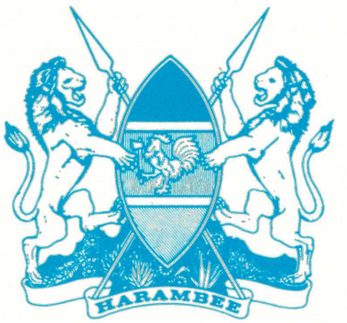
REPUBLIC OF KENYA



MINISTRY OF WATER DEVELOPMENT

SAMBURU

DISTRICT WATER DEVELOPMENT STUDY

1993 - 2013

EXECUTIVE SUMMARY

February 1991

WATER RESOURCES
ASSESSMENT SECTION
NAIROBI, KENYA

WRAP
WATER RESOURCES
ASSESSMENT & PLANNING

TNO – INSTITUTE
OF APPLIED GEOSCIENCE
DELFT, THE NETHERLANDS

PREFACE

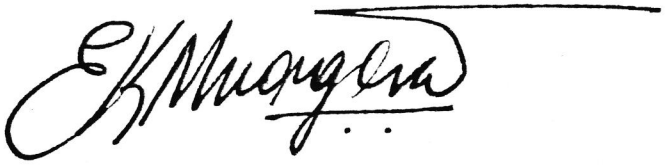
It gives me great pleasure to introduce the District Water Development Study for Samburu District.

The Ministry of Water Development has the task of planning for water resources development, both at national and district levels. Districts have been assigned a major role in the development of the country as illustrated by the District Focus Strategy for Rural Development Policy. Consistent with this policy the Ministry of Water Development has put great emphasis on the studies for District Water Development Planning.

Water resources development can only be successfully undertaken if the long-term planning reflects the balance between availability and exploitation of water. Extensive investigations and monitoring are needed to determine the potential of the water resources and the effects of development on long-term basis. Presently, the Districts do not have the research capacity to carry out the necessary studies independently. To overcome this situation, the Ministry of Water Development has established a Water Resources Assessment Section that supports the Districts in carrying out these studies. The Section is being strengthened by the Water Resources Assessment and Planning Project.

The present study provides extensive information on the availability of water resources, the existing supply, the future water demand and the investments involved in developing the water resources in Samburu District. Equipped with this information the District will be in a better position to plan its supply facilities. It is only after the District succeeds in explaining to the people the limitations of the natural system and the vulnerability of the environment involving them as much as possible in the planning and construction of their water supplies, that the difficult task of providing water to the people will see a good end.

I express the wish that this important study will be optimally used to achieve this common goal.



(E. K. MWONGERA)
Director of Water Development

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1. OVERVIEW AND CONTEXT OF THE STUDY

1.1 Purpose and Context

The District Water Development Study (DWDS) of Samburu District is aimed at providing the basis for the District Water Development Plan (DWDP), which in turn will be the sector input to the District Development Plan (DDP).

The study was undertaken by the Ministry of Water Development in its role of supporting the districts in their task to develop the available water resources in a safe and sustainable way. Two conditions will have to be fulfilled to achieve this goal.

- The development of water resources must be in balance both with the capacity of these resources and with the conditions set by the environment.

- Supply of water to the community must be sustainable, meaning that the proposed schemes be designed in agreement with the technical and financial support capability of the people for whom they will be constructed.

These conditions require a thorough assessment of the situation in the district and a planning that is well tuned with the socio-economic and technical development of the district as laid down in the District Development Plan. In this respect it should be understood that the water resources are not necessarily the key limiting factor in the economic development of a district.

The methodology for planning of water resources development, embarked upon by the Ministry facilitates full participation of the district authorities, community groups and individuals concerned in all stages of the planning process which is in line with the District Focus Policy. The DWDS can be considered the first stage of this process. The study provides insight into sustainable water supply options and the investments required to realize them. It also supports the district authorities in their search for donor contributions.

1.2 General Approach

The model for preparation of a District Water Development Plan is shown in figure 1. Three phases are distinguished in the planning procedure.

Phase 1 - focusing on the analysis of water demand and water resources. This part of the study includes assessment of current and projected demands and verification of the compatibility with available resources. It results in a description of water development options.

Phase 2 - focusing on the existing water supplies, the technical options for further water supply development and cost comparison of these technology options. The results provide insight into the viability and affordability of identified supply options.

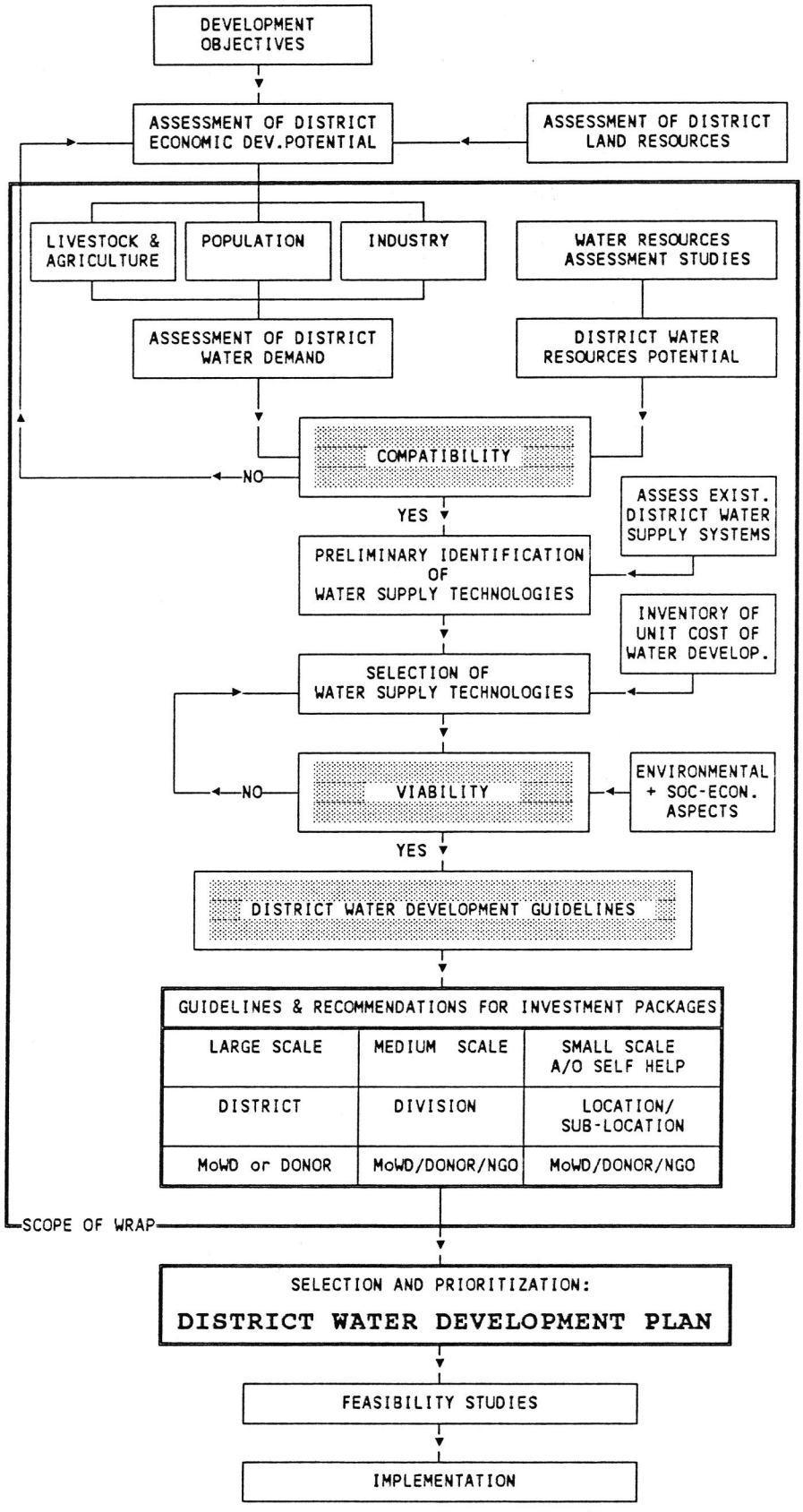


Figure 1 **Model for Preparation of District Water Development Plan**

Phase 3 - focusing on assessment of the social, technical/environmental, institutional and economic/financial elements involved in the design of the necessary investments and O & M structures. This part of the study provides cost estimates and recommendations for investment packages and includes a proposal for feasibility studies.

The studies and results (phases 1 through 3) are described in the respective parts of the DWDS report. A summary of the key findings is given in the following chapters.

1.3 International Co-operation

The District Water Development Study was undertaken under a Technical Co-operative Agreement between the Governments of Kenya and The Netherlands.

The studies were carried out by the Water Resources Assessment Section of the Ministry of Water Development, Nairobi, Kenya, in co-operation with the TNO Institute of Applied Geoscience, Delft, The Netherlands, within the framework of the **Water Resources Assessment and Planning Project (WRAP)**.

Consultancy services were provided by the Netherlands Economic Institute, Rotterdam, The Netherlands and the International Institute for Hydraulic and Environmental Engineering, Delft, The Netherlands.

2. PART 1: WATER DEMAND AND WATER RESOURCES

2.1 Water Demand

Water Demand was calculated for each Sub-location within the District. This demand was divided into four major categories:

- human domestic demands further subdivided into demands derived from urban and rural populations
- livestock demand calculated for each of the major types of animal
- demand from institutions, mainly schools and health centres, and
- other demand from small scale industries, tourism/wildlife and agriculture.

Demand from the last category of users could not be estimated either because current usage is included within domestic demand (industry and agriculture) or because insufficient information is available (wildlife). This category of demand should be monitored and may need to be addressed in more detail in the future.

Water Demand was calculated for 1988 and projected for 1993, 2003 and 2013.

