3.4 Planning of Newly Proposed Projects

3.4.1 Design Criteria

New development projects are proposed to meet urban water demand in the year 2010. Due to the limited data and information on the existing schemes, design factors adopted may be inaccurate particularly in some small urban centres. The present planning, therefore, are subject to further investigation and study to confirm their technical and economic feasibility, to be done in the later stage of the project development.

The water supply projects in the country, in general, are designed in accordance with the MWR 1986 Design Manual. Although the design criteria recommended in the manual are applied in all engineering fields, the Study Team further introduced the following concepts:

(1) Water Quality

The Kenyan drinking water standards will be applied for design of the newly proposed urban water supply project.

(2) Treatment Process

Treatment process will be subject to raw water quality, possible future pollution of the sources, ease of operation and maintenance, staff familiarity with the processes and availability of materials and chemicals.

Preliminary Proposal for Water Treatment Process

Water Source	Treatment Process Recommended	Remarks
River water	Full treatment + chlorination	
Borehole water	Chlorination + aeration	Aeration is recommended when high contents of iron and manganese are expected.
Dug well	Chlorination	When piped water supply

(3) Transmission and Distribution

Gravity supply is recommended, where possible, to reduce the annual cost in operation and maintenance of the schemes. Pumping facilities will be limited to areas where they are essential.

Transmission mains from the treatment works to the storage reservoirs will have a sufficient capacity to allow mean daily flow.

Recommended pipe materials of distribution and transmission pipelines are uPVC, in view of costs and ease of handling and transportation. Steel pipes and ductile iron pipes may be applicable only where animals access are expected and in rocky areas.

(4) Storage Facilities

A peak factor of 2.0 will be applied in planning distribution and storage facilities.

(5) Master and Zonal Meters

They will be installed on outlet pipe from treatment works and inlet mains to the distribution zones to facilitate flow and leakage control.

(6) Metering

All individual and non-individual connections will be metered aiming at reducing un-accounted for water and increasing water sales and revenue.

(7) Water Points and Kiosks

People residing in peripheral urban areas will receive piped water through water points or kiosks to be constructed. When considered reasonable, a supply area will be expanded to serve population in the surrounding rural areas. Service for those population will also be through water points.

3.4.2 Preliminary Design

For the purpose of estimating overall investment requirement for the long-term urban water supply development, preliminary design for typical water supply systems were prepared as shown in **Figures - 3.4.1** and **3.4.2**. Salient features of the newly proposed projects are summarised in **Table - 3.4.1**.

(1) Water Source Facilities

1) Large dam and inter-basin transfer system

Design of such source facilities as large dam and inter-basin diversion system requires extensive field surveys and technical feasibility study. Fortunately, NWMP provided general features of the basins and preliminary cost estimates which are quoted in this Study.

2) Run-of-river intake

As intake facilities for the surface water, weir and inlet chambers are proposed. The intake will be located at right angles to direction of flow with inlet velocities of less than 0.1m/s, at a level well above the river bed level. The coarse screen will be installed so that the floatage garbage should not be carried into treatment facilities.

Raw water mains are of uPVC. Length of the pipelines is assumed to be 1 km for small and medium scale schemes, and 5 km for large scale schemes. Flow velocity is assumed to be 1 m/s.

3) Borehole with powered pump

Subsection 2.4.2 of the Main Report evaluates the present operation and maintenance status of existing boreholes. The contemplated urban areas are supplied with electric power by KPLC, and, therefore, electric powered pump is adaptable.

(2) Water Treatment Facilities

Conventional treatment methods are recommended for the schemes that depend on surface water as they substantially reduce levels of suspended matter in water. The table below summarises effectiveness of the treatment methods generally applied for large scale water supply schemes.

Water quality parameters	Treatment Method			
	Chemical Coagulation	Sedimentation	Rapid Sand Filtration	Chlorination
Dissolved oxygen	=	=	-	=
Carbondioxide removal	=	=	+	=
Turbidity reduction	+++	++	+++	=
Colour reduction	++	+	+	++
Taste and odour removal	+	+	+	+
Bacteria removal	+	++	++	++++
Iron and Manganese Removal	+	+	++	=
Organic material removal	+	++	+	+++
Fluoride removal	=	=	=	=
Total dissolved solids reduction	=	=	=	=

Note: + Positive effect, - negative effect, = no effect

Source: International Reference Centre for Community Water Supply and Sanitation (IRC) August 1981

One of the targets set up in this Study is to produce safe and potable water. To achieve this target, disinfection by chlorine is applied to all schemes.

Surface water normally requires treatment. Dosing with chlorine is the final process for disinfection. In planning the chlorine dosing system, careful attention shall be paid to turgidity, not only because it causes aesthetic problems, but also endangers the safety of the water. Suspended particles that may cause turgidity shall be removed to a preferable level before chlorination. Otherwise, chlorine will not act as intended. Chlorine shall have a sufficient contact time with bacteria. There are a lot of examples of the failure in disinfection when turgidity is 5 NTU or more. Turgidity of the pre-treated water shall not exceed 1 NTU, a minimum requirement for chlorine dosage. This value shall be attained at the pre-treatment including coagulation, sedimentation and filtration. According to the literature, when the turgidity is less than 1 NTU at pH 8.0 with sufficient contact time more than 30 minutes and with the residual chlorine, 0.5 mg/l, suspended particles, more than 99%, E-coliforms and parasitic protozoan are removed safely.

The following are excerpts from the MWR 1986 Design Manual. As noted in Remarks, preferable level of turgidity is less than 1 NTU for efficient disinfection. Many water schemes are not even meeting the permissible level, 25 NTU.

Parameter	Unit	Desirable value	Permissible value	Remarks
Colour	True Colour Units (TCU)	15	50	
Turgidity	NTU	5	25	Preferably <1 for disinfection efficiently

Aside from the surface water, underground water abstracted from deep aquifer is usually safe and clean. Because of possible pollution from access by human beings and livestock, however, all schemes shall have equipment for chlorine dosage.

Outline feature of each treatment process is further described below;

1) Coagulation and flocculation

Coagulation and flocculation are assumed to be simple hydraulic mixing and flocculation. Chemicals for coagulation will basically use alum and soda ash which are widely in use in the country.

2) Sedimentation

For convenience of operation and maintenance, it is assumed to apply conventional horizontal flow sedimentation basin. Retention time is set at 4 hrs and surface load in basin is assumed at 1.0 $m^3/m^2/hr$.

3) Rapid sand filtration

Rapid sand filters with a rate at 120m/day are assumed. The filter media is backwashed periodically.

4) Disinfection

The chlorine disinfection is a final step to produce safe water. Sanitary safety is secured by the contact time more than 30 minutes as stated above. Disinfection will be by use of chloride of lime or hydrochloride solution, using gravity drip feeds.

(3) Storage Reservoir/Tank

Storage capacity was assumed to correspond to one day average water demand for small scale schemes and 12 hours for medium and large scale schemes.

(4) Distribution

Gravity flow distribution is assumed and uPVC pipes are proposed.

3.6 Operation and Maintenance Strengthening Plan

3.6.1 Establishment of Functional Metering System

Metering is a basic tool for effective management of water supply schemes. Without metering, water production and consumption cannot be measured. Accordingly, tariff will have no base for billing. Flat rate tariff is not an optimal solution. People tends to use water without any restriction. If a functional metering system is established, people suffering from chronicle water shortage may significantly benefit from vast amount of water saved from improved customers' attitude. Eventually water sales and revenue will increase, generating funds for better management and operation of the schemes.

Keeping in mind the vulnerable nature of the metering system which can be easily vandalised by the customers, all schemes shall endeavour to keep and pursue a desirable level of water supply services in terms of quantity and quality, and a close relationship with the customers in their routine operation and management.

At the national level, MWR shall be a key player in cooperation and consultation with NWCPC and MOLA, taking actions for administrative procedures, legislative set-up and national campaign programme. Thus, MWR shall be responsible for creating circumstances so that every water scheme can easily shift and adopt the metering system. To manage and support these activities, the Government shall do the following;

1) Mobilise meter readers from existing staff through KEWI courses for the training of trainers, and local training programmes;
2) Mobilise accountants for requisite bookkeeping and accounting at District level;
3) Mobilise technicians from existing staff for meter calibration and repair through KEWI courses for the training of trainers, and local training programmes;
4) Assist DWOs to set-up or refurbish meter repair shops with the necessary equipment;
5) Conduct public awareness campaigns for the introduction of the metering system, directly and through the media.

At district level, DWOs, Municipalities, Regional offices of NWCPC shall play a important role in driving all water schemes into introduction of the metering system.

3.6.2 Leakage Control

As described in the foregoing chapters, many waterworks are suffering from a large quantity of water losses particularly at their transmission, distribution, and service pipelines. In these

waterworks, leakage and wastage control are considered effective not only to reduce water losses but to save precious water resources. With a view to the limited water supply sources in the country, MWO shall work out a national programme for leakage and wastage control, that consists of crash and routine sub-programmes. To materialise this programme, the MWR shall take the following actions:

1) Establish a short course at KEWI for active leakage control (detection and repair);
2) Mobilise technicians from existing staff through KEWI courses for the training of trainers, and through local training programmes;
3) Assist DWOs to acquire and install bulk meters at the outlet of each treatment works and storage reservoir, and subsidiary meters to isolate sub-areas of each system;
4) Assist DWOs to set up or refurbish the necessary detection and repair facilities and equipment;
5) Assist DWOs to prepare the necessary work programmes to cover detection and repair in the distribution network where the majority of leakages occur.

Along with the implementation of the above programmes, agencies such as DWOs, municipalities and NWCPC regional offices shall intensively undertake necessary measures for the wastage control under overall supervision of MWR.

3.6.3 Staff Training

The training needs of the above programmes should be reviewed against the latest Action Plan for the Kenya Water Institute (KEWI) to see if they can be accommodated within the planned implementation schedule. If not, the KEWI resources should be further strengthened in both range of courses and capacity to accommodate larger numbers of trainees. The subjects for which training is required will include the following:

1) Meter reading;
2) Meter repair and calibration;
3) Billing and revenue collection;
4) Bookkeeping and accounting, with special reference to the billing and collection system;
5) Leakage control and the reduction of UFW;
6) Supervisory courses for the above;
7) Water and sewage treatment for operators and supervision;
8) Personal computing using spreadsheet and database software.

3.6.4 Customer Registration

These measures would not be effective if many consumers exist unregistered. To complement this programme, unregistered consumers shall be traced in the course of the metering system development. Since the consumers are usually reluctant to be registered and metered, the MWR shall take the following measures to accelerate this;

1) public campaign on needs of functional metering system, referring to inequity between metered and unregistered consumers,
2) rescue people from any duties arising from nonregistration, and
3) two step approach by scheduling periods separately for voluntary and compulsory registration.

3.6.5 Chemical Water Treatment

Many waterworks are not dosing with chemicals due to financial constraints and a lack of quest for better quality of water. To produce safe and potable water, chemicals must be acquired, stored, and added to process. This priority is absolutely required and failure will not be tolerated in the interest of public health. To this end, MWR or other related agencies shall take the following actions;

1) periodical water sampling and laboratory testing by district or provincial water offices,
2) technical guidance to all waterworks for producing potable water and protecting water sources from possible contamination, and
3) provide them with necessary equipment and chemical agents required for minimum level of water testing (pH, turbidity, chlorine residuals, etc.).

3.6.6 Technical Assistance to Districts

The above programme of work will need significant improvement in the practice and management of district activities. This will apply to operation and maintenance of water supply systems as well as to regulatory tasks, such as control of water abstraction, pollution and water quality. It is recommended that externally sourced expert engineers should be assigned to groups of MWR Districts including NWCPC schemes and municipality schemes. They will assist in upgrading service delivery and regulation and help implement the these programmes.

3.6.7 Water Tankers at Provincial Offices

The Household Survey indicates that during the dry season, more than 50% of the households are not accessible to water, getting only once a week. This is particularly serious in ASAL areas. Life of many vulnerable people and livestock is reportedly jeopardised due to water scarcity. It is recommended that two or more water tankers should be procured at each provincial office to alleviate this hardship.

3.7 Construction Method and Period

The construction period of the project is subject to scope and natures of works, physical and natural conditions prevailing over the project area, method of construction, etc. The proposed urban water supply development plan is highly diversified in terms of source development (large scale dam, run-of-river intake, borehole) and status (on-going, planned, designed). Taking such

factors into consideration, construction method and period required for the work are discussed below.

Water supply systems proposed above consist of the processes widely applied in Kenya. Use of mechanical equipment is minimised. Contractors in the country have a long term experience in construction of similar treatment works and pipeline networks. Hence, the planned schemes do not require any special skills for construction. Further, work force such as skilled and unskilled labourers are abundant and locally available.

The capital materials and equipment are generally available in the domestic market. Only master meters, large diameter steel pipes, gate valves, and pipe fittings shall be imported. The following are steps required for project implementation.

(1) Feasibility Study, Detailed Design and Financial Arrangement

For the proposed rehabilitation and newly proposed projects, it is absolutely necessary to do a feasibility study and detailed engineering design. The period required is assumed to be two years.

(2) Pre-construction Procedures

Various procedures for prequalification tender, tendering, and contract award are required for the proposed rehabilitation work, planned/designed projects, and newly proposed projects. This period is assumed to extend one year.

(3) Construction Period

Construction period varies depending on status and nature of the projects. The assumed construction period is shown in the table below:

Assumed Construction Period

Type of Project	Assumed Construction Period (Year)
Rehabilitation Works	1
On-going Project	
- Present progress less than 30%	2
- Present progress more than 30%	1
Planned/Designed and Newly Proposed Projects	1
- Project with borehole	1
- Project with run-of-river intake	2
- Project with a large dam	4
- Project with inter-basin transfer	4

CHAPTER 4 RURAL AND LIVESTOCK WATER SUPPLY DEVELOPMENT PLAN

4.1 Methodology

The situation of the rural water supply is worse than the urban water supply. Rehabilitation and rationalisation is considered most urgent and effective especially for LSRWS. As regards the existing SSRWS, they are usually managed and operated by communities. Under the circumstances, most preferred way is periodical support and guidance by the DWOs and the local authorities concerned so that can lead to sound management.

4.1.1 Small and Large Scale Rural Water Supply Schemes

In case of the small scale rural water supply (SSRWS), mainly water points with some pipe works are supply sources to the public and livestocks. On the contrary, the large scale rural water supply (LSRWS) may have pipe reticulation consisting of trunk, secondary and tertiary mains for distribution and transmission. Individual connections are a major type of service connection. At the peripheral supply areas, schemes may have water points to serve the surrounding rural population. Planning concept for expansion and rehabilitation of LSRWS is similar to those for the urban water supply (UWS) (refer to (1) Urban Water Supply, in this section). The following planning concepts, accordingly, are for constructing new SSRWS.

1) Water sources for domestic use may be spring, groundwater (shallow well, boreholes) or riverbed water from a hygienic viewpoint.

2) Supply basically from water points with minor piping works to supply water to major institution such as schools and hospitals

3) Disinfection is a minimum requirement for all schemes to meet MWR water quality guidelines.

4) Installation of a master meter to increase cost recovery, and the application of universal metering, especially at large consumers as minimum requirement.

5) Gravity supplies to reduce recurrent costs and pumping being limited to areas where it is essential.

6) Community based organisation and management in line with the decentralisation policy set up by the Government.

In planning and locating water sources in the rural areas, the following issues related to project management are considered important for successful operation.

1) Tribal issues: Conflicts between tribes are common in Kenya. Selection of the location shall be decided after a series of dialogues with the people concerned.

2) Religion: Due to religion, vandalisation of the constructed facilities is also common. Members of a water user committee will be selected through election by the people concerned.

3) Cultural issues: Nomads dependent on livestocks move seasonally from place to place. Provision of water points may cause socio-cultural problems among the people.

4) Assessment of public needs for water: People's needs for water will be assessed carefully. Where water supply is planned to be constructed by other undertakers, water point construction is not recommended.

5) Formation of water user committee: To ensure sustainability of the developed water supply scheme, a water user committee responsible for operation and management of the scheme will be organised within the community concerned.

6) Public involvement and participation: To increase opportunities of the public involvement to the schemes, it is more preferable to ask the community to provide work forces during construction.

7) Investment costs to be borne by the beneficiaries: Beneficiaries shall meet part of investment costs.

8) Women's involvement in the stage of design, construction and operation: Women play an important role in handling water in their daily lives and should therefore be involved in all stages of the scheme development.

9) Hygiene and health education: It is of vital importance to instruct people the needs for safe and potable water, sanitation, water borne diseases related to public hygiene and health through seminar, meetings, movies, etc.

10) Tariff: The water user committee will set up tariff levied on all customers. The revenue collected are to cover recurrent costs required for normal operation and maintenance.

Construction of water points in the rural areas poses a lot of issues to be tackled both before and after the project implementation. The current Study, paying attention to the above, intends to prepare design criteria for communal water points in the succeeding sections, identifying areas where water shortage is crucial, and estimating number of water points required on the basis of the available data.

4.1.2 Livestock

Apart from communal water points for domestic water use, water points for livestocks will be designed at strategic points of the study area. Abundant surface water is available in the coastal and western areas and in eastern slope of Mt. Kenya, while the perennial flow is very rare in the arid and semi-arid areas. The following concepts are used to identify needs of and planning the livestock water points:

1) Earth pans or small dam are most practical methods to supply water to livestock.

2) Despite aerial change in availability of the surface water, estimated incremental water requirements plus 20% of the present water consumption are assumed to be design capacity of water pans for safety.

3) In selecting potential areas for construction of the livestock water supply, ASAL areas shall have a priority.

4) Storage capacity of the pans shall be determined in view of the loss due to seepage and evaporation. It is tentatively assumed that the pan shall have gross storage capacity of 12,000 m^3.

5) Earth pans shall be accessible both for livestocks and human-beings. Each pan shall be separated into two basins so that livestocks can easily access to one without polluting the other. Hand pumps shall be constructed near the pans for domestic use.

4.2 Rehabilitation Plan

As same as the urban water supply projects, it is proposed to rehabilitate the existing rural water supply projects so that the quantity of water production can be restored to the originally designed level and water quality can be secured to the standard levels. Characterised by types of the rural water supply projects, two different approaches were applied.

Due to the limited information on the present conditions of the LSRWS, it is assumed that the component facilities are similar to those of the Urban Water Supply. It is also assumed that scope of the rehabilitation works will be the same as that of the UWS.

As discussed in the **Subsection 1.3.1** of this Report, 848 small scale rural water supply schemes were established and in operation in the country as of 1995. They are managed by communities, institutions and NGOs.

It is hardly possible to identify the present operation and maintenance status of these schemes. Sample surveys carried out in the current Study suggest that they are facing serious operational

and financial problems. This issue is dealt with in Chapter 11 of the Main Report. In the present Study, it is assumed that no public investment would be required.

From all the above, full scale rehabilitation of these SSRWS is not considered.

4.3 On-going Projects

There are many on-going RWS schemes in the country. As for LSRWS, 250 projects are under implementation and 120 projects are in design stage. Outline scope of these on-going projects, accordingly, are incorporated in the current Study as far as information are available.

4.4 Planning of Newly Proposed Projects

4.4.1 Design Criteria

In principle the same design criteria as stated in Subsection 3.4.1 of this report will be adaptable even for the rural water supply project. It is, however, necessary to be cognisant of the following:

1) Protected dug well and/or boreholes are major water sources. All facilities will be designed to be protected completely against possible pollution by human beings and livestocks.

2) Hand pumps installation at dug wells may be applicable for schemes that require water production less than 10 m^3/day.

3) Balancing tanks, where deemed necessary, will have a capacity of one day water demand.

4) Roof catchment is considered as one of supply sources to meet institutional water demand including health facilities, churches and schools located especially in the sparse rural areas.

4.4.2 Preliminary Design

The newly proposed rural water supply projects will have the same features as those of the urban water supply projects. Exception is only for the source development. Instead of the surface water, groundwater is a major water source especially for the SSRWS.

One of the objectives of the present Study is to grasp the scale of the projects in monetary term to achieve the long term development target for rural water supply. In order to secure accuracy within an allowable level, several water supply scheme models are developed. The project scale is largely dependent on served population, source facilities and distribution mode. With those factors in mind, the following prototype models are developed.

Typical Water Supply Models

Model Code	Water Supply Capacity	Target Population	Source Facilities	Distribution Type
SS-1	4 m^3/day	200	Dug well with hand pump	Point supply
SS-2	10 m^3/day	500	Same as above	Same as above
LS-1	600 m^3/day	5,000	Borehole with chlorination	Point and piped supply
			Surface water with full treatment	
LS-2	2,500 m^3/day	20,000	Same as above	Same as above

Source: The Aftercare Study Team

From the discussion made in Chapter 7 of the Main Report, some districts are expected to be in short of safe water supply even after completion of the on-going, and planned/designed water supply projects. Theoretically, it is possible to minimise such water deficit by implementing a single or a couple number of the new projects. In selecting one from the above models, population density, magnitude of the water deficit and availability of water resources within the district concerned shall be taken into consideration.

For the purpose of this study, it is tentatively assumed that application method of the models is in accordance with the following:

1) LSRWS

Basically both Models MS-1 and MS-2 will be applicable evenly.

2) SSRWS

Models SS-1/2, SS-3/4 and SS-5 will be applicable in the same proportion.

4.5 Livestock Water Supply Facilities

It is planned that the livestock water supply sources are water pans and/or small dams. A gross storage capacity is assumed 50,000 m^3 per unit, in accordance with the previous NWMP. Climatic characteristics varies from districts to districts. It is known that ASAL areas are subject to a relatively long dry period of 5-6 months with two rainy periods in a year. It is supposed the rain water and/or seasonal flow are available during the rainy period so that water storage is required for the rest of the year.

Table - 4.5.1 shows the number of small dams/water pans proposed for the respective district. It is assessed that 597 small dams/water pans are required to meet the long term livestock water demand in total. **Figure - 4.5.1** shows a sample drawing of typical water pans.

4.6 Construction Method and Period

The construction period of the project is subject to scope and natures of works, physical and natural conditions prevailing over the project area, method of construction, etc. The proposed rural water supply development plan is highly diversified in terms of source development (large scale dam, run-of-river intake, borehole) and status (on-going, planned, designed). Taking such factors into consideration, construction method and period required for the work are discussed below.

Construction works contained in each SSRWS is actually very minor in terms of work volume. It is common practice that the rural water supply project will be implemented on a basis of district unit, as experienced in Kajiado, South Nyanza and Kakamega Districts. Accordingly it is assumed that the SSRWS will be implemented on district basis. The civil works for construction of water points and storage reservoirs do not require any skilled labourers. It is recommended to use labour forces locally available in communities. Community participation to the project is an essential factor for sound management and effective operation of the schemes after construction. Feasibility study, design and construction may complete in a couple of years. As for the LSRWS, the same construction period as that of UWS is assumed.

Table below presents the construction periods of various types of rural water supply projects.

Assumed Construction Period of Rural Water Supply Projects

Type of Project	Construction Period (Year)	
	LSRWS	SSRWS
Rehabilitation Works	1	-
On-going Project		
- Present progress less than 30%	2	2
- Present progress more than 30%	1	1
Planned/Designed and Newly Proposed Projects		
- Project with borehole	1	
- Project with run-of-river intake	2	3
- Project with large pond	2	(for entire district without regard to type of project)

Source: The Aftercare Study Team

MWR has been mobilising its own resources for construction small dams/water pans. Major works are earth moving/excavation, which does not require a long period. As such a three-month period is allowed for construction of each structure.

CHAPTER 5 PRELIMINARY COST ESTIMATES

5.1 General Conditions

The proposed long-term development plan comprises: (a) rehabilitation of existing projects, (b) the on-going projects by the Government, (c) the planned/designed projects by the Government, (d) newly proposed projects, (e) leakage control programme, and (f) metering campaign. Of these, the required investment for categories (b) and (c) are available from the MWR Status Report and the NWCPC Status Report. As to the category f), all the costs for procurement and installation of individual meters shall be owed by beneficiaries as set forth in MWR regulation. Under the Study, therefore, the preliminary cost estimate is made for the rest of the categories.

5.1.1 Unit Cost and Exchange Rate

Unit cost of materials and equipment is estimated at the price level prevailing in February 1998. An exchange rate, US$1.00 = Kshs 61.1 = Japanese Yen 124.7 (as of 10 February 1998) is applied in estimating unit cost of imported materials and equipment. Materials and equipment locally available are based on market price, the latest quoted price or results of the recent studies carried out in the country.

5.1.2 Construction Cost

The construction cost comprises (a) direct construction cost, (b) land acquisition and compensation, (c) engineering services for studies, design and construction supervision, (c) administration cost by the executing agency and (d) contingencies which are estimated as follows:

1) Direct construction cost: sums of costs required to construct the respective facilities including intake, raw water mains, treatment works, storage reservoirs, mechanical equipment, and distribution mains, depending on the schemes.
2) Land acquisition and compensation: 5% of the direct construction cost.
3) Engineering services: 10% of the direct construction cost.
4) Administration cost: 15% of the direct construction cost.
5) Contingency: 10% of the sum of Items 1) through 4).

5.1.3 Rehabilitation Cost of Existing Schemes

As the scope and cost of the rehabilitation are clarified in the questionnaire surveys at most urban and rural water supply schemes, these estimated costs are utilised in the current study. The direct construction cost of the rehabilitation works exclusive of the above work items is estimated for the respective items as follows:

1) Flow meter: on the basis of a price quotation from manufactures and include an allowance of 30% of the procurement cost (CIF, Site) to allow erection, installation and other associated works.
2) Chlorination equipment: the same method as above.
3) Storage tank: on the basis of the unit construction cost: Kshs 3,137/m^3.
4) Other miscellaneous works

The rehabilitation works will involve various civil, electrical, mechanical and other miscellaneous works, apart from the above major works. It is estimated by applying unit rate of Kshs 4,257/m^3 of water produced.

The summary of estimated rehabilitation cost is presented in **Table - 5.1.1.**

5.2 Construction Cost of On-going and Planned/Designed Projects

The MWR Status Report and NWCPC Status Report provide information on the construction cost of the on-going and planned/designed projects undertaken by their administration. In this Study they are applied in order to obtain the total investment required to achieve the long-term water supply plan of the respective urban centre. The costs envisaged in the status reports are given in **Tables - 5.2.1** and **5.2.2.**

Note, the construction cost of the on-going projects shows the investment required to complete the remaining works.

5.3 Construction Cost of Newly Proposed Projects

5.3.1 Urban Water Supply

The direct construction cost of the main structures was estimated in the following manner:

(1) Source Works

Typical sources involves construction of dams and inter-basin transfer system, run-of-river intake facilitates, and boreholes.

1) Large dam and inter-basin transfer system: based on the construction cost obtained from NWMP after price escalation for the period form 1992 to 1997.

2) Run-of-river intake: based on the following equation.

$$Cri = US\$740{,}000 \times Qi^{3/4}$$

where,

Cri : Cost of run-of-river intake
Qi : Intake rate, m^3/s

A coefficient US$ 740,000 is referred to the feasibility study of the Seven Towns Water Supply Project.

3) Borehole with powered pump: based on prevailing local market prices for the three major works i) borehole construction, ii) procurement and installation of borehole pumps with instrument and iii) power receiving.

(2) Raw Water Main

A cost curve (cost vs. design intake rate) is developed from the recent study results. Unit construction costs for raw water mains (uPVC pipes) are estimated utilising the data collected from the local contractors. Estimated unit costs vs. diameter are plotted on a cost curve in **Figures - 5.3.1** and **5.3.2.**

(3) Treatment Works

A cost curve (cost vs. production capacity) given in **Figure - 5.3.3** is utilised in estimation.

(4) Storage Facilities

A cost curve (cost vs. production capacity) given in **Figure - 5.3.4** is also utilised in estimation.

(5) Distribution Pipe Network

It is roughly estimated by applying a unit rate of Kshs 14,420/m^3 of water distributed. The rate is derived from average of water supply projects in Japan.

Table - 5.3.1 presents the summary of the preliminary construction cost for the newly proposed urban water supply projects.

(6) Estimated Investment to Achieve Planning Targets

It is the sum of construction costs of the rehabilitation works, the on-going projects, the planned/designed projects and the newly proposed projects to achieve the long term urban water supply plan. The estimated investment requirement is US$ 1,322.2 million as summarised in table below.

(7) Estimated Investment Requirement for Urban Water Supply Plan

Type of Project	Number of Projects	Amount (US$10^3)
Rehabilitation of Existing Projects	120	44,500
On-going Projects	21	7,400
Planned/Designed Projects	21	27,400
Newly Proposed Projects	108	1,243,000
Total	270	1,322,200

Source: The Aftercare Study Team

On-going and planned/designed projects are under way under jurisdiction of MWR and NWCPC. These organisations will share the investment accordingly. It is supposed that MWR and NWCPC will be responsible for implementation of the newly proposed projects, though responsible executing agency will definitely be determined in the subsequent study stage. As case may be, local authorities concerned or MOLA will participate in some urban areas.

5.3.2 Rural Water Supply

For SSRWS, the construction cost is at first estimated for the respective typical model. The method of estimate is almost identical to that of the urban water supply project. Unit construction cost of the respective model as described below:

(1) Unit Construction Cost of Model Project

Model Name	Construction Cost (US$)
SS-1	1,980,000
SS-2	1,980,000
LS-1	1,566,000
LS-2	2,801,000

Source: The Aftercare Study Team

On the basis of the additional water development requirement and application method of the prototype model, the construction cost of SSRWS is estimated.

Table - 5.3.2 presents the construction cost of the rural water supply projects for the respective district. The investment requirement to achieve the long term rural water supply plan is estimated as summarised below.

