Working Paper

PARTICIPATORY APPRAISAL OF RIVER WATER SITUATION:

METHODOLOGICAL ISSUES

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TABLE OF CONTENTS

ABSTRACT IV

1. INTRODUCTION 5

2. CHALLENGES IN RIVER WATER MANAGEMENT 8

3. OVERVIEW OF RIVER WATER ABSTRACTION 10

3.1 USES TO WHICH WATER IS PUT FOR ABSTRACTIONS POINTS OF THE TARGET AREA 10
3.2 ILLEGAL ABSTRACTION OF RIVER WATER 17
3.3 TRENDS AND TEMPORAL VARIATIONS 19

4. STRUCTURE OF THE PARTICIPATORY APPRAISAL OF RIVER WATER SITUATION 19

4.1 RIVER WATER ABSTRACTIONS MONITORING CAMPAIGNS 19
4.2 INFORMATION SHARING WITH WATER USER ASSOCIATIONS 20
4.3 INFORMATION SHARING WITH THE WATER DEPARTMENT 21

5. CONCLUSIONS AND RECOMMENDATIONS 21

LIST OF ACRONYMS AND ABBREVIATIONS

NRM^3 – Natural Resources Monitoring, Modelling and Management

WUA – Water Users Associations

RWUA –River Water Users Associations

ABSTRACT

The Ewaso Ngiro River Basin, is characterized by a rapid highland to lowland climatic change with the vast parts being a semi-arid to an arid environment. During the dry season, water demand is much higher than the supply creating a large deficit and conflict situations. Most people rely on surface water sources and much more so river water sources. The increasing importance of irrigated farming has led to overexploitation of the perennial rivers mainly in the upper catchment and hence causing profound effects on downstream users due to reduced water availability. To contain this demand-supply imbalance, an improvement of water management is needed. This requires that an efficient appraisal and evaluation of river water situation be undertaken in line with management information requirements for a system having high temporal variability.

This paper aims at highlighting the participatory appraisal of river water situation method that is being used by NRM3 and the contribution this has in water resources management improvement.

Key words: Water management, Ewaso Ngiro North Basin, Water Users Associations, Kenya, Local institutions, Water Resources management.

1. INTRODUCTION

1.1 Background

Due to the population growth in the Ewaso Ngiro basin and the associated pressure on natural resources such as soil, water and vegetation, conflicts in resource use have already been noted. Most parts of this basin lie within a semi-arid to arid fragile environment and this has called for the development of technologies that permit efficient allocation and use of resources for sustainability. This then demands that management information be available when required .

1.2 Location of Target Area

On a wider scale, river water abstractions is being monitored at varying scales within the Upper Ewaso Ngiro Basin. More detailed monitoring is being done on a smaller part of the basin which is referred to as a target are. The target area covers the area of Laikipia East and the Mt. Kenya slopes. Administratively, it is located within Laikipia, Meru, and Nyeri Districts **(Figure 1.1).** It drains the Mt. Kenya and the northern slopes of the Aberdare ranges and is bound between latitudes 36°30" E and 41° E and longitudes 0° 30" S and 4° 30" N. It has an area of 2044 Km^2 which is 13.4% of the upper Ewaso Ngiro basin with an area of 15300 Km^2.