Demand projections were based on three Scenarios. These scenarios were in turn based on the projections of District population and economic growth. The Scenarios were intended to set out growth rates above and below those rates used in the DDP. Brief descriptions of the scenarios are as follows:

* Scenario 1 - high growth scenario deriving from maximum development potential; used only for comparison of the implications of growth
* Scenario 2 - medium growth scenario and that used by DDP; used to produce levels of demand which may eventuate and which could be met by a second stage of investment, and
* Scenario 3 - low growth scenario and most likely to eventuate; used to produce base level of demand which should be met by planned investment.

Table 2.1 summarises the growth rates used in the Scenarios.

Table 2.1 Annual Growth Rates 1988-2013

	Scenario 1	Scenario 2	Scenario 3
Applied Population Growth Rates			
Major Urban Areas 1)	5%	5%	2.5%
Minor Urban Areas	5%	1%	0%
Rural Areas	1%	0%	-1%
Resulting District Population Growth Rates			
1988 - 1993	2.5%	1.6%	-0.1%
1993 - 2013	3.0%	2.3%	0.2%
Applied Livestock Growth Rates	1.0%	0.5%	0%
Applied School Growth Rates 2)	8%	5%	2.5%
Applied Health (No. of Beds) Growth Rates	5%	5%	2.5%
Applied Commercial/Administr. Growth Rates	5%	5%	2.5%

Note: 1) Maralal, Suguta Marmar, Wamba, Baragoi
Scenario 3: Only Maralal and Suguta Marmar.
2) Maximum number of pupils not more than 36% of sub-location population.

Figure 2 summarises the demand projections by Scenario showing domestic, non-domestic and total demands.

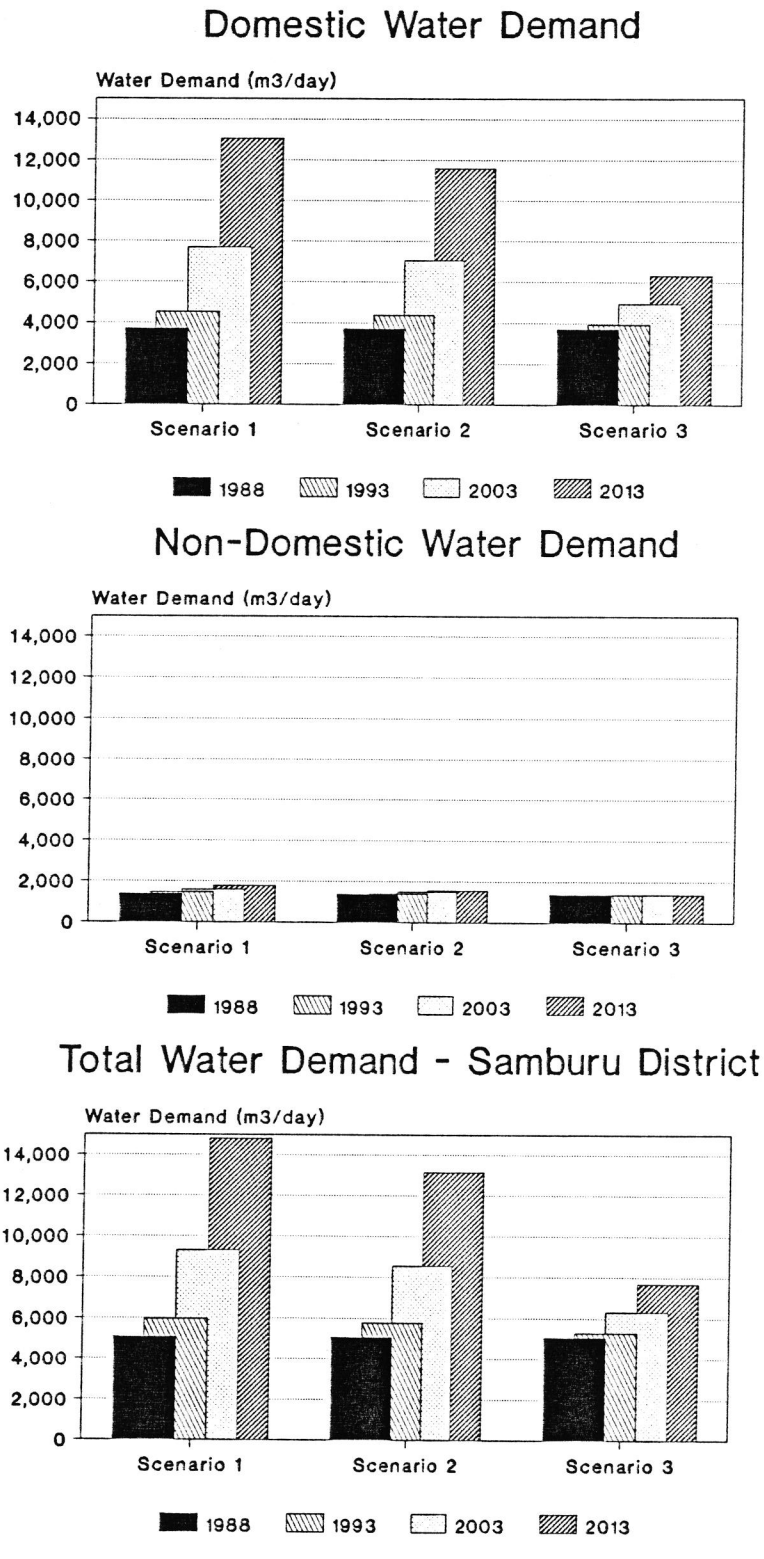


Figure 2 **Projected Domestic and Non-Domestic Demand in Samburu District**

2.2 Water Resources

Water Resources were divided into two main categories:

- groundwater obtained from dug wells or boreholes, and
- surface water obtained from dams/pans, and from spring, lagga, lake and river intakes.

The availability and quality of these resources was assessed from available data and from exploratory boreholes undertaken by WRAP. A rating of availability and quality was established, and Table 2.2 provides an overview by division of the number of sub-locations falling within each rating category.

Table 2.2 Water Resources Availability Summary

	Number of Sub-locations									
	Water Availability					Chemical Water Quality				
	Lorroki Div.	Baragoi Div.	Wamba Div.	Waso Div.	Samburu Distr.	Lorroki Div.	Baragoi Div.	Wamba Div.	Waso Div.	Samburu Distr.
GROUNDWATER										
Geology: Basement	8	9	12	8	37					
Volcanics	14	2	-	-	16					
Basement/Volcanics	7	9	-	-	16					
Alluvial Sediments	4	11	6	2	23					
Rating: high	-	-	-	-	-	19	15	6	2	42
medium/high	4	11	6	2	23	19	15	6	2	42
medium	23	14	6	2	45	29	20	12	8	69
low/medium	28	18	12	8	66	-	-	-	-	-
low	29	20	-	-	69	-	-	-	-	-
very low	-	-	-	-	-	-	-	-	-	-
SURFACE WATER										
Source: Perennial	11	4	4	4	23					
Temporary	18	15	8	4	45					
None	-	1	-	-	1					
Rating: high	-	-	-	-	-	19	20	12	8	59
medium/high	-	-	-	-	-	19	-	-	-	59
medium	18	8	8	5	39	29	-	-	-	69
low/medium	29	17	12	7	65	-	-	-	-	-
low	-	20	-	8	69	-	-	-	-	-
very low	-	-	-	-	-	-	-	-	-	-

Note: 1) Alluvial sediments are included only for sub-locations where sediments cover a significant area.
2) The numbers for rating are cumulative and indicate e.g. in Lorroki Division that 18 sub-locations have ranking of at least medium availability and 29 (all) sub-locations have ranking of at least low to medium availability.

The following conclusions may be drawn from the table:

- groundwater availability and quality is best in Lorroki Division
- groundwater availability is poor in both Wamba and Waso Divisions and is mainly from shallow, sandy sediments in laggas
- surface water availability is best in Lorroki Division (highest rainfall)
- perennial surface water availability is poor throughout the District with only 33% of sub-locations having any perennial surface water, and
- the chemical quality of surface water is usually better than that of groundwater, however, from observation, surface water is often contaminated bacteriologically.

2.3 Water Resources Compared to Water Demand

Future water demand must be met by existing supplies supplemented by development of local resources. Using Scenario 2 (medium projection) demand, the required level of development of water supplies was estimated. This development is shown in Table 2.3. The table shows the water demand for the two major categories of users as well as the proposed development to meet this demand. The proposed development is based on an assessment of the maximum environmentally sustainable land use, and the last columns of the table show the existing supply capacity.

Table 2.3 Proposed Water Development (m^3/day)

		Water Demand (Scenario 2)			Proposed Development						Existing Supply	
					Domestic			Non-Domestic			Domestic	Non-Domestic
		Domestic	Non-Domestic	Total	Gw	Rw/Sw	Sp	Gw	Rw/Sw	Sp	Sw	Sw
1988	Baragoi Division	600	280	880	508	0	0	151	109	0	92	20
	Lorroki Division	2,532	861	3,393	1,267	0	10	177	160	0	1,255	524
	Wamba Division	404	67	471	284	0	10	48	19	0	110	0
	Waso Division	169	174	343	71	0	0	64	47	0	98	63
	District Total	3,704	1,382	5,086	2,220	0	20	440	335	0	1,555	607
1993	Baragoi Division	675	287	962	583	0	0	151	116	0	92	20
	Lorroki Division	3,052	883	3,935	1,786	0	10	192	165	0	1,255	526
	Wamba Division	463	69	532	343	0	10	49	20	0	110	0
	Waso Division	182	179	361	74	0	0	66	48	0	108	65
	District Total	4,372	1,418	5,790	2,786	0	20	458	349	0	1,565	611
2003	Baragoi Division	1,022	301	1,323	910	0	0	158	122	0	112	21
	Lorroki Division	4,993	926	5,919	3,718	0	10	214	181	0	1,265	531
	Wamba Division	792	73	865	682	0	10	52	21	0	110	0
	Waso Division	245	187	432	94	0	0	68	52	0	151	67
	District Total	7,052	1,487	8,539	5,394	0	20	492	376	0	1,638	619

Gw = Groundwater, Rw = Rain Water, Sw = Surface Water, Sp = Spring

The following conclusions can be drawn:

- Domestic demand in rural areas is low and can easily be supplied from groundwater resources. Water quality can be a constraint in some areas.
- Demand from rural centres is not high and can usually be met from resources near the centre. Demand from the few large urban centres (Maralal, Wamba, Sukuta Marmar and Baragoi) is difficult to satisfy and detail planning is required for water supply of these centres.
- Livestock demand exists all year round and is present, due to limitations of range land, in only 32 out of 69 sub-locations. This demand can be supplied through surface water (pans) and groundwater sources (e.g. wells with windmills).