(2) Estimated Investment Requirement for Rural Water Supply Plan

Type of Project	Number of Projects			Construction Cost (US$ 10^3)		
	LSRWS	SSRWS	Total	LSRWS	SSRWS	Total
Rehabilitation of Existing Projects	295	0	295	95,100	0	95,100
On-going Projects	239	313	552	54,200	13,500	67,700
Planned/Designed Projects	25	192	217	3,700	5,000	8,800
Newly Proposed Projects	52	51,131	51,183	84,100	101,200	185,400
Total	611	51,636	52,247	237,100	119,700	357,000

Source: The Aftercare Study Team

As the same as the urban water supply, the above investment will be borne by the water undertakers, though further continuous assistance by NGOs are expected to be participated especially in realisation of SSRWS.

5.3.3 Livestock Water Supply

According to the MWR's data, average construction cost of small dam/water pan is US$ 0.61/m^3 of active storage capacity, resulting in initial construction cost US$ 30,500/small dam/water pan (50,000 m^3 x US$ 0.61).

Table - 5.3.2 also shows the summary of the construction cost for the respective district. The total construction cost is estimated at US$ 18.2 million for the entire works.

5.4 Annual Operation and Maintenance Cost

5.4.1 Water Supply Facilities

The annual operation and maintenance cost is estimated for the on-going, the planned/designed, and the newly proposed projects in order to facilitate the project evaluation.

The cost comprises all expenditures which are required to keep a system in operation and good condition after it is placed on line. They include expense for annual maintenance and repair costs, operation costs (ex., salary, power, fuels, chemicals) and miscellaneous costs. Detailed estimate is presented in Supporting Report II.

(1) Cost for Fixed Asset Costs

The costs for civil works, pipelines and electrical/mechanical works are conservatively assumed to be 1%, 1%, and 5% of the initial construction costs, respectively.

(2) Salary Cost

According to the 1986 Design Manual, the minimum staff requirement of the treatment works is 13. In addition, there must be adequate number of meter readers, administrative staff, supporting staff, etc. The required total staff is therefore estimated as a function of total population served.

(3) Chemical Cost

The unit rate is assumed to be Kshs 0.7 per water production (m^3) for chlorine and Kshs 1.3/m^3 for alum.

(4) Cost for Power and Fuels

The power requirement varies largely from one scheme to another, characterised mainly by water treatment process and water intake and transmission. It is considered difficult to assess the power requirements on a same basis for all schemes. Power costs are therefore estimated for each works on an adhoc basis.

The estimated annual operation and maintenance costs are as shown in **Tables - 5.4.1** and **5.4.2.**

5.4.2 Leakage Reduction Programme

It is hardly possible to estimate the cost for this programme because the actual situation varies greatly from one urban centre to the another. Especially in Kenya, this programme is recommended to be implemented as one of the national water supply sector programme comprehensively, covering all existing urban water supply and rural water supply schemes.

Referring to the actual annual expenditure of typical Japanese municipal water supply and taking into account of a difference in price levels between Kenya and Japan, it was estimated at Kshs 3 per water production (m^3).

5.4.3 Summary of Annual Cost

The annual operation and maintenance cost is summarised in the table below:

Annual Costs for Urban Water Supply

Type of Project	Amount (US10^3)
On-going Projects	1,676
Planned/Designed Projects	15,358
Newly Proposed Projects	14,234
Leakage Reduction Programme	23,567
Total	54,835

Source: The Aftercare Study Team

Annual Cost for Rural Water Supply

Type of Project	Amount (US$10^3)		
	LSRWS	SSRWS	Total
On-going Projects	13,183	746	13,929
Planned/Designed Projects	415	617	1,032
Newly Proposed Projects	1,120	757	1,877
Leakage Reduction Programme	8,029	-	8,029
Total	22,747	2,120	24,867

Source: The Aftercare Study Team

The annual operation and maintenance cost will be shared by the water undertakers concerned.

The leakage reduction programme is expected to be launched as a nation-wide campaign under coordination of every water undertakers.

As for livestock water supply, the proposed small dams/pans will be located in a relatively remote area and of earthfill structure. They are almost free from operation and maintenance and therefore the minimum cost, one percent of the initial cost is allowed as annual operation and maintenance cost.

CHAPTER 6 IMPLEMENTATION PROGRAMME

6.1 Criteria for Project Ranking among Urban Centres and Districts

Reliable data on project status are a few. Under such condition, project ranking in terms of urgency is tentatively made. Major data sources for the study are "Household Survey on Water Use and Sanitation" and "Survey on Urban Water Supply" both carried out under the current Study, "MWR's Project Status Reports", "Questionnaire Survey on Needs of Rehabilitation" by MWR and "Welfare Monitoring Survey II" by World Bank. Careful attention are paid to keeping consistency of these data. It is however essential to make a review of the ranking discussed below, when updated data are obtained. Working procedures for the project ranking comprise of the following four steps;

Selection of factors and parameter setting to estimate rating scores are made separately for UWS, RWS and Livestock Water Supply. For simplification, weighting among factors is not considered. Project ranking is based on the total rates computed for each scheme and district.

6.1.1 Urban Water Supply

As sauce-economic and technical factors, the following eight key factors are considered representing urgency or needs of piped water supply. They are: 1) service coverage by water supply schemes, 2) water supply conditions in the supply areas, 3) health conditions, 4) contribution to industrial and commercial development, 5) contribution to tourism, 6) willingness and affordability of households and 7) cost effectiveness.

(1) Percentage of Served Population to Total Supply Area Population

This implies the service coverage in the supply areas. Although other type of water schemes sometimes exist in the supply areas, this coverage ratio may suggest needs of expansion and augmentation of the UWS.

Service Ratio (Pop Served/Pop in Service Area)	Score
more than 50%	1
50% or less	2

(2) Water Supply Conditions in the Supply Areas

Many people, even those serviced from piped water supply, are suffering from serious water shortage due mainly to significant gaps between the production capacity and the water requirements. Percentage of the production capacity to the 1995 estimated water demand, as considered appropriate, is selected as the factor.

Supply Conditions (W. Production/1995 Water Requirements)	Score
more than 75%	1
75% - 50%	2
50% - 25%	3
25% or less	4

(3) Health Conditions

A provision of safe and clean water will significantly improve the living environment and accordingly public health as seen in many developing countries. The household survey indicates that almost all households despite poor and rich, are suffering from water related diseases. Due to the limited sources, district data on population case of vomit/diarrhoea and fever/malaria are utilised.

Health Conditions Population Case Percentage/Max Percentage (Vomit, Diarrhoea, Fever, Malaria)	Score
Less than 25%	1
25% - 50%	2
50% - 75%	3
More than 75%	4

(4) Contribution to Industrial and Commercial Development

Industrial development, as addressed in Sessional Paper No. 2 and the 8th National Development Plan, is one of the most important goal to create job opportunities to the growing number of the working forces. For the ranking, it is assumed that each district centre has more room for the development than the others.

Factor	Score
District Centres	2
Other Urban Centres	1

(5) Contribution to Tourism

Tourism is one of the most important industries in Kenya. The previous MP indicates that development of reliable, safe and potable water supply is in a urgent need for acceleration of the tourism industry.

Name of Urban Centre	Score
(Nairobi), Malindi, (Mombasa), Lamu, Marsabit, Kericho, Nakuru	2
Other Urban Centres	1

(6) Willingness and Affordability of Households

According to the Household Survey, people's willingness to pay for water is rather high. Hence, income levels of average households in each district were looked at o determine if the household could afford monthly payment for water bill. The following equation is utilised for the evaluation of affordability.

Monthly Ave. Household Income x 3% > Monthly Water Consumption x water tariff (230 Kshs)

Affordability (Monthly Average Household Income)	Score
More than > 7,700 Kshs	2
7,700 Kshs or less	1

(7) Cost Effectiveness

Unit production cost of the planned schemes is selected as a factor for the cost effectiveness.

Unit Production Cost	Score
More than > 1,000Kshs/m^3	1
1,000Kshs/m^3	2

6.1.2 Rural Water Supply

Criteria for project ranking for rural water supply (RWS) is basically similar to the one for urban water supply (UWS).

The majority of the rural population do not have any access to safe water. To provide people with safe and potable water, water supply system development is urgently required particularly in the arid and semi-arid areas. As discussed above, severity of water shortage during dry seasons, service coverage, health conditions, contribution to tourism, people's willingness and affordability to pay for water, and cost effectiveness of the planned schemes are considered as key determinant factors for ranking the projects. Instead, contribution to industrial and commercial development is disregarded as any significant difference in the commercial and industrial activities are not observed in the rural areas.

(1) Percentage of Served Population to the Total Population

This is a most fundamental factor that represents the water supply condition in the districts. Although many water schemes are developed throughout the country, service coverage ratio ranges widely between districts. To achieve coverage goals by the year 2010, RWS development is considered most effective. Accordingly, the 1995 service coverage ratio in each districts is selected for the evaluation.

Service Ratio (1995 Pop. Served/District Pop.)	Score
More than 75%	1
75% - 50%	2
50% - 25%	3
25% or less	4

(2) Water Shortage during Dry Season

Many people are suffering from serious water shortage during dry season. People who are dependent on river water in ASAL areas are most miserable. They, spending several hours, collect water and it is very often that they cannot access to any water in severe dry season. Early provision of safe and clean water by construction of RWS may save these people from shortage. Time spent for collecting water by these population is considered as most representative factor for this situation.

Time Spent by Households who don't have safe water sources (Total time spent/maximum) (%)	Score
More than 75%	1
75% - 50%	2
50% - 25%	3
25% or less	4

(3) Health Conditions

A provision of safe and clean water will significantly benefit on improvement of living environment and accordingly public health as seen in many developing countries. Same parameter as in UWS is utilised for the ranking.

Health Conditions Population Case Percentage/Max Percentage (Vomit, Diarrhoea, Fever, Malaria)	Score
Less than 25%	1
25% - 50%	2
50% - 75%	3
More than 75%	4

(4) Contribution to Tourism

Same parameter as in UWS is utilised for the ranking.

Name of Districts	Score
(Nairobi), Kilifi, (Mombasa), Lamu, Marsabit, Kipsigis, Nakuru	2
Other Districts	1

(5) Willingness and Affordability of the Customers

Same parameter as in UWS is utilised for the ranking.

Affordability (Monthly Average Household Income)	Score
More than > 7,700Kshs	2
7,700Kshs or less	1

(6) Cost Effectiveness

Same parameter as in UWS is utilised for the ranking.

Unit Production Cost	Score
More than > 1,000Kshs/m^3	1
1,000Kshs/m^3	2

6.1.3 Livestock Water Supply

Nomads in ASAL move from area to area to feed livestock. Without water, their lives are likely to be endangered. Livestock population and climate conditions (rainfall) are essential to assess the project needs. Project ranking is made assuming the following:

Evaluation Item	Classification	Score
Number of Livestock Unit	More than 300,000 heads	2
	300,000 heads or less	1
Annual Rainfall	Less than 500 mm	4
	500 - 900 mm	3
	900 - 1,500 mm	2
	More than 1,500 mm	1

Source: The Aftercare Study Team

6.2 Priority Orders of the Schemes

In evaluation, weights of urgencies among the above factors are not considered. Results of the project ranking for urban, rural and livestock water supplies are given in **Tables - 6.2.1, 6.2.2** and **6.2.3.**

6.2.1 Urban Water Supply

Most of the urban centres have on-going augmentation projects. Some of them do not have any existing water supply schemes, which are usually small in population. The results of the project ranking are also summarised in the table below:

Results of Project Ranking (UWS)

Rank	Existing Facilities					No Existing Facilities					Grand Total
	On-going		No Projects		Total	On-going		No Projects		Total	
	(1)	(2)	(1)	(2)		(1)	(2)	(1)	(2)		
A	1	4	1	21	27	0	0	0	2	2	29
B	8	13	1	33	55	1	0	0	7	8	63
C	2	4	6	35	47	0	0	0	0	0	47
Total	11	21	8	89	129	1	0	0	9	10	139

Note: Nairobi and Mombasa are excluded from the above. (1) implies the scheme will have sufficient capacity to meet the 2010 water demand by on-going project under construction stage or by the existing production capacity and (2) implies not sufficient all the time. No projects mean no expansion or augmentation projects under construction stage are currently undertaken.

Excluding Nairobi and Mombasa, there are 139 urban centres, out of which 29, 63, and 47 centres have a rank of A, B, and C, respectively. There are two urban centres ranked A, which have no existing or on-going projects. They are Lemok (4,405 population) and Simat (7,717 population) in Uasin Gishu district. These two centres are small in terms of population.

Cheptais (3,361 population) in Bungoma district assessed as Rank A operate their water supply schemes which have sufficient production capacity at present to meet the estimated 2010 water requirements.

Other urban centres ranked A, which have no on-going projects (under construction stages) and not sufficient production capacity, include Karuri (18,716 population) in Kiambu, Msambweni (7,247 population) in Kwale, Garsen (4,232 population) and Hola (12,853 population) in Tana River, Tala+Kangundo (14,656 population) in Masaku, Mwingi (5,469 population) in Mwingi, Mtito Andei (4,938 population) in Makueni, Bute (2,543 population), Eldas (2,242 population) and Wajir (26,239 population) in Wajir, Ahero (11,661 population) and Kisumu (231,327 population) in Kisumu, Homa Bay (30,995 population) in Homa Bay, Migori (14,913 population) in Migori, Naymira+Kebirigo (7,130 population) in Nyamira, Narok (19,859 population) in Narok, Kilgoris (7,665 population) in Transmara, Mawalie+Malakisi (3,119 population) in

Bunogma and Luanda (4,246 population), Mbale (3,672 population) and Vihiga/Majengo (5,274 population) in Vihiga District (21 urban centres in total).

Remaining urban centres ranked A, which have on-going projects under construction stages are 5 in number. Out of them, Elwak (8,087 population) and Rhamu (5,144 population) in Mandera, are assessed that design capacities of the on-going projects (under construction stage) are less than 50% of the estimated water deficit (2010 water demand - production capacity of the existing scheme) expected in 2010 (2 urban centres).

In Chapter 7, priority projects will be selected from the above urban centres (2 + 21 + 2) in block letters.

6.2.3 Rural Water Supply

District ranking for development of the RWS are as follows:

Results of Project Ranking (RWS)

Rank	Nos of Districts	On-going Projects (Design Cap.>W. Demand)	
		Sufficient	Not Sufficient
A	11	0	11
B	20	2	18
C	18	3	15
Total	50	5	45

Note: Nairobi and Mombasa are excluded.

In all of 11 districts ranked A, on-going projects are not sufficient to meet the estimated 2010 water demand even by completion of on-going projects. They are Kilifi, Kwale, Tana River, Kitui, Makueni, Mandera, Wajir, Migori, Kipsigis, Narok and Transmara districts. These districts are further assessed to select priority districts in Chapter 7.

Of all the districts ranked B and C, only five districts have sufficient scale of the on-going projects. They are Marsabit and Uasin Gishu (2 districts as Rank B) and Taita, Isiolo and Meru (3 districts as Rank C).

6.2.4 Livestock Water Supply

Results of assessment with the estimated 1995 livestock units are presented also in **Table - 6.2.3.** Areas ranked "A" for construction of water pan/dams are six districts including Makueni, Garissa, Mandera, Wajir, Narok, and Baringo.

6.3 Implementation Schedule

Implementation schedule is worked out taking into account several aspects of the schemes including results of the project ranking, scope and volume of proposed works, costs and period required for construction and rehabilitation. The following assumptions were made:

6.3.1 Urban Water Supply

(1) In case of the large sized urban centres more than 100,000 population, three year period is required for financial arrangement, feasibility studies, detailed design, etc. prior to initiation of the construction for expansion and augmentation. For small urban centres this period is reduced to 2 years. In case rehabilitation work at the urban centres where any expansion work is not required, this period is further reduced to one year.

(2) Rehabilitation (not including rationalisation) requires one year period in principle.

(3) Construction period is three years despite size of the urban centres and work volume required for developing the schemes.

(4) Rationalisation which require a long period of four years at least, is done in parallel with the above rehabilitation and expansion works.

An implementation schedule prepared on each scheme basis is schematically portrayed in **Figure - 6.3.1**, which reflects the progress of the on-going projects.

It is to be noted that the above implementation schedules are preliminary ones to achieve targets set up in Section 2.1.4 by the year 2010, which shall be reviewed for further amendment and revision.

6.3.2 Rural Water Supply

Assumptions made above for the urban water supply are effective also for the rural water supply. To work out the implementation schedule on a district basis, minor adjustments were made as follows:

(1) As regards the large scale rural water supplies, two year period is required for financial arrangement, feasibility studies, detailed design, etc. prior to initiation of the construction for expansion and augmentation. For small community based rural water supply schemes, this period is not considered explicitly. Because of scale and number of the schemes, all works for surveys, studies, design and construction are done simultaneously on an adhoc basis.

(2) Rehabilitation of each scheme (not including rationalisation) requires one year period in principle. Because of number of the schemes in each district, three year period in total is required for all the work in the district.

(3) Construction period is four or five years, depending on number of schemes planned in each district. Five year period is minimum for developing 1,000 schemes or more in one district. If number of the planned schemes is less than 1,000, four year period is considered appropriate.

(4) Rationalisation which require a long period of three - five years at least, is done in parallel with the above rehabilitation and expansion works.

Figure - 6.3.2 and **Figure - 6.3.3** show the implementation schedule prepared for developing the rural water supplies, that reflects the schedule of the on-going projects.

6.3.3 Livestock Water Supply

Construction of the livestock water supply in the districts ranked "A" will precede other areas. With a view to the work volume and number of the schemes to be constructed, two year period is for financial arrangement, studies and detailed design and three year period may be allowed to complete the construction in each district. **Figure - 6.3.4** portrays the implementation schedule for development of the livestock water supply.

CHAPTER 7 PRIORITY PROJECTS

7.1 Rehabilitation

7.1.1 Factors Considered

Project ranking made in the preceding sections does not reflect the operational status of the existing schemes. It is necessary to evaluate efficiency of the existing schemes in order to select priority projects for rehabilitation. The following efficiency factors were tentatively selected:

(1) Metered Connection (related to accounted-for water ratio)

Depending on metered or not, subscribers are likely to change their attitudes for water use, according to the previous and current studies. In general, percentage of metered connections to the total connections well represents an efficiency of the water supply, or accounted-for water ratio.

Metered Connections/Total Connections	Score
More than 75%	1
50% - 75%	2
50% or less	3

2) Operational Hour (related to production efficiency)

Many treatment works supply water intermittently. They are usually in operation less than 16 hours a day. This situation is very obvious in the rural water supply. It is a basic requirement to operate treatment facilities on continuous basis. If continuous supply is achieved, water production would increase significantly.

Operational Hours per Day	Score
More than 20 hours	1
15 - 20 hours	2
15 hours or less	3

3) Chlorine Dosage (related to quality control)

The Household Survey indicates that the majority of the people are not satisfied with the present water supply services. Major reasons for this are low pressure (less water available), poor quality of supplied water, and poor management. As assumed from these replies, all water supply schemes are not always dosing chemicals (or chlorine) on daily basis. Many schemes, particularly small scale schemes, are supplying water without proper treatment.

Frequency of Chlorine Dosage	Score
Daily	1
Not daily	2

In the selection, results of the project ranking in **Section 6.2** are also incorporated in addition to the above.

7.1.2 Results of Evaluation

(1) Urban Water Supply

Unit incremental rehabilitation cost shall not exceed unit incremental cost for expansion. Keeping this in mind, evaluation is made only for the schemes ranked "A", which have the existing schemes. For evaluation, technical data obtained from the current Survey on Urban Water Supplies by JICA Study Team and the Survey on Needs of Rehabilitation by MWR are utilised. Any weight between factors are not considered in evaluation. Urban water supply schemes thus evaluated are classified into two: UWS operated at relatively high efficiency and at low efficiency. Results are given in **Table - 7.1.1**. It is to be noted that the present evaluation is tentative one, based on data available. When more reliable data are obtained, technical efficiency of each scheme shall be re-evaluated.

The following 20 schemes are recommended for urgent rehabilitation.

Prioritised Scheme for Rehabilitation

	District	Code	Name of Urban Scheme
1.	Kiambu	U-3	Karuri
2.	Kwale	U-46	Msambweni
3.	Lamu	U-47	Lamu
4.	Tana River	U-58	Garsen
5.		U-59	Hola
6.	Masaku	U-77	Kangundo
7.	Mwingi	U-91	Mwingi
8.	Garissa	U-104	Garissa
9.		U-110	Rhamu
10.	Wajir	U-113	Bute
11.		U-114	Eldas
12.		U-116	Wajir
13.	Kisumu	U-119	Ahero
14.	Migori	U-136	Migori
15.	Kajiado	U-141	Kajiado
16.	Transmara	U-174	Kilgoris
17.	Bungoma	U-200	Cheptais
18.	Vihiga	U-213	Maseno/Luanda
19.		U-214	Mbale
20.		U-215	Vihiga/Majengo

As will be discussed in Subsection 7.2.2, six schemes of the above 20 (Msambweni, Kangundo, Wajir, Kilgoris, Maseno/Luanda and Mbale) are also selected for urgent expansion and rehabilitation. Accordingly, these six schemes are excluded from further discussion.

(2) Rural Water Supply

Although many schemes encounter operational and financial problems, overall features of the schemes are not known. Therefore, analyses for selecting rural schemes were cancelled. It is, however, recommended that rehabilitation of the existing schemes will be carried out in parallel with the expansion and/or on-going projects at all rural districts (refer to Section 7.2).

7.2 Expansion

7.2.1 Factors Considered

Project ranking in the foregoing Sections is based on social and technical factors. Due to a lack of data on scheme basis, social factor evaluation is made utilising district data. Factors selected for the project ranking may not be comprehensive and proper. More in-depth and thorough studies based on reliable and accurate data are required. To minimise such deviation of the project ranking, the selected schemes are further discussed from the following viewpoints;

(1) Development Status of the Scheme

Status of the scheme whether it has on-going projects is an important aspect to identify priority projects.

(2) Water Production to Be Expanded

Magnitude of the project scale in terms of production capacity is not considered in the project ranking. Depending on schemes, shortage of water production varies significantly.

(3) PIP Projects

The Government has prepared PIP, in which priority projects in the water supply sector are identified in a form of the project list. For the present prioritisation, the selected schemes are confirmed in the list.

(4) Impacts on Environment

Development of water supply systems may sometimes entail environmental problems. Particularly construction of the intake and water abstraction from the limited water sources might be influential to the fauna and flora at the construction site and to the other water users in the rivershed.

7.2.2 Selected Priority Projects

(1) Urban Water Supply

Urban centres ranked "A" where production deficits are expected in 2010 can be grouped into three: i) centres that have no water supply schemes at present (2 urban centres), ii) centres that have existing schemes for which augmentation projects are under way (2 urban centres), or iii) centres for which no projects are undertaken (21 urban centres). They are all evaluated from the factors stated above. The results of evaluation as given in **Table - 7.2.1** recommends 8 out of 25 urban centres for urgent rehabilitation and augmentation as parallel works.

(2) Rural Water Supply

Eleven districts selected in Chapter 6 are candidates for urgent implementation. Due to financial arrangement and manpower resources required for the project implementation, it is considered desirable to determine most urgent districts out of 11. Although factors are basically same as those for the urban water supply, the following two are considered as key factors in case of the rural water supply.

1) Project status

FINIDA assist communities in developing a number of borehole schemes (community water supply management project) in Kakamega, Bungoma, and Busia Districts in Western Province. There are many small schemes being developed by NGOs and other institutions. Under WRAP project, surveys and studies on the existing rural water supply schemes are carried out in Baringo, Kajiado, Kilifi, Marsabit and West Pokot districts. JICA, in its Study on Water Supply for Seven Towns in Eastern Province, carried out the survey on the existing community based water supply schemes in the study areas. After these studies, no funding sources are identified yet for the next stage development. Hence, merely districts where community water supply schemes are under implementation by FINIDA are excluded from the current selection.

2) Estimated Water Deficit in 2010

The estimated 1995 non-served population of these districts are summarised in **Table - 7.2.2**, which also gives the estimated water deficits in 2010. It is tentatively supposed that districts where the deficits are large in quantity (more than 10,000 m^3/day) will have a higher priority.

Districts assessed highly urgent are the following 6 districts: Kilifi, Kwale, Migori, Kipsigis, Narok and Transmara districts.

(3) Livestock

Based on the evaluation result presented in the previous Chapter 6, the projects of the following 6 districts with high priority were selected as priority livestock water supply projects.

Priority District for Livestock Water Supply

Province	District	Livestock
Eastern	Makueni	1,330,000
North-Eastern	Garissa	1,109,500
	Mandera	253,300
	Wajir	435,300
Rift Valley	Narok	261,900
	Baringo	734,200

Source: The Aftercare Study Team, 1998

7.3 Outline Scope of the Proposed Project

7.3.1 Rehabilitation

Urgent rehabilitation is recommended for 20 urban water supply schemes. Out of them, five schemes which are also selected for expansion and rehabilitation are excluded in the following summary table.

Summary of Rehabilitation for UWS

Code	Name of Urban Scheme	Production Capacity (m^3/day)	Scope of Rehabilitation Works						Estimated Rehabilitation Cost (US$1,000)
			(1)	(2)	(3)	(4)	(5)	(6)	
U-3	Karuri	624			X		X	X	88
U-46	Msambweni	624			X	X	X	X	142
U-47	Lamu	575			X	X	X	X	117
U-58	Garsen	100	X	X	X	X	X		57
U-59	Hola	228	X	X	X	X	X	X	105
U-77	Kangundo	441			X	X	X	X	95
U-91	Mwingi	300	X	X	X	X	X	X	145
U-104	Garissa	1,440	X	X	X	X	X	X	353
U-110	Rhamu	140			X	X	X	X	46
U-113	Bute	202			X	X	X		54
U-114	Eldas	65			X	X	X		36
U-116	Wajir	48			X	X	X		38
U-119	Ahero	23				X	X		33
U-136	Migori	960			X	X	X	X	184
U-141	Kajiado	2,000		X	X	X	X	X	533
U-174	Kilgoris	864	X	X	X	X	X	X	249
U-200	Cheptais	2,400	X	X	X	X	X	X	505
U-213	Maseno/Luanda	1,192	X	X	X	X	X	X	309
U-214	Mbale	960			X	X	X	X	114
U-215	Vihiga/Majengo	63			X	X	X	X	41
Total		10,080							3,244

Note: (1) Intake facilities, (2) Treatment works, (3) Storage tanks, (4) Pipeline, (5) Master meters, and (6) Chlorine dosing equipment.
Source: The Aftercare Study Team

7.3.2 Expansion

(1) Urban Water Supply

Present status and outline scope of the eight (8) water supply projects are briefed below.

1) Msambweni

Msambweni urban centre had a population of 7,247 in 1995. The existing water supply scheme operated by MWR has production capacity, 624 m^3/day, not sufficient to meet the present water demand, 1,704 m^3/day. The existing scheme extracts groundwater from the two boreholes. Chlorine is dosed daily for domestic use. No other treatment than chlorination is practised. Due to population growth, water demand is forecast to be more than 3 times the present value.

As for future expansion, river water is assumed as water source. The required capacity of the treatment works is 5,000 m^3/day. Total length required for transmission and distribution is estimated at 37 km.

2) Tala+Kangundo

Tala/Kangundo is located in Masaku District. It has a population of 14,656 in 1995. There is no on-going projects. The existing scheme operated by Town Council depends on two boreholes as water sources. Extracted groundwater, pumped up to the storage tank, then boosted to hill tank and are gravitated to the customer. Rapid population growth in the coming 15 years will result in water deficit, 7,490 m^3/day in 2010.

As same as Msambweni, river water is supposed as water source for the new treatment works. It has a production capacity, approximately 7,000 m^3/day with full treatment.

3) Wajir

Wajir is a district centre in Wajir district. MWR is a responsible agency for operating the existing schemes, which extracts groundwater from shallow wells. Its yield is very limited, 48 m^3/day, not sufficient to meet the present water demand. Major customers of this scheme are government offices and small number of houses.

In the vicinity of Wajir, there is no promising water sources other than groundwater. Construction of boreholes are proposed as major water sources. No treatment is required other than chlorination. Treatment works to be constructed will have production capacity of 9,000 m^3/day. Pipeline length to supply water to the residents extends to 38 km in total.

4) Kisumu

JICA Study on developing the existing water supply scheme is currently on going. Its operational body is Municipal Council. It has two waterworks, Kajulu and L. Victoria waterworks. The supply capacity of these treatment works is merely one third of the estimated water demand in 1995. Since the present water source is the Lake Victoria, it applies conventional treatment process. Several water sources for future expansion are assessed in the JICA Study.

Tentatively it is assumed that the impounded water of the dam is water source that require full treatment. Production capacity of the treatment works is 61,000 m^3/day. Storage tanks to be constructed will have 30,000 m^3 storage to supply water continuously. Total pipe length to be installed will be 1,170 km.

5) Homa Bay

Homa Bay has a urban water supply scheme operated by MWR, with a design capacity, 1,500 m^3/day. The treatment process applied is conventional type, consisting of coagulation, sedimentation, filtration and disinfection. The existing intake on Lake Victoria is choked with water 'hyacinth' causing problems in the supply of water. The existing pumps are also not adequate with no standby arrangements. There is no project underway around the areas.
As for future expansion, it is proposed that surface water is a major water source. Treatment works to be constructed will have a production capacity 12,000 m^3/day. Pipeline to be installed will have a total length, 363 km.