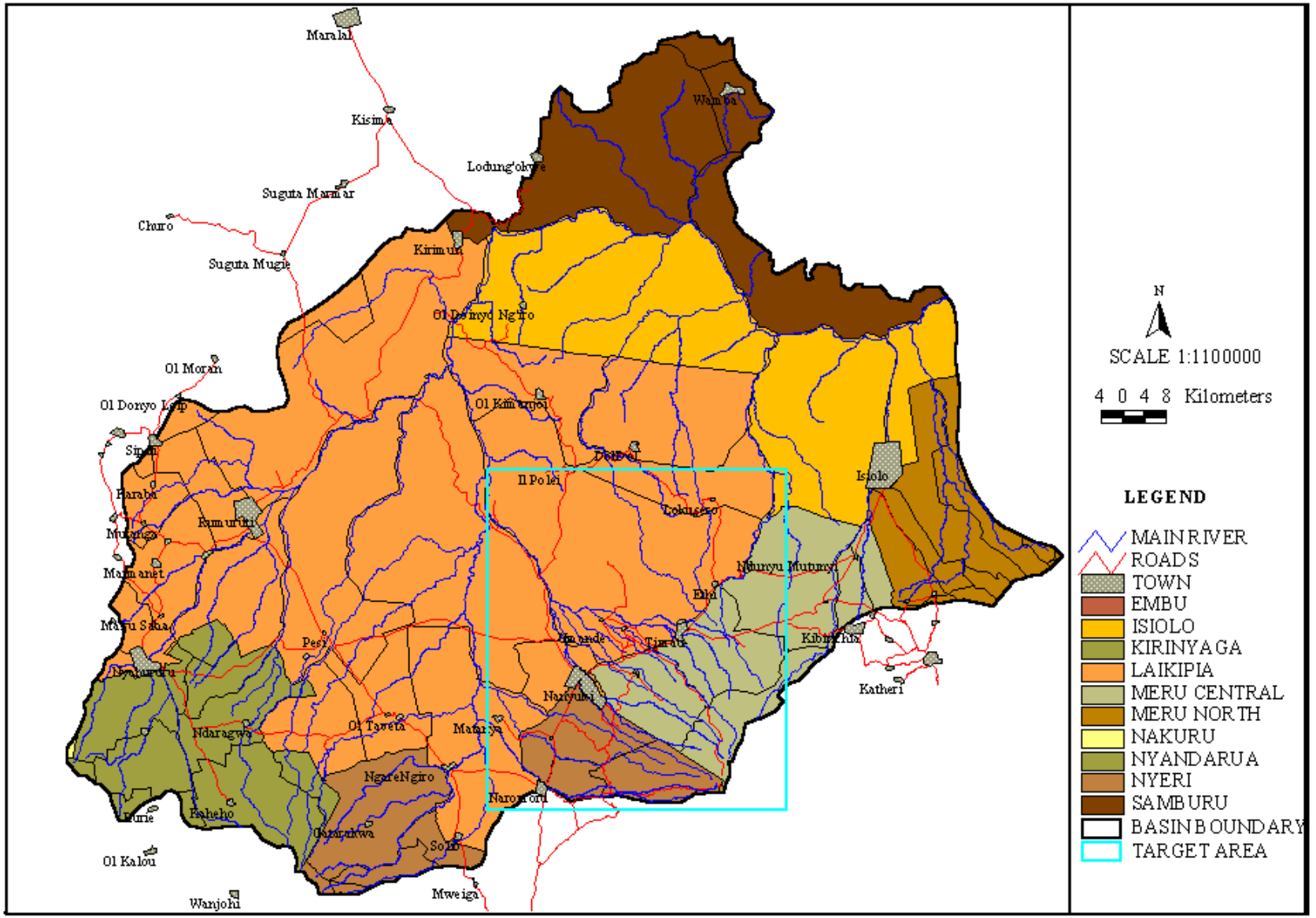
1.3 Water Resources Situations

The basin relies heavily on surface water sources. Domestic, urban and agricultural needs have been met directly from the river as there are no large storage reservoirs, rainfall is low and highly variable and development of ground water sources is expensive (Berger, 1989).

The area is characterized by low amount of rainfall which can be attributed to its location on the leeward side of the highland masses of Mt. Kenya, the Aberdare's and Nyambene ranges. The distribution of this bimodal low rainfall amounts is highly skewed with the highest both in depth and intensity received in the upper forested zone and lower moorland area (mean of 2030 mm). This decreases gradually downwards through the savannah and alpine zones to the semi-arid and arid areas to the East and Northeast (mean of 300 mm). April to June and October to December are wet or rainy seasons with maximas occurring in April and November respectively The rest of the months represent the dry seasons. January and February are the driest and in some places, the hottest months as well. (LRP, 1996). With a big scarcity of water resources, the basin is characterized by an unbalanced distribution of the little available river water with the highland and mid-slope based agriculturists using most of it and leaving very little for the lowland nomadic pastoralists who have limited options left for their survival. The uneven distribution of rainfall has resulted to both low flows leading to insufficient supply during the dry season and high flows which leads to serious damage and loss of water during the wet season (Eastern and Southern Africa Geographical Journal, 1998). Most of the basin has ground water yield

potential of about 50 l/min which remains largely unexploited due to the high cost of ground water development.

Figure 1.1 The Upper Ewaso Ngiro North Basin showing the Target Area



1.4 Water Availability And Demand

As compared to the other basins, Northern Ewaso Ng'iro has the least number of suitable dam sites for run off harvesting as well as having the fewest small surface and sub-surface dams already in existence. Projections of annual water demand by the year 2000 is approximated to be 67350 m^3/day. To satisfy projected demands requires the new measures be taken to ensure that the needs of future generation are met while satisfying current demand.

In the Ewaso basin the main uses of water are domestic, livestock, Industrial and agriculture as well as that required to sustain the natural habitat (ecosystem) including wildlife. The water demand in the basin varies greatly. The upper parts of the basin have a higher demand. The pressure on water resources does not only come from the human population which is higher, but also from agricultural activities. The migration patterns still indicate a continuously increasing human population in the region and this will continue to raise the demand for food. Rapid urbanization and increased industrialization between 1990 to 2010 is expected to substantially increase the demand on the water supply and subsequently affect its quality (MoWD, 1992). This higher demand will have to be met with food produced under irrigation, and/ or food relief. The latter option is very undesirable as it is dehumanizing and not dependable on.

Irrigated farming is more intense in the upper parts of the basin where irrigation water is more readily available. A massive increase in irrigation acreage has been noted especially from 1993. This has resulted from land and labour availability at cheap rates, good climatic conditions and the increased commercial significance of irrigated agriculture. Horticulture has established itself as a stable revenue earning establishment hence resulting in an increasing irrigation water demand.

The basin is a habitat of various game species. This includes the elephant, rhino, buffalo, giraffe, lion, hyena, bongo, ostrich and a variety of aquatic species. With the development of the region for the tourism trade through the protection of wildlife, the water demand for this sector has remained high. There are downstream areas that support sensitive water dependent ecosystems, including wetlands such as the Lorian swamps into which the Ewaso Ngiro drains. This fulfill valuable functions, such as filtering pollutants, and supporting biodiversity to achieve ecological sustenance and hence their water demand should be addressed.

2. CHALLENGES IN RIVER WATER MANAGEMENT

Presently water abstractions monitoring which is a vital process in water resource management receives low priority. The amount of work needed to monitor abstractions is enormous considering logistical difficulties, as many abstractions are located in remote areas having a poor road access system. An efficient, easy to use system for the water resources accounting has not been developed for the basin and hence even where river discharge and abstractions data are available, effective use of this information has not been realized. The water

apportionment and allocation process still relies heavily on the district administrative units and the fact that water resources traverse such boundaries presents drawbacks.

There are many issues at play in the river water abstractions scenario. Furthermore, the situation is so dynamic that a more or less continuous monitoring and evaluation is required. Often, there have been in conflicts among uses and users resulting from allocation and regulation of use issues, a situation that has demanded formulation of various management strategies.