3 PART 2: EXISTING SUPPLY, TECHNOLOGY OPTIONS AND COST

3.1 Existing Water Supply

Water supplies in the District can be divided into two categories:

- protected, which are relatively safe from contamination and should be suitable for drinking, and
- unprotected, the quality of which cannot be assured.

Assessment of existing supplies found that about 70% of the District population relies on unprotected supplies from rivers, dams, pans and wells. The reliability and quality of these sources is generally not satisfactory (see Table 2.2). The results of this assessment imply that an increase in the number and coverage of protected supplies is of high priority.

An inventory of the existing protected supplies in the District was carried out. The results are set out in Appendix 1 of this summary. The schemes were assessed on several indicators for:

- technical capacity against current demand
- service level in terms of coverage of target population
- service level in terms of the reliability of supply, and
- financial performance.

The results of the assessment are:

- a total production capacity of 126 m3/hr meets 17% of 1988 water demand
- the schemes are estimated to serve 29,000 people, about 30% of district population
- the schemes operate on average 80% of the year, with the urban schemes more reliable at 90%
- the average revenue collected as a percentage of operation costs (not including maintenance and staff costs) is 35%, with urban schemes more efficient at 54%

The conclusion from the above assessment is that existing protected sources require significant improvement in virtually all areas of operation.

3.2 Water Supply Development Technologies and Cost

Choice of the technology appropriate to the need depends on several considerations. The most important among them are:

- the type of area in which it will be used which determines the environmental context, quantities required, the availability of maintenance support, and
- the resources available.

Table 3.1 summarises the technologies considered by the study, and their feasibility, by area of use.

Table 3.1 Recommended Technologies for Various Types of Users

Supply Area	Source Development	Water Supply Development 1)	Feasi-bility 2)
Urban Areas	Dug/Drilled wells	Motorized pump, Storage, Distr.	++
	Spring protection	Storage, distribution	+
	Surface Water Intake	Treatment, storage, distrib.	+
	Roof Catchment	Gutters, storage (individual)	+
Rural Centres	Dug/Drilled Well 3)	Windmill, storage	++
	Dug/Drilled Well	Hand pumps	++
	Sub-surface Dam	Dug Well + Hand pump	++
	Spring Protection	Storage	+
	Roof Catchment	Gutters, storage (individual)	+
	Rock Catchment	Storage	+
Rural Institution	Dug/Drilled wells 3)	Hand pumps (small units)	++
	Dug/Drilled well 3)	Windmill + storage (large units)	++
	Sub-surface Dam	Dug Well + Hand pump	++
	Spring protection	Storage	+
	Roof Catchment	Gutters, storage (individual)	+
	Rock Catchment	Storage	+
Dispersed Rural Population	Spring protection	Storage	++
	Rock Catchment	Storage	+
	Dug/Drilled Well 3)	Hand pump	+
	Sub-surface Dam	Dug Well + Hand pump	+
Rural Livestock	Deepening Depressions	-	++
	Dug/Drilled well 4)	Windmill, storage, trough	++
	Dam construction 4)	Fencing, trough	+

1) Development shown in decreasing order of suitability for each type of supply area
2) Feasibility with regards to availability of water resources
3) Dug wells in aquifer, or in storage provided by sub-surface dam
4) May be used for supply of rural population, provided adequate measures are taken to ensure safe water quality

Given that government policy on cost sharing is to be implemented, the costs of supply technologies are of prime importance in choosing a technology option. In order to include this issue in the analysis, a cost effectiveness analysis was undertaken, and the results are presented in Table 3.2.

Detailed cost estimates of water supply technologies are included in Appendix 2.

Table 3.2 Technologies Ranked by Minimum Discounted Total Cost

Ranking Number	Technology	Yield (m^3/day)	Capital Costs (Shs)	Total O&M Costs (Shs)
1	Spring	10	25,000	10,500
2	Dug Well with Handpump	10	187,500	10,500
3	Spring, 35 m3 Storage	35	293,750	627,375
4	Dug Well with Handpump	5	187,500	10,500
5	Spring, Gravity Distribution, 70 m3	70	1,281,250	2,050,125
6	Surface Water, Weir, Gravity Distr.	35	487,500	1,572,375
7	Surface Water, Weir, Gravity Distr.	70	1,150,000	3,181,500
8	Spring, Gravity Distribution, 200 m3	200	4,800,000	6,216,000
9	Borehole with Handpump	10	450,000	73,500
10	Borehole with Motorpump, Distribution	70	1,925,000	3,176,250
11	Dug well with Windmill	35	1,175,000	283,500
12	Pan (5000 m3, 6 months with water)	25	312,500	580,125
13	3 Boreholes with Motorpump, Distrib.	200	6,218,750	10,976,427
14	Borehole with Motorpump, Distribution	35	1,275,000	1,811,250
15	Borehole with Windmill	35	1,425,000	336,000
16	Dam (25000 m3) with Handpump and Trough	50	2,137,500	2,669,625
17	Surface Water, Weir, Distribution	200	7,250,000	16,012,500
18	Borehole with Windmill	20	1,131,250	336,000
19	Borehole with Motorpump, Limited Distr.	20	1,093,750	1,563,240
20	Borehole with handpump	5	450,000	73,500
21	Surface Water, Dam, Distribution	200	13,250,000	17,272,500

Notes:
1. Costs are total costs over a 20 year period.
2. Windmill supply estimated at only 300 days per year.
3. Pan supply estimated at only 180 days per year

The conclusions of the cost effectiveness analysis are:

- The most cost effective systems are generally spring supplies with or without gravity distribution.
- Since springs are not usually available in Samburu, the next most cost effective supplies are dug wells with handpumps, supplemented with subsurface dams where appropriate.
- Surface water weir with gravity distribution is next most effective, but only a few sites are available in the District.
- Boreholes with handpumps are more costly still, but sometimes constitute the only feasible solution when resources are considered. For higher yields windmills and pumps should be considered.

4 PART 3: GUIDELINES AND RECOMMENDATIONS FOR INVESTMENT PACKAGES

4.1 Design of Investment Packages

Packages are assumed to comprise one or more investment project(s). Each project must be designed to suit its circumstances.

Four factors were identified as central to the design of successful investment projects. These were:

- Appropriate technology choice
  in terms of its ability to produce the required quantity and quality, and to avoid adverse impact on the environment; the latter is particularly sensitive as there is insufficient data on the direct and indirect impact of water schemes on the ASAL environment.
- The socio-economic base
  which determines the attitude to participation in the project; this issue is important as nomadic communities of the Samburu are particularly difficult to mobilise and social factors add to the technical difficulties of supplying water to nomads and stock as the communities (or parts thereof) move throughout the year.
- The institutional base
  for design, construction and operation of the investment project, including community consultation during all of these phases.
- The financial base of the project
  including the policy framework, particularly on cost sharing and on district financial autonomy, and the financial systems used.

Each of these considerations effect the economic demand of the people for water on the one hand, and the ability of the MoWD and other bodies to supply it on the other.

The major conclusions from consideration of the above factors are:

- supply of water for livestock must be provided only in areas where any consequent increase in numbers will not degrade the environment
- cost sharing policies with respect to government/donor schemes may need to be flexible depending on the community served; full cost sharing (Capital and O&M costs) may be feasible in urban schemes, but for rural schemes cost sharing may have to be limited to recovery of O&M costs (at least initially)
- even with these limited objectives, the choice of technology must be appropriate to the communities ability and willingness to pay, in particular rural schemes must have minimum O&M costs if they are to be borne by the community
- in order to implement the District Focus policy which gives the District MoWD responsibility for co-ordinating the provision of water to the Samburu communities, several facets of the operation of the Central and District MoWD should change. The most important are set out in section 4.4 below.

4.2 Appraisal of Packages

Based on the above considerations, specific criteria were developed for use in the appraisal of investment projects. These criteria were incorporated in a simple checklist, a version of which, after modification by the District authorities, should be included in the DWDP. Such a checklist will enable a quick assessment of the impact and viability of a proposed project.

The checklist covers the following topics:

- water resources
- land use planning/ environmental impact
- social impact
- institutional/ community participation
- economics/ affordability
- finance.

An example of the full checklist is given in Appendix 3 of the summary.

The result of the assessment in each of these areas (except finance) will indicate, either qualitatively or quantitatively, whether the proposed project is viable. It is suggested that priority for implementation should be given to projects according to their performance against financial cost recovery criteria. Projects which are self-sustaining (that is, recover both capital and O&M costs) will be highest priority.

4.3 Investment Packages

The study sets out a methodology to design investment packages, suitable for establishing the broad outline of donor funded projects. This methodology requires that specific assumptions be made as to the growth scenario and cost sharing policy (and consequent choice of technology). An example of such a package is set out in Appendix 4 for domestic and livestock water supplies in the rural areas. Tables 4.1 and 4.2 summarise the possible rural and urban investment packages respectively. Tentative locations of rural supplies, which are subject to confirmation by feasibility studies, are indicated on Plates 1, 2 and 3.