6) Narok

The Narok river and spring are water sources of Narok Urban Water Supply Scheme. It produces 1,315 m^3/day. The treatment process applied is also conventional type, consisting of coagulation, sedimentation, filtration and disinfection. Service area has a population of approximately 30,000. Due to recent heavy rains, the scheme has been heavily damaged. Distribution mains are washed away and intake chamber are clogged. Rehabilitation and augmentation of the scheme are urgently required.

Narok water supply expansion will depend on impounded water of the dam to be constructed as no water source is available. Conventional treatment process is assumed to treat the raw water. Pipeline length to be constructed extends to 69 km in total.

7) Luanda/Maseno

Maseno water supply was constructed in 1957 and expanded in 1978 and 1987. This scheme operated by MWR serves Luanda/Maseno urban centre and its surrounding rural areas. It takes raw water from the existing open furrow. After full treatment, it supply to approximately 68,400 population. The scheme has been heavily affected by the recent heavy rains with section of the furrow washed away and filters clogged. Some section of distribution system has also been washed away. The estimated water shortage in 2010 is 23,000 m^3/day.

Future water source is same as the existing system. Full treatment is required to treat the turbid river water. Production capacity of the expanded treatment works is around 23,000 m^3/day. Pipeline length inclusive of transmission and distribution is around 300 km.

8) Mbale

Mbale water supply was commissioned in 1975. Conventional treatment process is applied to clarify the turbid river water. It has production capacity of 960 m^3/day, servicing 20,000 population. Approximately 450,000 population reside in its supply area.

Despite its large supply area, Mbale urban centre is small with 3,700 population in 1995. To meet the rapidly growing water demand, it is considered urgent to implement the project.

As the design is currently under way, no accurate information on the design factors are available to the JICA Study Team. According to the MWR Project Status Report, the new treatment works will have a production capacity of 22,500 m^3/day.

Total project base cost required for rehabilitation and expansion is estimated at US$ 149.3 million. out of which US$ 2.5 million and US$ 146.8 million are for rehabilitation and expansion of the prioritised urban water supply schemes respectively.

Summary of Expansion for UWS

Scheme Name	Production Cap. of the Existing (m^3)	Production Cap. to be Expanded	Water Source	Treatment Process	Storage Tank Cap. (m^3)	Length of Distribution Pipes (km)	Estimated Costs (US$ 1,000)	
							Reh.	Exp.
Msambweni	624	4,937	S	F	2,600	37	142	3,796
Kangundo/Tala	441	6,885	S	F	3,500	51	95	5,309
Wajir	48	9,088	G	C	4,700	68	38	9,608
Kisumu	14,565	60,750	D	F	30,200	436	1,172	77,257
Homa Bay	1,500	11,524	S	F	6,000	87	363	8,257
Narok	1,315	9,558	D	F	4,700	69	249	27,242
Maseno/Luanda	1,192	23,174	S	F	11,700	170	309	15,331
Mbale	960	0	S	F	0	0	114	34
Total	20,645	125,915			63,400	918	2,481	146,834

Note: S... surface water, G...groundwater, D...impounded dam, F... full treatment, C... chlorination

Source: JICA Study, 1998

(2) Rural Water Supply

The estimated project base cost includes LSRWS and SSRWS. Investment cost required for rehabilitation and expansion is US$5.5 and US$44.4 million in total. If these schemes are implemented as planned, new 11,968 SSRWS will start operation under Phase 1.

Summary of Rehabilitation and Expansion for RWS

Districts	Type of Scheme	Nos. of Schemes to be Developed	Production Cap. of the Existing (m^3/day)	Production Cap. to be Expanded	Major Water Sources	Estimated Costs (US$ 1,000)	
						Reh.	Exp.
Kilifi	LS	0	2,416	0	-	1,290	0
	SS	2,416	9,592	13,804	G	-	4,784
Kwale	LS	0	2,160	0	-	645	0
	SS	2,080	7,727	11,883	G	-	4,118
Migori	LS	0	409	0	S	323	0
	SS	3,411	2,539	19,486	G	-	6,754
Kipsigis	LS	0	887	0	-	645	0
	SS	3,537	5,943	20,199	G	-	196
Narok	LS	7	2,049	5,975	G	1,955	12,196
	SS	524	1,443	2,987	G	-	1,038
Transmara	LS	9	25	7,122	S	645	15,328
	SS	0	400	0	-	-	0
Total	LS	16	7,946	13,097		5,503	27,524
	SS	11,968	27,644	68,359		-	16,890

Note: S... surface water, G...groundwater, D...impounded dam, F... full treatment, C... chlorination

Source: JICA Study, 1998

(3) Livestock Water Supply

Total estimated project base cost for construction of the livestock water supply is US$7.9 million. Under this project, it is planned that 260 livestock water supply facilities will be constructed.

Summary of Livestock Water Supply

Districts	Nos. of Schemes	Total Storage (m^3)	Estimated Costs (US$ 1,000)
Makueni	79	3,950	2,410
Garissa	98	4,900	2,989
Mandera	23	1,150	702
Wajir	39	1,950	1,190
Narok	16	800	488
Baringo	44	2,200	1,342
Total	299	14,950	9,121

Source: JICA Study, 1998

7.3.3 Total Project Cost

Project costs of the prioritised projects including rehabilitation and expansion are summarised in the table below. Total project base costs are summed up to US$ 208.4 million, out of which US$ 8.0 million and US$ 200.4 million are for rehabilitation and expansion, respectively.

Project Base Cost Summary

(Unit: US$ 1,000)

Type of Scheme	No.	Rehabilitation	Expansion	Total
Urban Water Supply (Reh)	15	2,481		2,481
-ditto- (Exp)+(Reh)	8		146,834	146,834
Rural Water Supply - Large	16	5,503	27,524	33,027
Rural Water Supply - Small	11,968	-	16,890	16,890
Livestock Water Supply	260	-	9,121	9,121
Total		7,984	200,369	208,353

Source: JICA Study, 1998

- PART II : WATER SUPPLY DEVELOPMENT PLAN -

TABLES

Table - 1.2.1 (1/2) Ongoing Project by District

Province	District	Number of On-going Schemes												Design Population (Nr)	Population Served (Nr)
		<19%	Original Costs (KShs million)	Amount required to Complete (KShs million)	20-49%	Original Costs (KShs million)	Amount required to Complete (KShs million)	50-79%	Original Costs (KShs million)	Amount required to Complete (KShs million)	>80%	Original Costs (KShs million)	Amount required to Complete (KShs million)		
Central	Kiambu	4	69.45	20.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	181,984	23,500
	Kiriyanga	2	6.30	9.60	2	8.54	11.82	4	17.09	16.16	2	17.20	61.32	69,556	21,620
	Muranga	0	0.00	0.00	2	101.50	60.00	0	0.00	0.00	3	220.00	40.50	1,099,324	190,000
	Nyandarua	7	39.75	43.94	9	19.76	9.76	7	9.88	6.78	4	6.48	1.07	444,468	95,947
	Nyeri	3	170.60	88.00	4	181.00	24.25	6	150.46	101.90	14	81.33	5.86	490,184	62,760
	Thika	0	0.00	0.00	2	320.00	160.00	5	170.00	173.00	0	0.00	0.00	56,420	70,000
	Sub-total	16	286.10	161.54	19	630.80	265.83	22	347.43	297.84	23	325.01	108.75	2,341,936	463,827
Coastal	Kilifi	2	4.44	4.49	3	5.76	3.57	4	57.83	45.28	2	40.76	20.24	315,000	131,800
	Kwale	2	3.10	5.47	1	3.60	3.47	3	4.30	4.88	1	0.63	0.00	16,000	8,100
	Lamu	0	0.00	0.00	2	10.80	12.70	3	8.19	14.72	3	0.96	0.00	54,515	20,784
	Mombasa	6	8.11	8.11	2	0.97	0.97	0	0.00	0.00	3	2.46	2.56	30,000	119,000
	Taita Taveta	5	0.50	2.82	4	15.09	0.52	9	5.56	32.98	15	10.55	1.26	77,546	75,640
	Tana River	0	0.00	0.00	0	0.00	0.00	1	12.60	2.00	1	10.00	3.00	25,000	6,000
	Sub-total	15	16.15	20.89	12	36.22	21.23	20	88.48	99.86	25	65.36	27.06	518,061	361,324
Eastern	Isiolo	2	9.80	15.00	2	3.27	2.92	2	0.62	3.53	0	0.00	0.00	166,067	240,000
	Kitui	3	167.90	378.73	4	17.44	96.85	6	6.69	7.30	4	19.89	17.25	176,449	12,698
	Maachakos	1	56.00	0.00	1	40.40	4.40	6	162.86	443.03	3	4.69	0.00	317,637	86,560
	Marsabit	0	0.00	0.00	1	-	0.40	6	1.90	8.16	17	5.09	0.80	96,815	121,615
	Meru	5	13.40	13.25	15	51.86	58.20	14	22.33	23.30	20	24.11	14.89	318,220	251,840
	Makueni	2	35.00	33.00	3	158.60	146.10	10	74.92	31.67	3	9.10	1.30	322,538	98,800
	Mwingi	1	2.40	1.90	3	11.95	9.03	1	0.40	1.00	3	6.78	2.85	59,261	29,637
	Tharaka Nithi	4	16.00	6.53	2	1.10	2.15	2	0.80	4.40	2	400.00	5.00	122,316	13,250
	Mbeere	2	0.50	27.00	0	0.00	0.00	1	0.11	1.31	0	0.00	0.00	77,400	-
	Nyambene	0	0.00	0.00	18	976.72	207.42	0	0.00	0.00	0	0.00	0.00	162,220	34,894
	Sub-total	20	301.00	475.41	49	1261.34	527.47	48	270.63	523.70	52	469.66	42.09	1,818,923	889,294
North Eastern	Garissa	0	0.00	0.00	3	201.02	322.00	0	0.00	0.00	3	1.66	0.30	101,400	63,720
	Mandera	2	4.00	5.00	2	3.00	3.30	3	32.00	12.80	1	2.00	4.00	14,000	334,000
	Wajir	1	-	-	4	4.80	5.88	0	0.00	0.00	0	0.00	0.00	39,000	-
	Sub-total	3	4.00	5.00	9	208.82	331.18	3	32.00	12.80	4	3.66	4.30	154,400	397,720
Nyanza	Gusii	0	0.00	0.00	4	27.62	39.15	5	5.43	2.59	5	20.80	2.09	192,898	58,069
	Kisumu	0	0.00	0.00	2	2.60	2.20	1	1.01	0.40	2	7.40	13.60	56,500	600
	Siaya	0	0.00	0.00	2	0.03	0.12	2	0.03	0.01	3	0.34	34.02	887,000	708,000
	Homa Bay	0	0.00	0.00	2	3.30	2.20	1	3.00	1.80	0	0.00	0.00	151,000	165,500
	Migori	4	-	-	1	5.00	3.50	1	0.82	6.30	0	0.00	0.00	255,000	48,750
	Nyamiria	0	0.00	0.00	0	0.00	0.00	2	2.80	1.60	2	2.45	0.45	75,000	8,600
	Rachuonyo	0	0.00	0.00	2	12.30	113.00	0	0.00	0.00	0	0.00	0.00	570,150	35,000
	Sub-total	4	0.00	0.00	13	50.85	160.17	12	13.09	12.70	12	30.99	50.16	2,187,548	1,024,519

Table - 1.2.1 (2/2) Ongoing Project by District

Province	District	Number of On-going Schemes												Design Population (Nr)	Population Served (Nr)
		<19%	Original Costs (KShs million)	Amount required to Complete (KShs million)	20-49%	Original Costs (KShs million)	Amount required to Complete (KShs million)	50-79%	Original Costs (KShs million)	Amount required to Complete (KShs million)	>80%	Original Costs (KShs million)	Amount required to Complete (KShs million)		
Rift Valley	Kajiado	0	0.00	0.00	1	8.00	7.88	3	20.80	26.90	4	81.50	24.89	49,900	5,100
	Laikipia	4	87.51	125.80	4	3.81	11.94	3	7.70	12.00	2	3.20	0.06	381,931	91,308
	Nakuru	0	0.00	0.00	0	0.00	0.00	7	125.60	145.63	0	0.00	0.00	25,100	28,204
	Narok	0	0.00	0.00	2	13.74	16.50	1	4.00	0.80	1	3.73	9.40	34,694	12,650
	Trans Nzoia	1	1.30	2.50	5	33.20	54.48	0	0.00	0.00	0	0.00	0.00	647,792	1,010
	Uasin Gushu	1	6.00	5.55	7	58.45	46.67	7	245.80	74.69	2	2.80	-	161,937	74,122
	Baringo	1	3.30	2.24	1	-	-	4	86.88	25.12	5	51.44	80.20	128,243	109,129
	Elgeyo	1	1.20	1.13	1	30.00	23.35	4	7.09	3.24	3	8.20	0.67	97,253	23,100
	Nandi	2	25.60	39.00	1	1.68	1.18	4	122.30	42.50	5	47.62	5.49	88,600	11,950
	Samburu	3	1.43	4.70	4	2.28	2.55	4	5.22	3.90	7	9.37	1.91	32,400	75,000
	Turkana	1	13.00	0.50	1	2.00	1.13	6	11.74	20.30	8	11.66	4.56	96,834	27,050
	West Pokoko	0	0.00	0.00	4	0.94	23.52	3	1.46	1.69	3	2.13	0.02	661,500	11,400
	Sub-total	14	139.34	181.42	31	154.10	189.20	46	638.59	356.77	40	221.65	127.20	2,406,184	470,023
Western	Bomet	2	8.38	6.70	2	12.70	6.70	0	0.00	0.00	2	13.21	-	36,879	-
	Marakwet	1	0.76	-	1	0.08	-	0	0.00	0.00	1	21.72	0.40	59,100	5,000
	Keiyo	3	5.90	4.86	4	310.18	105.43	0	0.00	0.00	3	21.88	5.40	27,071	7,820
	Trans Mara	2	5.00	4.80	2	0.50	9.00	0	0.00	0.00	1	1.00	2.00	33,000	8,500
	Bungoma	3	87.06	79.18	1	0.60	0.81	1	0.21	0.07	1	0.95	-	127,936	11,800
	Busia	6	42.90	95.99	2	86.00	4200.10	3	2.75	3.86	1	0.83	0.58	190,470	74,300
	Kakamega	1	7.00	60.00	0	0.00	0.00	1	2.00	5.00	0	0.00	0.00	5,200	4,500
	Vihiga	5	-	140.00	0	0.00	0.00	1	11.73	0.60	1	-	0.04	3,200	1,500
	Teso	0	0.00	0.00	1	85.00	225.00	1	0.85	1.50	0	0.00	0.00	89,870	-
	Sub-total	23	157.00	391.53	13	495.06	4547.04	7	17.54	11.03	10	59.59	8.42	572,726	113,420
TOTAL		**95**	**903.59**	**1235.79**	**146**	**2837.19**	**6042.12**	**158**	**1407.76**	**1314.70**	**166**	**1175.92**	**367.98**	**9,999,778**	**3,720,127**

Data source : MWR water supply projects and schemes staatus repor,1996

Table - 1.2.2 Present Status of Planned Projects

(Investigation, Planning and Design Stages)

Water Supply Agency	Stage of Projects	Stage of the Projects						Design Population	Design Capacity (m^3/d)	Estimated Costs (KShs million)
		Investi-gation	Planning	Design/ Designed	Implement/ Operation	No-Data	Total			
MWR	RWS	33	26	115	8	9	191	5,281,339	571,040	10,625.5
	UWS	5	3	8	0	0	16	433,054	101,060	952.0
	Sub-total	38	29	123	8	9	207	5,714,393	672,100	11,577.5
NWCPC	RWS	37	22	89	4	6	158	1,392,385	98,100	3,400.6
	UWS	2	0	3	0	0	5	148,373	11,400	103.4
	No-data	1	9	10	4		24			
	Sub-total	40	31	102	8	6	187	1,540,758	109,500	3,504.0
OTHERS	RWS	10	6	25	1	2	44	109,048	16,114	283.5
Community										
Self-Help										
Institute										
Private										
Others										
	No-data	2	3	12	1	2	20			
	Sub-total	12	9	37	2	4	64	109,048	16,114	283.5
Total of Pre-Implementation Programmes		90	69	262	18	19	458	7,364,199	797,714	15,365.0

Data source : Water supply projects and schemes status report in 1996, MWR

Table - 1.2.3 Historical Trend of Foreign Assistance to MOWR, 1992/93 - 1996/97 with a Focus on Assistance to Water Supply and Sewerage Development

(Unit: K£million)

Donor Agencies	1992/93			1993/94			1994/95			1995/96			1995/96			Grand Total			Share
	Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	(%)
ADB																			
ADF								2.000	2.000		1.600	1.600		2.400	2.400		6.000	6.000	1.8
Austria	0.500		0.500	2.134		2.134	1.500		1.500	4.750		4.750	20.000		20.000	28.884		28.884	8.8
Belgium		0.800	0.800														0.800	0.800	0.2
DANIDA	1.258		1.258	0.975		0.975	2.160	8.465	10.625		3.477	3.477		2.751	2.751	4.393	14.693	19.086	5.8
EDF/EDC																			
FINIDA	4.610	1.343	5.953	3.361		3.361	3.484		3.484	1.315		1.315				12.770	1.343	14.113	4.3
France	0.175		0.175		0.300	0.300		1.100	1.100		1.300	1.300		0.600	0.600	0.175	3.300	3.475	1.1
FRG		2.000	2.000		6.000	6.000		6.730	6.730		4.900	4.900		0.700	0.700		20.330	20.330	6.2
IDA		3.952	3.952	1.469		1.469	4.600		4.600	7.400		7.400	13.500	2.935	16.435	26.969	6.887	33.856	10.3
IFAD	0.075	0.095	0.170	0.147	0.025	0.172		1.754	1.754	0.186	0.030	0.216		0.210	0.210	0.408	2.114	2.522	0.8
Italy	4.000	2.760	6.760	8.084		8.084	35.000		35.000	33.738		33.738	29.010		29.010	109.832	2.760	112.592	34.2
Japan		3.525	3.525				7.600		7.600					2.000	2.000	7.600	5.525	13.125	4.0
Kuwait														2.496	2.496		2.496	2.496	0.8
Netherlands	1.995		1.995	2.115		2.115	2.680	7.993	10.673	2.680	7.170	9.850	0.200	13.771	13.971	9.580	28.934	38.514	11.7
Saudi Fund														2.000	2.000		2.000	2.000	0.6
SIDA	4.200		4.200	3.003		3.003	3.050		3.050	4.800		4.800	5.080		5.080	20.133		20.133	6.1
Switzerland								0.700	0.700		0.758	0.758		0.517	0.517		1.975	1.975	0.6
UK							0.625		0.625							0.625		0.625	0.2
UNICEF								0.195	0.195		1.220	1.220		0.880	0.880		2.295	2.295	0.7
WFP							0.868	2.389	3.257		2.370	2.370	0.654		0.654	1.522	4.759	6.281	1.9
TOTAL	16.723	14.475	31.198	21.288	6.325	27.613	61.567	31.326	92.893	54.869	22.825	77.694	68.444	31.260	99.704	223.891	106.211	329.102	100.0

Source: Development Estimates and Estimates of Recurrent Expenditure, 1992/93 - 1997/98

Table - 1.2.4 Historical Trend of Foreign Assistance to MOLA, 1992/93 - 1996/97 with a Focus on Assistance to Water Supply and Sewerage Development

(Unit: K£million)

Donor Agencies	1992/93			1993/94			1994/95			1995/96			1995/96			Grand Total			Share
	Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	(%)
ADB		10.000	10.000		6.880	6.880		10.485	10.485								27.365	27.365	7.1
ADF		18.900	18.900		10.320	10.320		17.741	17.741		11.800	11.800		54.100	54.100		112.861	112.861	29.1
Austria																			
Belgium																			
DANIDA								3.000	3.000								3.000	3.000	0.8
EDF/EDC		3.000	3.000		1.500	1.500											4.500	4.500	1.2
FINIDA																			
France																			
FRG		6.514	6.514		44.449	44.449		35.860	35.860		6.372	6.372		16.600	16.600		109.795	109.795	28.3
IDA		6.000	6.000		8.530	8.530		11.091	11.091		20.200	20.200		29.000	29.000		74.821	74.821	19.3
IFAD																			
Italy																			
Japan		11.000	11.000		4.000	4.000		1.660	1.660					20.000	20.000		36.660	36.660	9.4
Kuwait																			
Netherlands																			
Saudi Fund		2.000	2.000		0.800	0.800		7.436	7.436		3.700	3.700		5.000	5.000		18.936	18.936	4.9
SIDA																			
Switzerland																			
UK																			
UNICEF																			
WFP																			
TOTAL	0.000	57.414	57.414	0.000	76.479	76.479	0.000	87.273	87.273	0.000	42.072	42.072	0.000	124.700	124.700	0.000	387.938	387.938	100.0

Source: Development Estimates and Estimates of Recurrent Expenditure, 1992/93 - 1997/98

Table - 1.3.1 (1/5) Present Status of Urban Water Supply

Code	District	Code	Name of Urban Scheme	Water Undertaker	Area of U.C. (Km^2)	Area Covered (Km^2)	Source/Treatment Process	Present Water Production (m^3/day)	Consumer (Metered)	Consumer (Unmetered)	Population in Service Area	Population Served	Population in 2010 (pop)	Future Expansion	Remarks	Data Source
110	Nairobi	U - 1	Nairobi	Nairobi City Council	693.00	540.00	Kikuyu Springs , Sasumua, Ruiru, Thika, & Chania Dams / Conventional Full Treatment.	364,000	142,206	7,358	1,980,000	1,784,577	3,023,000		The extreme western parts of the City experiences low pressure thus severe water shortages.	WSSS
210	Kiambu	U - 2	Githunguri	MWR	2.00	1.00	Borehole / No Treatment	300	439	Nil		8,000	12,062		Existing Githunguri water supply has outlived its original design horizon and the whole system needs to be improved and extended.	WSSS
		U - 3	Karuri	Municipal Council of Karuri	0.93	8.00	Borehole / No Treatment	520	Nil	396	30,000	15,000	40,535		Operation and Maintenance require to be strengthened and all consumers metered.	WSSS
		U - 4	Kiambu	Kiambu Municipal Council	2.59	2.00	Pipeline offtake & Borehole / No Treatment	490	1,580	Nil		8,058	21,356		The current supply is not adequate and sinking of more boreholes has been identified as a viable source for future.	WSSS, Status'96
		U - 5	Kikuyu	MWR	1.78	8.00	Borehole / Disinfection by chlorine	1,278	1,181	Nil	23,892	9,586	20,677		At present there is no disinfection being carried as result of breakdown of dosing equipment	WSSS
		U - 7	Ndumberi		1.25								20,579			
		U - 8	Ruiru	MWR	18.79	2.00	Ruiru River / Conventional Full Treatment.	781	650	Nil	100,000	60,000	70,142		Ruiru urban is one of the fast growing industrial towns and the existing water supply is not adequate to meet the demand	WSSS, MWR
		U - 9	Thika	Thika Municipal Council	1.25	80.00	Thika & Chania Rivers /Conventional Full Treatment.	24,000	320	6,175	149,448	120,000	190,350		Thika water supply is adequate to meet the anticipated demand until year 2005.	WSSS, MOLA
	Sub-total				28.59	101.00		27,369	4,170	6,571	303,340	220,644	375,701			
220	Kirinyaga	U - 12	Kerugoya	MWR	1.96	4.00	Rutui River / Conventional Full Treatment.	1,200	1,717	Nil	37,000	8,215	35,966		The existing water supply system is not adequate to meet the demand of the growing urban population.	WSSS
		U - 12	Kutus	NWCPC			Pipeline offtake (Ndia Water Supply) / Conventional Full Treatment.	246	250	Nil	9,550	1,234			Kutus urban does not have its own water . There is a pipe line offtake from Ndia water supply Scheme.	WSSS
		U - 16	Wanguru	MWR	0.68	4.00	Thiba River / Conventional Full Treatment.	80				667	8,724		The existing Scheme has not been operating for the last 5 years due to major rehabilitation works being carried out.	WSSS
	Sub-total				2.64	8.00		1,526	1,967	0	46,550	10,116	44,690			
230	Murang'a	U - 19	Makuyu	Punda Milia Farmers Co-operative	1.33	6.00	Borehole / No Treatment	360	170	140	24,000	600	7,943	Final Design for an alternative source (earth dam) was carried in 1994 but the project has not been implemented.	Makuyu urban does not have it's own source.	WSSS
		U - 20	Maragua	MWR	83.00		Borehole / No Treatment	15	14	169	12,000	6,200	79,924		The existing borehole should be abandoned since yield is very little and it is in uneconomical state to rehabilitate.	WSSS
		U - 21	Muranga	MWR	11.66	5.00	Mathioya & Kayahwe Rivers / Conventional Full Treatment.	2,000	2,672	Nil	56,000	24,000	62,635		The existing water Supply System is not adequate to meet the demand of the growing urban population.	WSSS
	Sub-total				95.99	11.00		2,375	2,856	309	92,000	30,800	150,502			
240	Nyandarua	U - 28	Nyahururu	Nyahururu Municipal Council	17.00	4.80	River / Conventional Full Treatment	3,000	2,250	32	150,000	50,000	60,186	Alternative source has been identified on eastern side of Town for 1998 requirement.	The existing source is adequate for future planning but is polluted.	WSSS
		U - 30	Ol kalou	MWR	4.58	4.00	Boreholes / Disinfection by Chlorine (TCL)	220	390	Nil	10,000	9,000	9,944		The existing supply comprises of 4 No. boreholes of which 2No.are not equipped.	WSSS
	Sub-total				21.58	8.80		3,220	2,640	32	160,000	59,000	70,130			
250	Nyeri	U - 32	Endarasha	SH	0.84		Kamigogo River						7,564			NWMP
		U - 33	Karatina	MWR	2.00	37.00	Ragati River / Conventional Full Treatment.	1,300	1,195	Nil		14533	19,471			WSSS
		U - 36	Nyeri	Nyeri Municipal Council	167.00	20.00	Chania River / Conventional Full Treatment.	5,940	4,488	2	100,000	40,000	331,393	Feasibility Studies have been carried out by a firm of consulting Engineers for 2010 requirement.		WSSS, MOLA
		U - 37	Othaya	NWCPC	1.33	8.00	Gakira River & Borehole / Disinfection by Chlorine (TCL)	700	472	Nil	17,500	14,000	16,981		The scheme was designed for 2000 demand of 11000m^3/day.	WSSS
	Sub-total				171.17	65.00		7,940	6,155	2	117,500	68,533	375,409			
310	Kilifi	U - 38	Kilifi	NWCPC	8.18	120.00	Pipeline Offtake (Mzima Springs) / Conventional Full Treatment.	4,300	2,733	Nil	73,000	30,170	57,082	Preliminary Design has been carried out for 2020 requirement.	At present water supply is irregular due to frequent breakdown at the T/Works as well as along Sabaki pipeline.	WSSS
		U - 39	Majengo		1.20								5,549			
		U - 40	Malindi	NWCPC	15.58	5.00	Sabaki River / Conventional Full Treatment.	15,985	4,810	Nil		141,293	134,152		The existing supply is not adequate to meet the demand of the growing Urban population.	WSSS
		U - 41	Mambrui	Local Community	7.22	2.00	Well / No Treatment	207	Nil	157	3,000	2,000	8,964	L location of boreholes has been identified for 2008 requirement.		WSSS
		U - 42	Maribkani	NWCPC	5.00	30.00	Pipeline Offtake (Sabaki Pipe line) / Disinfection by Chlorine (TCL)	1,200	1,009	Nil	19,109	12,600	34,857	Preliminary Design has been carried out for 2020 requirement.	The existing water supply is not adequate to meet the demand of the growing urban population.	WSSS
		U - 43	Watamu	NWCPC	2.11	6.00	Pipeline offtake / Conventional Full Treatment.		1,250	Nil		6,375	7,857			WSSS
	Sub-total				39.29	163.00		21,692	9,802	157	95,109	192,438	248,461			
320	Kwale	U - 44	Kwale	NWCPC	7.75	4.00	Pipeline Offtake from Marere Spring / Disinfection by chlorine	520	452	Nil	4,300	3,005	13,230	Preliminary design for 2020 requirement has been done under Second Mombasa and Coastal Water Supply Project.	Studies carried out by Consultants in 1995 indicate that unaccounted for water(UFW) is approximate 81% which is very high.	WSSS, Second Mombasa Report
		U - 45	Lunga Lunga	MWR	3.35	2.00	Borehole / N o Treatment	220	28	Nil		1,833	22,289	Location of boreholes has been identified for 2017 requirement.	The scheme is in a terrible state of affair due to lack of regular maintenance.	WSSS
		U - 46	Msambweni	MWR	3.49	4.00	Wells / Disinfection by chlorine	520	240	Nil	25,000	12,000	20,741		There was a proposal to construct a dam for 1997 requirement which was never implemented.	WSSS
	Sub-total				14.59	10.00		1,260	720	0	29,300	16,838	56,260			
330	Lamu	U - 47	Lamu	MWR	1.00		Shallow Wells / Disinfection by Chlorine (TCL)	575	1,315	Nil	20,000	5,000	29,618		The existing water supply system is not adequate to meet the demand of the growing urban population. At present majority of residents resort to the numerous contaminated shallow wells.	WSSS
		U - 49	Mokowe T.C		4.11			260			3,000	2,100	5,151			MWR
	Sub-total				5.11	0.00		835	1,315	0	23,000	7,100	34,769			
340	Mombasa	U - 52	Mombasa	NWCPC	282.00	12.00	Sabaki River & Mzima Springs / Conventional Full Treatment.	18,200	19,894	0	138,300	370,764	736,000	Preliminary Design has been carried out for 2020 requirement.	The existing water supply system is not adequate to meet the demand of the growing Population. At present the supply is 18200m^3/day while the demand is 56000m^3/day.	Second Mombasa Report