One such strategy has been the formation of river based water associations a concept we have been promoting and working with. These associations have provided a forum for addressing some of the above mentioned management problems as a way for achieving an efficient and economical use of the scarce water resources available as a precondition for sustainable development in this region. We recognize that the full potential of these bodies has not been exploited for the benefit of improved water resources management. We recognize too that through these association's emphasis is placed on the role of the community in self-regulation. This not only reduces the burden of water use policing on the Water Department but also give the communities a guiding role in water resources development.

There is great potential of the members providing very vital information relating to the way water resources are in their areas. Once the responsibility of maintaining updates of this information is given to the communities through this WUA's, we are capable of establishing a very rich source of information and managerial data, which only requires to be supported in terms of compilation and at times some form of analysis. The value of such information when consolidated from different regions and used for wider scale planning cannot be down-played.

Strengthening of partnership with WUA's remains a major challenge in river water management. This has an objective of contributing to the improvement of water resources management and development of water management plans through supporting development and sharing of data and information targeting the following aspects of management:

i). Use of up to-date information on water resources in meetings, analysis and discussions with participation of all the stakeholders and establishing water use efficiency

ii). Attaching importance to water resources monitoring both in terms of quality and quantity.

iii). Improvement of equity of water use especially between upstream and downstream users to control the often observed increased water scarcity as one moves downstream.

iv). Enhancing the wider public awareness on the need and methods of dealing with water related problems and all aspects of water management.

v). Strengthening of self-regulatory measures and mechanisms through strong community participation and a clear understanding of how to go about the monitoring requirements to supplement the Water Department's work.

vi). Creating an understanding of other peoples needs and hence change attitudes and perception of sharing of water resources

vii). Promoting of an integrated approach to water development in the region where the water users play an active role in its conservation and wise use while without ignoring other related developmental and environmental issues..

viii). Utilization of management strategies based on the changing land use systems in their area of jurisdiction and their experiences of the area.

3. OVERVIEW OF RIVER WATER ABSTRACTION

Appendix I gives a list of 398 abstractions systems, their location, type. The layout of the abstraction points within the target area is shown in **Figure 3.1.** This are the abstractions points that are under monitoring within the target area and do not represent all the abstraction points of the entire catchment. Included information includes the method used, system description and river on which the abstraction is

3.1 USES TO WHICH WATER IS PUT FOR ABSTRACTIONS POINTS OF THE TARGET AREA

From the abstractions inventory, 91% was found to be for irrigation purposes. This is an indicator of the importance attached to irrigation in the region with the resultant rapid expansion in the horticultural industry. Methods of irrigation range from inefficient wild flooding for small scale farmers to the efficient drip irrigation for commercial horticulturists as depicted in **Plates 3.1** to **3.4**.

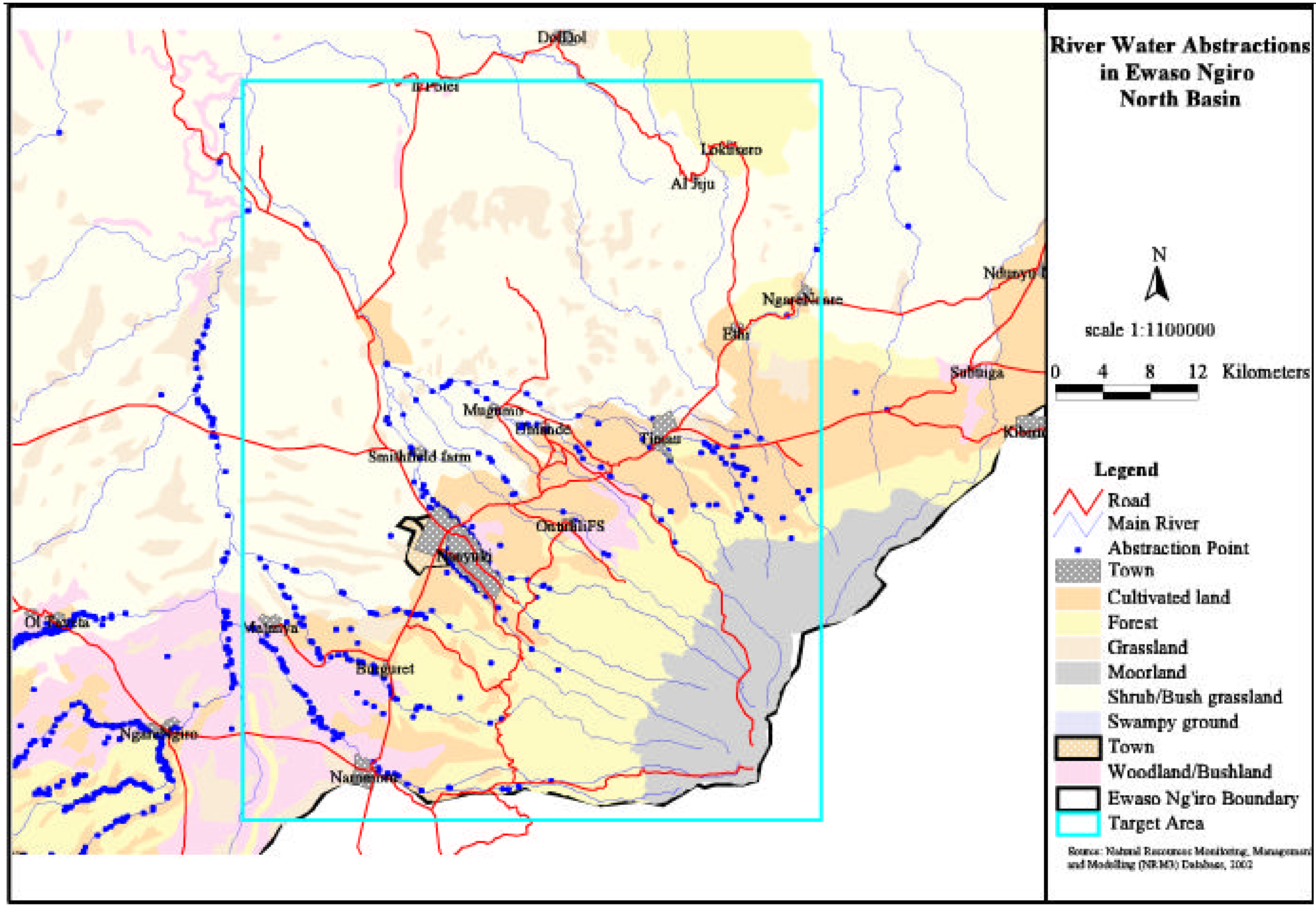
Plate 3.1 Wild Flooding for a Tomatoe Crop in Umande.