Table 4.1 Investment Package - Rural Supplies

Supply Area	Supply Development (m3/day)	Number of Units	Capital Costs (Shs)	O & M Costs (Shs)	Costs/Head	
					Capital (Shs/Cap)	O & M (Shs/Cap)
Rural Centre	314	20	15,512,500	5,538,000	3,406	1,216
Rural Institution	208	34	12,237,500	2,047,500		
Rural Area	1119	123	50,543,750	11,094,250	826	181
Rural Domestic	1641	177	78,293,750	18,679,750	1,191	284
Non-domestic	868	65	42,068,750	19,971,000		
Total	2509	242	120,362,500	38,650,750	1,830	588

Note: 1) Technology choice based on recovery of O&M costs only

Table 4.2 Investment Package - Urban Supplies

Urban Centre	2003 Population		Capital Costs	Total [1] O & M Costs	Costs/Head	
	Total	To be Supplied	(Shs)	(Shs)	Capital (Shs/Cap)	O & M [1] (Shs/Cap)
Maralal	36,666	25,145	49,750,000	87,811,416	1,979	3,492
Sukuta Marmar	3,114	3,114	5,131,250	8,402,625	1,648	2,698
Baragoi	7,920[2])	7,920	18,656,250	32,929,281	2,356	4,158
Wamba	10,697	8,698	18,656,250	32,929,281	2,145	3,786

Notes: [1]) O & M costs are total costs over 20-year period
[2]) Includes 1109 rural population

4.4 Institutional Requirements

In order to implement the DWDP in the context of the District Focus policy several institutional strengthening measures are required. These measures will reinforce the actions already undertaken by the MoWD. The two objectives of these measures are:

1) To provide the District MoWD with the systems and resources to carry out its responsibility for co-ordinating the provision of water to communities, and

2) To strengthen the Central MoWD in support activity for the districts and in broader scale planning and policy formulation.

The most important measures required to achieve the first objective are:

- Strengthening of assessment and planning capacity at District level, in turn requiring equipment and training in these subjects

- Strengthening administrative and financial systems along lines already under discussion within the MoWD, specifically the measures below are suggested.
  - District water offices should retain revenue collected as an incentive to better collection and to ease cash flow problems. In the interim, the "appropriations in aid" policy with respect to funding of recurrent expenditure should be reassessed so as to ensure it will not to disadvantage high cost schemes and that it will provide a real incentive to efficient management.
  - Financial systems should be revised to enable effective management and implementation of District Focus and Cost Sharing policies, in particular, full costs and revenues should be brought together in one set of accounts
  - Flexibility in pricing policy, reflecting the different operating costs of water schemes, is also required to effectively implement the national cost sharing policy.

  Additional equipment and training are also required to implement these measures.

- District office staff also require training/support in O&M activity and in catalysing community participation.

The most important measures required to achieve the second objective are:

- Central office staff, in their role as support to the Districts, require better training in higher level skills in the areas of training, water resources planning, O&M, financial systems, community mobilisation, technical design, environmental management and project appraisal, and

- MoWD in general, requires strengthening of the links to other agencies and organisations, both public and private, involved in provision of water supplies.

5 MAJOR ISSUES RAISED BY THE STUDY

The major issues raised by the study are:

- Can the District Water Office achieve the organisational and financial autonomy it requires to effectively implement the District Focus Policy? And will it have the capacity to do so?

- Can the necessary infra-structure be implemented to improve the collection of revenues on water use, to achieve the aim of self sufficiency of water supplies in at least operation and maintenance?

- Will the policy of cost sharing and community participation achieve the expected improvement in water supply conditions?

- Does the District have sufficient capacity to formulate and implement a comprehensive District Water Development Plan, using the present studies prepared by WRAP? And will it be able to update such a Plan in the future?

- How reliable is the projection of water demand as the basis for the planning of water development in respect of the incompleteness and general inaccuracy of basic data?

- Can the District, the Central MoWD and the District Water Office be organised to acquire and co-ordinate external assistance from bi-lateral, multi-lateral and NGO donors for water supply projects?

- Can an administrative framework for co-ordination of water resource management be achieved, encompassing MoWD and other organisations such as the Ministries of ASAL, Health, Social Services, Agriculture and Livestock?

APPENDIX 1

EXISTING WATER SUPPLIES IN SAMBURU DISTRICT

APPENDIX 1

EXISTING WATER SUPPLIES IN SAMBURU DISTRICT

1. Technical Data
2. Operational Data

Appendix 1: Existing Water Supplies in Samburu District: Technical Data

NAME OF SUPPLY	SUB-LOCATION	SOURCE	OWNER	YEAR COMM.	YIELD (SOURCE) (m^3/hr)	PUMP PLANT	INSTALLED CAPACITY (m^3/hr)	STORAGE (m^3)	PIPES (km)	QUALITY SOURCE	TREAT-MENT	1988 POPUL. SERVED	METER CONNC.	NON-METERED CONNC.	KIOSKS	CWP	AREA (km^2)	CATTLE TROUGH /DIP	WORK COND.
LORROKI																			
Maralal	Maralal	Dam	MoWD	1986	-	EP	49	970	43	OP	Full	10,000	347	1	4	1	50	0	1
Suguta Marmar	Suguta Marmar	SP	MoWD	1951	-	DP	(2.8)	50	5.5	OK	No	2,500	8	35	0	0	6	2	3
Bauwa	Lkilorit	BH	MoWD/SH	1985	4	EP	3	22.5	5	OK	No	500	0	-	0	3	16	Dip	2
Poro	Poro	Dam	MoWD/SH	UC	-	DP	-	45	2	OP	No	500	0	-	0	-	8	-	2
Sirata Oirobi	Sirata Oirobi	BH	MoWD	1973	2.2	DP	1.4	22.5	3.5	OK	No	500	19	4	1	1	6.5	-	2
Amaiya	Amaiya	River	MoA/SH	1978	-	Gr	-	0	8	OP	No	175	0	0	0	2	-	0	2
Amaiya	Amaiya	River	Miss	1978	-	HD	-	-	6.5	OP	-	10	0	-	-	1	-	0	1
Kirimun	Kirimun	SP	MoLD/NYS	1960	(20)	DP	-	200	6	OK	No	400	1	6	0	0	-	2	1
Kisima	Mbaringon	Dam	MoWD	UC	-	DP	0.4	100	11.4	OP	Full	700	10	0	0	2	-	-	UC
Longewan	Longewan	BH	SH	1952	2.5	DP	1.8	45	0.4	OK	No	500	0	0	0	1	-	2	3
Lodokojek	Lodokojek	BH	Miss	UC	-	EP	-	-	-	-	No	(200)	0	-	-	-	-	0	1
Barsaloi	Barsaloi	River	Miss	UC	-	-	-	-	-	-	-	(20)	-	-	-	-	-	-	-
Opiroi	Opiroi	SP	School	-	-	Gr	-	2	0.4	OK	No	(150)	-	-	-	1	-	0	2
BARAGOI																			
Baragoi	Baragoi	BH	MoWD	1974	0.9	DP	3	45	3.5	OK	No	3,000	17	0	1	0	12	1	3
Baragoi Sec. Sch.	Baragoi	BH	School	1977	1.73	WM	-	20	1.5	NOK	No	400	0	5	0	2	-	0	2
Marti	Kalele	BH	MoWD	1952	0.68	DP	-	24	2.0	OK	No	500	0	2	2	1	11	1	3
Tuum	Tuum	River	MoWD/SH	1988	16.2	Gr	-	22.5	4	OK	No	500	0	12	0	0	-	0	1
Lesirikan	Lesirikan	BH	MoWD/DDC	UC	5.5	S	3.2	50	0.6	-	No	700	0	0	0	1	2.6	-	3
South Horr	South Horr	River	Miss	-	-	Gr	-	-	-	OK	No	(800)	-	-	-	2	-	0	1
South Horr	South Horr	River	MoWD/SH	UC	746	Gr	-	100	1	OK	Sed	-	100	10	-	10	75	3	UC
Ngoronot	Ngoronot	SP	Miss	-	-	Gr	-	-	-	-	-	(400)	-	-	-	1	-	-	-
WAMBA																			
Wamba	Wamba	SP	MoWD	UC	(1)	Gr	-	200	7.6	OK	No	-	-	3	0	2	15	-	UC
Wamba	Wamba	BH	MoWD	1982	6.8	DP	4.1	No	3	OK	No	(3,000)	0	30	0	1	15	-	3/UC
Lodungokwe	Lpus	BH	MoWD	1978	4.0	DP	2.2	45	4.5	Saline	No	800	17	0	1	0	10	-	2
Loijok	Lerata	BH	MoWD	1974	2.5/4.8	DP	1.5	45	0.1	OK	No	(450)	0	0	0	1	26	0	4
Lerata	Lerata	BH	MoWD	1974	2.27	WM	(1.6)	150	0.1	Saline	No	350	0	0	0	1	11	1	1
Naisunyai	Lerata	Dam	MoWD	1981	-	HP	-	-	-	OP	No	(300)	-	-	-	1	-	1	1
Samburu Lodge	Archer's Post	BH	Priv.	-	-	EP	-	40	3	OK	Cl	150(1500)	0	75	0	0	-	0	1
West Gate	Archer's Post	River	CC	1980	-	PP	-	-	1	OP	Full	111	0	13	0	0	-	0	4
Archer's Post	Archer's Post	SP	MoWD	1986	-	DP	7.5	437	12	OK	Cl	900(3180)	12	3	3	0	28	Dip	1
Serolipi	Serolipi	BH	Police	1971	3.57	DP	-	50	2	NOK	No	500	0	0	0	1	1	0	2

BH = Borehole
SP = Spring
EP = Electrical Pump
DP = Diesel Pump
S = Solar Pump
PP = Petrol Pump
HD = Hydram
Hp = Hand pump
Gr = Gravity

WM = Windmill
CC = County Council
Miss = Mission
SH = Self Help
MoLD = Min. of Live Stock dev.
MoA = Min. of Agriculture
MoWD = Min. of Water Development
NYS = National Youth Service

CWP = Communal Water Points
OP = Organic Pollution
OK = Good Water Quality
NOK = Not Good Quality
Cl = Chlorination
Sed = Sedimentation
UC = Uncommissioned or Under Construction