Table - 1.3.1 (2/5) Present Status of Urban Water Supply

Code	District	Code	Name of Urban Scheme	Water Undertaker	Area of U.C. (Km^2)	Area Covered (Km^2)	Source/Treatment Process	Present Water Production (m^3/day)	Consumer (Metered)	Consumer (Unmetered)	Population in Service Area	Population Served	Population in 2010 (nos)	Future Expansion	Remarks	Data Source
350	Taita	U - 54	Taveta	NWCPC	7.93		Njoro springs / Disinfection by chlorine	1,600	879	Nil	43,790	4,400	25,433			WSSS, MOLA
		U - 55	Voi	NWCPC	16.05	9.00	Pipeline offtake (Mzima pipe line) / Disinfection by chlorine	2,700	1,594	Nil	4,600	20,300	35,159		The existing supply is not adequate to meet the demand of the growing Urban population.	WSSS, MOLA
		U - 56	Wundanyani	MWR	1.71	12.00	River / Conventional Full Treatment.	1,233	1,001	Nil		8,000	8,344			WSSS, MOLA
	Sub-total				25.69	21.00		5,533	3,474	0	48,590	32,700	68,935			
360	Tana River	U - 58	Garsen	MWR	3.15		Tana River / Conventional Full Treatment.				10,000	10,000	10,110		Garsen water supply system was swept away by floods in 1989 and no rehabilitation works has been carried out since then.	WSSS, MWR, Status96
		U - 59	Hola	MWR	13.40	4.00	Tana River / Conventional Full Treatment.	228	410	Nil	15,000	9,000	36,818		Operation and Maintenance cost is far much higher than the revenue generated from the sales of water. The scheme experiences chemical shortages during rainy seasons due to inaccessible roads.	WSSS
	Sub-total				16.55	4.00		228	410	0	25,000	19,000	46,928			
410	Embu	U - 60	Embu	NWCPC	24.00	31.00	Pipeline Offtake (Embu Water Supply) / Conventional Full Treatment.	4,058	4,852	23	55,000	35,000	92,214			WSSS, MOLA
		U - 61	Runyenjes	Municipal council of Runyenjes.	3.06	15.00	Ena River / No Treatment	135	Nil	840	4,500	4,284	5,329		All consumers should be metered in order to control wastage of water and enhance revenue collection.	WSSS, Status96
	Sub-total				27.06	46.00		4,193	4,852	863	59,500	39,284	97,543			
420	Isiolo	U - 63	Isiolo	MWR	12.82	18.00	Pipeline Offtake from Ewaso Nyiro Water Supply / Conventional Full Treatment.	4,356	2,771	Nil	40,000	36,000	83,440		The existing source is not adequate to meet the demand of the growing Urban population.	WSSS
		U - 64	Modo Gashe	Local Community	2.20		Gaa Gof River / No Treatment						6,074		This is an old community managed water supply scheme which is currently being rehabilitated.	WSSS
		U - 65	Merti	Local Community	6.48	3.00	Borehole / No Treatment	69	Nil	230	6,248	1,173	19,553		The current water supply serves a very small section of the community & residents depend on individual shallow wells.	WSSS, Status96
	Sub-total				21.50	21.00		4,425	2,771	230	46,248	37,173	109,067			
430	Kitui	U - 68	Kitui	MWR	6.00	10.00	Borehole / No Treatment	800	900	250	25,000	11,000	37,781	Plan are underway to connect the urban supply with Masinga Kitui water supply Scheme.	Water test carried out indicate that the borehole water require disinfection.	WSSS
440	Masaku	U - 69	Athi River	Mavoko Municipal Council	14.53	35.00	Pipeline offtake / Conventional Full Treatment.	2,000	1,200	Nil	50,000	12,500	48,441	Feasibility study for a concrete dam on Mbagathi River are being carried by consultants	The existing supply is not adequate to meet demand of the growing Urban population	WSSS
		U - 71	Machakos	NWCPC	723.00	22.50	Dam on maruba River / Conventional Full Treatment.	2,660			120,000	80,000	407,822		Majority of the meters are not working or are buried. 85% of the consumers are billed on estimates thus loss of revenue.	WSSS, Status96
		U - 74	Matuu	MWR	1.30		Yatta Canal	281			5,200	10,000	7,947			MWR
		U - 77	Kangundo	Kangundo-Tala Town Council	26.54	4.00	Borehole / Disinfection by chlorine (TCL)	341	316	120	9,500	4,500	37,848		Operation and Maintenance require to be strengthened.	WSSS
		U - 77	Tala	Kangundo-Tala Town Council		5.00	Borehole / No Treatment	100	80	320	13,000	10,000			Operation and Maintenance require to be strengthened for efficient running of the Scheme.	WSSS
	Sub-total				771.37	76.50		5,382	1,596	440	197,700	117,000	502,058			
450	Marsabit	U - 79	Kargi	Local Community	1.87		Borehole / No Treatment	160	Nil	6		8,000	14,518	Location of Boreholes and pans have been identified for 2023 requirement.	The existing Source is not adequate to meet the demand of the local Community.	WSSS, MOLA
		U - 80	Korr		1.90	3.00	Shallow well / No Treatment					8,000	14,816		The scheme comprises of 3No.shallow well which are equipped with handpumps.	WSSS
		U - 82	Marsabit	MWR	6.05		Bakuli Spring / Conventional Full Treatment	136	643	37	28,000	19,750	37,785	Planning for an alternative source (Dam) for 2023 requirement are underway.	The existing water supply is not adequate to meet the demand of the growing Urban population.	WSSS
		U - 83	Moyale	MWR	5.74	3.00	Moyale Dam / Disinfection by chlorine (TCL)	62			20,000	10,000	23,231		The capacity of the dam has been reduced considerably as a result of sitation.Depth reduced from 10m to 1m.	WSSS, MWR
		U - 84	North Horr	Local Community	2.18	0.50	Shallow well / No Treatment	21	Nil	6	9,690	2,500	5,596	The design year (1989) for future development of shallow wells and pans has already been surpassed.	The existing Source is not adequate to meet the demand of the local Community.	WSSS
		U - 85	Sololo	Local Community and NGO.	13.75	8.00	Wells equipped with Handpumps / Disinfection by chlorine (TCL)	21			9,885	6,500	12,125		Sololo does not have a formal water supply and residents depend on water from shallow wells which are not protected and are prone to contumination.	WSSS, Status96
	Sub-total				31.49	14.50		399	643	49	67,575	54,750	108,071			
460	Meru	U - 86	Meru	MWR	10.54	12.00	Gatabora Spring & Kathita River / Conventional Full Treatment	4,730	2,247	272	85,000	16,330	337,437	Another source on Kathita river has been proposed including convention full treatment with a capacity of 10280m^3/day for 2010 requirement.	High level zone experiences severe water shortages as a result of siltation at Kathita intake	WSSS
		U - 87	Nkubu	MWR	3.30		Thirgithu River / Conventional Full Treatment	325	300	23	15,000	5,000	19,261	Another source on Kiangua Ndegwa river has been proposed including convention full treatment with a capacity of 1160m^3/day for 2010 requirement.	The existing Scheme is not adequate to meet the demand of the growing Urban centre	WSSS, MWR
	Sub-total				13.84	12.00		5,059	2,547	295	100,000	21,330	356,698			
470	Nyambene	U - 89	Maua	MWR	1.95		Mboone stream / Conventional Full Treatment	164	0	465	8,000	2,372	12,144	A new source on Ura River has been identified including conventional full treatment with a capacity of 1590m^3/day for 2000 requirement	The system is designed for convention full treatment however at present only disinfection by chlorine is carried out.	WSSS
480	Tharaka Nithi	U - 90	Chuka	MWR	6.93		Tungu River / Disinfection by Chlorine (TCL)	355	590	0	8,000	7,560	12,729	A new source on Ruguti River has been identified but detailed survey has not been carried out.		WSSS
490	Mwingi	U - 91	Mwingi	MWR	3.79	1.50	Tyaa River / Disinfection by Chlorine	300	18	296	15,000	12,000	15,747	Plans are underway to supplement the Urban supply with Kiambere Water Supply Project.	The existing source is not adequate to meet the demand of the growing Urban population.	WSSS
4A0	Makueni	U - 93	Kilwezi	MWR	1.35								7,702			
		U - 98	Mtito Andei	MWR	1.38	5.00	Umanyi Springs / No Treatment	334	328	25	35,000	15,000	12,205			WSSS, MWR
	Sub-total				2.73	5.00		334	328	25	35,000	15,000	19,907			

Table - 1.3.1 (3/5) Present Status of Urban Water Supply

Code	District	Code	Name of Urban Scheme	Water Undertaker	Area of U.C. (Km^2)	Area Covered (Km^2)	Source/Treatment Process	Present Water Production (m^3/day)	Consumer (Metered)	Consumer (Unmetered)	Population in Service Area	Population Served	Population in 2010 (nos)	Future Expansion	Remarks	Data Source
510	Garissa	U - 104	Garissa	MWR	40.32	35.00	Tana River / Conventional Full Treatment.	1,440	958	1,909	57,930	34,758	115,126		Due to high demand and inefficient filtration units untreated water is supplied to consumers.	WSSS
		U - 105	Liboi	MWR	10.38			123				6,180	6,850			S R 96
	Sub-total				50.70	35.00		1,563	958	1,909	57,930	40,938	121,976			
520	Mandera	U - 108	Elwak	Local Community	168.00		Borehole / Disinfection by Chlorine						15,805		The DWE provide the local community with Chlorine but not on regular basis due to funds and transport constraints.	WSSS
		U - 109	Mandera	MWR	25.58		Borehole / Disinfection by Chlorine	500	Nil	1,600		8,160	51,680	Location of Boreholes has been identified for 2020 requirement.	The existing Scheme comprises of 6No.shallow Boreholes of which water from 2No. Boreholes is saline and contaminated.	WSSS
		U - 110	Rhamu	Local Community	66.00		Borehole / Disinfection by Chlorine	140			16,000	8,000	10,031		The DWE provide the local community with Chlorine but not on regular basis due to funds and transport constraints.	WSSS
	Sub-total				259.58	0.00		640	0	1,600	16,000	16,160	77,519			
530	Wajir	U - 113	Bute	MWR	16.05	0.50	Borehole / No Treatment						5,491		There is no formal water supply Scheme in Bute. Residents depend on individual shallow wells which are not protected and are prone to contamination.	WSSS
		U - 114	Eldas	MWR	3.18		Borehole	69			6,000	5,000	5,185			MWR
		U - 116	Wajir	MWR	133.00	1.50	Shallow Wells / Disinfection by Chlorine (TCL)_	20	Nil	74		1,500	66,062		Operation and Maintenance cost is far much higher than the revenue generated from the sales of water.The supply serves Government offices and houses only.	WSSS
	Sub-total				152.23	2.00		89	0	74	6,000	6,500	76,738			
610	Gusii	U - 117	Kisii	NWCPC	34.00	18.00	Gucha River / Conventional Full Treatment	3,520	3,074	620	74,000	45,000	120,615		Due to frequent silation at the intake works and breakdown of raw water pumps the Treatment Works production is lower than its design capacity.	WSSS, MOLA
620	Kisumu	U - 119	Ahero	Ahero Catholic Church	3.15	0.50	Borehole / No Treatment		91	Nil		464	24,135		The existing water supply system managed by Ahero Catholic Church and is not adequate to meet the demand of the local Community.	WSSS
		U - 120	Kisumu	Kisumu Municipal Counc	141.00	180.00	Lake Victoria & Kibos River / Conventional Full Treatment.	14,565	11,192	389	280,845	280,845	561,029	A master plan to Augment Water Supply System for the Township is under preparation by JICA.	Operation and Maintenance require to be strengthened including customer survey to identify location of customers and their physical addresses since there no records available/ kept on service connection.	WSSS, MOLA
		U - 121	Maseno	NWCPC	6.42			N'A				30,000	8,054			S R 96
		U - 122	Muhoroni	MWR	5.46	2.00	Nyando River / Conventional Full Treatment.	600	Nil	120	10,000	5,000	28,231		Production is hindered due to frequent breakdown of pumps.	WSSS
	Sub-total				156.05	182.50		15,165	11,283	509	290,845	316,309	621,449			
630	Siaya	U - 123	Asiro		0.81								9,373			
		U - 125	Siaya	NWCPC	12.03	12.00	Abura Dam on Nyamwin River / Conventional Full Treatment	770	1,710	180	20,364	11,340	47,503	Preliminary Design for alternative Source to 2020 requirement completed	The existing Scheme is primarily a pumping Scheme and the operational cost is much more than the revenue earned.The water supply is not adequate to meet the demand of the growing Urban population	WSSS, MOLA
	Sub-total				12.84	12.00		770	1,710	180	20,364	11,340	56,876			
640	Homa Bay	U - 129	Homa Bay	MWR	18.00	40.00	Lake Victoria /Conventional Full Treatment	1,231	1,498	10		43,000	71,860	Boreholes are being considered as a future source for development.	The existing intake is choked with water hyacinth causing problems in the supply of water.	WSSS
		U - 130	Kendu Bay	MWR	1.46		Awach River / Conventional Full Treatment	17				10,000	7,534		There no records available/kept on production, service connections and finances.	WSSS, Status'96
		U - 131	Mbita		0.67								11,531			
		U - 133	Oyugis	MWR	2.40	4.00	Awach River / Conventional Full Treatment	82				30,000	12,215	There are plan to change the Scheme fro pumping system to gravity system..	There no records available/kept on production, service connections and finances.	WSSS, Status'96
	Sub-total				22.53	44.00		1,330	1,498	10	0	83,000	103,140			
650	Migori	U - 134	Awendo	MWR	4.14		No existing Water supply System						16,258	There is no existing water supply system in Awendo. Proposed water supply with conventional full treatment and river Sare as source is under design.		WSSS
		U - 135	Kenhacha	MWR	3.43		Orawe Dam / No Treatment	44			9,000	3,800	5,008		Construction of a composite filtration unit is in progress.	WSSS
		U - 136	Migori	MWR	7.96		Borehole / Disinfection by chlorine (TLC)	220	450	380		4,233	34,694	Preliminary Design for rehabilitation and expansion of the scheme for 2018 requirement has been done.	Operation and maintenance require to be strengthened including repairing of meters and billing of consumers.	WSSS
		U - 137	Nyabikaye		0.89								8,341			
		U - 138	Rongo	MWR	2.00			497				4,142	8,012			S.R'96
	Sub-total				18.42	0.00		761	450	380	9,000	12,175	72,313			
660	Nyamira	U - 139	Keroka	MWR	1.05		Chirichiri River(1KB)	84					5,343			S.R'96
		U - 140	Nyamira	MWR	2.63		Eyaka River / Conventional Full Treatment	466	802	296	40,000	17,000	17,592		The existing Water Supply is not adequate to meet the demand of the growing Urban population.	WSSS
	Sub-total				3.68	0.00		550	802	296	40,000	17,000	22,935			
710	Kajiado	U - 141	Kajiado	NWCPC	31.00	60.00	Nolturesh pipeline offtake & Borehole / Disinfection by chlorine (TCL).	450	350	750	9,000	5,000	32,847		The existing supply is not adequate to meet the demand of the growing Urban population. All consumers should be metered inorder to control wastage of water and to enhance revenue collection.	WSSS
		U - 142	Magadi	Magadi Soda Factory	0.59	2.00	Ololbor river / Conventional Full Treatment.	1,364			10,000	10,000	15,471			WSSS
		U - 143	Namanga	MWR	4.18	12.00	Oldonyo Orok springs / Disinfection by chlorine (TCL).	341	57	473	12,000	4,500	25,364	Location of Boreholes has been identified for 2010 requirement.	The existing supply is not adequate to meet the demand of the growing Urban population. All consumers should inorder to control wastage of water and to enhance revenue collection.	WSSS, MWR

Table - 1.3.1 (4/5) Present Status of Urban Water Supply

Code	District	Code	Name of Urban Scheme	Water Undertaker	Area of U.C. (Km^2)	Area Covered (Km^2)	Source/Treatment Process	Present Water Production (m^3/day)	Consumer (Metered)	Consumer (Unmetered)	Population in Service Area	Population Served	Population in 2010 (nos)	Future Expansion	Remarks	Data Source
710	Kajiado (cont'd)	U - 144	Ngong	MWR	3.86	19.00	Borehole / No Treatment	1,260	300	1,776	45,000	6,000	41,207		The existing supply is not adequate to meet the demand of the growing Urban population. All consumers should be metered inorder to control wastage of water and to enhance revenue collection.	WSSS
		U - 145	Loitokitok	NWCPC	22.56	40.00	Nol Turesh Springs/Preventive Chrolination (TCL)	1,440	1,491	Nil		20,000	31,353		The existing supply is not adequate to meet the demand of the growing Urban population. All consumers should be metered inorder to control wastage of water and to enhance revenue collection.	WSSS
		U - 146	Ongata Longai	MWR	9.45		Mbagathi River	978			15,000	7,300	81,185			MWR
	Sub-total				71.64	133.00		5,832	2,198	2,999	91,000	52,700	227,427			
720	Kipsigis	U - 148	Kericho	Kericho Municipal Council	8.00	66.00	Timbill River / Conventional Full Treatment	5,325	4,616	0	58,723	58,723	152,522		Operation and Maintenance require to be strengthened, inorder to enhance revenue collection, control wastage of water and ensure equitable distribution of water to more consumers.	WSSS, MOLA
		U - 149	Kipkelion	MWR	6.07		River / Conventional Full Treatment	48	108	Nil	20,000	1,500	6,738		Chemical dosing is supposed to be carried out on daily basis .However due to frequent breakdown of dosing equipment chemical dosing is rarely carried out.	WSSS
		U - 151	Londiani	MWR	6.59		River / Conventional Full Treatment	169	190	34	18,000	4,000	11,552		The Scheme is currently supplying untreated water to consumers due breakdown of dosing equipment and lack of chemicals.	WSSS
		U - 152	Sotik	NWCPC	2.16		Kipsonoi River & Pipeline Offtake / Conventional Full Treatment						10,259	Preliminary Design for alternative source for 2020 demand completed.	The existing scheme has been dilapidated over the years and is uneconomical to rehabilitate.	WSSS
	Sub-total				22.82	66.00		5,542	4,914	34	96,723	64,223	181,371			
730	Laikipia	U - 153	Nanyuki	Nanyuki Municipal Council	26.65		Liki River / Conventional Full Treatment	2,720			53,100	43,100	97,975		River Liki has been identified as the source for future, but no comprehensive study has been carried out. There are no records available / kept on water production and service connections.	WSSS, NWMP
		U - 154	Rumuruti	Laikipia County Council	9.26	6.00	Borehole / Conventional Full Treatment		Nil	232		3,200	7,532	Alternative source with Conventional Full Treatment has been identified on Ewaso River, for 2020 requirement.	The existing spring source is not adequate to meet the demand of the growing Urban population.	WSSS, NWCPC
	Sub-total				35.91	6.00		2,720	0	232	53,100	46,300	105,507			
740	Nakuru	U - 155	Elburgon	NWCPC	4.53	1.00	Boreholes / Disinfection by Tropical Chloride of Lime (TCL)	391	681	6	30,000	6,000	54,658	Feasibility Study in progress for 2020 requirement	Present supply not adequate to meet the demand of the area	WSSS
		U - 156	Gilgil	NWCPC	3.87	2.00	Murandiri & Malewa rivers / Conventional Full Treatment	760	501	776	8,000	8,000	65,442		Operation and Maintenance require to be strengthened in order to enhance revenue collection	WSSS, MOLA
		U - 157	Molo	NWCPC	4.13	0.80	Nguso springs & Boreholes / Disinfection by Tropical Chloride of Lime (TCL)	775	602	61	30,000	10,000	52,394	Feasibility Study in progress for 2020 requirement	Present supply not adequate to meet the demand of the area	WSSS
		U - 158	Naivasha	NWCPC	9.89	3.00	Boreholes / Disinfection by Tropical Chloride of Lime (TCL)	762	1,531	416	48,000	46,000	168,905	Feasibility Study in progress for 2020 requirement	Present supply not adequate to meet the demand of the area	WSSS
		U - 159	Nakuru	Municipal Council of Nakuru	108.00	44.10	Mereroni & Malewa rivers, Kabatini & Baharini boreholes / Conventional Full Treatment	41,120	19,223	Nil	475,000	304,561	760,237	Feasibility Study in progress for 2020 requirement	Operation and Maintenance require to be strengthened inorder to control wastage of water and enhance revenue collection	WSSS, NWCPC
		U - 160	Njoro	NWCPC	6.85	2.00	Boreholes / Disinfection by Tropical Chloride of Lime (TCL)	224	200	98	20,000	5,000	41,421	Feasibility Study in progress for 2020 requirement	Present supply not adequate to meet the demand of the area	WSSS
	Sub-total				137.30	52.90		44,032	22,738	1,357	611,000	379,561	1,143,059			
750	Narok	U - 163	Narok	Narok Municipal Council	9.00	3.00	Narok river & spring / Conventional Full Treatment	1,315	913	114	30,000	12,000	77,231		Present Water Supply is not adequate to meet the demand of the area. Existing spring source require to be rehabilitated to supplement the supply	WSSS
760	Trans Nzoia	U - 164	Kitale	Kitale Municipal Council	91.80		Nzoia River / Conventional Full Treatment.	9,000	4,000	0	70,000	60,000	229,328	Mount Elgon spring has been proposed as an alternative source including conventional full treatment with a capacity of 7500m^3/day for 2000 requirement.	Frequent pump breakdowns have resulted in intermittent functioning of the T/Works and water supply interruption.	WSSS
770	Uasin Gishu	U - 165	Burnt Forest	MWR	3.00	11.00	Dam & Borehole / No Treatment	500	42	125	5,000	1,810	5,989		The existing water supply system is not adequate to meet the demand of the growing urban population.	WSSS
		U - 166	Eldoret	Eldoret Municipal Council	89.27	150.00	Kaptagat, Eldoroto, Ehigirini Rivers & Dam on Moiben River / Conventional Full Treatment.	28,650	7,506	70	220,000	90,000	450,629		Eldoret Municipal Council does not have any major problems with its water supply system for the next 10 years.	WSSS, MOLA
		U - 167	Lemok		7.73								11,048			
		U - 169	Moi's Bridge	MWR	1.20		Nzoia River / Conventional Full Treatment.	105			4,200	1,010	8,869		Operation and maintenance cost is far much higher than the revenue generated from the sales of water	WSSS
		U - 170	Simat		12.24								20,468			
		U - 172	Turbo	MWR	0.67	6.00	Confluence of Sergoit & Sosiani River / Conventional Full Treatment.	300	245	Nil	4,600	2,450	9,175		Frequent pump breakdowns have resulted in intermittent functioning of the T/Works and water supply interruption.	WSSS
	Sub-total				114.11	167.00		29,755	7,793	195	233,800	95,270	506,179			
790	Transmara	U - 174	Kilgoris	MWR	3.47		Inpounded reservoir-stream	25			10,000	8,000	23,132			MWR
810	Baringo	U - 178	Eldama Ravine	NWCPC	4.67	10.00	Chemususu River / Conventional Full Treatment.	2,460	480	120		20,000	22,617			WSSS
		U - 179	Karbarnet	NWCPC, DWE	7.48		Kapcherusuwo Dam & Boreholes / No Treatment	2,042	596	154	250,000	127,500	32,363	Kirandich dam is under construction	The existing scheme is supplied from 2Nos boreholes with a production capacity of 90m^3/day.Upon completion of Kirandich Dam water supply will improve by augmenting the future demand by 14000m^3/day.	WSSS, NWCPC, WRAP
		U - 180	Maji Mazuri	MWR	2.37	5.00	Kapkor River / No Treatment	96	Nil	96	10,000	2,000	22,152		Absence of any form of treatment of the raw water makes it susceptible to water borne diseases.	WSSS, Status'96
		U - 181	Marigat	MWR	3.30		Perekera River / Conventional Full Treatment.	154	Nil	239		1,219	10,740		Records on population and finances are not available/kept. All consumers are on flat rate and they should be metered inorder to enhance revenue collection.	WSSS

Table - 1.3.1 (5/5) Present Status of Urban Water Supply

Code	District	Code	Name of Urban Scheme	Water Undertaker	Area of UC. (Km^2)	Area Covered (Km^2)	Source/Treatment Process	Present Water Production (m^3/day)	Consumer (Metered)	Consumer (Unmetered)	Population in Service Area	Population Served	Population in 2013 (nos)	Future Expansion	Remarks	Data Source
810	Baringo (cont'd)	U - 182	Mogotio	MWR, DWE	5.36		Molo River & Borehole / No Treatment	686	580	Nil	15,000	5,000	10,554		All consumers should be metered inorder to ensure equitable distribution of water to more consumers and enhance revenue collection.	WSSS, Status'96, WRAP
	Sub-total				23.18	15.00		5,438	1,656	609	275,000	155,719	98,432			
820	Elgeyo Marakwet	U - 183	Iten	MWR	2.51		Kamariny Springs & Boreholes / Disinfection by Chlorine (TCL)	460	572	37	13,000	1,900	14,951		The existing sources have a potential of $600m^3$/day and if fully exploited the served area can be extended.	WSSS
830	Nandi	U - 185	Kapsabet	NWCPC	14.00	3.00	Kabutie River / Conventional Full Treatment.	1,100	840	190	20,000	7,000	44,693		The Kapsabet water supply is not adequate to meet the demand of the growing urban population.	WSSS
840	Samburu	U - 188	Maralal	MWR	13.58	6.00	Nundoto Earth Dam / Conventional Full Treatment	529	415	11		2,173	34,381	There are plans to construct another dam for 2020 requirements.	The existing spring source is not adequate to meet the demand of the growing Urban population.	WSSS
		U - 189	Wamba	MWR	43.00	1.00	Chlorine(TCL)	181	Nil	126	10,000	10,000	13,572		The existing spring source is not adequate to meet the demand of the growing Urban population.	WSSS, MWR
	Sub-total				56.58	7.00		710	415	137	10,000	12,173	47,953			
850	Turkana	U - 190	Kakuma T.C	MWR	3.12		1 shallow well, 2 boreholes	260			30,000	20,000	6,974			MWR
		U - 191	Kalokol	MWR, Community	4.27		Shallow wells and infiltration gallery	8			5,000	2,000	6,437			MWR
		U - 194	Lodwar	MWR	6.53	3.00	Boreholes / Disinfection by Chlorine (TCL)	1,506	1,652	25	40,000	30,000	45,315		As a result of delays in purchase/ delivery of chemicals, quite often water is supplied to consumers without being treated	WSSS
		U - 195	Lokitaung	MWR	3.15		Shallow wells and infiltration gallery	24			10,000	4,000	10,882			MWR
	Sub-total				17.07	3.00		1,797	1,652	25	85,000	56,000	69,608			
860	West pokot	U - 197	Kapenguria	MWR	6.58	2.00	Kapolet River / Conventional Full Treatment.	247	21	536	6,500	5,500	29,602		Kapenguria water supply is not adequate to meet the demand of the growing urban population.	WSSS
		U - 198	Makutano	MWR	0.61	41.00	River Kapenguria / Conventional Full Treatment.	262	107	349	6,500	5,200	23,493		The existing pumps are old and require replacement.	WSSS
	Sub-total				7.19	43.00		509	128	885	13,000	10,700	53,095			
910	Bungoma	U - 199	Bungoma	NWCPC	35.00		Kuywa River & Borehole / Conventional Full Treatment	2,620	2,830	205	57,600	36,000	114,086	There are plans to rehabilitate and expand the existing scheme to meet 2020 requirements.		WSSS
		U - 200	Cheptais	MWR	3.61	1.00	Malakisi River / Conventional Full Treatment						7,930		There no records available / kept on water production, service connections etc.	WSSS
		U - 202	Kimilili	MWR	4.00		River / Conventional Full Treatment	4,123	670	1,090	113,100	93,800	25,327		The existing Water Supply is not adequate to meet the demand of growing Urban population.	WSSS
		U - 203	Malakisi	MWR	4.91	45.00	River / Conventional Full Treatment		500	400			8,436		Records on population, finances and production not available kept.	WSSS
		U - 205	Webuye	MWR	12.58		River / Conventional Full Treatment	1,700	1,552	554	52,000	40,000	120,647		Power supply interruption and inadequate chemical supply adversely affect water supply to consumers.	WSSS
	Sub-total				60.10	46.00		8,443	5,552	2,249	222,700	169,800	276,426			
920	Busia	U - 206	Busia	MWR	2.15	3.00	Sio River & Boreholes / Conventional Full Treatment.	2,072			50,000	17,267	103,635	Augmenting the existing treatment works to capacity of$3100m^3$/day for 2005 requirement.	Operation and maintenance require to be strengthened for efficient operation of the scheme.	WSSS
		U - 207	Malaba Town		1.28								8,770			
		U - 208	Nambale	MWR	1.28	2.00	Boreholes / No Treatment	159				1,325	7,929		Most consumers do complain about the quality of water being supplied. Water borne diseases are commoe in this area.	WSSS
	Sub-total				4.71	5.00		2,231	0	0	50,000	18,592	120,335			
930	Kakamega	U - 209	Butere	MWR	1.48	3.00	Borehole / Disinfection by Chlorine (TCL)	264	204	99		5,000	6,526		The Scheme experiences frequent power interruption which sometimes cause damage to submersible pumps. Quite often water is supplied to consumers without being treated.	WSSS
		U - 210	Kakamega	NWCPC	48.00	3.00	River & Borehole / Conventional Full Treatment	7,000	5,422	34		27,826	202,516		Production/financial details are not available/kept by the Scheme Manager.	WSSS, NWCPC
		U - 211	Mumias	MWR	8.92	6.00	Lusumu River & Borehole / Conventional Full Treatment	1,498	814	130	20,000	12,440	65,150		The existing water supply is not adequate to meet the demand of the growing Urban population.	WSSS
	Sub-total				58.40	12.00		8,762	6,440	263	20,000	45,266	274,192			
940	Vihiga	U - 213	Maseno/ Luanda	MWR	1.68	1.50	Open Furrow / Coovention Full Treatment	1,192	759	1,000	71,400	68,400	11,138	Alternative Source for 2018 requirement	The existing Scheme has been adversely affected by the recent heavy rains with section of the furrow intake washed away, filters clogged, and sections of the distribution system washed away.	WSSS
		U - 214	Mbale		0.89		Surface Water	889			450,000	20,000	7,887			MWR
		U - 215	Vihiga/ Majengo	MWR	3.73	1.00	Spring / Disinfection by Chlorine(TCL)	63	185	60	15,000	12,000	12,600		The existing Water Supply System is not adequate to meet the demand of the growing Urban population. Alternative source with conventional full treatment should be considered.	WSSS
	Sub-total				6.30	2.50		2,144	935	1,060	536,400	100,400	31,625			
TOTAL					3729.01	1988.20		629,793	290,375	33,303	6,575,574	4,974,003	11,300,635			

