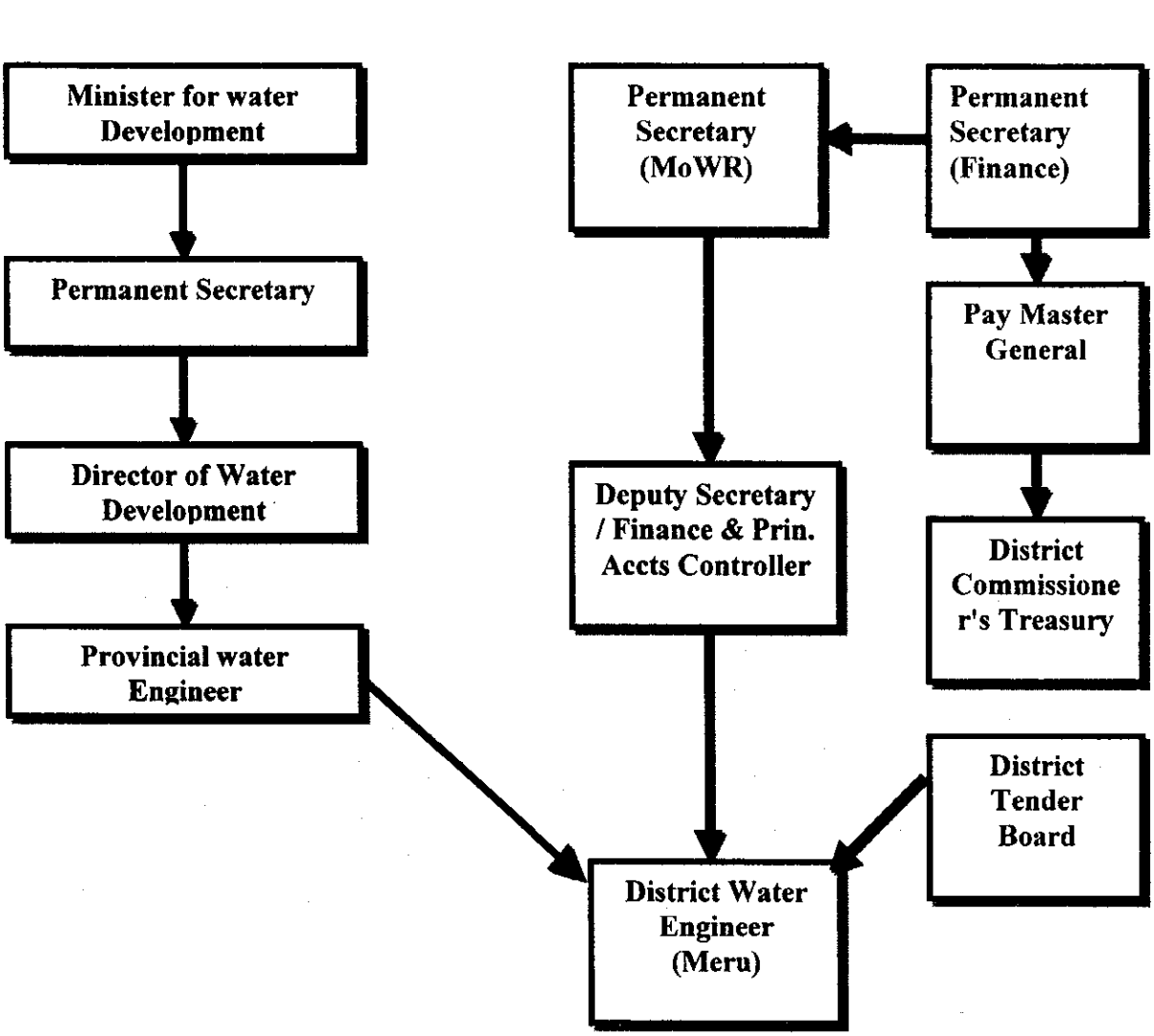
The four branches of the department are:

- Water resource development
- Water resource management
- Water research
- Kenya Water Institute

(b) Water Operations at District and Scheme Level

In Districts and scheme level, management is vested on the District Water Engineer. The District Water Engineer is also Secretary to the District Water Board and executes decisions as required by the DDC.

Chart 1: Management Structure for Water and Sewerage Services - Water Undertaker: Director of Water Development



9.2.2 Agencies Related to the Ministry of Environment and Natural Resources

There are various agencies operating in support of the mission of the Department of Water Development. These include:

(a) Water Appointment Board (WAB)

WAB reports to the Minister of Water. It, on behalf of the Minister, authorises, supervises and controls the use of water throughout Kenya. The function is discharged through Catchment Boards. There are six catchment Boards as follows: Tana, Rift Valley, Athi, Northern Ewaso Nyiro, Lake Victoria North, and Lake Victoria South.

(b) District Water Boards

District Water Board, established since 1991, in each district assist the planning and coordination of water related activities. The Boards are subcommittees of the DDC's. Their mandate includes:

- Protection, conservation and preservation of all catchment areas in the district;
- Partitioning, allocations and authorisation of al water bodies;
- Water quality and pollution control activities;
- Management and control of water use;
- Overseeing and coordinating all water related activities in the District;
- Assisting in the enforcement of the Water Act.

(c) National Water Conservation and Pipeline Corporation (NWCPC)

The National Water Conservation and Pipeline Corporation (NWCPC) was established under the State Corporations Act, Chapter 446 of the Laws of Kenya vide Legal Notice No. 270 of 24th June, 1988, as an autonomous agency reporting to the then Ministry of Water Development. The Corporation became operational on 1st July, 1989. The Corporation was created to meet the following objectives:

- To commercialize the water sector operations;
- To achieve financial autonomy in water operations;
- To improve performance of water supplies and
- To reduce dependence on public funding of water projects.

At the time of establishment, the Corporation was mandated to undertake the following in connection with water supplies and projects where it had been appointed water undertaker:

(i) Under the general direction of the Minister for the time being responsible for water resources, manage and develop the specified water supplies and projects;

(ii) Supply water in bulk to such water undertakers as the Minister may, after consultation with the Board of Directors, by notice in the Gazette, designate;

(iii) Supply water in bulk or otherwise, to such persons or class of persons as the Minister may, after consultation with the Board, by notice in the Gazette, designate;

(iv) Do all such things as may be necessary or advantageous for the management of the water projects and for securing an adequate supply of water;

(v) Apply for and obtain all such licenses, permits and other authorities required under any written law or as may be desirable.