\- = No data available
0 = nil
( ) = Data not accurate

WORKING CONDITION:
1 = Good
2 = Fair
3 = Poor
4 = Not Working

Appendix 1: Existing Water Supplies in Samburu District: Operational Data

Name of Supply	Sub-Location	Main-tenance Agency	Utilization		Average Walking Distance (Km)	Rates Flat/ Metered	Water Produced (m^3/y)	Water Sold (m^3/y)	Revenue Billed (Year)	Revenue Collected (Year)	Cost of Operation (Shs/Year)	No. of Days Without Water per Year	Source of Information
			House-holds	Live-stock									
Lorroki													
Maralal	Maralal	MoWD	2000	0	0.5	M	190,000	178,000	383,000	(301,500)	429,000	5	'87-'88/Visit
Suguta Marmar	Suguta Marmar	MoWD	500	0	1.2	F	8,064	0	0	0	(17,800)	29	MPND/Visit
Bauwa	Lkilorit	MoWD/SH	100	-	1.5	F	7,160	0	0	0	18,200	60	MPND/Visit
Poro	Poro	MoWD/SH	100	900	1.5	F	9,200	0	0	0	16,000	48	MPND/Visit
Sirata Oirobi	Sirata Oirobi	MoWD	100	80	2.5	M	2,800	2,630	5,400	-	80,000	60	'87-'88/Visit
Amaiya	Amaiya	MoA/SH	35	0	-	-	-	0	0	0	-	-	Visit
Amaiya	Amaiya	Miss	1	0	0.1	-	-	0	0	0	-	-	Visit
Kirimun	Kirimun	MoLD	80	1300	-	-	-	0	0	0	56,400	60	Visit
Kisima	Mbaringon	MoWD	150	0	1.0	M	0	0	0	0	-	UC	Visit
Longewan	Longewan	SH/MoWD	100	2000	2.0	-	-	0	0	0	-	270	Diocese
Lodokojek	Lodokojek	Miss	40	-	-	-	-	-	-	-	-	-	Diocese
Barsaloi	Barsaloi	Miss	1	-	-	-	-	-	-	-	-	-	Diocese
Opiroi	Opiroi	-	40	-	-	-	-	-	-	-	-	-	Visit
Baragoi													
Baragoi	Baragoi	MoWD	600	130	2.8	M	4,117	4,024	12,591	6,800	46,500	60	'85-'86/Visit
Baragoi Sec. Sch.	Baragoi	School	80	0	-	F	-	-	900	900	25,800	120	Visit
Marti	Kalele	MoWD	100	1200	4	F	-	-	0	0	26,500	180	'86-'87/Visit
Tuum	Tuum	MoWD/SH	100	50	3.5	F	-	-	0	0	-	60	Visit
Lesirikan	Lesirikan	DDC	150	50	2	M	-	0	0	0	-	UC	Visit
South Horr	South Horr	Miss	160	0	-	F	-	0	0	0	-	-	Visit
South Horr	South Horr	MoWD/SH	-	-	-	-	-	-	-	-	-	UC	Visit
Ngoronot	Ngoronot	Miss	80	-	-	-	-	-	-	-	-	-	Diocese
Wamba													
Wamba	Wamba	MoWD		0	2.5	F	-	-	0	0	-	-	Visit
Wamba	Wamba	MoWD	600	0	2.5	F	9,160	0	0	0	78,000	60	MPND/Visit
Lodungokwe	Lpus	MoWD	160	100	3.0	M	8,700	-	(2,160)	(3,813)	24,500	60	'85-'86/Visit
Loijok	Lerata	MoWD	60	1100	3.0	F	9,900	-	0	0	26,000	365	MPND
Lerata	Lerata	MoWD	80	1000	3.5	-	10,200	-	-	-	18,700	(30)	MPND/Visit
Naisunyai	Lerata	MoWD	60	(1000)	5	-	-		-	-	-	-	Visit
Samburu Lodge	Archer's Post	Private	75*	0	0	-	-	-	-	-	-	0	Visit
West Gate	Archer's Post	CC	25	0	-	-	-	-	-	-	22,000	365	Visit
Archer's Post	Archer's Post	MoWD	180	0	-	M	22,000	20,750	42,000	(33,000)	80,000	60	'88-'89/Visit
Serolipi	Serolipi	Police	100	0	-	-	-		-	-	(20,000)	-	Visit

KEY

MoWD = Ministry of Water
SH = Self Help
DDC = District Development Committee
CC = County Council
MoA = Ministry of Agriculture
Miss = Missionary
MoLD = Ministry of Livestock Development
* = Cottages

\- = No data available
( ) = Data not accurate

Source of Information:

'87-'88 = Data from Operational Chart
MPND = Data from Inventory Ministry of Planning & National Dev.
Visit = Data Collected from Field visit

APPENDIX 2

COST OF WATER SUPPLY DEVELOPMENT

APPENDIX 2

COST OF WATER SUPPLY DEVELOPMENT

1. Overview of Domestic Water Supply
2. Overview of Combined Domestic - Livestock and Livestock Water Supply

Appendix 2: Cost of Water Supply Development: Overview of Domestic Water Supply

Supply Area	Source Development	Water Supply Development	Initial Capital Cost (Shs)			Annual O&M Cost (Shs)	Capital Cost/ Capita (Shs)	Annual Cost/ Capita (Shs)	Yield	Unit Costs (Shs/m³)		
			Source Develop.	Supply Develop.	Total Cost					Discount rate		
									(m³/d)	5%	10%	15%
Domestic Supply												
Urban Area 5,000 pop. (200 m³/d)	Boreholes (Volcanic:3) (Basement:5)	Borehole pump, storage, chlorination, distribution	1,406,250	4,362,500	5,768,750	522,687	1,150	105	200	13.3	15.6	18.2
	Spring protection	Storage, chlorination, distribution	625,000	4,175,000	4,800,000	296,000	960	60	200	8.9	11.0	13.1
	Surface Water Intake (weir)	Transmission, treatment, storage, distribution	250,000	6,000,000	6,250,000	762,500	1,250	155	200	17.3	19.8	22.5
	Surface Water Intake (Dam)	Transmission, treatment, storage, distribution	6,250,000	6,000,000	12,250,000	822,500	2,450	165	200	24.2	29.3	34.7
Rural Centre 500 pop. (20 m³/d)	Borehole	Windmill, storage, limited distribution	312,500	818,750	1,131,250	16,000	2,265	32	20	16.7	22.5	28.6
	Borehole	Pump, storage, limited distribution	312,500	531,250	843,750	74,440	1,690	150	20	20.0	23.3	26.8
	Dug wells (3 no)	Handpumps (3 no)	112,500	225,000	337,500	25,500	675	51	20	7.8	9.1	10.5
	Spring protection	Storage, limited distrib.	25,000	185,000	210,000	28,200	420	56	20	6.0	6.9	7.8
	Surface Water Intake (weir)	Storage, Chlorination, limited distribution	125,000	275,000	400,000	38,000	1,865	76	20	9.3	11.0	12.8
	Individual Roof Catchment	Gutters, storage	-	-	-	-	-	-	-	-	-	-
	Rock Catchment	Storage, limited distrib.	-	-	-	-	-	-	-	-	-	-
Rural Institution 200 pop. (10 m³/d)	Dug Well	Handpump	37,500	75,000	112,500	500	565	2.5	10	3.3	4.1	5.0
	Borehole	Handpump	312,500	62,500	375,000	3,500	1,875	17.5	10	9.5	12.5	15.8
	Spring protection	Storage, one outlet	25,000	-	25,000	500	125	2.5	10	0.6	0.9	1.1
	Roof Catchment	Gutters, storage	-	-	-	-	-	-	-	-	-	-
	Rock Catchment	Storage	-	-	-	-	-	-	-	-	-	-
Dispersed Rural Pop. 100 pop. (5 m³/d)	Spring protection	One outlet	25,000	-	25,000	500	250	5	5	1.3	1.7	2.2
	Dug well	Hand pump	37,500	75,000	112,500	500	1,125	5	5	6.6	8.3	10.1
	Borehole	Hand pump	312,500	62,500	375,000	3,500	3,750	35	5	18.9	25.0	31.5

Price level: 1988

Appendix 2: Cost of Water Supply Development: Overview of Combined Domestic - Livestock and Livestock Water Supply

Supply Area	Source Development	Water Supply Development	Initial Capital Cost (Shs)			Annual O&M Cost (Shs)	Capital Cost/ Capita (Shs)	Annual Cost/ Capita (Shs)	Yield	Unit Costs (Shs/m^3)		
			Source Develop.	Supply Develop.	Total Cost					Discount rate		
									(m^3/d)	5%	10%	15%
Combined Domestic - Livestock Supply												
Rural Centre 500 pop. 1000 L.U ($70\ m^3$/d)	Spring Protection	Storage, limited distrib.	62,500	1,218,750	1,281,250	97,625	2,560	195	70	7.5	9.1	10.7
	Surface Water Intake (Weir)	Storage, chlorination, Limited distribution	150,000	1,000,000	1,150,000	151,500	2,300	303	70	9.3	10.7	12.1
	Borehole	Pump, storage, limited distribution	468,750	1,156,250	1,625,000	151,250	3,250	300	70	11.1	12.9	14.9
Rural Centre 200 pop. 500 L.U ($35\ m^3$/d)	Spring Protection	Storage, cwp, trough	25,000	268,750	293,750	29,875	1,470	150	35	4.0	4.8	5.5
	Dug Wells (5 no)	Handpumps (5 no.)	187,500	375,000	562,500	26,500	2,815	135	35	6.1	7.4	8.7
	Surface Water Intake (Weir)	Storage, chlorination, Limited distribution	150,000	327,500	487,500	74,875	2,440	375	35	8.7	9.9	11.1
	Dug well	Windmill, storage, cwp, trough	37,500	1,137,500	1,175,000	13,500	5,875	65	35	9.6	13.0	16.7
	Borehole	Pump, storage, cwp, trough	312,500	712,500	1,025,000	110,250	5,125	550	35	15.3	17.6	20.1
	Borehole	Windmill, Storage, cwp, trough	312,500	1,112,500	1,425,000	16,000	7,125	80	35	11.6	15.8	20.2
Livestock Supply												
Rural Livestock 500 L.U ($25\ m^3$/d)	Pan (5000 m^3)	-	312,500	-	312,500	27,625	-	-	25[1]	11.3	13.4	15.7
	Borehole	Windmill, storage, trough	312,500	793,750	1,106,250	16,000	-	-	25	13.1	17.6	22.5
Rural Livestock 1000 L.U ($50\ m^3$/d)	Borehole	Windmill, storage, trough	312,500	1,075,000	1,387,500	16,000	-	-	50	7.9	10.8	13.8
	Dam (25,000 m^3)	Fencing, trough, handpump	1,562,500	500,000	2,062,500	127,125	-	-	50	15.5	19.0	22.7

[1] Pan contains water on average 6 months/year.