Data Source : WSSS; Water Supply Sector Survey
MWR; Project Rehabilitation Survey by the Ministry of Water Resources
Status 96; Project Status Report 96, Ministry of Water Resources, Dec. 1997
NWCPC; Brief on National Water Conservation and Pipeline Corporation's Activities and Present Status, National Water Conservation & Pipeline Corporation, Sep.
NWMP; The Study on the National Water Master Plan, Sectoral Report (D), Domestic and Industrial Water Supply, Japan International Cooperation Agency, July
WRAP; District Water Development Plan, Water Resources Assessment & Planning
MOLA; Ministry of Local Authority

Table - 1.3.2 (1/5) Present Status of Large Scale Rural Water Supply Schemes

Code	District	Project Name	Location		Water Source	Design Capacity (m3/day)	Water Production (m3/day)	Population Served (Nos)	Management Agency	Data Source
			Code	Name						
210	Kiambu	Limuru	213.1.	Limuru, Meiya	Borehole	1,538	1,538	12,000	MOWR	Status '96
		Karai	216.3	Karai	Borehole	527	527	15,000	MOWR	Status '96
		Limuru Uplands	217.1	Lari	Borehole	196	196	6,500	MOWR	Status '96
		Ngecha	213.3	Ngecha	Borehole, Gitungu	Nil	Nil	5,000	MOWR	Status '96
		Ikinu Rioki	215.2	Ikunu		Nil	Nil	16,400	NWCPC	Status '96
		Korio				R/NA	R/NA	5,000	NWCPC	Status '96
		Githa				R/NA	R/NA	8,538	NWCPC	Status '96
		Kanunga				-	-	6,500	NWCPC	Status '96
		Kiaria				R/NA	R/NA	4,500	NWCPC	Status '96
		Kiu South				R/NA	R/NA	4,000	NWCPC	Status '96
		Thiririka	212.3	Kiganjo	Thiririka River	7,005	7,005	50,000	MOWR	Status '96
		Gatundu			Pipeline offtake (Ngethu Water Supply)	411	411	10,719	Nairobi City Council	JICA
		Komotha			River gatamaiyo	432	4,290	40,000	MOWR	MOWR
		Uplands			Borehole	9,264	204	14,000	MOWR	MOWR
		Bathi	217.1.	Lari, Limuru	River Bathi	106,440	2,732	35,000	MOWR	MOWR
		Karimenu			Karimenu River	3,605	158	45,000	MOWR	MOWR
		Ithanga			Thika River	1,200	2,268	30,000	MOWR	MOWR
		Ndarugu	212.5	Ndaruru	Ndarugu River	5,568	5,497	45,000	MOWR	MOWR
	Sub-total					136,186	24,826	353,157		
220	Kirinyaga	Ngariama	223.1	Ngariama	Kiri and Kiye River	1,018	1,018	39,885	MOWR	Status '96
		Kabare	223.3	Baragwi	Thiba River	1,602	1,602	16,390	MOWR	Status '96
		Karuti W/P				4,310	4,310	12,000	NWCPC	Status '96
		Kiangombe S/H				800	800	6,120	NWCPC	Status '96
		Kianguenyi Women				219	219	4,370	NWCPC	Status '96
		Teithia/Teith S/H				1,262	1,262	7,651	NWCPC	Status '96
		Mutungara S/H				383	383	7,650	NWCPC	Status '96
		Ndia Ph A				8,188	8,188	27,400	NWCPC	Status '96
		Ph B				-	-	24,500	MOWR	Status '96
		Ph C				-	-	85,000	MOWR	Status '96
		Sagana	222.5	Kiine South	River Ragati	624	617	21,300	MOWR	MOWR
		Kabara Rural			Thiba River	5,400	2,959	16,530	MOWR	MOWR
		Ngariama Rural	223.1	Ngariama	Kive and Kiri River	783	757	43,900	MOWR	MOWR
		Kirinyaga			Thiba River	168	159	8,000	MOWR	MOWR
	Sub-total					24,757	22,273	325,696		
230	Murang'a	Sabasaba			Sabasaba River	45	45	9,327	MOWR	Status '96
		Gatanga	231.2	Gatanga	Take off from Gatanga	2,640	2,640	7,813	MOWR	JICA
		Kigumo	232.2	Kigumo	River Irati	8,640	8,640	150,000	MOWR	JICA
		Kandara			Thika river	14,640	14,640	78,183	NWCPC	JICA
		Kahuti			S Mathioya / Maragua rivers	12,910	12,910	60,298	NWCPC	JICA
	Sub-total					38,875	38,875	305,621		
240	Nyandarua	Ngorika				247	247	15,000	S/H	Status '96
		Mawingo				1,090	1,090	8,686	NWCPC	Status '96
		Mugiliri				648	648	12,000	NWCPC	Status '96
		Gitel				612	612	5,500	NWCPC	Status '96
		Kinangop R.M.				4,471	4,471	11,300	MOWR	Status '96
		Ol-Jl Kangui				37	37	15,000	MOWR	Status '96
		Kirima			Protected well	254	254	5,000	MOWR	MOWR
		Kitiri				3,785	3,785	3,900	MOWR	MOWR
	Sub-total					11,145	11,145	76,386		
250	Nyeri	Zaina				586	586	16,000	MOWR	Status '96
		Tetu Thegenge	255.2.	Tetu Thegenge	Zaina River	4,008	3,551	40,000	MOWR	MOWR
		Mukurweini	253.3	Gikondi	Served by Mukrweini Rural	197	197	6,000	MOWR	MOWR
		Mukurweini Rural	253.3	Gikondi	Chinga dam	5,016	4,290	45,000	MOWR	MOWR
	Sub-total					9,808	8,624	107,000		
310	Kilifi	Tezo-Roka	313.2.	Tezo Roka		313	313	8,736	NWCPC	Status '96
		Mazeras/Jaribuni				2,005	2,005	10,192	NWCPC	Status '96
		Mackinon Road				55	55	5,260	NWCPC	Status '96
		Pidmango			Take off Baricho pipeline	42	42	6,459	NWCPC / Community	JICA
	Sub-total					2,416	2,416	30,647		
320	Kwale	Vanga				432	89	4,500	MOWR	MOWR
		Kikoneni	324.7	Kikoneni	Dam, Mkanda River	1,728	66	12,000	MOWR	MOWR
	Sub-total					2,160	155	16,500		
330	Lamu	Central W/S	332.1	Mkunumbi	Wells	1,085	1,085	7,000	GTZ/PC	Status '96
	Sub-total					1,085	1,085	7,000		
340	Mombasa	Mtongwe-Mwenza	344.2	Mtongwe	piped	400	400	10,000	NWCPC	Status '96
		Mrima Flats Ext.				160	160	4,000	NWCPC	Status '96
		Vyemani Line Ext.				160	160	4,000	NWCPC	Status '96
		Soweto/Mwatsalafu				183	183	8,000	NWCPC	Status '96
		Kwa Jomvu Miritini				150	150	5,000	NWCPC	Status '96
	Sub-total					1,053	1,053	31,000		
350	Taita	Chongoni				39	39	12,200	NWCPC	Status '96
		Bura	354.2	Bura		2,599	2,599	6,100	NWCPC	Status '96
		Wundanyi	353.4	Wundanyi		751	751	16,000	MOWR	Status '96
		Maungu Bureta				603	603	7,000	NWCPC	Status '96
		Ngiriwunyi w/s				65	65	12,200	MC	Status '96
		Mwakiki			Sangunyi and	-	-	7,512	Community	JICA
	Sub-total					4,056	4,056	61,012		
360	Tana River	Bura W/S	362.3	Bura		5,200	5,200	8,000	MOWR	Status '96
		Ngao	364.4	Ngao	River Tana	1,200	46	6,500	MOWR	MOWR
	Sub-total					6,400	5,246	14,500		

Table - 1.3.2 (2/5) Present Status of Large Scale Rural Water Supply Schemes

Code	District	Project Name	Location		Water Source	Design Capacity (m3/day)	Water Production (m3/day)	Population Served (Nos)	Management Agency	Data Source
			Code	Name						
410	Embu	Ena-Siakago			River Ena	1,562	1,562	42,500	MOWR	Status '96
		Siakago			Pipeline Offtake	196	196	8,000	MOWR	JICA
		Nganderi A			Rupingazi and Karingazi River.	19,200	16,570	20,000	MOWR	MOWR
		Nganderi B			Thambana River	6,840	4,856	20,000	MOWR	MOWR
		Kyeni Rural	414.1, 414.2	Kyeni North, Kyeni South	River	3,552	3,503	28,000	MOWR	MOWR
		Ishiara	412.4	Evurore	River Thuchi	670	369	5,572	MOWR	MOWR
	Sub-total					32,020	27,056	124,072		
420	Isiolo	Garbatula	422.1	Garbatula	Borehole	128	128	4,746	Community	Status '96
		Ngaremara W/S				128	128	6,172	Community	Status '96
	Sub-total					256	256	10,918		
430	Kitui	Mwingi				27	27	15,000	MOWR	Status '96
		Kabati			2 no. Boreholes			6,643	Community	JICA
		Mutito-Mui	432.1	Mutito	Springs	120	46	8,000	MOWR	MOWR
	Sub-total					147	73	29,643		
440	Masaku	Ikombe				80	80	4,000	NWCPC	Status '96
		Mutheiheni	443.5	Mutheiheni		-	-	13,400	NWCPC	Status '96
		Katheka Kithayoni				-	-	8,000	NWCPC	Status '96
		Vyulya				13	13	4,000	NWCPC	Status '96
		Mutheiheni Dam	443.5	Muhtheiheni	Dam on Kyethivu	100	100	9,000	Community	JICA
		Mekilingi			Mekingiti river	124	124	10,000	Community	JICA
		Ukani			Pipeline Offtake	na		10,000	Local Community	JICA
		Wamunyu	443.4	Wamunyu	Athi River	312	522	11,000	MOWR	MOWR
		Siathani			Borehole/Surface from Miu river	2	2	4,000	MOWR	MOWR
		Mbiuni	443.1	Mbiuni	Surface(Athi River)	15	15	7,500	MOWR	MOWR
		Kibauni	443.6	Kibauni	Athi river	2,050	22	12,000	MOWR	MOWR
		Kathiani			Muoni Dam	26,400	384	9,800	MOWR	MOWR
	Sub-total					29,096	1,261	102,700		
450	Marsabit	South Horr				137	137	6,300	NWCPC	Status '96
		Godoma	456.3	Godoma		20	20	6,000	NWCPC	Status '96
		Uran	455.1	Uran	Borehole	39	39	5,000	NWCPC	Status '96
		Maikona Wells	451.3	Maikona	Wells	68	68	11,000	MOWR/NWCPC	Status '96
		Bubisa	451.4	Bubisa		21	21	7,000	NWCPC	Status '96
		Loyangalani	452.1	Loyangalani	Springs	82	82	8,000	NWCPC	Status '96
		Dabel	456.3	Godoma	Borehole	52	52	9,000	FHI/NWCPC	Status '96
		Bori				11	11	5,000	NWCPC	Status '96
		Walda	455.1	Uran	Borehole	137	137	6,000	NWCPC	Status '96
		Drib-Gombo B/H	454.3	Sagante	Borehole	49	49	4,600	NWCPC	Status '96
		Laisamis	453.2	Logologo	Borehole	27	27	8,200	MOWR	Status '96
		Loglogo	453.2	Logologo	Borehole	137	137	13,000	MOWR/NWCPC	Status '96
		Ngurunit				3	3	6,000	MOWR/NWCPC	Status '96
	Sub-total					783	783	95,100		
460	Meru	Mitunguru	463.7	Mitunguru	River Thingith	480	438	91,000	MOWR	MOWR
		Mwimbi	463.5	Igoji	Mt. Kenya Forest	3,000	4,290	32,000	MOWR	MOWR
		Nkabune			Kathita River	600	195	7,000	MOWR	MOWR
	Sub-total					4,080	4,923	130,000		
470	Nyambene	Kaweru				1,620	1,620	20,000	NWCPC	Status '96
		Amwamba				389	389	8,000	NWCPC	Status '96
		Murimi				294	294	4,500	NWCPC	Status '96
		K.K. Mwethe				1,499	1,499	12,000	NWCPC	Status '96
		Kamberwa				155	155	25,000	NWCPC	Status '96
		Riaki(Kaongone)				900	900	5,000		Status '96
		Girwe				1,000	1,000	5,000	NWCPC	Status '96
		Kithetu Miori				500	500	5,000	NWCPC	Status '96
		Miathene						35,000	NWCPC	Status '96
		Tigania			Spring	4,104	3,755	80,000	MOWR	MOWR
	Sub-total					10,461	10,112	199,500		
480	Tharaka Nithi	Muruti Mugumango				706	706	20,000	NWCPC	Status '96
		Magumoni				2,191	2,191	9,000	NWCPC	Status '96
		Karingani	481.6	Kanjuki	Tungu River	3,600	3,146	45,000	MOWR	MOWR
		Mwimbi Chogoria			Mutonga River	2,400	4,261	20,000	MOWR	MOWR
	Sub-total					8,896	10,303	94,000		
490	Mwingi	Ngomeni W/S	492.3	Ngomeri	Rock Catchments	Nil	Nil	10,000	MOWR	Status '96
		Migwani	493.2	Migwani	Borehole	243	243	19,000	NWCPC	Status '96
	Sub-total					243	243	29,000		
4A0	Makueni	Wote	4A3.1	Makueni	Borehole	75	75	5,500	MOWR	Status '96
		Makindu	4A4.1	Makindu	Makindu springs	480	395	12,000	MOWR	MOWR
		Kikumbulyu Rural	4A4.4	Kikumbulyu	Umani springs at the foot of Chyulu hills.	720	728	9,400	MOWR	MOWR
		Ena-Siakago			River Ena	2,400	2,509	8,800	MOWR	MOWR
	Sub-total					3,675	3,706	35,700		
510	Garissa	Masalani	515.4	Masalani	River Tana	55	55	5,150	MOWR	Status '96
		Mbalambala	511.3	Mbalambala		68	68	4,120	MOWR	Status '96
		Modogashe	513.1	Modogashe	Shallow Wells	38	38	6,065	MOWR	Status '96
		Dadaab	518.0	Dadaab	Borehole	82	82	4,625	MOWR	Status '96
		Alijugur				25	25	5,150	MOWR	Status '96
		Shanta-abak			Borehole	23	23	4,635	MOWR	Status '96
		Ijara	515.2	Ijara	Pans	na	na	5,000	Local Community	JICA
	Sub-total					292	292	34,745		

Table - 1.3.2 (3/5) Present Status of Large Scale Rural Water Supply Schemes

Code	District	Project Name	Location		Water Source	Design Capacity (m3/day)	Water Production (m3/day)	Population Served (Nos)	Management Agency	Data Source
			Code	Name						
520	Mandera	Wargadud	523.3	Wargadud	Borehole	80	80	6,000	MOWR	Status '96
		B/H. Eleven				80	80	4,000	MOWR	Status '96
		S.Fatuma				80	80	4,000	MOWR	Status '96
		Kutulo	523.2	kutulo	Borehole	15	15	4,500	MOWR	Status '96
		Kalaliyo	521.3	Kalaliyo	River Daua	79	79	4,000	MOWR	Status '96
		Neboi (Army	521.2	Neboi	River Daua	160	160	5,000	MOWR	Status '96
	Sub-total					494	494	27,500		
530	Wajir	Kutulo			River Daua	68	68	5,000	MOWR	Status '96
		Sabuli	531.3	Sabuli		110	110	5,000	MOWR	Status '96
		Abakore				151	151	5,000	MOWR	Status '96
		Sarif				100	100	25,000	MOWR	Status '96
		Arbajahan	535.2	Arbajahan	Borehole	141	298	16,000	MOWR	MOWR
		Habaswein	531.1	Habaswein	Borehole	168	142	20,000	MOWR	MOWR
		Wajir Minor	533.2	Wajir-Bor	Well	240	178	5,000	MOWR	MOWR
		Khorof Hakar	533.1	Khorof Hakar	Borehole	192	107	8,000	MOWR	MOWR
		Kujulo			Borehole	192	71	7,000	MOWR	MOWR
		Damras			Borehole	216	9	10,000	MOWR	MOWR
		Hadado	535.5, 535.6	Hadado North,South	Borehole	101	1,790	5,000	MOWR	MOWR
		Biyamadhow			Borehole	126	142	20,000	MOWR	MOWR
	Sub-total					1,805	3,165	131,000		
610	Gusii	Geteri/Gesusu	618.2	Nyanibari		5	5	27,532	MOWR	Status '96
		Birongo	613.1	Nyanibari	Chirichiro River	2,812	2,812	18,000	MOWR	Status '96
		Gionseri	612.4	Bassi Masige	Spring	490	490	4,720	MOWR	Status '96
		Mosocho Gesoni			Ria Modito spring	60	60	6,000	MOWR	JICA
		Tabaka			Bombure Spring	100	100	4,200	MOWR	JICA
		Keroka			Chirichiri River	960	150	22,349	MOWR	JICA
	Sub-total					4,428	3,618	87,801		
620	Kisumu	M.Kombewa						30,000	NWCPC	Status '96
		Nyakach W/S						120,000	NWCPC	Status '96
		Kenasia W/S				28	28	5,000	NWCPC	Status '96
		Othoo						10,000	NWCPC	Status '96
		Nyahera(Gazetted			Orinde Springs	720	126	10,000	MOWR	MOWR
		Kibigori			Stream/Spring	720	710	10,000	MOWR	MOWR
		Koru/Mnara W/S	626.1	Koru	Kipcherian Stream	192	93	5,000	MOWR	MOWR
		Kisumu Rural W/S			Lake Victoria	1,992	994	25,000	MOWR	MOWR
		Ovugis			River Awach	8,640	129	32,000	MOWR	MOWR
		West Karachuonyo			Lake Victoria	1,920	13	140,000	MOWR	MOWR
		Kendu Bay			River	1,080	237	12,000	MOWR	MOWR
	Sub-total					15,292	2,330	399,000		
630	Siaya	Bondo	632.4	West Sakwa	River Yala	296	296	10,000	MOWR	Status '96
		Yala Township	633.2	East Gem	River Yala	548	548	5,000	MOWR	Status '96
		Uyoma	631.1	East Uyoma	Lake Victoria	1,080	1,080	5,110	Community	JICA
		Mauna Dam	636.2	Ukwala	Mauna Dam and spring	166	166	12,275	MOWR	JICA
		Ukwala	636.2	Ukwala	Borehole	na	214	13,000	MOWR	JICA
		North Sakwa	632.2	North Sakwa	River Yala	0	0	8,913	MOWR	MOWR
		South Sakwa	632.1	South Sakwa	Lake Victoria	0	0	13,457	MOWR	MOWR
		Ugunja	635.2	Uholo	Borehole	288	166	6,000	MOWR	MOWR
		Sega	636.3	North Ugenya	1 Borehole	336	272	16,000	MOWR	MOWR
		Sidindi Macanga	632.2	North Sakwa	Yala River	3,480	2,130	90,000	MOWR	MOWR
		Uranga/Ramula	633.2	East Gem	Stream	648	0	5,000	MOWR	MOWR
		Bar Ober	635.2	Uholo	Spring	0	0	20,000	MOWR	MOWR
		Yenga/Sirawega			Yenga Dam	960	0	5,000	MOWR	MOWR
		Sigomure	635.2	Uholo	Borehole	600	600	10,000	MOWR	MOWR
	Sub-total					8,402	5,472	220,255		
640	Homa Bay	Kochia	641.3	Kochia		N/E	N/E	28,000	MOWR	Status '96
		West Rachuonyo				17	17	104,000	MOWR	Status '96
	Sub-total					17	17	132,000		
650	Migori	Nyasare				409	409	6,500	PC/NGO	Status '96
	Sub-total					409	409	6,500		
660	Nyamira	Nyambaria	663.2	North Kitutu	Stream	429	429	14,500	MOWR	Status '96
		Nyansiongo	662.1	Nyansiongo	Dam	260	260	8,000	MOWR	Status '96
		Manga w/s	663.3	Central Kitutu	Spring	96	20	4,500	MOWR	MOWR
		Tombe w/s	663.3	Central Kitutu	Spring	432	85	4,000	MOWR	MOWR
		Mochenwa w/s	663.1	East Kitutu	Spring	130	85	4,000	MOWR	MOWR
	Sub-total					1,347	879	35,000		
710	Kajiado	Kiserian	712.3	Ngong	Spring	647	647	6,300	NWCPC	Status '96
		Lower				353	353	4,000	NWCPC	Status '96
		Kibiko				459	459	5,800	NWCPC	Status '96
		Olchorinyori				213	213	3,800	NWCPC	Status '96
		Oloosees				100	100	8,000	NWCPC	Status '96
		Bissel	713.B	Lorongoswa	Borehole	8	8	20,000	MOWR	MOWR
		Rongai			Mbagathi River	3,600	978	7,200	MOWR	MOWR
	Sub-total					5,380	2,758	55,100		
720	Kipsigis	Chesinende				100	100	3,600	Community	Status '96
		Sosiot			River	787	480	15,000	MOWR	MOWR
	Sub-total					887	580	18,600		
730	Laikipia	Doldol water supply	732.2	Mukogondo	Borehole	21	21	5,000	MOWR	MOWR
	Sub-total					21	21	5,000		

Table - 1.3.2 (4/5) Present Status of Large Scale Rural Water Supply Schemes

Code	District	Project Name	Location		Water Source	Design Capacity (m3/day)	Water Production (m3/day)	Population Served (Nos)	Management Agency	Data Source
			Code	Name						
740	Nakuru	Lanet	749.3	Lanet	River Merironi	57	57	5,000	MOWR	MOWR
		Nyamamithi				R/NA	R/NA	3,200	NWCPC	Status '96
		West acre			River	259	341	4,000	MOWR	MOWR
		Crater Stream			Crater River	864	36	45,000	MOWR	MOWR
		Olenguruone			Arap Mzee River	65	19	3,500	MOWR	MOWR
		Lake Nakuru Block 4	749.5	Lake Nakuru	Borehole	166	95	18,000	MOWR	MOWR
		Lake Nakuru Block 2	749.5	Lake Nakuru	Borehole	103	37	6,000	MOWR	MOWR
	Sub-total					1,514	584	84,700		
750	Narok	Angata Baragoi				8	8	4,000	MOWR	Status '96
		Kilgolis			Inkituaak River	1,315	1,315	3,500	MOWR	JICA
		Lemek	753.3	Lemek	Lemek borehole	100	100	3,066		JICA
		Mulot	753.1	Mulot	Mara river	300	300	12,775	MOWR	JICA
		Ololunga	753.2	Ololunga	Ewaso Nyiro river	110	110	4,650	Community	JICA
		Ilmasharian			Spring	216	216	9,198	MOWR	JICA
	Sub-total					2,049	2,049	37,189		
770	Uasin Gishu	Ainabkoi	774.9	Ainabkoi		3,111	3,111	44,770	NWCPC	Status '96
		Sosian	772.4	Sugoi	Borehole	36	36	4,000	MOWR	Status '96
		Kaptagat	774.2	Kaptagat		60	60	6,800	MOWR	Status '96
		Moi Barracks			River Sergoig	1,173	1,173	14,000	Instit.	Status '96
		Kapunda				980	980	4,600	NWCPC	Status '96
		Yamumbi			Sosiani river	980	980	7,665	Passenga Sec. school	JICA, Status'96
		Moi University			Samul river	1600	1600	4,267	Moi University	JICA
		Arangai			River Rongai			22,032	Community	JICA
	Sub-total					6,340	6,340	113,333		
780	Bomet	Sigor/Longisa	782.3	Longisa		473	473	5,000	MOWR	Status '96
		Bomet water supply			Nyanuores River	1,200	7	4,000	MOWR	MOWR
		Chepalungo			River	1,200	473	10,000	MOWR	MOWR
	Sub-total					2,873	954	19,000		
790	Transmara	Angata Baragoi w/s	792.3	Siria Central	Spring	10	10	4,000	MOWR	Status '96
		Lolgorien W/S	792.1	Siria East	Stream	15	15	3,500	MOWR	Status '96
	Sub-total					25	25	7,500		
810	Baringo	Narusura				750	750	11,000	NWCPC	Status '96
		Chemeron				15	15	17,000	MOWR	Status '96
		Torongo			Perennial Stream	480	10	8,000	MOWR	MOWR
		Oilokwe			1 - Borehole	166	49	4,000	MOWR	MOWR
	Sub-total					1,411	825	40,000		
820	Elgeyo Marakwet	Kpatarakwa	821.7	Mosop		538	538	8,000	MOWR	Status '96
		Nerkwo			River	5	5	4,088	Community	JICA
		Kapsowar			Emston river	1,600	1,600	5,000	MOWR	JICA
		Kaptarakwa	821.7	Mosop	Small Stream	840	0	4,800	MOWR	MOWR
		Chepkorio	821.5	Marichor	Kipkaen river	240	355	4,500	MOWR	MOWR
	Sub-total					3,223	2,498	26,388		
830	Nandi	Nandi Hills	831.3	Nandi Hill		263	263	15,000	MOWR	Status '96
		Lelmokwo	833.6	Lelmokwo	Dam	312	312	4,000	MOWR	Status '96
		Kemeloi Kobujoi Ph I	834.1, 841.4	Kaptumo South, Mararal Urban	River Yala	517	517	10,000	MOWR	Status '96
	Sub-total					1,092	1,092	29,000		
840	Samburu	Londongelewe	842.3	Londongelewe	Borehole	192	192	4,000	MOWR	Status '96
		Kisima	841.7	Kisima	Dam	192	192	4,000	MOWR	Status '96
		Baragoi 1 Borehole	843.8	Baragoi	Borehole	60	84	4,000	MOWR	MOWR
		Baragoi 2 Borehole	843.8	Baragoi	Borehole	31	43	4,000	MOWR	MOWR
		Suguta marmar water supply	841.1	Suguta marmar	Spring	1,200	118	3,000	MOWR	MOWR
		Archers post	844.1	Waso	Borehole, Buffalo	864	1,184	4,000	MOWR	MOWR
		South Horr water			Spring	1,200	296	10,000	MOWR	MOWR
		Loikas water supply			Borehole	133	187	30,000	MOWR	MOWR
	Sub-total					3,872	2,295	63,000		
850	Turkana	Katilu	854.1	Katilu	Borehole	138	138	5,000	MOWR	Status '96
		Lokori	855.3	Ngibilae	Borehole	197	197	7,000	MOWR	Status '96
		Kainuk	854.4	Lobokat	Shallow wells	72	72	9,300	MOWR	JICA
		Lokichogio	851.1	Lokichogio	Shallow wells near Ewaso River	Data N/A	Data N/A	5,400	Community/NGOs	JICA
		Loarewgak	852.3	Ngissiger	Borehole	144	39	7,000	MOWR	MOWR
		Lokichar	854.2	Lokicher	Borehole	120	18	7,000	MOWR	MOWR
	Sub-total					671	465	40,700		
860	West Pokot	Tartar/Keringet	861.4	Mnagei		301	301	6,180	MOWR	Status '96
		Orium W/S	862.3	Batei	Streams	548	548	7,210	MOWR	Status '96
		Chepareria w/s	862.1	Kipkomo	Streams	685	685	8,240	MOWR	Status '96
		L/Prog. B/h (90 Drilled, 75 Installed)				R/NA	R/NA	18,437	MOWR	Status '96
		Kacheliba	864.1	Suan	Perennial River (Swam)	197	197	4,000	MOWR	MOWR
	Sub-total					1,732	1,732	44,067		
910	Bungoma	Naitiri Health Centre	915.1	Naitiri		3	3	21,600	MOH	Status '96
		Bokoli Health Centre	915.1	Bokoli		44	44	19,270	MOH	Status '96
		Kabuchai Health				41	11	33,049	MOH	Status '96
		Machwele				22	22	5,000	NWCPC	Status '96
		Kibabii Complex				85	85	6,800	NWCPC	Status '96
		Lubbuna				R/NA	R/NA	5,000	NWCPC	Status '96
		Kapsokwony	918.1	Kapsokwony		296	296	15,000	NWCPC	Status '96
		Kaptama/Chesito	918.2	Kaptama		48	48	4,400	NWCPC	Status '96
		Chepkube				721	721	17,000	NWCPC	Status '96
		Ndivisi-Makusehwa			Kibis river	2,736	2,691	60,000	MOWR	MOWR
		Boikoli / Kibicitori			River Kuywa	1,680	1,657	50,000	MOWR	MOWR
		Old Kibicitori			River Kuywa	480	473	25,000	MOWR	MOWR
		Chwele	911.6	Chwele	Borehole	2,040	32	5,000	MOWR	MOWR
		Chesikaki			River Malakisi	2,312	2,857	88,000	MOWR	MOWR
	Sub-total					10,508	8,970	355,119		

Table - 1.3.2 (5/5) Present Status of Large Scale Rural Water Supply Schemes

Code	District	Project Name	Location Code	Location Name	Water Source	Design Capacity (m3/day)	Water Production (m3/day)	Population Served (Nos)	Management Agency	Data Source
920	Busia	Funyula Bumala	922.3, 923.3, 926.1	West Bukhayo, North Samia, West Marach		426	426	29,000	MOWR	Status '96
		Wakhungu	923.3, 923.2	North Samia, South Samia	River Wakhungu	1	1	5,550	MOWR	Status '96
		Sio Port	923.2	South Samia	Lake Victoria	Nil	Nil	4,717	MOWR	Status '96
		Amukura Complex	925.2	South Teso	Borehole	30	30	4,000	MOWR	Status '96
		Amukura				30	30	4,000	MOWR	Status '96
		Port Victoria	924.2, 924.1	North Maragoli, South Maragoli	Lake Victoria	600	426	10,000	MOWR	MOWR
		Busia Hills	924.1	West Maragoli	Lake Victoria	840	734	15,000	MOWR	MOWR
		Funyula - Nangina	923.1	North Samia	Spring	250	352	7,000	MOWR	MOWR
		Fibumala			Sio River	1,001	639	12,800	MOWR	MOWR
	Sub-total					3,178	2,638	92,067		
930	Kakamega	Bukura W.S				316	316	4,590	MOA	Status '96
		Shikusa W.S				92	92	4,070	MOH	Status '96
		Lumakanda	936.4	Lumakanda		Nil	Nil	4,350	MOWR	Status '96
		Soy	936.2	Soy		N.E	N.E	10,000	Community	Status '96
		300N W.P				N.E	N.E	60,000	Community	Status '96
		Little Nzoia			Dam	4,992	3,551	15,000	MOWR	MOWR
		Malava			Protected Springs - 2No.	96	24	8,000	MOWR	MOWR
	Sub-total					5,496	3,983	106,010		
940	Vihiga	Bumbo Shamakhokh	942.4	Shamakhokho		50	50	4,500	RDF	Status '96
		Malindi/Sirulo				50	50	3,830	RDF	Status '96
		Magui-Buyani				200	200	8,240	RDF	Status '96
		Moi Girl's Vokoli				49	49	15,450	Instit.	Status '96
		Kaimosi				1,440	597	52,500	MOWR	JICA
		Sosiani			Sosiani spring	720	533	10,000	MOWR	MOWR
	Sub-total					2,509	1,479	94,520		
TOTAL						412,865	234,434	4,484,047		

Source : JICA; Field Survey by the Study Team
MOWR; Project Rehabilitation Survey by the Ministry of Water Resources
Status'96; Project Status Report '96, Ministry of Water Resources, Dec. 1997

NOTE : Design capacity is adopted as water production for water supply schemes reffered to Status Report '96.
Water production is adopted as design capacity for water supply schemes reffered to the field survey result by JICA Study Team in case design capacity is not available.