Plate 3.2 Runner Beans Growing Under Drip Irrigation Oldonyo Farm (Timau)

Plate 3.3 Typical Intake Works for a Gravity Pipe Water Abstraction System (Timau)

Plate 3.4 Mia Moja Water Project Intake Works (Piped Gravity System)

Figure 3.1 Map of Abstraction Points Within The Target Area


River Water Abstractions
in Ewaso Ngiro
North Basin
N
scale 1:1100000
0 4 8 12 Kilometers
Legend
Road
Main River
Abstraction Point
Town
Cultivated land
Forest
Grassland
Moorland
Shrub/Bush grassland
Swampy ground
Town
Woodland/Bushland
Ewaso Ng'iro Boundary
Target Area
Smithfield farm
Al Jiju
Ethi
Burguret

The most common abstraction methods used in the Target area include

(i). Pool and portable pump

(ii). Weir and pump

(iii). Weir and gravity pipe systems

(iv). Weir and gravity canal systems

The weirs vary in design and are made up of either concrete, masonry, stones, logs or sand bags. Over 58% of the existing irrigation abstraction volumes are open furrow exhibiting high seepage and evaporation losses. They have been noted to have the following problems that have instigated proposals for their lining or piping.

(i). Excess seepage losses

(ii). Vegetation which impends flow and also increases losses through evapotranspiration.

(iii). Control of off-taking structures from the main lining is almost impossible

(iv). Maintenance is minimal.

(v). Erosion occurs in steep sections

(vi). Ponding occurs in relatively flat furrow sections increasing evaporation and seepage losses.

(vii). Contamination and pollution of the resource is common due to use of agrochemicals and animal waste contamination at livestock watering sites.

The following observations have been made regarding river water abstractions:

(i). Abstractions are rarely monitored due to lack of flow monitoring devices.

(ii). Over abstraction has been observed frequently.

(iii). Abstraction weirs in some cases do not conform to permit specifications.

(iv). Abstracted water is used for other purposes other than what is permitted. i.e.- domestic water supply systems have components of irrigation.

(v). Water quality analysis is hardly done,

The methods of water distribution found in the region with their estimated efficiencies, include:

(i). Surface open (30-50% efficiency)

(ii). Surface closed (50-60% efficiency)

(iii). Sprinkler (65-75% efficiency)

(iv). Drip irrigation (80-95% efficiency), is a water conserving method whose initial installation costs have been cited as prohibitive

(v). Wild flooding (<40% efficiency)

The proportion of total abstraction by numbers and volumes for the period 1994-2001 by abstraction system type is shown in **Figure 3.2** and **Figure 3.3.**

Figure 3.2 Total Abstraction Numbers Classified by System Type for the Target Area