Price level:1988

APPENDIX 3

EXAMPLE OF CHECKLIST FOR ASSESSMENT

OF IMPACT AND VIABILITY OF PROPOSED PROJECTS

APPENDIX 3: EXAMPLE OF CHECKLIST FOR ASSESSMENT OF IMPACT AND VIABILITY OF PROPOSED PROJECTS

a) Water Resources

The basis for these criteria is the Water Resources Assessment Study by WRAP. This study contains all the existing basic data on the availability and quality of both surfacewater and groundwater. The basic questions to be answered are:

Can the required present and future water supply be met from the indicated water source throughout the year?

e.g if a surfacewater reservoir is proposed, how will siltation affect its capacity?
or if a groundwater source is proposed, how will groundwater levels develop in future.

Can the required water supply be maintained during drought periods?

Does the proposed technology make optimum use of the available water source?

e.g if a groundwater source is proposed, does the pump capacity match the well yield?

Is there an alternative water source and has it been considered? Maybe to serve as alternative if the first source is out of order?

i.e a system using two different sources is more reliable (e.g Wamba water supply)

Is the quality of the water suitable for its intended use?

e.g for livestock water supply quality criteria are less than for domestic water supply

b) Land Use/Environmental Impact

The basis for these criteria are the District Development Plan and documents on land resources, such as the Livestock Rangeland Management Handbook. The basic questions to be answered are:

Does the project supply water to activities consistent with the District Development Plan?

e.g is water for livestock provided near settlements in order to encourage nomads to settle?

Are the facilities/plant of the project consistent with the existing land carrying capacity?

e.g. can the rangeland sustain the number of livestock which will be attracted by the new water supply?

Are the facilities/plant of the project consistent with plans for urban/rural development?

e.g the proposed siting of the reservoir will not sterilise mineral deposits, or block the most appropriate route for an upgraded access road?

Will the facilities/plant of the project, or their construction, have an adverse environmental impact?

The major forms of impact to be considered in the Samburu District are:

- *the degradation of vegetation cover and soils from overgrazing, in particular the extensive damage occurring around water points in droughts*
- *the impact of dams which intercept surface water causing downstream wet lands to dry up - this may have a significant impact on some wildlife*
- *heavy pumping of ground water may cause springs to dry up, affecting animals and sometimes people.*

APPENDIX 3: EXAMPLE OF CHECKLIST FOR ASSESSMENT OF IMPACT AND VIABILITY OF PROPOSED PROJECTS

c) Social Impact

It is difficult to discuss appropriate criteria for social assessment in the absence of a socio-economic study of the district which is designed to develop such criteria. However, some significant issues have been raised in consultation with local people. These are:

Where traditional groups are affected by the scheme, does the proposed scheme work within the cultural context of those groups?

> *This issue should be balanced against development goals in so far as sub-groups, such as women, within these groups should be given the opportunity to develop their talents*

Does the proposed scheme improve the welfare of the people of the district, particularly lower income groups and/or women?

> *i.e. does it provide employment, or does it provide opportunities for people to earn income from conditions created by the scheme?*

d) Institutional/Community Participation Issues

- Institutions

The major tasks which must be addressed with respect to institutional issues are design, construction and operation/maintenance of the systems. The organisation, or grouping of organisations must be able to carry out these tasks effectively. One organisation should be in charge of co-ordinating these tasks, and, preferably, this organisation should be that which will operate and maintain the project. The key issues are thus:

Which organisation is co-ordinating the project?

Does it have a realistic project organisational structure and implementation schedule?

Which organisations have responsibility for design, construction and operation of the schemes?

Are skills and financial resources available for each of these organisations to undertake their tasks?

If not, who is to supply training/funds to achieve the required levels of performance?

Are there written agreements with the co-ordinating organisation to support the above statements?

- Community Participation

Community participation can occur in any of the above tasks. In small scale water supply projects, it is likely that it will occur in all of these tasks. The organisation of this participation is thus a key element in the successful implementation of the project. The main issues involved are:

Are the leaders of the community organisation representative of the community?

- *i.e are the ones promising resource inputs capable of organising the delivery of those inputs?*

Can they deliver the promised labour and money inputs to the project on time?

- *i.e does the community have the resources?*

Can the community organisation effectively carry out the liaison activities that are required to implement the project?

- *e.g with government, contractors etc.*

APPENDIX 3: EXAMPLE OF CHECKLIST FOR ASSESSMENT OF IMPACT AND VIABILITY OF PROPOSED PROJECTS

Is the organisation recognised by the local government agencies and will/can they provide the organisational and logistic support required?

e) Economic Issues

The methodology required to undertake an economic assessment of the project is set out in Paragraph 5.2 above. For small scale projects which are to be implemented and paid for by the community, it may be assumed that the economic benefit is proven by the level of commitment shown. Where substantial levels of government or donor funds are to be used, a feasibility study of the project should include an assessment of economic viability, and the average/indicative values used in the above analysis should be replaced with those applicable to the specific project.

f) Affordability Issues

Based on the above analysis, the issue of affordability can be addressed. Particularly with respect to water supplies for the partly nomadic peoples, the issues of affordability and willingness to pay are complex, and bound up with slowly changing traditional beliefs and priorities. If the community is to implement and pay for the water scheme, there is little need to assess willingness to pay. Only confirmation of this must be obtained in feasibility studies. Where government and/or donor involvement is envisaged, the feasibility studies must address this issue in some detail.

In the latter case, the main consideration is the level of cost sharing required by the government or donor agency. This will determine the fee or tariff set in the scheme.
General guidelines which are likely to be adopted require full cost recovery in urban schemes, and, outside urban areas, recovery of operation and maintenance costs. The basic questions are:

Does the sum involved in cost recovery constitute more than 5% of the income of, say, the poorest 20% of the population?

- *if so, use another technology or review level of cost sharing*

If not, what is the community attitude to paying this amount of money?

- *if negative, as it often is, then additional questions are required*

Is there an acceptable alternative source and what is the cost?

- *if there is no alternative, or if it is more expensive than the proposed scheme, then there is a good prospect of achieving a sufficient level of willingness to pay given adequate institutional systems and political support*

- *if there is an alternative which is acceptable to the people, even if the water is technically inferior, another technology should be considered, or the level of cost recovery should be reviewed.*

g) Financial Issues

The key financial issue is the sustainability of the project. With the above analysis complete, and concurrently with the determination of affordability, it is possible to project likely demand for (see Paragraphs 4.3 and 5.2), and the costs of, the scheme over time. The feasibility study must identify the sources of funds for design, construction and operation/maintenance. The projection of the expenditure of these funds must be realistic. A basic cash flow analysis can then be carried out to identify potential liquidity problems, and measures developed to overcome them. The financial return on the project can also be calculated.

Financial systems for revenue collection and recording financial flows (simple records of costs and receipts) have been developed, and could be applied to even the smallest schemes. For larger schemes, simple procedures for capital budgeting and funding of preventative maintenance schemes could be developed based on experience in some NGO projects. These types of procedures will take some time to establish, however.

APPENDIX 3: EXAMPLE OF CHECKLIST FOR ASSESSMENT OF IMPACT AND VIABILITY OF PROPOSED PROJECTS

The key criteria are thus:

Does the cash flow show that expenditures are covered by revenues through the life of the project?

Are procedures for revenue collection and monitoring of revenues and expenditures described and realistic?

APPENDIX 4

COST ESTIMATE INVESTMENT PACKAGE - RURAL WATER SUPPLIES

APPENDIX 4

COST ESTIMATE INVESTMENT PACKAGE - RURAL WATER SUPPLIES

based on:

- Growth Rates Scenario 2
- Water Demand Year 2003
- Cost Recovery of O & M Costs

BARAGOI DIVISION

LORROKI DIVISION

WAMBA DIVISION

WASO DIVISION

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

BARAGOI DIVISION — Rural Area — INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 — Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	Supply Development New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	Estimated Coverage Rural Population New
Nyiro	South Horr	Rural Centre	60	60	0	-		0	0	845	
		Rural Institution	-	-	0	-		0	0		
		Rural Area	18	-	18	3	Dug Well with Handpump	562,500	31,500		1120
		Non-domestic	12	12	0	-		0	0		
Nyiro	Tuum	Rural Centre	23	16	7	1	Dug Well with Handpump	187,500	10,500	250	
		Rural Institution	-	-	0	-		0	0		
		Rural Area	5	-	5	1	Dug Well with Handpump	187,500	10,500		333
		Non-domestic	0	0	0	-		0	0		
Nyiro	Parkati	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	7	-	7	2	Dug Well with Handpump	375,000	21,000		610
		Non-domestic	0	-	0	-		0	0		
Nyiro	Uaso Rongai	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	9	-	9	2	Dug Well with Handpump	375,000	21,000		608
		Non-domestic	29	0	29	1	Pan (5000 m3)	312,500	580,125		
						1	Dug Well with Windmill	1,175,000	283,500		
Kawop	Losurukoi	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	13	-	13	3	Dug Well with Handpump	562,500	31,500		1083
		Non-domestic	42	0	42	1	Pan (5000 m3)	312,500	580,125		
						1	Borehole with Windmill	1,425,000	336,000		
Kawop	Lonyangaten	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-			0		
		Rural Area	37	-	37	1	Dug Well with Windmill	1,175,000	283,500		2857
						2	Dug Well with Handpump	375,000	21,000		
		Non-domestic	8	0	8	1	Borehole with Handpump	450,000	73,500		
Ndoto	Latakweny	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	32	-	32	1	Borehole with Windmill	1,425,000	336,000		1694
						2	Dug Well with Handpump	375,000	21,000		
		Non-domestic	1	0	1	-		0	0		