Table - 1.3.3 Operation and Maintenance and Financial Management for Municipal Council Water Supply Systems

	Parameters	Unit	Eldoret	Kericho	Nyeri
1-a	Area covered by the municipality	sq.km	147	66	200
b	Estimated total population within the area of jurisdiction	nr	220,000	58,723	100,000
c	Estimated population served by water supply network	nr	90,000	58,723	40,000
d	Estimated population served by sewer network	nr	70,000	30,000	16,000
e	Nunber of water connections receiving solid collection service	nr	n/a	2,041	2,833
2	Total number of permanent staff in WSD	nr	159	152	186
3-a	Total number of registered water connections	nr	9,596	4,647	4,782
b	Total metered connections	nr	9,596	4,616	4,488
c	Total un-metered connections	nr	0	0	2
d	Total number of water disconnections	nr	** 48	835	215
e	Total number of meters operational	nr		4,593	3,761
f	Total number of meters serviced/repaired	nr	** 39	25	82
g	Number of communal water points, kiosks, standpipes etc	nr	160	397	3
4-a	Number of new water connections made	nr	** 75	24	14
b	Number of sewer connections made	nr	0	0	2
5-a	Total number of connections billed for water	nr	7,518	3,377	4,620
b	Total number of connections billed for sewer	nr	5,540	1,662	1,900
c	Total number of connections billed for refuse	nr	-	1,969	2,833
6-a	Total volume of raw water received for treatment	cu.m	** 942,660	172,190	-
b	Total volume of water produced	cu.m	832,070	159,210	178,200
c	Total volume of water billed	cu,m	614,410	100,370	114,243
d	6-c/6-b	%	73.8	63.0	64.1
7-a	Number of samples taken for free residual chlorine test				
	- at treatment units	nr	279	7	240
	- on endline samples	nr	10	7	8
b	Number of samples for free residual chlorine less than 0.2 ppm				
	- at treatment units	nr	0	0	0
	- on endline samples	nr	1	0	0
c	No. of sewage effluent samples tken for BOD5 tests	nr	2	12	2
	- test samples recording greater than 20 mg/l	nr	2	12	0
8	Total quantity of chemicals used - Alum	kg	57,412	5,090	11,270
	- Soda ash	kg	2,325	1,250	1,970
	lime	kg	4,216	455	1,930
9	Revenue collected during the month (average of Jan to Jun)	Kshs	5,518,295	2,718,703	4,588,976
10	Expenditure during the month (average of Jan to June)	Kshs	5,518,295	2,612,121	3,750,937

Source: Biannual records of MOLG/GTZ - UWASAM in 1997
** Aaverage of Jan to May 1997
Expenditure includes chemical/power costs, plant/vhicle O/M costs, Repair/maintenance costs of pipelines, payroll, capital expenditure, renewal fund, etc.

Table - 1.3.4 (1/5) Operation Hours in Existing Water Supply Systems

Code	District	Name of Water Supply	Code	Design Capacity (m³/h)	Design Capacity (m³/mon)	Design Capacity (m³/year)	Actual Capacity (m³/h)	Actual Capacity (m³/mon)	Actual Capacity (m³/year)	Actual Capacity (m³/day)	Actual Operation (h/day)	No. of Pop in Scheme Area	No. of Pop Served	Water Source
210	Kiambu	Komotha					181.25	120,500	1,566,000	1,290	24.00	75,000	40,000	River gatamaiyo
		Githunguri	U-2	18.00	540	6,480	9.50	285	3,420	9	24.00	40,000	10,000	Borehole
		Kikuyu	U-3				110.00	3,300	39,600	308	24.00	14,000	7,500	Boreholes
		Uplands		386.00	386	4,632	20.00	6,200	74,400	204	24.00		14,000	Borehole
		Karuri	U-3				48.66	36,160	440,000	1,205	24.00	13,000	5,400	Boreholes
		Limuru	U-6	120.00	86,400	1,036,800	27.00	19,440	233,280	639	20.00			Boreholes
		Ruiru		4435.00	133,050	1,596,600	93.00	32,240	992,200	2,732	12.00	120,000	35,000	River Ruiru
		Karimenu		150.21	108,150	1,297,800	200.00	144,000	57,600	158	24.00		45,000	Karimenu River
		Thiririka water supply		300.00	216,000	2,592,000	9428.00	226,282	2,715,382	7,439	24.00	80,000	2,500	Thiririka river
		Ruiru water supply	U-8	33.00	23,760	285,120	33.00	23,760	285,120	781	24.00	400,000	60,000	River
		Ithanga		50.00	36,000	432,000	96.00	69,000	828,000	2,268	24.00	32,000	30,000	Thika River
		Ndarugu		232.00	167,192	2,006,300	232.00	167,192	2,006,300	5,497	24.00	60,000	45,000	Ndarugu River
220	Kirinyaga	Sagana		26.00	158	2,250,060	26.00	18,755	225,060	617	24.00	26,000	18,300	River Ragati
		Kabara Rural		225.00	162,000	1,944,000	125.00	90,000	1,080,000	2,959	24.00	40,000	16,530	Thika River
		Wanguru	U-16	250.00	22,500	270,000	On test			0			10,500	6,000 National Irrigation Canal
		Ngariama Rural		32.63	23,490	281,880	32.00	23,040	276,480	757	24.00	70,285	38,900	Kiye and Kiti River
		Kerugoya Urban		44.00	31,842	382,104	44.00	31,842	382,104	1,047	24.00	43,720	15,500	Rutui River
		Kirinyaga	U-33	3.00	5,040	60,480	9.00	4,896	53,672	158	18.00	20,000	8,000	Thika River
230	Murang'a	Kiguno		-			-			0	24.00	2,700	2,200	Kiguno scheme maintahe "A"
		Kiguno(Rural)		4503.60	3,350,000	40,210,000	360.00	259,000	31,140,000	85,315	24.00	300,000	200,000	Irati River-Aberdare forest
		Saba Saba		40.00	12,000	144,000	34.00	1,023	12,276	34	12.00	40,000	2,700	Saba Saba river
		Maragua	U-20	9.30	2,232	26,784	1.00	720	8,640	24	12.00	40,000	4,200	Borehole
		Murang'a water supply	U-21	250.00	180,000	2,160,000	133.00	4,123,000	495,500	1,358	24.00	70,000	22,000	Kayahwe River
		Gatango		75.00	22,500	27,000	75.00	2,250	27,000	74	24.00	95,000	17,000	River Mathioya North
		Mathioya		244.00	7,320	89,060	244.00	7,320	83,060	244	24.00		80,000	River
240	Nyandarua	Olkalou	U-30				12.50	360	4,428	12	18.00		5,453	Borehole
		Kiriima		-			268.00	7,740	92,880	254		23,000	5,000	Protected well
		Kitiri					26.50	21,890	1,381,600	3,785	12.00		3,900	
		OlJoroOrok	U-29				1240.00	15,000	180,000	493	12.00	7,601	3,346	Dam
				-			-			0		10,000	12,000	River
250	Nyeri	Karatina Urban W/S	U-33	104.20	75,000	900,000	54.20	39,000	468,000	1,282	24.00	10,000	10,000	Rivers ragati
		Tetu Thegege		167.00	120,000	1,440,000	150.00	108,000	1,296,000	3,551	24.00	98,000	40,000	Zaina River
		Mukurweini					8.00	6,000	72,000	197	24.00		6,000	Served by Mukurweini Rural
		Mukurweini Rural		209.00	150,000	1,800,000	181.00	130,000	1,565,851	4,290	24.00	106,757	45,000	Chinga dam
							21.00	17,374	214,490	585	24.00	9,000	4,000	Kiburugwe Stream
320	Kwale	Vanga		18.00	9,720	116,640	18.00	2,700	32,400	89	5.00	10,000	4,500	Borehole
		Shimba Hills		15.00	4,500	54,000	15.00	1,800	21,600	59	4.00	5,000	3,000	River
		Mkongani		11.00	3,960	47,520	11.00	1,320	15,840	43	4.00	7,000	2,500	Borehole
		Kikononi		72.00	29,430	353,160	50.00	2,000	24,000	66	5.06	30,000	12,000	Dam
		Lungalunga	U 45	8.50	3,060	36,720	3.50	2,100	25,200	69	20.00	14,000	5,000	Borehole
		Msambweni	U-45	26.00	10,140	121,680	20.00	7,800	93,600	256	13.00	25,000	13,000	Well
330	Lamu	Mokowe T C	U-49	5.00	3,000	36,000	12.00	7,920	95,040	260	12.00	3,000	2,100	Hand dug wells and Boreholes 3 No
		Kiunga Mkokoni		50.00	1,536	18,360				0	6.00	700	450	Wells
		Lamu	U-40	50.00	26,000	432,000	25.00	18,000	216,000	592	15.00			Wells
350	Taita Taveta	Mwanjika Teri		2.30	1,656	19,872	2.20	1,584	19,008	52	24.00	Over 5000	3,000	Streams
		Wundanyi	U-56	32.00	23,040	276,480	32.00	23,040	276,480	757	12.00	Over 17000	16,100	Stream
		Dembwa wusi		4.30	3,200	38,400	4.30	3,100	37,200	102	24.00	Over 5000	3,000	Streams
360	Tana River	Hola	U-59	50.00	1,500	18,000	47.00	1,410	16,920	46	8.00	20,000	15,000	River Tana
		Garsen	U-58	10.00	300	3,600						10,000		River Tana
		Ngao		50.00	1,500	15,000	47.00	1,410	16,920	46	6.00	10,000	6,500	River Tana
410	Embu	Ngandori"B"(operated by NGAGAKA W/Association)		285.00	20,400	244,800	205.00	14,772	1,772,556	4,856	24.00	60,000	20,000	Thambana River
		Kyeni Rural		148.00	106,560	1,278,720	148.00	106,560	1,278,929	3,503	24.00	55,000	28,000	River
		Ngandori"A" (operated by NWCPC)		800.00	576,000	6,912,000	700.00	504,000	6,048,000	16,570	24.00	50,000	20,000	Rupingazi and Kapingazi River
		Ishiara		27.92	20,100	241,200	15.59	11,226	134,712	369	24.00	20,000	5,572	River Thuchi
420	Isiolo	Isiolo	U-63	152.00	131,040	1,572,480	190.00	136,832	1,643,954	4,499	24.00	60,000	40,952	Isiolo River
430	Kitui	Ikanga		-	-	-			9,610	26	8.00		500	Borehole
		Kitui	U-68	139.00	4,170	50,040	27.00	19,243	230,920	633	24.00	-	25,000	Boreholes
		Mutomo(Not operated)		-			-			0			10,000	Borehole
		Matito-Mui		5.00	1,200	14,400	2.00	1,408	16,900	46	24.00	10,000	8,000	Springs
440	Masaku	Kilima Kimwe								0				Bring served from Nol Turesh
		Wamunyu		13.00	8,970	107,640	23.00	15,870	190,440	522	23.00	11,000	11,000	Athi River
		Siahani					5.00		800	2	4.30	5,000	8,000	Borehole/Surface from Mui river
		Miiuni					0.68	492	5,415	15	3.33		2,500	Surface(Athi River)
		Matuu	U-74	20.00	14,400	172,800	19.00	8,550	102,600	281	15.00	5,200	10,000	Yatta Canal
		Kibauni		85.42	61,500	738,000	0.92	673	8,081	22	1.92	5,600	12,000	Athi river
		Kathiani	U-70	1100.00	792,000	9,504,000	16.20	11,667	140,004	384	24.00	50,000	9,800	Mwani Dam
450	Marsabit	Marsabit	U-82	17.00	9,180	110,160	11.00	5,940	63,360	174	18.00	20,000	25,000	
		Moyale		34.00	12,000	144,000	10.00	1,860	22,320	61	6.00	20,000	10,000	Shallow wells and infiltration gallery
460	Meru	Mitunguru		20.00	14,400	172,800	18.00	13,325	159,900	438	24.00	30,000	91,000	River Thingith
		Mwimbi		125.00	90,000	1,095,750	179.00	130,428	1,565,850	4,290	24.00	60,000	32,000	Mt. Kenya Forest
		Timau		5.50	4,013	48,156	5.00	3,960	47,515	130	24.00	7,800	3,650	Mt. Kenya forest
		Nkubu		25.00	18,262	219,150	8.00	5,917	71,000	195	24.00	20,000	7,000	Kathita River
		Kanyekine		12.50	9,000	108,000	10.00	7,314	87,770	240	24.00	16,800	1,520	River
		Meru	U-86	605.00	18,150	217,800	194.00	141,858	1,702,300	4,664	24.00	55,099	50,000	River Kathita and Gatabora springs
		Nkubu	U-87				33.00	10,000	120,000	329	10.00	15,000	5,000	River thingithu
470	Nyambene	Maua	U-89	14.00	10,220	122,640	13.00	8,175	95,140	269	24.00	12,000	12,000	River
		Tigania		171.00	125,000	1,500,000	156.00	114,205	1,370,500	3,755	24.00		50,000	Spring
480	Tharaka/Nithi	Kariogani		150.00	108,333	1,300,000	134.00	95,689	1,148,270	3,146	24.00	60,000	45,000	Tunga River
		Mitunguu Chiakariga W/S								0				Thingithu River Kariogari W/S
		Chuka	U-90	17.00	12,240	146,880	16.00	11,520	138,240	379	24.00	45,000	30,000	Tunga River
		Mwimbi Chogoria		100.00	72,000	864,000	145.00	128,700	1,555,200	4,261	24.00	40,000	20,000	Mutonga River

Table - 1.3.4 (2/5) Operation Hours in Existing Water Supply Systems

Code	Division	Name of Water Supply	Code	Design Capacity (m³/h)	Design Capacity (m³/mon)	Design Capacity (m³/year)	Actual Capacity (m³/h)	Actual Capacity (m³/mon)	Actual Capacity (m³/year)	Actual Capacity (m³/day)	Actual Operation (h/day)	No. of Pip in Scheme Area	No. of Pop. Served	Water Source
410	Maringi	Ncumeti								0				
		Mgwasi					6.50	1,440	17,820	49	12.00	3,000	1,600	Borehole
		Mgwasi					14.40	3,456	41,472	114	8.00		3,000	Borehole
		Kyuso					0.40	305	3,690	10			2,000	rock catchment
		Maringi	U-91	9.00			9.00	2,130	26,160	72		10,000	15,000	
		Ngusi Tavia					-	-	-	0			-	
430	Makueni	Mbumbuni	U-97				18.00	670	8,040	22	5.00	3,000	3,500	Kiuze Dam
		Sikala	U-95				0.30	200	2,400	7	24.00	2,000	500	Spring
		Wote	U-101	30.20			11.48	2,430	28,920	79	7.00	13,000	5,500	Boreholes
		Makindu		20.00	12,000	144,000	20.00	12,000	144,000	395	20.00	2,500	12,000	Makindu springs
		Kikumbulyu Rural		30.00	21,600	259,200	30.00	22,185	265,536	728	24.00	20,000	9,400	Umani springs at the foot of Chyulu hills
		Mtito Andei	U-98	125.00	90,000	1,080,000	34.42	10,162	122,000	334	24.00	22,840	22,500	Umani springs at the foot of Chyulu hills
		Ewa Siakago		300.00	14,400	172,800	106.00	76,302	915,624	2,509	24.00	219,112	8,500	River Ewa
520	Mandera	Mandera	U-109	120.00	43,200	518,400	100.00	45,000	576,000	1,578	16.00	35,000	20,000	Boreholes
530	Wajir	Athajahan		9.40	6,810	81,720	12.60	9,072	108,864	298	18.00	17,000	16,000	Borehole
		Habaswein		7.00	3,780	45,360	8.00	4,320	51,840	142	18.00	20,000	20,000	Borehole
		Wajir Mjini		10.00	5,400	64,800	10.00	5,400	64,800	178	18.00	5,000	5,000	Well
		Eldas	U-114	2.70	1,950	23,400	2.90	2,088	25,056	69	18.00	6,000	5,000	Borehole
		Khorof Harar		8.00	2,880	34,560	6.00	3,240	38,880	107	18.00	10,000	8,000	Borehole
		Korjoto		8.00	2,880	34,560	4.00	2,160	25,920	71	18.00	9,000	7,000	Borehole
		Diamas		9.00	4,536	58,320	9.00	4,860	3,240	9	18.00	12,000	10,000	Borehole
		Bute	U-113	1.00	360	4,320	3.50	3,240	15,120	41	18.00	6,000	2,000	Borehole
		Gurar		1.70	612	7,344	1.50	540	6,480	18	14.00	1,000	300	Borehole
		Hadado		4.20	3,024	36,288	1.54	5,443	653,184	1,790	18.00	7,000	5,000	Borehole
		Biyamadhow		7.00	3,780	45,360	8.00	4,320	51,840	142	20.00	20,000	20,000	Borehole
620	Kwamu	Nyahera (Gazetted Rural W.S)		30.00	14,400	172,800	16.00	3,840	46,089	126	8.00	15,000	10,000	Oriande Springs
		Muhuroni Water Supply	U-122	20.00	18,000	216,000	25.00	18,000	210,000	575	24.00	15,000	10,000	River Nyando
		Kibigori		30.00	21,600	259,200	30.00	21,600	259,200	710	24.00	30,000	10,000	Stream/Spring
		Kona Mzaa W.S		16.00	760	69,120	14.00	2,820	33,540	93	6.00	10,000	5,000	Kipcherian Stream
		Tama					4.00			0	16.00	2,000		Borehole
		Kwamu Rural W.S		83.00	60,000	720,000	42.00	30,240	362,880	994	9.00	50,000	25,000	Lake Victoria
		Mkendwa/Kanyakwar (Gazetted Rural W.S)		29.70	7,340	85,680	16.00	3,840	46,080	126	8.00		2,000	Oriande Springs
		Osieka-Nambo		7.00	4,850	58,200	7.00	4,850	58,200	159	10.00			Lake Victoria
		Oyugis		360.00	108,000	1,296,000	132.00	3,936	47,160	129	4.00	73,540	32,000	River Awach
		Kanya'od		40.00	19,200	230,400	-	-	-		-	60,000	-	River Awach Tende
		West Karachuonyo		80.00	26,150	423,800	40.00	400	4,800	13	10.00	120,000	140,000	Lake Victoria
		Kendu Bay		45.00	21,600	259,200	15.00	3,200	86,400	237	-	17,000	12,000	River
		Wang Chieng		200.00	2,000	24,000	-			0	-	50,000	-	River Awach Kobuoa
630	Siaya	Ugie		6.75	1,229	14,640	5.50	990	11,880	33	3.00	3,000	360	Lake Victoria
		Asembo Bay		25.00	7,560	2,800,000	25.00	7,560	2,800,000	7,671		5,000	2,000	Lake Victoria
		North Sakwa								0			8,913	River Yala
		South Sakwa								0			13,457	Lake Victoria
		Ugunja		33.00	5,760	69,120	8.40	5,040	60,480	166	24.00	10,000	6,000	Borehole
		Bondo	U-124	585.00	17,550	210,600	315.00	9,450	113,400	311	24.00	22,000		River Yala
		Bondo	U-124	27.00	9,720	116,640	19.00	6,569	82,428	226	12.00	28,000	10,000	River Yala
		Sega		24.00	10,080	120,960	11.50	8,280	99,360	272	24.00	22,000	16,000	1 Borehole
		Ukwala	U-126	16.00	11,525	138,240	10.50	7,568	90,720	249	24.00	20,000	15,000	3 Boreholes
		Yala	U-125	22.20	16,000	192,000	16.00	11,520	138,240	379	12.00		5,000	River Yala
		Sidindi Maranga		195.00	78,300	939,600	120.00	64,800	777,600	2,130	18.00	310,000	90,000	Yala River
		Uyoma		30.00	900	10,800	16.00	4,800	57,600	158	8.00	40,000	6,000	Lake Victoria
		Alara		8.60	3,096	37,152	6.90	1,250	15,000	41	6.00	3,000	2,000	River
		Maona Dam		13.00	480	5,760	7.00	5,640	60,480	166	16.00	40,000	15,000	Dam
		Uranga		6.00	1,080	6,480	2.00	600	7,200	20	6.00	4,000	1,500	Borehole
		Sinaga								0		450	450	Stream
		Kolise								0		300	300	Lake Victoria
		Chianda		100.00	30,000	360,000	50.00	3,000	36,000	99	2.00	5,000	1,500	Lake Victoria
		Ramogi Research Station		7.00						0			1,000	
		Uranga Ramula		27.00	12,960	155,520				0			5,000	Stream
		Bar Ober								0			20,000	Spring
		Yenga Sirunga		40.00	28,800	345,600	-			0		35,000	5,000	Yenga Dam
		Sira Nyavita								0				Borehole
		Aram		22.00	5,280	63,360	6.00	1,440	17,280	47	4.00	12,000	2,000	Lake Victoria
		Lwak								0		1,500	1,500	Lake Victoria
		Sigomere							219,000	600			10,000	Borehole
		Ramba Ndiri								0				Lake Victoria
640	Homa Bay	Obera		5.75	2,760	23,120	5.75	2,760	23,600	65	16.00	13,000	1,970	River Riana
		Homa Bay	U-129	83.80	60,000	720,000	83.30	60,000	720,000	1,973	16.00	50,000	43,000	Lake Victoria
		Ndhiwa	U-132	0.83	600	3,600	0.83	600	3,600	10	16.00	8,000	2,000	River Kuwanda
		Kochia		35.00	1,050	12,600	30.00	1,800	215,000	592	20.00		2,722	Direct Lake Suction
		Got Kojowi		5.50	2,640	31,680	5.50	2,640	31,680	87	16.00	5,000	3,577	Borehole
660	Nyandra	Nyamira w/s	U-139	86.00	45,280	495,360	25.00	18,000	216,000	592	24.00	52,000	40,000	Eyaka River
		Tai'ga w/s		9.00	2,700	32,400	7.20	864	10,368	28	4.00	3,000	500	Protected Spring
		Manga w/s		8.00	1,920	23,040	2.50	600	7,200	20	8.00	5,000	4,500	Spring
		Tombe w/s		16.00	8,640	103,680	10.80	2,592	31,104	85	8.00	5,000	4,000	Spring
		Mochenwa w/s		5.40	3,888	46,656	3.60	2,592	31,104	85	24.00	4,000	4,000	Spring
		Gesure w/s		14.40	10,368	124,416	14.40	1,728	20,736	57	4.00	3,500	1,500	Riangumbe Dam
		Nyasome gravity w/s		1.80	1,296	15,552	2.88	2,073	24,883	68	24.00	2,428	1,092	Sprng
		Ekerenyo gravity w/s		6.45	4,665	55,987	2.10	1,512	18,144	50	24.00	1,500	1,000	Sprng
		Menyenya w/s		7.50	2,700	32,400	5.40	1,296	15,552	43	8.00	820	450	Dam
		Nyamongo w/s		17.00	8,160	97,920	35.00	3,600	43,200	118	8.00	8,000	2,600	Gesabesi Dam
		Nyanbaria		75.60	53,432	653,184	60.00	7,200	86,400	237	4.00	15,000	1,500	River