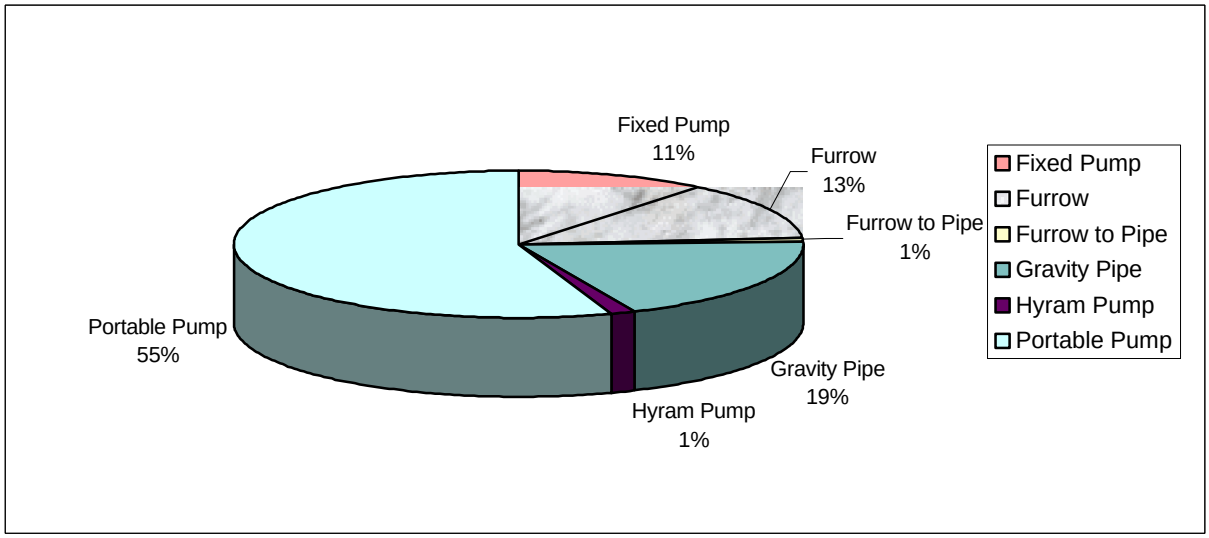
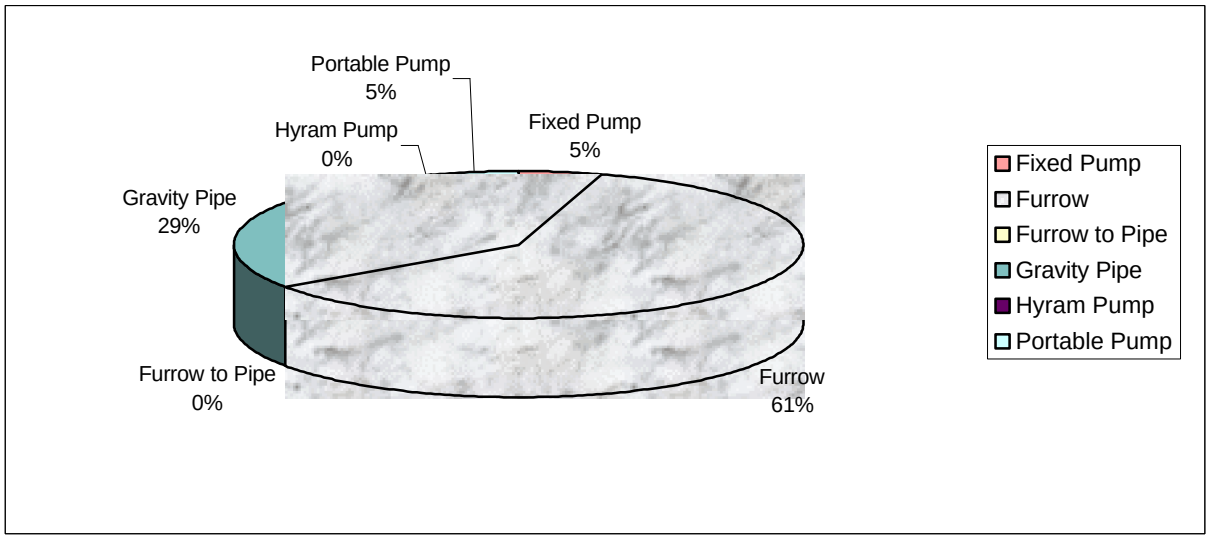
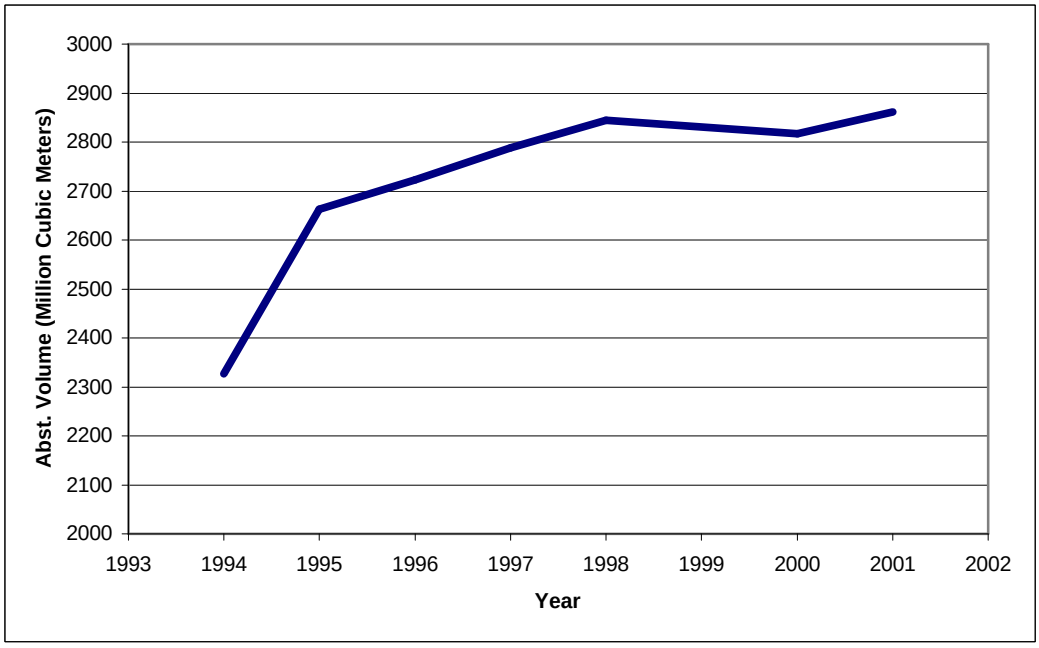


Figure 3.3 Total Abstraction Volumes Classified by System Type for the Target Area



Based on water abstractions data from the monitoring campaigns and other water abstractions monitoring exercises that have been undertaken by NRM3, analysis of annual trends has been carried out and a summary is presented in **Figure 3.4.**

Figure 3.4 Annual Abstraction Volumes Over the Target Area



Total Volume of river water abstractions has been found to increase with time though the increase is seen to be declining in recent years as shown by **Figure 3.4**

In the area of irrigation development, it was observed that some discrepancies exist within various design activities. The gauging and process of permit issuance is carried out prior to design using an allocation of $9m^3$/acre/day as allowed by MLRRWD. Crop water requirements are generally higher resulting in over abstraction to meet the design deficit. Designs are done independently by the different parties hence duplication, lack of standards or conformity and lack of consideration of environmental issues result.

3.2 ILLEGAL ABSTRACTION OF RIVER WATER

Based on the measured abstractions and the permitted abstractions as per the permits contained in the NRM3 abstrractions database, the proportion of flow abstracted illegally has been analysed as an indicator of the level of illegal water use. From this results it is seen that the greater proportion of river water is diverted or abstracted without legal authority. For most of the time this level is above 65% and at times goes as high as 93% in some places.