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

BARAGOI DIVISION — Rural Area — INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 — Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	Supply Development New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	Estimated Coverage Rural Population New
Ndoto	Lesirikan	Rural Centre	27	15	12	1	Borehole with Handpump	450,000	73,500	250	94
		Rural Institution	29	-	29	1	Borehole with Windmill	1,425,000	336,000		
		Rural Area	49	-	49	2	Dug Well with Windmill	2,350,000	567,000		2784
						2	Dug Well with Handpump	375,000	21,000		
		Non-domestic	46	0	46	1	Pan (5000 m3)	312,500	580,125		
						1	Dug Well with Windmill	1,175,000	283,500		
Arsim	Illaut	Rural Centre	-	-	0	-		0	0		
		Rural Institution	5	-	5	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	15	-	15	3	Dug Well with Handpump	562,500	31,500		230
		Non-domestic	3	0	3	-		0	0		
Arsim	Arsim	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	7	-	7	2	Dug Well with Handpump	375,000	21,000		368
		Non-domestic	9	0	9	1	Dug Well with Handpump	187,500	10,500		
Arsim	Nguronit	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	11	11	0	1	Dug Well with Handpump	187,500	10,500	400	168
		Non-domestic	9	9	0	-		0	0		
Nachola	Nachola	Rural Centre	-	-	0	-		0	0		
		Rural Institution	16	-	16	2	Dug Well with Handpump	375,000	21,000		
		Rural Area	17	-	17	1	Dug Well with Windmill	1,175,000	283,500		1281
		Non-domestic	31	0	31	1	Pan (5000 m3)	312,500	580,125		
						1	Dug Well with Windmill	1,175,000	283,500		
Nachola	Terter	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	12	-	12	2	Dug Well with Handpump	375,000	21,000		958
		Non-domestic	7	0	7	1	Dug Well with Handpump	187,500	10,500		
Baragoi	Baragoi	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	13	-	13	-		0	0		
		Non-domestic	1	0	1	-		0	0		
Marti	Kalele	Rural Centre	-	-	0	-		0	0		
		Rural Institution	16	-	16	1	Borehole with Windmill	1,131,250	336,000		
		Rural Area	12	-	12	2	Dug Well with Handpump	375,000	21,000		892
		Non-domestic	32	0	32	1	Pan (5000 m3)	312,500	580,125		
						1	Dug Well with Windmill	1,175,000	283,500		

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

BARAGOI DIVISION | Rural Area | INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 | Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	Supply Development New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	Estimated Coverage Rural Population New
Marti	Lokorkor	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	11	-	11	2	Dug Well with Handpump	375,000	21,000		867
		Non-domestic	27	0	27	1	Pan (5000 m3)	312,500	580,125		
						1	Dug Well with Windmill	1,175,000	283,500		
Marti	Moru-Akiring	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	11	-	11	2	Dug Well with Handpump	375,000	21,000		874
		Non-domestic	0	0	0	-		0	0		
Elbarta	Marti	Rural Centre	20	10	10	1	Borehole with Windmill	1,131,250	336,000	100	99
		Rural Institution	-	-	0	-		0	0		
		Rural Area	14	-	14	2	Dug Well with Handpump	375,000	21,000	100	800
		Non-domestic	34	0	34	1	Pan (5000 m3)	312,500	580,125		
						1	Dug Well with Windmill	1,175,000	283,500		
Elbarta	Ngilai	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	6	-	6	1	Dug Well with Handpump	187,500	10,500		404
		Non-domestic	5	0	5	1	Dug Well with Handpump	187,500	10,500		
Elbarta	Masikita	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	-		0	0		
		Rural Area	14	-	14	3	Dug Well with Handpump	562,500	31,500		837
		Non-domestic	5	-	5	1	Dug Well with Handpump	187,500	10,500		
BARAGOI DIVISION		Total Rural Supply	515	112	403	55		18,887,500	3,034,500	1945	18961
		Total Non-domestic	301	21	280	19		11,862,500	6,213,375	0	0
		Total	816	133	683	74		30,750,000	9,247,875	1945	18961

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

LORROKI DIVISION | Rural Area | INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 | Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	Supply Development New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	Estimated Coverage Rural Population New
Poro	Siambu	Rural Centre	33	?	33	1	Dam,pumped supply (in constr.)	500,000	1,800,000	250	350
		Rural Institution	-	-	0	-		0	0		
		Rural Area	8	-	8	2	Dug Well with Handpump	375,000	21,000		530
		Non-domestic	-	-	0	-		0	0		
Poro	Seketet	Rural Centre	-	-	0	-		0	0		
		Rural Institution	2	-	2	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	10	-	10	2	Dug Well with Handpump	375,000	21,000		457
		Non-domestic	32	32	0	-		0	0		
Poro	Sirata Oirobi	Rural Centre	-	-	0	-		0	0		
		Rural Institution	14	-	14	-		0	0		
		Rural Area	30	10	20	1	Borehole with Windmill	1,131,250	336,000	300	615
		Non-domestic	25	25	0	-		0	0		
Poro	Nkejemueny	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	6	-	6	1	Dug Well with Handpump	187,500	10,500		294
		Non-domestic	20	20	0	-		0	0		
Angata Nanyukie	Angata Nanyukie	Rural Centre	-	-	0	-		0	0		
		Rural Institution	10	-	10	2	Dug Well with Handpump	375,000	21,000		
		Rural Area	27	-	27	1	Dug Well with Windmill	1,175,000	283,500		1171
		Non-domestic	3	3	0	-		0	0		
Angata Nanyukie	Loibashai	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	6	-	6	1	Dug Well with Handpump	187,500	10,500		304
		Non-domestic	10	10	0	-		0	0		
Angata Nanyukie	Barsaloi	Rural Centre	31	-	31	1	Dug Well with Windmill	1,175,000	283,500		583
		Rural Institution	-	-	0	-		0	0		
		Rural Area	4	-	4	1	Dug Well with Handpump	187,500	10,500		216
		Non-domestic	5	5	0	-		0	0		
Opiroi	Opiroi	Rural Centre	45	-	10	1	Spring supply	25,000	10,500		761
				-	35	1	Borehole with Windmill	1,425,000	336,000		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	29	-	29	1	Borehole with Windmill	1,425,000	336,000		1546
		Non-domestic	-	0	0	-		0	0		

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

LORROKI DIVISION | Rural Area | INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 | Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	Supply Development New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	Estimated Coverage Rural Population New
Opiroi	Mabati	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	7	-	7	2	Dug Well with Handpump	375,000	21,000		434
		Non-domestic	-	0	0	-		0	0		
Opiroi	Mbukoi	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	13	-	13	2	Dug Well with Handpump	375,000	21,000		886
		Non-domestic	1	0	1	1	Dug Well with Handpump	187,500	10,500		
Loosuk	Malaso	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	13	-	13	2	Dug Well with Handpump	375,000	21,000		718
		Non-domestic	57	25	32	1	Pan (5000 m3)	312,500	580,125		
						1	Dug Well with Windmill	1,175,000	283,500		
Loosuk	Tinga	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	19	-	19	1	Borehole with Windmill	1,131,250	336,000		1094
		Non-domestic	48	25	23	1	Dug Well with Windmill	1,175,000	283,500		
						1	Pan (5000 m3)	312,500	580,125		
Loosuk	Loosuk	Rural Centre	48	-	48	2	Borehole with Windmill	2,850,000	672,000		494
		Rural Institution	-	-	0	-		0	0		
		Rural Area	19	-	19	1	Borehole with Windmill	1,131,250	336,000		439
		Non-domestic	59	50	9	-		0	0		
Maralal	Ledero	Rural Centre	-	-	0	-		0	0		
		Rural Institution	8	-	8	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	35	-	35	5	Dug Well with Handpump	937,500	52,500		1258
		Non-domestic	-	0	0	-		0	0		
Maralal	Township	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	44	-	44	2	Dug Well with Handpump	375,000	21,000		1841
						1	Borehole with Windmill	1,425,000	336,000		
		Non-domestic	-	0	0	-		0	0		
Maralal	Lpartuk	Rural Centre	-	-	0	-		0	0		
		Rural Institution	5	-	5	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	44	-	44	2	Dug Well with Handpump	375,000	21,000		1989
						1	Borehole with Windmill	1,425,000	336,000		
		Non-domestic	-	0	0	-		0	0		