Table - 1.3.4 (3/5) Operation Hours in Existing Water Supply Systems

Code	District	Name of Water Supply	Code	Design Capacity (m³/h)	Design Capacity (m³/mon)	Design Capacity (m³/year)	Actual Capacity (m³/h)	Actual Capacity (m³/mon)	Actual Capacity (m³/year)	Actual Capacity (m³/day)	Actual Operation (h/day)	No. of Pop. in Scheme Area	No. of Pop. Served	Water Source
710	Kajiado	Scheme 305		20.00	480	5,760	18.00	12,960	155,520	426	24.00	8,000	3,000	Borehole
		Olooloo		6.00	4,320	51,840	5.00	3,600	43,200	118	24.00	2,500	1,332	Borehole
		Bulbul		5.00	3,600	43,200	5.00	3,600	43,200	118	24.00	6,000	1,300	Borehole
		Olepolos		22.00	7,920	95,040	6.00	4,320	51,840	142	24.00	3,500	1,730	Borehole
		Olkeri Rural		18.00	12,960	155,520	18.00	12,960	155,520	426	24.00	5,000	2,262	B'Hole
		Bissel					5.00	240	2,880	8	20.00		20,000	Borehole
		Namanga	U-143				34.40	10,320	124,800	341	24.00	20,000	17,280	Spring from Namanga hill
		Rongai	U-144	150.00	108,000	1,296,000	41.30	29,736	356,832	978	6.00	15,000	7,200	Mbagathi River
		Ngong Main	U-144	5.00	3,600	43,200	4.00	320	3,840	8	24.00	5,000	4,500	Borehole
		Olkeri		25.00	18,000	216,000	20.00	14,400	172,800	473	24.00	6,000	3,000	Borehole
		Rongai	U-144				8.30	5,997	71,964	192	20.00	1,500	800	Borehole
		Rongai	U-144	5.00	2,400	28,800	3.60	2,160	25,920	71	20.00		400	B'Hole
720	Kipsigis	Londiani		22.50	5,400	64,800	22.50	5,400	64,800	178	8.00	18,000	4,000	River
		Sosiot		32.80	23,628	283,540	20.00	14,600	175,200	480	8.00	26,000	15,000	River
		Kipketino		21.00	7,256	86,832	10.00	3,618	43,416	119	8.00	20,000	15,000	River
		Dolded water supply			5	1,684	2.10	630	7,560	21	8.00	10,000	5,000	Borehole
740	Nakuru	Keraip		-	-		13.64	409	5,010	14	15.00	8,000	2,000	Borehole
		West acre		10.50	3,744	92,951	14.40	10,368	124,416	341	24.00	10,000	4,000	River
		Crater Stream		36.00	1,080	12,960	36.00	1,080	12,960	36	24.00	16,075	45,000	Crater River
		Babati Chania		32.85	23,652	283,824	29.00	20,880	250,560	686	24.00	7,000	2,920	Chania River
		Olonganuone		2.70	405	4,860	2.40	576	6,912	19	8.00	5,000	3,500	Arap Moye River
		Kijabe		-			0.50	360	4,320	12	24.00	5,000	3,000	Jongjogi River
		Sirwa		206.00	267,200	302,400	87.00	10,440	125,280	343	4.00	7,500	2,500	Boreholes
		Lake Nakuru Block 4		6.90	3,312	39,744	6.00	2,880	34,560	95	16.00	36,000	18,000	Borehole
		Lake Nakuru Block 2		4.30	4,200	50,400	3.80	1,140	13,680	37	10.00	10,000	6,000	Borehole
		Lake Nakuru Block 1		21.00	1,980	23,760	9.00	4,050	48,600	133	15.00	20,700	1,850	Borehole
		Nakuru	U-159	100.00	30,000	360,000	58.00	1,740	20,880	57	14.00	15,000	5,000	River Mchomgi
750	Narok	Lemek		18.00	540	6,480	1.04	750	9,000	25	8.00	3,000	800	Ground Surface The surface source dried up
		Narok water supply	U-163	1100m3 da	36,345		75.00			0	24.00	30,000	15,000	Surface(Fogace Narok)
		Olkarto		20.00	14,400	172,800	15.00	450	540	1	8.00	30,000		Surface water
		Mulot		2.10	3,500	18,000	0.60	450	5,400	15	8.00	12,000	5,000	Mara River
		Monjo Lolta		7.20						0	8.00		650	Surface Ground water mb surface one in seasonal
		Ilmasharian		80.00	28,800	345,600	30.00			0	8.00	6,000	2,500	Spring
760	Trans Nzoia	Saboti		20.00	7,200	86,400	15.00	720	8,640	24	4.00	2,000	1,200	Spring
		Kwanzal Kolongolo		35.00	12,600	151,200	29.00	3,192	16,704	46	4.00	2,000	900	Dam
770	Uasin Gishu	Kipkabus					30.00	2,520	30,240	85	3.36		390	Dam
		Turbo	U-172				28.00	9,460	113,520	311	8.00	4,370	2,110	River Sosiani
		Sosiani					3.20	397	4,764	13	4.00	920	720	Borehole
		Burnt Forest	U-165				6.44	3,192	38,304	105	16.00	3,560	1,770	River, Borehole
		Moi's Bridge	U-169				20.00	4,800	57,600	158	8.00	4,070	1,790	River Nzoia
		Kaptagat					15.00	2,490	29,880	82	20.00		750	River
		Toi W.S		10.00	24,000	288,000	10.00	24,000	288,000	789	24.00	6,500	2,062	River
780	Bomet	Sigor water supply		55.00	3,650	19,800	40.00	1,200	14,400	39	12.00			Nyagol River
		Longisa water supply		10.00	4,800	57,600	8.00	1,440	17,280	47	6.00	1,200	800	Protected Spring
		Bomet water supply	U-173	50.00	1,500	18,000	75.00	225	2,700	7	12.00	20,000	4,000	Nyasunores River
		Chepalungo		50.00	24,000	288,000	30.00	14,400	172,800	473	10.00	50,000	10,000	River
790	Transmara	Kilgois	U-174	36.00	576	13,140	25.00	750	9,125	25	16.00	10,000	8,000	Impounded reservoir-stream
		Angata Baragwi			222	2,664		222	2,664	7		2,000	1,000	Spring
		Nkararo	U-176	15.00	7,200	86,400	14.00	424	5,056	14	5.00	3,000	2,000	Spring
		Emarti		15.00	7,200	86,400	-			0		4,500		Mara River
		Lolgorian	U-175				5.12	874	2,092	6	1.00	2,000	1,000	Seasonal stream, Impounded Dam
							3.60	520	6,480	18	8.00	3,364	540	Spring
		Sacho		48.00	14,400	172,800	20.00	3,438		0	6.00	3,296	950	Spring
		Kilgoris		36.00	576	13,140	25.00	750	9,125	25	16.00	10,000	8,000	Stream
810	Baringo	Ngromoi		9.00	2,700	32,400	9.00	522	6,264	17	2.00	2,707	1,065	Spring
		Kipkarch		9.00	2,200	32,400	9.00	576	6,912	19	2.00	2,564	1,056	Spring
		Kapkeng		69.00	20,200	248,400	45.00	5,670	68,040	186	4.00	5,068	2,844	2 Springs
		Chemo		9.00	2,700	32,400	6.00	588	7,056	19	4.00	2,584	632	Borehole
		Marigat	U-181	5.00	600	7,200	14.00	3,360	40,320	110	8.00	4,920	2,430	River
		Chemeron		58.60	37,352	452,016	16.25	5,400	65,700	180	16.00	3,999	84	Dam
		Gangulbei		9.00	2,700	32,400	9.00	1,242	14,904	41	5.00	2,693	992	Borehole
		Kampi ya Samaki		14.00	4,200	50,400	9.00	1,428	17,136	47	4.00	4,441	620	Lake
		Sevetanin		24.00	7,200	87,600	14.00	4,200	50,100	140	6.00	2,876	2,040	Stream
				2.00	2,200	32,400	Not operation			0		2,584	388	Borehole
		Paghawasin		13.00	5,070	60,840	10.00	3,600	43,200	118	12.00	1,682	870	Spring
		Bartolimo		14.00	4,200	10,400	14.00	1,330	15,960	44	3.00	4,167	528	Stream
		Kapleh W.S		32.70			12.50	1,340	16,085	44	4.00	10,759	280	Borehole
		Kabartenjo		70.00	21,000	252,000	28.00	5,600	67,200	184	8.00	13,555	2,160	Stream
		Barrabwa Dam								0		3,492	884	Dam
		Jalai		18.00	5,400	6,480	6.50	510	6,170	17	5.00	2,876		Spring
		Tamboiywo		6.80	576	6,912	0.80	576	6,912	19	24.00	1,109		Spring
		Pemwai		12.00	3,600	43,200	55.00	1,106	13,272	36	3.00	4,219	1,108	Spring
		Kaparis		1835	13,212	158,544	3.28	2,722	32,659	89	24.00	4,218	84	Springs
		Tiri nia		14.00	4,200	50,400	10.00	250	3,150	9	1.00	3,776	892	Spring
		Teogea		24.00	7,200	86,400	24.00	4,835	58,020	159	8.00	1,792	1,344	Stream
		Mogotio	U-182	54.00	38,880	466,560	22.00	15,840	190,080	521	24.00	18,000	5,000	Molo River
		Kisanana		11.60	8,338	16,960	1.23	295	3,542	10	5.00	2,500	1,000	Borehole
		Ngrowdalel		9.47	2,273	23,274	2.40	576	6,912	19	8.00	900	400	Borehole
		Cherbwa		5.10	3,672	44,064	4.90	3,528	42,336	116	24.00	2,800	800	Stream
		Tororgo		20.00	600	7,200	10.00	300	3,600	10	15.00		8,000	Perennial Stream
		Olkokwe		6.90	1,800	21,600	5.40	1,500	18,000	49	5.00	4,500	3,000	1 - Borehole
		Radad		14.00	420	5,040	-	-	-	-	-			River
		Ndabibi		11.80	348	4,176	8.66	774	9,288	25	3.00	1,850	800	Ground water 811,959 C 49516
		Maji Moto		6.00	1,440	17,280	3.90	1,404	16,848	46	8.00	1,250	800	Spring

Table - 1.3.4 (4/5) Operation Hours in Existing Water Supply Systems

Code	District	Name of Water Supply	Code	Design Capacity (m^3/h)	Design Capacity (m^3/month)	Design Capacity (m^3/year)	Actual Capacity (m^3/h)	Actual Capacity (m^3/month)	Actual Capacity (m^3/year)	Actual Capacity (m^3/day)	Actual Operation (hr/day)	No. of Pop in Service Area	No. of Pop. Served	Water Source
820	Elgeyo Marakwet	Chebilbai		22.61	16,277	195,333	20.34	14,650		0		500	200	Spring
				7.00	3,680	20,160	5.00	1,200	15,400	42	6.00	1,500	800	River
				265.00	3,920		6.00			0	6.00		600	River
		Kapsowar		22.63	16,292	195,216	21.89	12,785		0	24.00	15,000	8,000	River
				265.00	1,920		6.00			0	6.00			
		Tambach	U-154	15.00	450	5,400	10.00	240	3,600	30	16.00	4,000	3,500	Small Spring
		Chepsigot (Bepkebe wk's		824.00	24,720	296,640	400.00	8,200	141,200	387	24.00	3,500	3,000	River
		Kapkoi		8.00	240	2,760	5.00	150	1,800	5	12.00	4,000	250	River (Ton k river)
		Kaptarakwa		35.00			30.00			0	22.00	8,000	4,800	Small Stream
		Chepkorio		10.00	7,200	86,400	15.00	10,800	129,600	355	24.00	8,000	4,500	Kipkoa river
830	Baringo	Mossmbor		30.00	900	1,800				0		4,000	3,000	River
		Kapterwo		9.00	1,800	21,600	3.00	1,260	18,000	49	4.00	3,000	100	Stream
830	Nandi	Kemeloi Kobujoi		60.00	1,500	21,600	60.00	7,200	86,400	237	4.00	31,000	-	Ombo River
		Nandi Hills	U-156	60.00	10,800	180,000	43.00	6,450	77,400	212	5.00	5,000	2,500	Tailo River
		Lelmolwo		30.00	10,000	120,000	30.00	9,000	108,000	296	10.00	-	-	Olare Onyokie (Kiptaragon dam)
		Cheptil		30.00	7,200	86,400	30.00	240	2,880	8	8.00	-	-	Cheptil dam
		Leesos		15.00	4,320	51,840	8.00	240	2,880	8	8.00	-	400	Dam (Leesos)
		Samira		30.00	240	2,880	-	-	-	-	-	-	-	Samira dam
		Cheptarsai		-	-	-	12.00	2,880	34,560	95	150min	2,500	-	Earth dam
840	Samburu	Baragoi 1 Borehole		2.50	596	7,157	3.55	2,556	30,672	84		4,000	4,000	Borehole
		Baragoi 2 Borehole		1.30	38	454	1.85	1,296	15,552	43	8.00	4,000	4,000	Borehole
		Wamba	U-159	4.76	1,142	13,705	6.85	1,632	19,584	54	5.00	10,000	10,000	Borehole
		Wamba	U-159	3.28	907	10,886	5.40	3,888	46,656	128	5.00	10,000	10,000	Spring
		Sugata marmar water supply		50.00	12,000	144,000	40.00	3,600	43,200	118	3.00	3,000	3,000	Spring
		Archers post		26.00	8,580	102,960	50.00	26,000	432,000	1,184	8.00	4,000	4,000	Borehole
		Tuum water supply		6.00	1,440	17,28	14.00	10,080	120,960	331	6.00	1,000	1,000	Spring
		Maralal water supply	U-158	60.00	14,400	172,800	45.00	13,500	162,000	444	10.00	30,000	30,000	Nundoto Dam
		South Horr water supply		50.00	18,000	216,000	30.00	9,000	108,000	296	10.00	10,000	10,000	Spring
		Sirata Ombi Borehole		1.54	370	124,904	2.20	1,584	19,008	52	5.00	2,000	2,000	Borehole
		Nundoto Borehole		4.20	3,008	12,096	6.00	4,320	51,840	142	8.00	2,000	2,000	Borehole
		Loikas water supply		5.55	1,327	15,926	7.90	5,688	68,256	187		30,000	30,000	Borehole
		Opiod Borehole								0		1,500		Borehole is dry
		Loijek Borehole								0		1,000		
		Loikas water supply		5.55	1,327	15,926	7.90	5,688	68,256	187		30,000	30,000	Borehole
		Opiod Borehole								0		1,500		Borehole is dry
		Loijek Borehole								0		1,000		
		Baawa Borehole		3.00	731	8,770	4.55	3,132	31,584	87	5.00	1,600	1,600	Borehole
		Kisima water supply		40.00	9,600	115,200	30.00	1,800	21,600	59	2.00	3,000	3,000	Surface Dam
		Poro water project		10.00	2,400	28,800	3.00	720	8,640	24	5.00	2,000	2,000	Surface Dam
		Maseikita Borehole		3.64	874	10,483	5.20	1,248	14,976	41	5.00	1,000	1,000	Borehole
		Lesidkan Phase I		3.85	816	1,386	5.50	165	1,980	5	5.00	2,000	2,000	Borehole
		Loosoil Borehole water project		8.30	2,016	24,192	12.00	8,640	103,680	284	8.00	1,500	1,500	Borehole
		Kowoi Borehole		1.40	336	4,032	2.00	1,440	17,280	47	5.00	800	800	Borehole
		Manti Borehole		3.00	720	8,640	4.30	3,096	37,152	102	5.00	2,000	2,000	Borehole
		Ledungalwe Borehole		2.90	689	8,266	4.10	2,952	35,424	97	3.00	2,000	2,000	Borehole
		Lesata Borehole		1.61	386	4,637	2.30	1,656	19,872	54	5.00	1,000	1,000	Borehole
850	Turkana	Kalokol	U-192	3.00	240	2,880	8.00	240	2,880	8	6.00	5,000	2,000	Shallow wells and infiltration gallery
		Lokitaung	U-195	10.00	2,400	28,800	4.00	720	8,640	24	6.00	10,000	4,000	Shallow wells and infiltration gallery
		Katilu 1	U-193	4.50	1,080	12,960	1.30	234	2,808	8	6.00	8,000	3,350	Borehole
		Namalak		4.00	960	11,520	3.50	21	252	1	6.00	3,000	2,000	Borehole
		Katilu 2	U-193	5.00	1,200	14,400	3.00	720	8,644	24	8.00	5,000	1,500	Borehole
		Lodwar	U-194	75.00	54,000	648,000	71.00	51,120	613,440	1,681	24.00	30,000	20,000	Boreholes
		Kaperado	U-192	4.00	720	8,640	3.50	840	10,080	28	8.00	5,000	2,000	Shallow wells and infiltration gallery
		Kaluuk		5.00	1,200	14,400	3.00	540	6,480	18	6.00	6,000	2,000	Shallow wells and infiltration gallery
		Kibish		7.50	1,800	21,600	5.00	750	9,000	25	5.00	2,000	1,500	Borehole
		Kaaleng		12.00	2,160	25,920	2.00	480	5,760	16	8.00	6,000	3,000	Borehole
		Leanwgak		6.00	1,440	17,280	5.00	1,200	14,400	39	8.00	10,000	7,000	Borehole
		Lemkon		10.00	2,400	28,800	8.00	1,440	17,280	47	6.00	4,000	1,500	Shallow wells and infiltration gallery
		Lekichar		5.00	1,200	14,400	3.00	540	6,480	18	6.00	8,000	7,000	Borehole
		Lokori		4.00	960	11,520	3.00	720	8,640	24	8.00	7,000	4,000	Borehole
		Kokum		4.00	960	11,520	2.00	360	4,320	12	6.00	2,000	800	Shallow well
		Kalobeyei		12.00	2,880	34,560	10.00	1,800	21,600	59	6.00	3,000	2,000	Borehole
		Katabey		5.00	1,200	14,400	4.00	960	11,520	32	8.00	5,000	3,350	Shallow well
		Kaluma		45.00	10,800	129,600	37.50	9,000	108,000	296	8.00	30,000	20,000	1 shallow well, 2 boreholes
860	West Pokot	Makutano	U-195	-			25.00	11,250	135,000	370	15.00	6,749	5,000	Kotorok Perennial River
		Twalatecke Morbus		-	-	-	47.00	33,840	406,080	1,113	24.00	5,000	500	Perennial River (Molywon)
		Karas		-	-	-	25.00	6,000	72,000	197	8.00	1,100	800	Perennial River (Apoulpon river)
		Chepareria	U-196	-	-	-	33.00	23,760	285,120	781	24.00	2,500	1,800	Perennial River (Kosokol river)
		Kapenguria	U-197	-	-	-	20.00	6,000	72,000	197	10.00	7,000	5,000	Kapenguria River
		Kacheliba		-	-	-	20.00	6,000	72,000	197	10.00	10,000	4,000	Perennial River (Swam)
		Tartar Keringet		-	-	-	25.00	7,500	90,000	247	10.00	5,000	2,000	Perennial River (Kapenguria)
		Sigor		-	-	-	65.00	46,800	561,600	1,539	24.00	3,300	1,200	Perennial River (Weiwei river)
		Ortum		25.00	18,000	216,000	20.00	14,400	172,800	473	24.00	1,400	1,200	Perennial River (Kerelwa river)

Table - 1.3.4 (5/5) Operation Hours in Existing Water Supply Systems

Code	District	Name of Water Supply	Code	Design Capacity (m^3/h)	Design Capacity (m^3/mon)	Design Capacity (m^3/year)	Actual Capacity (m^3/h)	Actual Capacity (m^3/mon)	Actual Capacity (m^3/year)	Actual Capacity (m^3/day)	Actual Operation (h/day)	No. of Pop. in Scheme Area	No. of Pop. Served	Water Source
910	Busgoma	Ndivisi-Makuselwa		114.00	81,340	982,080	114.00	81,340	982,080	2,691	24.00	80,000	60,000	Kibisi river
		Webuye	U-205	75.00	54,000	648,000	75.00	54,000	64,800	178	24.00	40,000	30,000	River Nzoia
		Bokoli / Kibichoi		70.00	50,400	604,800	70.00	50,400	604,800	1,657	24.00	80,000	50,000	River Kuywa
		Old Kibichoi		20.00	14,400	172,800	20.00	14,400	172,800	473	24.00	60,000	25,000	River Kuywa
		Chwele		85.00	2,040	24,480	4.00	960	11,520	32	8.00	10,000	5,000	Borehole
		Chesikaki		96.34	69,365	832,000	120.70	86,904	1,042,848	2,857	24.00	145,000	88,000	River Malakisi
920	Busia	Nambale	U-208	15.00	10,800	129,600	8.00	5,760	69,120	189	24.00	10,500	3,000	Borehole (2No)
		Port Victoria		25.00	18,000	216,000	18.00	12,960	155,520	426	24.00	15,000	10,000	Lake Victoria
		Busia Hills		35.00	96,840	1,162,080	31.00	22,320	267,840	734	24.00	35,000	15,000	Lake Victoria
		Sio Port		12.50	3,000	30,000	5.00	1,200	144,000	395		3,500		Lake Victoria
		Butula		10.00	3,600	43,200	3.50	1,260	15,120	41	8.00	6,000	1,200	2No Boreholes
		Mudana		16.70	12,024	144,288	14.25	4,267	51,204	140	10.00	7,500	2,850	Dam
		Walhonga		6.25	1,500	18,000	3.75	900	10,800	30		3,000		River Walhonga
		Funyula - Nangina		10.40	7,488	89,856	14.90	10,714	128,568	352	24.00	8,500	7,000	Spring
		Hibumafa		41.70	30,024	360,288	27.00	19,440	233,280	639	24.00	33,000	12,800	Sio River
		Busia - Mundika		112.50	81,000	985,500	74.50	53,640	643,680	1,764	24.00	50,000	30,000	River Sio
		Amukura		9.80	76	941	6.70	201	2,412	7	24.00	5,000	3,000	Borehole
		Amagoro								0		2,000	1,000	Spring
		Rock catchment water supply								0		400	200	Rock catchment
930	Kakamega	Mumias	U-211	90.00	65,400	784,800	60.00	43,200	518,400	1,420	24.00	30,000	20,000	River Lusumu
		Butere	U-209	9.00	6,480	77,760	5.40	3,888	46,656	128	12.00	15,000	15,000	3No Boreholes
		Lumakanda		8.00	6,000	72,000	7.00	4,500	54,000	148	8.00	3,000	8,000	Stream
		Little Nzoia		208.00	150,000	1,800,000	150.00	108,000	1,296,000	3,551	24.00	120,000	15,000	Dam
		Malava		4.00	150	1,200	12.00	360	8,640	24	9.00	20,000	8,000	Protected Springs - 2No
940	Vihiga	Kaimosi		60.00	32,400	388,800	60.00	32,400	388,800	1,065	18.00	400,000	15,000	Dam
		Vihiga	U-215	30.00	10,800	129,600	20.00	7,200	79,400	218	12.00	30,000	15,000	A protected spring
		Hamisi		7.00	3,780	45,360	5.00	2,700	32,400	89	18.00	30,000	2,000	Spring
		Mbale	U-214	40.00	21,600	259,200	60.00	2,700	324,000	887.67	18.00	450,000	20,000	Surface water
		Maseno		60.00	43,200	583,200	90.00	48,600	583,200	1,597.81	24.00	900,000	70,000	Surface
		Seviani		30.00	16,200	194,400	30.00	16,200	194,400	532.60	18.00	40,000	10,000	Seviani spring

Source: MWR Water supply schemes operation status (1997)

Table - 1.3.5 (1/2) Drinking Water Quality Standards in Kenya

Parameter	Unit	Constituent of Health Significance	Desirable Aesthetic Quality	Permissible Aesthetic Quality
Heavy metal and Harmuful Substance				
Arsenic	mg/ℓ	0.05		
Asbestos	mg/ℓ	-		
Barium	mg/ℓ	-		
Beryllium	mg/ℓ	-		
Cadmium	mg/ℓ	0.005		
Chlomium	mg/ℓ	0.05		
Cynide	mg/ℓ	0.1		
Fluoride	mg/ℓ	1.5		
Lead	mg/ℓ	0.05		
Mercury	mg/ℓ	0.001		
Selenium	mg/ℓ	0.01		
Aluminium	mg/ℓ		0.2	0.2
Copper	mg/ℓ		1.5	1.5
Iron	mg/ℓ		0.3	1
Mangnese	mg/ℓ		0.1	0.5
Zinc	mg/ℓ		5.0	15.0
Chloride	mg/ℓ		250	600
Sodium	mg/ℓ		200	200
Total dissolved solid	mg/ℓ		1,000	1,500
Sulphate	mg/ℓ		400	400
Hardness (as $CaCO_3$)	mg/ℓ		500	500
pH			6.5 - 8.5	6.5 - 9.2
Turbidity	NTU		5	25
			Preferable <1 for Disinfection Efficiency	
Colour	TCU		15	50
Taste and odour				

Source: Design Manual for Water Supply in Kenya
Arranged: JICA Study Team

Table - 1.3.5 (2/2) Drinking Quality Standards in Kenya

Parameter	Unit	Desirable Aesthetic Quality	Permissible Aesthetic Quality	Remarks
A. Piped Water Supply				
1. Treated water entering the distribution system				
Faecal Coriforms	N/100 mℓ	0		Turbidity 1NTU: for disinfection with chlorine, pH preferable<0.8, free chlorine residual 0.2-0.5 mg/l following min (min.) contact.
Coliform Organisms	N/100 mℓ	0		
2. Untreated water entering the distribution system				
Faecal Coliforms	N/100 mℓ	0		
Coliform Organisms	N/100 mℓ	0		In 98% of samples examined throughout the year for large supplies with sufficient samples examined
Coliform Organisms	N/100 mℓ	3		In occasional samples but not in consecutive samples.
3. Water in the Distribution System				
Faecal Coliform	N/100 mℓ	0		
Coliform Organisms	N/100 mℓ	0		In 95% of samples examined throughout the year for large supplies with sufficient samples examined.
Coliform Organsms	N/100 mℓ	3		In occasional sample but not in consecutive samples.
B. Unpiped Water Supply				
Faecak Coliform	N/100 mℓ	0		
Coliform Organisms	N/100 mℓ	10		Not occurring repeatedly. Repeated occurrence and failure to improve sanitary protection, alternate source to be found if possible

Source: Design Manual for Water Supply in Kenya
Arrange: The Aftercare Study Team

Table - 2.2.1 Population Projection by District, 1991 - 2010

(Unit: 1000)

Province	Code	District	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Nairobi	110	Nairobi	1,564	1,635	1,708	1,782	1,857	1,932	2,009	2,086	2,164	2,243	2,322	2,402	2,481	2,560	2,639	2,718	2,796	2,873	2,949	3,023
Central	210	Kiambu	1,044	1,072	1,100	1,128	1,156	1,182	1,209	1,234	1,259	1,283	1,307	1,330	1,352	1,373	1,394	1,413	1,431	1,447	1,463	1,476
	220	Kirinyaga	417	426	435	444	453	461	469	477	484	491	497	504	509	515	519	524	527	531	533	535
	230	Murang'a	916	935	954	972	990	1,006	1,023	1,038	1,052	1,066	1,079	1,090	1,101	1,111	1,119	1,126	1,133	1,138	1,141	1,144
	240	Nyandarua	358	368	378	388	398	408	417	426	435	444	453	461	469	477	485	492	498	505	511	516
	250	Nyeri	668	680	692	704	715	725	735	744	752	760	767	773	778	782	786	789	790	791	791	791
Coast	310	Kilifi	659	677	696	714	732	750	767	784	801	817	833	848	863	878	891	905	917	929	940	950
	320	Kwale	428	439	450	460	471	481	491	501	510	519	528	537	545	552	559	566	572	578	583	588
	330	Lamu	65	67	69	71	73	75	76	78	80	82	84	85	87	88	90	91	93	94	95	97
	340	Mombasa	517	531	545	559	573	586	600	612	625	637	649	661	672	683	693	702	712	720	728	736
	350	Taita	215	220	225	230	235	240	244	249	253	257	261	265	268	271	274	277	280	282	284	286
	360	Tana River	147	152	157	161	166	171	175	180	184	188	193	197	201	206	209	213	217	221	224	227
Eastern	410	Embu	402	414	425	436	448	458	469	480	490	500	510	520	529	538	546	555	563	570	577	583
	420	Isiolo	78	81	85	88	91	94	98	101	105	108	112	115	118	122	125	129	132	135	138	141
	430	Kitui	437	450	462	475	487	500	512	524	536	547	559	570	580	590	600	610	619	628	636	644
	440	Machakos	743	763	783	804	823	842	862	880	899	916	934	950	966	982	996	1,011	1,024	1,036	1,048	1,058
	450	Marsabit	143	147	150	154	157	161	164	167	170	173	176	178	181	183	186	188	190	192	193	195
	460	Meru	516	532	547	562	577	592	607	621	636	650	664	677	690	703	715	727	738	749	759	768
	470	Nyambene	490	505	519	534	548	562	576	590	604	617	630	643	656	668	679	690	701	711	721	730
	480	Tharaka Nithi	284	292	301	309	317	326	334	342	350	357	365	372	380	387	393	400	406	412	417	423
	490	Mwingi	279	287	296	304	312	319	327	335	342	350	357	364	371	378	384	390	396	401	406	411
	4A0	Mutweni	805	827	849	870	892	913	933	954	973	993	1,011	1,030	1,047	1,064	1,080	1,095	1,109	1,123	1,135	1,147
North Eastern	510	Garissa	198	203	209	215	220	226	231	236	241	246	251	256	261	265	269	273	277	281	284	288
	520	Mandera	190	198	206	215	223	231	240	248	257	266	274	283	292	300	309	317	326	334	342	350
	530	Wajir	197	202	206	210	214	217	221	224	227	230	233	235	238	240	243	243	244	246	246	247
Nyanza	610	Gusii	1,198	1,233	1,268	1,303	1,337	1,371	1,405	1,437	1,469	1,501	1,533	1,563	1,592	1,621	1,648	1,674	1,700	1,723	1,746	1,765
	620	Kisumu	792	814	836	857	878	899	919	939	958	977	996	1,014	1,031	1,047	1,063	1,078	1,092	1,105	1,118	1,128
	630	Siaya	698	711	722	733	744	754	762	771	779	786	792	797	801	805	807	808	809	809	809	809
	640	Homa Bay	802	825	848	871	893	915	937	958	979	999	1,020	1,039	1,057	1,076	1,093	1,110	1,125	1,140	1,153	1,166
	650	Migori	558	574	590	605	621	636	651	666	680	694	708	722	735	747	759	771	782	793	802	811
	660	Nyamira	263	271	278	286	294	301	308	316	323	330	336	343	350	356	362	368	373	378	383	388
Rift Valley	710	Kajiado	284	297	310	324	338	352	366	381	396	411	426	441	456	471	485	500	515	530	543	557
	720	Kipsigis	543	562	582	602	622	642	661	681	701	721	741	760	780	799	817	836	853	870	887	904
	730	Laikipia	247	257	268	279	291	302	313	325	337	349	361	373	384	396	408	419	431	442	454	464
	740	Nakuru	947	987	1,028	1,069	1,111	1,154	1,196	1,240	1,283	1,327	1,370	1,414	1,458	1,501	1,544	1,586	1,628	1,670	1,709	1,750
	750	Narok	281	295	310	326	342	358	374	391	408	426	443	460	478	496	513	531	548	566	583	601
	760	Trans Nzoia	447	464	481	499	516	534	551	569	587	604	622	640	657	674	691	708	724	739	755	770
	770	Uasin Gishu	509	528	547	566	585	604	623	642	661	680	699	718	736	755	773	790	808	824	840	856
	780	Baringo	521	540	559	578	597	616	636	655	674	693	712	731	749	767	785	803	820	836	852	868
	790	Transmara	151	159	167	175	184	193	202	211	220	229	238	248	257	267	276	286	295	305	314	323
	810	Baringo	325	336	347	357	367	377	387	397	407	416	424	433	442	451	460	468	476	484	491	497
	820	Elgeyo Marakwet	239	247	255	262	270	278	285	293	300	307	314	322	329	335	342	348	355	361	366	372
	830	Nandi	494	511	528	545	562	579	596	613	630	647	663	680	696	712	727	743	757	771	784	795
	840	Samburu	122	126	130	134	137	141	145	148	152	155	159	162	165	169	172	175	178	180	183	185
	850	Turkana	192	195	197	199	201	203	204	205	206	206	207	207	207	207	207	207	207	207	207	207
	860	West Pokot	252	259	267	275	282	289	297	304	311	318	325	332	338	345	351	357	362	368	373	378
Western	910	Bungoma	827	858	889	920	951	982	1,014	1,045	1,076	1,108	1,139	1,170	1,200	1,231	1,260	1,290	1,318	1,346	1,373	1,400
	920	Busia	435	446	458	469	480	491	502	512	522	532	542	551	560	568	576	584	591	597	603	609
	930	Kakamega	1,032	1,065	1,098	1,130	1,162	1,195	1,227	1,258	1,289	1,320	1,351	1,381	1,409	1,438	1,466	1,492	1,518	1,543	1,567	1,589
	940	Vihiga	556	573	591	609	626	643	660	677	694	711	727	743	759	774	789	804	818	831	844	856
TOTAL			24,476	25,236	26,001	26,762	27,520	28,266	29,011	29,745	30,470	31,187	31,897	32,590	33,259	33,922	34,555	35,178	35,772	36,344	36,882	37,405

Source: Kenya Population Census 1989, Analytical Report Volume VII, April 1996.