Illegal abstractions are therefore predominant in the target area. This results from the lack of Water Permits or having expired permits that have not been renewed. Another cause of illegal use is the non-adherence to conditions spelt out in the permits which is manifested in the form of:

(i). Having different uses with different demand from what is stipulated.

(ii). Exceeding authorized amounts.

(iii). Deviation from stated designs.

(iv). Lack of storage facilities.

(v). Use of poor technology in water conveyance and application resulting in big losses that necessitate larger than necessary diversions or abstractions.

There are a variety of reasons noted for this illegal abstractions:

(i). The lack of other income generation opportunities for the rural community resulting in increased irrigation farming and hence a raised water demand.

(ii). 90 days storage facility for irrigation water users has proved to be very expensive in terms of constructional requirements and most farmers lack ideal land on which to site these storage facilities. Relevant authorities have then found it very difficult to enforce this law.

(iii). The attitude of water as a free and abundant resource that one should utilize to ones satisfaction which is purely guided by commercial gains ignoring many other vital considerations such as environmental protection, social equity and efficiency of use.

(iv). Poor performance by the regulatory arm of the government in effective policing and control of water use. Various factors lead to this, among them inadequate financing.

(v). Lack of coordination in the implementation of individual and communal water use projects as well as having conflicting objectives. As an example, the goal of the Agricultural Department is to promote agricultural production that incorporates the use of irrigation methods. On the other hand the Water Department has an objective of regulation of stream flow that may necessitate discouragement of irrigation from rivers. There lacks effective exchange of information between such organs that should be used in planning and improvement of efficiencies of water use.

(vi). Communication difficulties between managers of water resources and the users. The terms *"Normal Flow"* and *"Flood Flow"* still remain vague and unclear to the users whereas they are the basis of the law governing water use.

(vii). Difficulties in quantifying stream flow and abstractions amounts from rivers due to the low density of RGS's and lack of flow measuring devices for the abstractions. This should be one of the basis of legal redress. Even where data is available, methods of temporal and spatial analysis are lacking.

(viii). Too much time (as much as 5-10 years) taken to process a permit application.

(ix). Excessive reliance on the government to enforce water laws with limited contribution by the community and other non-governmental agencies.

(x). Current water management is biased towards apportionment rather than efficient allocation.

(xi). Patronage and protection of those who are not doing things in the right way.

(xii). Slow and ineffective retribution process.

(xiii). Lack of capital to improve on efficiency of water use.

3.3 TRENDS AND TEMPORAL VARIATIONS

The trends in river water abstractions show increases during the dry periods to support the expected higher water demand. The variation does also show dependency on the type of abstractions system with gravity systems having lower wet to dry season variations compared to the pumped systems. This suggests that there is a more water demand oriented control for the pumped systems, a fact that can be attributed to the cost of water abstractions.

4. STRUCTURE OF THE PARTICIPATORY APPRAISAL OF RIVER WATER SITUATION

4.1 RIVER WATER ABSTRACTIONS MONITORING CAMPAIGNS

Appraisal of river water situation begins with a river water monitoring campaign carried out a number of documenting teams assigned to monitor the river in a period not exceed one week. These campaigns target the following information:

i) Geo-reference and ownership of abstraction works
ii) Principal water uses
iii) Water resources apportionment, authorizations and permits
iv) Description of abstraction works, peak capacities, measuring and controlling devices
v) Abstraction quantities estimates and measurements
vi) Water quality

The task for each team includeds:

i) Walking along the river and identifying points of the river water abstraction.
ii) Following a provided check list, making notes of physical aspects of the diversion works, and making appropriate measurements.
iii) Looking for and identifying a suitable respondent to provide additional information as outlined in the check list.
iv) Taking photographs of the abstraction works or relevant aspects of the abstraction system.

To access the quantities of river abstractions, the following methods are used

(a) Pumping Capacity and Pumping Schedule

This involves the collection of information on the pump used for the system and using this information to determine the operating pumping capacity for the system. Additionally, the operating time table is collected to determine the monthly hours of operation and the two used to compute an average rate of abstraction.

(b) Upstream and Downstream Double Gauging

River flow measurements are made by use of current meter gauging upstream and downstream of the abstraction point. The difference of the upper higher value minus the lower value defines the abstraction amount.

(c) Demand Based Estimate

Where abstractions quantity measurement are not possible especially for the small abstraction points where a double gauging for instance does not yield dependable results, or where pumping information is not available, then an estimated based on the demand is used. Usually, the considered demand components are; Irrigation, domestic and livestock water demands.

(d) Volumetric Measurements and Pumping Schedule

This involves the determination of the pump capacity by making volume –time measurements. Additionally, the operating time table is collected to determine the monthly hours of operation and the two used to compute an average rate of abstraction.

(e) Channel Current Meter Gauging

This involves the use of a velocity area summation method with the flow velocities at various vertical sections of the flow path being measured using Current Meter equipment and the total discharge computed as a summation of the discharges at the measurement verticals.

This type river abstractions campaigns are designed to be carried out with once in two years.

To maintain the suitable updates of the inventory information between campaigns, a structure of a data and information scheme is being utilized.

4.2 INFORMATION SHARING WITH WATER USER ASSOCIATIONS

This has been implemented for those rivers that have an active WUA. At present, NRM3 deals with five WUA's. These cover the rivers, Nanyuki, Burguret, Ngushishi, Likii and Ngare Nything. It involves a collaboration where the WUA provided information on changes and new developments in exchange for assessments carried out by NRM3 with the information they receive.

Generally, NRM3 receives from WUA's with the following and related information.