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

LORROKI DIVISION | Rural Area | INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 | Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	Supply Development New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	Estimated Coverage Rural Population New
Sukuta Marmar	Lolmolok	Rural Centre	-	-	0	-		0	0		
		Rural Institution	3	-	3	1	Borehole with Handpump	450,000	73,500		
		Rural Area	30	-	30	1	Borehole with Motorpump	1,275,000	1,811,250		1488
		Non-domestic	85	25	60	1	Pan (5000 m3)	312,500	580,125		
						2	Borehole with Windmill	2,850,000	672,000		
Sukuta Marmar	Amaiya	Rural Centre	20	10	10	2	Dug Well with Handpump	375,000	21,000	125	125
		Rural Institution	-	-	0	-		0	0		
		Rural Area	6	-	6	1	Dug Well with Handpump	187,500	10,500		330
		Non-domestic	-	0	0	-		0	0		
Sukuta Marmar	Longewan	Rural Centre	-	-	0	-		0	0		
		Rural Institution	9	-	9	-		0	0		
		Rural Area	12	-	12	1	Borehole with Windmill	1,131,250	336,000		512
		Non-domestic	70	25	45	1	Pan (5000 m3)	312,500	580,125		
						2	Borehole with Windmill	2,262,500	672,000		
Sukuta Marmar	Logorate	Rural Centre	-	-	0	-		0	0		
		Rural Institution	2	-	2	-		0	0		
		Rural Area	21	-	21	1	Borehole with Windmill	1,131,250	336,000		977
		Non-domestic	66	25	41	1	Pan (5000 m3)	312,500	580,125		
						2	Borehole with Windmill	2,262,500	672,000		
Sukuta Marmar	Sukuta Marmar	Rural Centre	-	-	0			0	0		
		Rural Institution	-	-	0			0	0		
		Rural Area	49	-	49	2	Borehole with Windmill	2,850,000	672,000		2255
		Non-domestic	94	40	54	1	Pan (5000 m3)	312,500	580,125		
						2	Borehole with Windmill	2,850,000	672,000		
Kisima	Nauneri	Rural Centre	-	-	0			0	0		
		Rural Institution	2	-	2	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	31	-	31	1	Dug Well with Windmill	1,175,000	283,500		836
		Non-domestic	67	25	42	1	Pan (5000 m3)	312,500	580,125		
						2	Borehole with Windmill	2,262,500	672,000		
Kisima	Lmisigiyoi	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	14	-	14	1	Dug Well with Windmill	1,175,000	283,500		644
		Non-domestic	26	26	0	-		0	0		
Kisima	Lkilorit	Rural Centre	-	-	0	-		0	0		
		Rural Institution	26	-	26	1	Borehole with Windmill	1,425,000	336,000		
		Rural Area	36	20	16	1	Borehole with Windmill	1,131,250	336,000	500	1104
		Non-domestic	49	40	9	-		0	0		

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

LORROKI DIVISION — Rural Area — INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 — Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	Supply Development New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	Estimated Coverage Rural Population New
Kisima	Mbaringon	Rural Centre	20	5	15	1	Borehole with Windmill	1,131,250	336,000	200	285
		Rural Institution	-	-	0	-		0	0		
		Rural Area	22	-	22	1	Dug Well with Windmill	1,175,000	283,500		984
		Non-domestic	92	40	52	1	Pan (5000 m3)	312,500	580,125		
						2	Borehole with Windmill	2,850,000	672,000		
Lodokejek	Moru	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	21	-	21	1	Dug Well with Windmill	1,175,000	283,500		1068
		Non-domestic	7	0	7	1	Dug Well with Handpump	187,500	10,500		
Lodokejek	Nonkeek	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	19	-	19	1	Dug Well with Windmill	1,175,000	283,500		970
		Non-domestic	-	0	0	-		0	0		
Lodokejek	Lodokejek	Rural Centre	11	-	11	1	Borehole with Windmill	1,131,250	336,000		200
		Rural Institution	2	-	2	-		0	0		
		Rural Area	34	-	34	1	Borehole with Windmill	1,425,000	336,000		1648
		Non-domestic	55	40	15	1	Pan (5000 m3)	312,500	580,125		
						1	Borehole with Windmill	1,131,250	336,000		
Lodokejek	Kirimun	Rural Centre	35	20	15	1	Borehole with Windmill	1,131,250	336,000	250	206
		Rural Institution	2	-	2	-		0	0		
		Rural Area	19	-	19	1	Borehole with Windmill	1,131,250	336,000		927
		Non-domestic	55	50	5	1	Dug Well with Handpump	187,500	10,500		
LORROKI DIVISION		Total Rural Supply	962	65	897	68		42,975,000	12,788,250	1625	30539
		Total Non-domestic	926	531	395	27		22,193,750	10,187,625	0	0
		Total	1888	596	1292	95		65,168,750	22,975,875	1625	30539

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

WAMBA DIVISION | Rural Area | INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 | Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	Supply Development New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	Estimated Coverage Rural Population New
Ngilai	Swari	Rural Centre	-	-	0	-		0	0		
		Rural Institution	24	-	24	1	Borehole with Windmill	1,425,000	336,000		
		Rural Area	25	-	25	1	Borehole with Windmill	1,425,000	336,000		1577
		Non-domestic	3	-	3	1	Dug Well with Handpump	187,500	10,500		
Ngilai	Ngare narok	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	22	-	22	4	Dug Well with Handpump	750,000	42,000		1476
		Non-domestic	42	-	42	1	Dug Well with Windmill	1,175,000	283,500		
						1	Pan (5000 m3)	312,500	580,125		
Ngilai	Ngilai	Rural Centre	15	-	15	3	Dug Well with Handpump	562,500	31,500		369
		Rural Institution	2	-	2	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	22	-	22	3	Dug Well with Handpump	562,500	31,500		1307
						1	Spring Supply	200,000	400,000		
		Non-domestic	8	-	8	1	Dug Well with Handpump	187,500	10,500		
Ngilai	Lkisin	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	12	-	12	2	Dug Well with Handpump	375,000	21,000		700
		Non-domestic	-	-	0	-		0	0		
Ngilai	Ngogoltin	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	15	-	15	3	Dug Well with Handpump	562,500	31,500		866
		Non-domestic	10	-	10	2	Dug Well with Handpump	375,000	21,000		
Lodungokwe	Nkaroni	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	6	-	6	1	Dug Well with Handpump	187,500	10,500		492
		Non-domestic	-	-	0	-		0	0		
Lodungokwe	Lpus	Rural Centre	28	10	18	1	Borehole with Windmill	1,131,250	336,000	200	395
		Rural Institution	2	-	2	-		0	0		
		Rural Area	9	-	9	2	Dug Well with Handpump	375,000	21,000		789
		Non-domestic	-	-	0	-		0	0		
Lodungokwe	Litrimin	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	20	-	20	3	Dug Well with Handpump	562,500	31,500		1333
		Non-domestic	-	-	0	-		0	0		

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

WAMBA DIVISION — Rural Area — INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 — Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	New
Lodungokwe	Sesia	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	11	-	11	2	Dug Well with Handpump	375,000	21,000		821
		Non-domestic	2	-	2	-		0	0		
Wamba	Matakwen	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	4	-	4	1	Dug Well with Handpump	187,500	10,500		325
		Non-domestic	8	-	8	2	Dug Well with Handpump	375,000	21,000		
Wamba	Kolting	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	13	-	13	2	Dug Well with Handpump	375,000	21,000		853
		Non-domestic	-	-	0	-		0	0		
Wamba	Wamba	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	22	-	22	4	Dug Well with Handpump	750,000	42,000		1189
		Non-domestic	-	-	0	-		0	0		
WAMBA DIVISION		Total Rural Supply	257	10	247	40		10,931,250	1,786,000	200	12492
		Total Non-domestic	73	0	73	8		2,612,500	926,625	0	0
		Total	330	10	320	48		13,543,750	2,712,625	200	12492

Appendix 4: Cost Estimate Investment Package - Rural Water Supplies

WASO DIVISION — Rural Area — INVESTMENT PACKAGE 2B : Demand year 2003, Scenario 2 — Cost Recovery: Approach 2

Location	Sub Location	Supply Area	Water Demand (m3/day)	Supply Development Existing (m3/day)	Supply Development New (m3/day)	Number of Units	WATER SUPPLY TECHNOLOGY	CAPITAL COSTS (Shs)	O & M COSTS (Shs)	Estimated Coverage Rural Population Existing	Estimated Coverage Rural Population New
Waso	Lerata	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	5	5	0	-		0	0	350	369
		Non-domestic	-	-	0	-		0	0		
Waso	Lengusaka	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	7	-	7	2	Dug Well with Handpump	375,000	21,000		498
		Non-domestic	10	-	10	2	Dug Well with Handpump	375,000	21,000		
Waso	Remote	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	5	-	5	1	Dug Well with Handpump	187,500	10,500		319
		Non-domestic	4	4	0	-		0	0		
Waso	Ngutuk Ongiron	Rural Centre	20	-	20	1	Dug Well with Windmill	1,175,000	283,500		292
		Rural Institution	1	-	1	1	Dug Well with Handpump	187,500	10,500		
		Rural Area	6	-	6	1	Dug Well with Handpump	187,500	10,500		477
		Non-domestic	23	23	0	-		0	0		
Waso	Archer's Post	Rural Centre	98	98	0	-		0	0	1165	0
		Rural Institution	33	33	0	-		0	0		
		Rural Area	10	-	10	2	Dug Well with Handpump	375,000	21,000		685
		Non-domestic	31	25	6	1	Dug Well with Handpump	187,500	10,500		
Waso	Losesia	Rural Centre	-	-	0	-		0	0		
		Rural Institution	-	-	0	-		0	0		
		Rural Area	4	-	4	1	Dug Well with Handpump	187,500	10,500		344
		Non-domestic	31	15	16	2	Dug Well with Handpump	375,000	21,000		
						1	Pan (5000 m3)	312,500	580,125		
Serolipi	Donyo Uasin	Rural Centre	-	-	0	-		0	0		
		Rural Institution	1	-	1	-		0	0		
		Rural Area	1	-	1	1	Dug Well with Handpump	187,500	10,500		118
		Non-domestic	23	-	23	1	Dug Well with Windmill	1,175,000	283,500		
						1	Pan (5000 m3)	312,500	580,125		
Serolipi	Serolipi	Rural Centre	39	15	24	1	Borehole with Windmill	1,131,250	336,000	200	301
		Rural Institution	9	-	9	1	Borehole with Windmill	1,131,250	336,000		
		Rural Area	5	-	5	1	Dug Well with Handpump	187,500	10,500		363
		Non-domestic	65	-	65	2	Dug Well with Windmill	2,350,000	567,000		
						1	Pan (5000 m3)	312,500	580,125		
WASO DIVISION		Total Rural Supply	245	151	94	14		5,500,000	1,071,000	1715	3766
		Total Non-domestic	187	67	120	11		5,400,000	2,643,375	0	0
		Total	432	218	214	25		10,900,000	3,714,375	1715	3766