Note: Projection for each district from 2001 to 2010 is estimated by the Aftercare Study Team on the basis of the total population of the country projected in the Analytical Report.

Table - 2.2.2 (1/4) Population Projection by Urban Centres

Province	Code	District	Code	Urban Centre Name	Population in 1989	Projected Urban Population (Nos.)				
						1990	1995	2000	2005	2010
Nairobi	110	Nairobi	U - 1	Nairobi	1,324,570	1,444,285	1,857,000	2,323,000	2,639,600	3,023,000
Central	210	Kiambu	U - 2	Githunguri	3,673	3,518	4,706	7,354	10,558	12,662
			U - 3	Karuri	14,929	15,238	18,716	27,229	37,113	40,535
			U - 4	Kiambu	6,522	6,220	8,239	13,001	18,605	21,356
			U - 5	Kikuyu	6,247	6,023	7,962	12,623	18,058	20,677
			U - 6	Limuru	1,742	1,665	1,958	2,874	3,964	4,347
			U - 7	Ndumberi	5,763	5,767	7,759	12,336	17,883	20,579
			U - 8	Ruiru	23,316	26,348	32,302	46,943	64,180	70,142
			U - 9	Thika	57,603	55,502	73,718	116,313	166,252	190,356
			Sub-Total		119,795	120,280	155,361	238,672	336,613	380,048
	220	Kirinyaga	U - 10	Baricho	940	915	1,110	1,601	2,202	2,445
			U - 11	Kagumo	498	486	602	903	1,261	1,393
			U - 12	Kerugoya/Kutus	9,585	10,215	13,784	21,479	31,142	35,966
			U - 13	Kianyaga	406	398	498	691	973	1,057
			U - 14	Kimenye	823	802	995	1,492	2,084	2,302
			U - 15	Sagana	2,546	2,459	2,569	3,189	4,277	4,617
			U - 16		3,093	3,044	3,956	6,314	8,255	8,724
			Sub-Total		17,891	18,319	23,514	35,468	50,193	56,506
	230	Muranga	U - 17	Kandara	582	567	640	962	1,249	1,358
			U - 18	Kangema	1,277	1,276	1,491	2,097	2,797	3,088
			U - 19	Makuyu	2,607	2,638	3,355	5,007	7,015	7,943
			U - 20	Maragua	30,931	33,462	39,411	55,259	74,091	79,924
			U - 21	Muranga	21,650	20,861	26,376	39,680	55,613	62,635
			Sub-Total		57,047	58,804	71,273	103,006	140,765	154,948
	240	Nyandarua	U - 22	Engineer Town	446	435	539	808	1,130	1,247
			U - 23	Mairo Inya	1,473	1,455	1,846	2,843	3,858	4,091
			U - 24	Miharati	1,058	1,032	1,279	1,918	2,680	2,959
			U - 25	Murungara	743	724	899	1,347	1,882	2,078
			U - 26	Ndunyu Njeru	1,141	1,113	1,380	2,068	2,890	3,191
			U - 27	Njabini	1,265	1,233	1,530	2,293	3,096	3,038
			U - 28	Nyahururu	14,829	14,126	19,446	32,704	50,393	60,186
			U - 29	Ol Joro Orok	646	643	792	1,192	1,547	1,682
			U - 30	Ol Kalou	2,546	2,742	3,840	6,401	8,945	9,944
			U - 31	Wanjohi	825	804	998	1,495	2,089	2,307
			Sub-Total		24,972	24,317	32,549	53,069	78,509	90,723
	250	Nyeri	U - 32	Endarasha	2,358	2,321	3,016	4,661	6,661	7,564
			U - 33	Karatina	5,554	5,484	7,299	11,313	16,695	19,471
			U - 34	Mweiga	1,557	1,518	1,883	2,822	3,969	4,315
			U - 35	Naro Moru	1,379	1,345	1,668	2,500	3,750	3,822
			U - 36	Nyeri	91,258	93,165	123,508	191,728	282,940	331,393
			U - 37	Othaya	4,811	4,785	6,379	9,832	14,546	16,981
			Sub-Total		106,917	108,618	143,753	222,856	328,562	383,545
Coastal	310	Kilifi	U - 38	Kilifi	14,145	14,092	20,555	32,943	48,767	57,082
			U - 39	Majengo	1,984	1,934	2,399	3,596	5,025	5,549
			U - 40	Malindi	34,047	33,101	43,227	77,339	114,547	134,152
			U - 41	Mambrui	2,951	2,935	3,859	5,696	8,011	8,964
			U - 42	Marikani	8,372	8,599	12,496	20,044	29,761	34,857
			U - 43	Watamu	2,089	1,985	2,846	4,574	6,767	7,857
			Sub-Total		63,588	62,647	90,383	144,193	212,879	248,461
	320	Kwale	U - 44	Kwale	3,510	3,460	4,590	8,198	11,627	13,230
			U - 45	Lungalunga	7,926	7,687	9,329	15,118	20,656	22,289
			U - 46	Msambweni	5,680	5,426	7,247	12,858	18,251	20,741
			Sub-Total		17,116	16,572	21,167	36,175	50,534	56,260
	330	Lamu	U - 47	Lamu	8,959	8,448	11,437	17,401	25,463	29,618
			U - 48	Matondoni T.C	1,728	1,685	2,090	3,132	4,376	4,833
			U - 49	Mokowe T.C	1,842	1,796	2,228	3,339	4,665	5,151
			U - 50	Mpeketoni T.C	631	615	763	1,144	1,598	1,765
			U - 51	Witu	1,200	1,154	1,563	2,395	3,485	4,036
			Sub-Total		14,360	13,698	18,081	27,410	39,587	45,402
	340	Mombasa	U - 52	Mombasa	461,753	489,377	573,000	637,000	693,000	736,000
	350	Taita	U - 53	Mwatate	1,659	1,618	2,006	3,007	4,202	4,640
			U - 54	Taveta	10,378	11,480	13,223	17,845	23,689	25,433
			U - 55	Voi	13,202	12,837	15,772	22,676	31,353	35,159
			U - 56	Wundanyi	2,764	3,026	3,733	5,321	7,369	8,343
			Sub-Total		28,003	28,960	34,734	48,852	66,613	73,575
	360	Tana River	U - 57	Bura & Madogo	608	593	735	1,102	1,549	1,700
			U - 58	Garsen	3,186	3,342	4,232	6,698	9,253	10,410
			U - 59	Hola	9,508	9,207	12,853	22,421	32,235	36,818
			Sub-Total		13,302	13,142	17,820	30,220	43,029	48,628
Eastern	410	Embu	U - 60	Embu	26,525	25,006	34,309	55,302	79,735	92,214
			U - 61	Runyenjes	1,979	1,938	2,346	3,455	4,740	5,239
			Sub-Total		28,504	26,944	36,654	58,556	84,476	97,452
	420	Isiolo	U - 62	Garbatula	1,077	1,060	1,565	2,395	3,497	3,947
			U - 63	Isiolo	16,824	15,198	26,968	45,626	70,131	83,439
			U - 64	Modogash	2,030	1,978	2,571	3,973	5,588	6,074
			U - 65	Merti	4,957	5,269	7,779	11,988	17,288	19,533
			Sub-Total		24,868	23,506	38,883	64,031	96,505	112,993
	430	Kitui	U - 66	Kavati	569	555	688	1,031	1,441	1,591
			U - 67	Kalungu	555	541	671	1,006	1,406	1,552
			U - 68	Kitui	9,305	9,275	13,261	22,131	32,485	39,781
			Sub-Total		10,429	10,371	14,619	24,168	35,332	44,925

Table - 2.2.2 (2/4) Population Projection by Urban Centres

Province	Code	District	Code	Urban Centre Name	Population in 1989	Projected Urban Population (Nos.)				
						1990	1995	2000	2005	2010
Eastern	440	Masaku	U - 69	Athi River	13,022	13,302	18,304	28,602	41,713	48,441
			U - 70	Kathiani T.C	854	833	1,633	1,548	2,163	2,386
			U - 71	Machakos	116,293	111,992	154,006	240,703	351,071	407,822
			U - 72	Masii T.C	669	652	809	1,213	1,694	1,871
			U - 73	Masinga	753	734	911	1,365	1,907	2,106
			U - 74	Matuu	2,849	2,804	3,644	5,631	7,555	7,947
			U - 75	Mitaboni	655	639	792	1,187	1,633	1,745
			U - 76	Syathani	791	771	557	1,434	1,775	1,822
			U - 77	Tala + Kangundo	10,880	10,795	14,656	22,680	32,858	37,845
			U - 78	Wamunyu	906	883	1,096	1,642	2,295	2,534
			Sub-Total		147,722	143,406	196,206	306,003	444,663	514,531
	450	Marsabit	U - 79	Kargi	4,055	4,065	6,215	9,064	12,724	14,515
			U - 80	Kor	5,161	5,368	7,382	10,057	13,599	14,816
			U - 81	Laisamis	1,215	1,185	1,469	2,202	3,077	3,398
			U - 82	Marsabit	11,113	10,553	16,084	23,441	33,116	37,785
			U - 83	Moyale	7,049	6,478	9,853	14,354	20,360	23,231
			U - 84	North Horr	2,080	2,037	2,805	3,808	5,182	5,596
			U - 85	Sololo	3,640	3,431	5,146	7,539	10,651	12,125
			Sub-Total		34,313	33,116	48,955	70,465	98,708	111,469
	460	Meru	U - 86	Meru	94,947	89,444	124,412	199,692	290,856	337,437
			U - 87	Nkubu	5,138	5,097	7,059	11,357	16,549	19,261
			Sub-Total		100,085	94,541	131,471	211,049	307,406	356,698
	470	Nyambene	U - 88	Lare	1,270	1,238	1,536	2,302	2,943	3,200
			U - 89	Maua	4,175	4,209	5,349	7,879	10,920	12,143
			Sub-Total		5,445	5,447	6,885	10,181	13,863	15,344
	480	Tharaka Nithi	U - 90	Chuka	4,258	4,412	5,607	8,259	11,446	12,729
	490	Mwingi	U - 91	Mwingi	3,742	3,859	5,469	9,221	13,527	15,747
	4A0	Makueni	U - 92	Kambu T.C	186	181	225	337	471	520
			U - 93	Kibwezi	2,432	2,329	3,116	4,702	6,739	7,702
			U - 94	Kikima	1,879	1,832	2,272	3,406	4,343	4,629
			U - 95	Kilala Market	611	596	739	1,108	1,547	1,709
			U - 96	Machinery T.C	390	380	472	707	988	1,091
			U - 97	Mbumbumi Market	248	242	300	450	628	694
			U - 98	Mtito Andei	3,854	3,693	4,938	7,451	10,679	12,205
			U - 99	Sultan Hamud	1,529	1,464	1,833	2,604	3,614	3,981
			U - 100	Tawa Market	755	736	913	1,369	1,912	2,111
			U - 101	Wote	1,294	1,262	1,731	2,705	3,946	4,595
			Sub-Total		13,178	12,713	16,539	24,837	34,866	39,236
North Eastern	510	Garissa	U - 102	Dadaab	1,228	1,183	1,338	2,178	2,941	3,197
			U - 103	Damajare	573	559	693	1,039	1,336	1,512
			U - 104	Garissa	31,319	31,245	40,000	72,261	101,498	115,126
			U - 105	Liboi	2,380	2,343	3,044	4,704	6,049	6,850
			U - 106	Modo Gashe	1,004	979	1,170	1,910	2,560	2,775
			Sub-Total		36,504	36,308	46,245	82,092	114,385	129,461
	520	Mandera	U - 107	Bannisa	723	705	874	1,311	1,831	2,022
			U - 108	Elwak	7,473	7,478	8,087	10,977	14,578	15,808
			U - 109	Mandera	22,699	19,940	22,856	32,775	45,389	51,680
			U - 110	Rhamu	4,878	4,801	5,144	7,015	9,319	10,031
			U - 111	Takaba	1,873	1,826	2,265	3,395	4,515	4,719
			Sub-Total		37,646	34,751	39,227	55,473	75,632	84,256
	530	Wajir	U - 112	Buna	846	825	989	1,396	1,919	2,111
			U - 113	Bute	2,593	2,128	2,543	3,621	4,969	5,491
			U - 114	Eldas	1,854	1,808	2,242	3,361	4,695	5,185
			U - 115	Wagalla	734	716	888	1,330	1,859	2,053
			U - 116	Wajir	19,382	20,144	26,239	39,542	57,066	66,062
			Sub-Total		25,409	25,621	32,901	49,249	70,509	80,902
Nyanza	610	Gusii	U - 117	Kisii	44,149	42,853	50,604	77,666	107,195	120,615
			U - 118	Ogembo	899	877	978	1,383	1,883	2,003
			Sub-Total		45,048	43,729	51,583	79,049	109,078	122,618
	620	Kisumu	U - 119	Ahero	9,097	9,929	11,661	16,197	21,989	24,135
			U - 120	Kisumu	192,733	183,217	231,327	344,460	489,348	561,029
			U - 121	Maseno	3,331	3,328	3,890	5,470	7,409	8,054
			U - 122	Muhoroni	9,538	9,236	11,694	17,389	24,721	28,231
			Sub-Total		214,699	205,710	258,572	383,517	543,468	621,449
	630	Siaya	U - 123	Asembo	2,922	2,876	3,737	5,776	8,255	9,373
			U - 124	Bondo	1,936	2,096	2,348	3,244	4,308	4,662
			U - 125	Siaya	16,103	17,340	20,762	30,281	42,062	47,503
			U - 126	Ukwala	1,083	1,047	1,127	1,593	2,075	2,222
			U - 127	Usenge T.C	1,245	1,217	1,509	2,262	3,161	3,499
			U - 128	Yala	2,141	2,245	2,552	3,418	4,616	4,955
			Sub-Total		25,833	26,822	32,035	46,574	64,477	72,205
	640	Homa Bay	U - 129	Homa Bay	23,335	24,061	30,995	45,428	64,065	71,866
			U - 130	Kendu Bay	2,693	2,512	3,262	4,843	6,692	7,534
			U - 131	Mbita	4,497	4,426	5,751	8,889	11,820	11,531
			U - 132	Ndhiwa	1,611	1,574	1,948	2,920	3,696	3,720
			U - 133	Oyugis	4,933	5,141	6,467	8,525	11,399	12,215
			Sub-Total		37,070	37,712	48,424	71,604	97,673	106,866
	650	Migori	U - 134	Awendo/Sare	6,982	6,828	8,213	11,456	15,174	16,258
			U - 135	Kehancha	2,082	2,108	2,528	3,495	4,674	5,068
			U - 136	Migori	12,274	11,600	14,913	22,316	30,831	34,694
			U - 137	Nyabikaye	3,656	3,507	4,184	5,871	7,897	8,341
			U - 138	Rongo	3,391	3,345	3,982	5,677	7,371	8,012
			Sub-Total		28,395	27,390	33,820	48,814	65,856	72,315
	660	Nyamira	U - 139	Keroka	2,321	2,353	2,649	3,695	4,931	5,343
			U - 140	Nyamira + Kebirigo	6,338	6,027	7,130	11,435	15,093	17,592
			Sub-Total		8,659	8,380	9,769	15,130	20,024	22,935

Table - 2.2.2 (3/4) Population Projection by Urban Centres

Province	Code	District	Code	Urban Centre Name	Population in 1989	Projected Urban Population (Nos.)				
						1990	1995	2000	2005	2010
Rift Valley	710	Kajiado	U - 141	Kajiado	6,326	6,209	9,434	16,916	27,010	32,647
			U - 142	Magadi	3,135	2,969	4,398	8,019	12,782	15,471
			U - 143	Namanga	4,710	4,791	7,262	13,035	20,821	25,364
			U - 144	Ngong	8,775	8,725	12,730	22,070	34,527	41,207
			U - 145	Oloitokitoki	5,922	5,936	8,955	16,137	25,817	31,353
			U - 146	Ongata Longai	17,288	17,189	25,080	43,481	68,122	81,185
			Sub-Total		46,156	45,819	67,860	119,658	189,329	227,427
	720	Kipsigis	U - 147	Keduwa	357	348	432	647	904	998
			U - 148	Kericho	48,511	46,593	56,108	91,602	132,237	152,522
			U - 149	Kipkelion	2,319	2,068	2,472	4,035	5,893	6,738
			U - 150	Litein	1,575	1,536	1,905	2,855	3,796	3,968
			U - 151	Londiani	3,988	3,606	4,346	7,101	10,190	11,852
			U - 152	Sotik	3,725	4,008	4,509	6,771	9,335	10,259
			Sub-Total		60,475	58,159	69,772	113,010	162,354	186,338
	730	Laikipia	U - 153	Nanyuki	24,070	22,995	31,559	53,207	81,989	97,975
			U - 154	Rumuruti	2,434	2,368	2,941	4,596	6,591	7,532
			Sub-Total		26,504	25,363	34,501	57,802	88,580	105,506
	740	Nakuru	U - 155	El Burgon	12,072	11,632	16,693	28,954	45,399	54,658
			U - 156	Gilgil	14,304	13,910	19,960	34,627	54,234	65,444
			U - 157	Molo	11,175	11,136	15,940	27,708	43,459	52,394
			U - 158	Naivasha	34,519	35,921	51,442	89,460	140,157	168,905
			U - 159	Nakuru	163,927	161,682	231,687	402,560	630,866	760,237
			U - 160	Njoro	9,026	8,804	12,635	21,909	34,394	41,421
			U - 161	Rongai	906	885	1,098	1,846	2,300	2,539
			Sub-Total		245,931	243,974	349,455	606,863	950,808	1,145,599
	750	Narok	U - 162	Nairagie (Enkare)	543	506	799	1,295	1,977	2,262
			U - 163	Narok	11,629	11,619	19,859	37,753	62,377	77,230
				Sub-Total	12,172	12,125	20,658	39,048	64,354	79,493
	760	Trans Nzoia	U - 164	Kitale	56,218	55,786	73,956	128,530	193,913	229,326
	770	Uasin Gishu	U - 165	Burn Forest	2,041	1,994	2,463	3,724	5,308	5,989
			U - 166	Eldoret	111,882	112,285	148,204	247,486	378,415	450,629
			U - 167	Lemok	3,444	3,390	4,405	6,807	9,929	11,048
			U - 168	Magoon	566	552	684	1,026	1,433	1,583
			U - 169	Moi's Bridge	2,833	2,925	3,556	5,428	7,852	8,859
			U - 170	Simat	5,732	5,736	7,717	12,270	17,787	20,468
			U - 171	Soy	1,037	1,002	1,156	1,766	2,619	2,946
			U - 172	Turbo	3,098	3,028	3,703	5,658	8,103	9,175
			Sub-Total		130,631	130,912	171,889	284,165	431,247	510,707
	780	Bomet	U - 173	Bomet	765	746	925	1,387	1,783	1,817
	790	Transmara	U - 174	Kilgoris	5,059	5,063	7,665	12,888	19,862	23,132
			U - 175	Lolgorian	1,608	1,568	1,945	2,915	4,072	4,497
			U - 176	Nkararo	647	631	782	1,173	1,639	1,809
			Sub-Total		7,314	7,261	10,392	16,976	25,573	29,438
	810	Baringo	U - 177	Arabal	701	683	848	1,271	1,775	1,960
			U - 178	Eldama Ravine	6,831	6,606	8,272	13,142	19,393	22,617
			U - 179	Kabarnet	9,268	9,416	11,804	18,812	27,776	32,363
			U - 180	Maji Mazuri	6,815	6,480	8,083	12,858	19,077	22,152
			U - 181	Marigat	3,887	4,027	4,707	6,865	9,656	10,746
			U - 182	Mogotio	3,182	3,073	3,808	6,097	9,038	10,554
			Sub-Total		30,684	30,316	37,522	59,044	86,714	100,392
	820	Elgeyo Marakwet	U - 183	Iten	4,658	4,999	6,034	9,654	13,473	14,951
			U - 184	Tambach	999	1,072	1,294	2,071	2,890	3,206
			Sub-Total		5,657	6,071	7,329	11,725	16,363	18,157
	830	Nandi	U - 185	Kapsabet + Baraton	10,537	11,278	14,604	25,747	38,277	44,693
			U - 186	Nandi Hills	1,317	1,266	1,491	2,329	3,300	3,693
			Sub-Total		11,854	12,544	16,095	28,076	41,577	48,386
	840	Samburu	U - 187	Baragoi	765	765	1,006	1,660	2,531	2,983
			U - 188	Maralal	8,982	8,802	11,660	19,101	29,012	34,381
			U - 189	Wamba	3,531	3,481	4,618	7,560	11,503	13,572
			Sub-Total		13,286	13,048	17,284	28,321	43,046	50,936
	850	Turkana	U - 190	Kakuma T.C	2,174	2,140	2,780	4,297	6,141	6,974
			U - 191	Kalokol	2,485	2,446	3,178	4,912	6,316	6,437
			U - 192	Kapenguria T.C	1,340	1,367	1,621	2,429	3,394	3,788
			U - 193	Katilu T.C	715	697	865	1,296	1,811	2,008
			U - 194	Lodwar	13,619	13,556	15,588	28,353	39,849	45,315
			U - 195	Lokitaung	4,201	4,135	5,373	8,304	10,678	10,882
			Sub-Total		24,534	24,281	29,405	49,590	68,181	75,355
	860	West Pokot	U - 196	Chepareria	767	739	836	1,366	1,837	2,053
			U - 197	Kapenguria	7,729	7,955	10,291	16,846	25,206	29,642
			U - 198	Makutano	6,934	6,297	8,096	13,370	20,504	23,493
			Sub-Total		14,630	14,991	19,133	31,522	47,547	55,188

Table - 2.2.2 (4/4) Population Projection by Urban Centres

Province	Code	District	Code	Urban Centre Name	Population in 1989	Projected Urban Population (Nos.)				
						1990	1995	2000	2005	2010
Western	910	Bungoma	U - 199	Bungoma	26,805	25,339	39,679	65,103	97,172	114,086
			U - 200	Chepalais	2,467	2,386	3,361	5,057	7,091	7,930
			U - 201	Kapsakwony	592	577	795	1,205	1,695	1,919
			U - 202	Kikilili	5,483	5,633	8,812	14,482	21,637	25,327
			U - 203	Mawalic + Malakisi	2,271	2,292	3,119	5,415	7,572	8,436
			U - 204	Sirisia	944	968	1,389	2,010	2,894	3,195
			U - 205	Webuye	27,758	26,791	41,935	68,887	102,762	120,647
			Sub-Total		66,320	63,896	99,089	162,157	240,824	281,540
	920	Busia	U - 206	Busia	20,781	21,125	32,441	60,049	89,110	103,635
			U - 207	Malaba Town	2,734	2,691	3,497	5,404	7,723	8,770
			U - 208	Nambale	2,284	2,236	3,080	5,154	7,222	7,929
			Sub-Total		25,799	26,053	39,018	70,607	104,056	120,335
	930	Kakamega	U - 209	Butere	2,369	2,401	2,947	4,385	6,020	6,526
			U - 210	Kakamega	58,862	57,093	77,306	123,558	177,064	202,516
			U - 211	Mumias	23,668	23,825	29,626	43,681	59,682	65,150
			Sub-Total		84,899	83,319	109,879	171,624	242,766	274,192
	940	Vihiga	U - 212	Chavakali	420	419	508	761	1,012	1,058
			U - 213	Luanda	3,361	3,131	4,246	6,765	9,759	11,138
			U - 214	Mbale	2,871	2,826	3,672	5,675	7,546	7,887
			U - 215	Vihiga + Majengo	4,335	4,230	5,274	8,499	11,591	12,600
			Sub-Total		10,987	10,600	13,699	21,700	29,908	32,683
TOTAL					**3,955,543**	**4,070,000**	**5,280,000**	**7,440,000**	**10,010,000**	**11,500,000**

Source: Kenya Population Census 1989
The National Water Master Plan Study 1992

Note: Projection of urban population was made on the basis of the urban population growth rate estimated in the National Water Master Plan Study 1992, with adjustment made in accordance with the total urban population projected in the Eighth National Development Plan 1997-2001.

Table - 2.2.3 Estimated Population Served in 1995

Province	District	Population (x 1,000)			Service	Served Population (x 1,000)				Non-served	Data
		Total	Urban	Rural	Coverage	Total	by UWS	by LSRWS	by SSRWS	(x 1,000)	Source
Nairobi	Nairobi	1,857	1,857	0	96.1	1,785	1,785	0	0	72	1)
Central	Kiambu	1,156	153	1,003	60.1	695	221	353	121	461	2)
	Kirinyaga	453	18	435	76.6	347	10	326	11	106	3)
	Muranga	990	69	921	79.8	790	31	306	454	200	4)
	Nyandarua	398	23	375	63.0	251	59	76	115	147	2)
	Nyeri	715	140	575	61.1	437	69	107	261	278	2)
Coastal	Kilifi	732	90	642	67.2	492	192	31	269	240	2)
	Kwale	471	21	450	46.5	219	17	17	186	252	2)
	Lamu	73	14	59	60.7	44	7	7	30	29	2)
	Mombasa	573	573	0	95.4	547	371	31	145	26	2)
	Taita	235	33	202	62.1	146	33	61	52	89	2)
	Tana River	166	17	149	24.1	40	19	15	7	126	4)
Eastern	Embu	448	37	411	53.8	241	39	124	78	207	2)
	Isiolo	91	37	54	73.9	67	37	11	19	24	4)
	Kitui	487	13	474	17.8	87	11	30	46	401	2)
	Masaku	823	191	633	38.9	320	117	103	101	503	2)
	Marsabit	157	47	110	96.1	151	55	62	34	6	3)
	Meru	577	131	446	62.5	361	21	130	209	216	2)
	Nyambene	548	5	543	50.3	276	2	200	74	273	3)
	Tharaka Nithi	317	6	312	33.7	107	8	94	5	210	2)
	Mwingi	312	5	306	18.9	59	12	29	18	253	4)
	Makueni	892	8	884	17.9	160	15	36	109	732	2)
North-Eastern	Garissa	220	43	177	58.3	128	41	35	53	92	3)
	Mandera	223	36	187	31.3	70	16	28	26	153	2)
	Wajir	214	31	183	70.8	152	7	131	14	63	3)
Nyanza	Gusii	1,337	51	1,287	31.5	421	45	30	346	916	2)
	Kisumu	878	259	619	65.5	627	316	259	52	303	3)
	Siaya	744	24	720	31.1	238	11	220	7	512	3)
	Homa Bay	893	46	847	26.0	232	83	132	17	661	2)
	Migori	621	34	587	6.6	41	12	7	22	580	2)
	Nyamira	294	10	284	43.0	126	17	35	74	167	2)
Rift Valleey	Kajiado	338	68	270	72.9	246	53	55	139	92	2)
	Kipsigis	622	67	554	44.0	274	64	5	204	348	4)
	Laikipia	291	35	256	29.3	85	46	5	34	206	2)
	Nakuru	1,111	348	763	74.5	828	380	85	363	283	2)
	Narok	342	20	322	26.0	89	12	37	40	253	2)
	Trans Nzoia	516	74	442	39.6	204	60	0	144	312	2)
	Uasin Gishu	585	170	415	58.4	342	95	113	133	243	2)
	Bomet	597	0	597	29.6	177	0	19	158	421	2)
	Transmara	184	8	176	11.0	20	8	8	5	164	4)
	Baringo	367	37	330	64.0	235	156	40	39	132	3)
	Elgeyo Marakwet	270	6	264	29.0	78	2	26	50	192	4)
	Nandi	562	15	547	36.8	207	7	29	171	355	2)
	Samburu	137	16	121	53.4	93	12	63	18	44	4)
	Turkana	201	27	174	59.3	119	56	41	22	82	2)
	West Pokot	282	18	264	27.6	78	11	44	23	204	4)
Western	Bungoma	951	97	854	65.6	624	170	355	99	327	2)
	Busia	480	39	441	66.6	320	19	92	209	160	2)
	Kakamega	1,162	110	1,052	55.5	645	45	106	494	517	2)
	Vihiga	626	13	613	60.5	379	100	95	184	247	5)
TOTAL		27,520	5,191	22,329	53.2	14,698	4,974	4,239	5,485	12,880	

Note:

(1) Service coverage ratio for each district is obtained from Welfare Monitoring Survey and/or the 1996 Project Status Report. The coverages underlined are from the 1996 PSR.

(2) LSWS and SSWS imply Large Scale Water Supply and Small Scale Water Supply respectively.

(3) Data source:

1) Coverage from WMSII

2) Coverage from WMS while served population from Status Report and/or Survey Results. Further adjusted to balance SSWS.

3) Coverage and served population from Status Report and/or Survey Results

4) Coverage from WMS while served population from Status Report and/or Survey Results.

5) As served population exceeds district population, the figure was adjusted.