1. Inventory of Abstraction Works
2. Inventory of Stake Holders at the local level

3. Information on collaborating institutions
4. Minutes of WUA meetings

On the other hand, the WUA's receive from NRM3 the following and related information,

1. Analysis on water availability
2. Water permits and applications information
3. Rainfall analysis and potentials of water harvesting
4. Land use changes and its effect or relationship with water availability both in the short and long terms.
5. soils information relevant to water resources management.
6. Analysis of water consumption patterns, spatially and temporally.
7. Legislative or managerial issues that touch on performance of the particular WUA.

4.3 INFORMATION SHARING WITH THE WATER DEPARTMENT

Through the Water Act (CAP 372), the water department and constituted water boards are legally mandated to allocate, monitor and regulate the use of river water resources. In their line of duty they deal with all river water abstractions applicants and users. They maintain records of all applications, there status of operation and lists of issued water abstraction permits. Though this information is not always in tandem with the situation in the field, what they gather during their field work and while processing applications for water permits is important in maintaining an inclusive information base of river water use.

1. Their contribution to river water use appraisal therefore targets the following data:
2. Any new water permit applicants.
3. Any new records of water abstraction works gathered during their field visits
4. Lists of new issued water permits
5. Lists of proposed water abstraction systems.

This is gathered by having the office of the District Water Bailiff fill in the updates.

5. CONCLUSIONS AND RECOMMENDATIONS

River water abstractions monitoring is essential in order to realize the objective of improved water management in the basin and is suggested for adoption as a continuous management task. The established river water situation appraisal methodology is geared towards providing decision support information in a timely manner. Its main areas of contribution are:

i) Providing a consolidated information base that surpasses administrative boundaries.

ii) Improving the accuracy and availability of data on water resources availability, permitted and effected abstractions.

iii) An easily achievable spatially coordinated water account with changed abstraction patterns.

iv) Spatial and temporal details of illegal abstractions for use in development of policing activities.

v) Basis for improving water resources allocation and ensuring equitable distribution.

The appraisal methodology works well where the WUA's are operational. Since this is not so for all the rivers in the target area, a lot of support is still required in the establishment of these associations, a task that NRM3 is involved in.

6. REFERENCES

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APPENDIX 1

List of Monitored Abstraction Points for theTarget Area

Key:

Owner	Person or Organization owning the abstraction works and rights to use water
Permit	Water Permit issued for the abstraction point
System Decription	Type of abstraction works
River Name	River from which water is taken
Lat	UTM Latitude
Long	UTM Longitude
Abst	Typical water abstraction rate for the point expressed in M^3/day. Since water use has a high temporal variation, the figure provided here represents the common abstraction rates observed for the point.

OWNER	Permit	SystemDescription	RiverName	LAT	LONG	Abstr
Mt.K.N. Park	11872	Fixed Pump	Naro Moru	293742	9981327	53.89
Kiburugutu		Gravity Pipe	Naro Moru	292440	9981718	172.17
N. Moru W.P.	12513	Gravity Pipe	Naro Moru	292144	9980703	1,098.82
Kabendera	147	Gravity Pipe	Naro Moru	291253	9982153	680.80
Manyata Gitwe		Gravity Pipe	Naro Moru	290621	9980406	600.91
Kabunda W.P	22808	Furrow	Naro Moru	288759	9981591	1,812.10
Tamarid Fish Farm		Furrow	Naro Moru	287067	9980872	2,081.96
Mathenge Mwangi Kanyere		Gravity Pipe	Naro Moru	287065	9980919	40.49
Aguthi Furrow	18118	Furrow	Naro Moru	286136	9980449	12,365.37
Peterson Waniohi Theuri (Ngorano		Portable Pump	Naro Moru	284967	9980443	28.22
M. Gitero W.P.	17215	Gravity Pipe	Naro Moru	284967	9980347	432.76
N. M. Catholic	11920	Furrow to Pipe	Naro Moru	284144	9980152	25.37
Rware Farm (Waniohi Theuri)	3850	Fixed Pump	Naro Moru	283380	9980622	29.72
Mwai Kibaki	1150	Furrow to Pipe	Naro Moru	282753	9980935	25.42
Maina / Wa Ben		Portable Pump	Naro Moru	282675	9980935	17.39
Mwiremia S. Help W.P	17509	Gravity Pipe	Naro Moru	282600	9980924	
Jackson Nderitu		Portable Pump	Naro Moru	282068	9981327	39.12
Mariga		Portable Pump	Naro Moru	281892	9981374	13.78
N. M. Rail.Stn.	908	Gravity Pipe	Naro Moru	281680	9981448	35.72
John Kaberenge		Portable Pump	Naro Moru	281154	9981491	23.77
Gabriel Matu	19127	Portable Pump	Naro Moru	280868	9981491	21.44
Waruta Wairoto (Matunda Farm)		Portable Pump	Naro Moru	280677	9981682	38.04
James Murage Gichuiri	17997	Portable Pump	Naro Moru	280677	9981491	30.97
Joseph Wagothi (Thuita Farm)		Portable Pump	Naro Moru	280486	9981587	28.17
Waniau Karuri		Portable Pump	Naro Moru	280246	9981934	38.32
N.M.Town	16688	Fixed Pump	Naro Moru	280115	9982021	1,679.49

OWNER	Permit	SystemDescription	RiverName	LAT	LONG	Abstr
N.M.Tree Nursery		Fixed Pump	Naro Moru	280031	9982150	30.86
Mwai Miano		Portable Pump	Naro Moru	279874	9982267	26.75
N.M.River Lodge	2018	Fixed Pump	Naro Moru	278895	9982933	116.50
Simon Mwangi Kanyora		Portable Pump	Naro Moru	277594	9984352	24.38
Mwangi (stat)		Portable Pump	Naro Moru	277425	9984493	18.07
Robert Munyiri	25574	Portable Pump	Naro Moru	277263	9984720	10.45
Kamau		Portable Pump	Naro Moru	277244	9984594	22.74
Solio Ranch	2138	Fixed Pump	Naro Moru	276418	9984670	28.06
Solio Ranch	2410	Fixed Pump	Naro Moru	276845	9984829	41.97
Robert Wanjohi	25574	Portable Pump	Naro Moru	275638	9985270	43.37
Matanya Kabanga		Gravity Pipe	Naro Moru	275608	9985202	37.61
Kihato F.S (Mwiremia)		Gravity Pipe	Naro Moru	275596	9985226	408.68
Muya Gichuru		Portable Pump	Naro Moru	275500	9985394	50.57
Macharia wa Mundia		Portable Pump	Naro Moru	275500	9985394	51.78
Muthukia (Karatina)		Portable Pump	Naro Moru	275464	9985899	39.23
Gatheru Kigeni		Portable Pump	Naro Moru	275437	9986073	59.97
Peter Ngure		Portable Pump	Naro Moru	275413	9985497	28.78
Ephraim Wamae / Waweru Gakoe		Portable Pump	Naro Moru	275238	9986461	87.93
Michael Niama		Portable Pump	Naro Moru	275225	9986041	22.14
Joel Mwangi		Portable Pump	Naro Moru	275210	9986260	61.10
Ndii Farm (Ndii Kaguongo)		Fixed Pump	Naro Moru	274838	9986548	20.60
Ephraim Macharia		Portable Pump	Naro Moru	274791	9987055	46.17
John Wanyeki		Portable Pump	Naro Moru	274775	9986184	42.12
Samuel Kariuki		Portable Pump	Naro Moru	274720	9986945	26.91
Simon Kabogo		Portable Pump	Naro Moru	274716	9986819	55.98
Mbuthia		Portable Pump	Naro Moru	274622	9987144	24.86
Karuga Kahiko		Portable Pump	Naro Moru	274622	9987144	18.72
Kaleb Kihunia		Portable Pump	Naro Moru	274622	9987144	53.02
Joseph Kariuki		Portable Pump	Naro Moru	274622	9987144	32.44
Joseph Kahuthu (Caragan)		Portable Pump	Naro Moru	274622	9987144	16.63
Joseph Githogo		Portable Pump	Naro Moru	274622	9987144	19.95
Carrissa Farm (Christopher Nderi)	9803	Fixed Pump	Naro Moru	274562	9987309	18.26
Jack Mwangi		Portable Pump	Naro Moru	272958	9989206	28.01
Edward Kiburi	18877	Portable Pump	Naro Moru	272897	9989095	23.43
Thome	1154	Furrow	Naro Moru	272496	9989933	7,374.50
Mathenge	23376	Portable Pump	Naro Moru	272432	9990122	44.08
Matanya		Furrow	Naro Moru	272363	9990308	8,787.40
Tigithi W.P.		Gravity Pipe	Naro Moru	271539	9992256	871.00
Paul Githu		Portable Pump	Naro Moru	270762	9992550	56.77

OWNER	Permit	SystemDescription	RiverName	LAT	LONG	Abstr
Reuben Mithamo		Portable Pump	Naro Moru	270635	9992498	65.10
Charles Wachira (Mzee Guy)	24001	Portable Pump	Naro Moru	270395	9992944	28.18
David Gacihi		Portable Pump	Naro Moru	270190	9993408	28.41
Simon Gaturuku		Portable Pump	Naro Moru	269855	9994154	17.36
Samuel Gakuniu Ndungu		Portable Pump	Naro Moru	269842	9993696	36.96
James Niogu		Portable Pump	Naro Moru	269028	9994089	38.51
Githimu		Portable Pump	Naro Moru	268929	9994200	27.94
Purity Watare		Portable Pump	Naro Moru	268026	9994175	71.81
Murava Ngetha		Portable Pump	Naro Moru	267819	9994180	55.03
David Ngetha		Portable Pump	Naro Moru	267729	9994185	69.52
John Mwangi		Portable Pump	Naro Moru	277425	9984493	24.64
NGK Muriru W.P	21948	Gravity Pipe	Burguret	290635	9986390	1,365.28
Muriru W.P	13073	Furrow	Burguret	286154	9986641	414.40
Burguret W.P		Gravity Pipe	Burguret	283432	9987161	1,198.33
Mt Rock Hotel	17998	Furrow	Burguret	282978	9986979	17.02
Ranges View (Gituku Mwangi)	11979	Portable Pump	Burguret	281378	9988404	6.69
Tamarid Trout ltd		Furrow	Burguret	281324	9988485	12.61
Michael Macharia		Portable Pump	Burguret	280702	9989756	12.62
Benard Mwariri		Portable Pump	Burguret	280053	9989999	11.05
Jasho Small Scale Farmers		Portable Pump	Burguret	279972	9990188	93.26
Valley View		Portable Pump	Burguret	279918	9990729	27.67
David Munga Mungatu	20157	Portable Pump	Burguret	279324	9990864	10.58
Mirera W.P		Furrow	Burguret	279008	9995821	986.91
Francis Wachira Mathenge		Portable Pump	Burguret	278702	9991026	19.81
Geoffrey Gichuki Mario	21618	Portable Pump	Burguret	278324	9991269	11.81
Valley Site		Portable Pump	Burguret	278215	9991269	7.27
Fr. Mugambi	21488	Portable Pump	Burguret	277864	9991269	8.16
David Douglas Ndefu		Portable Pump	Burguret	277810	9991269	14.39
Samuel Ndungu Muhuhi	22152	Portable Pump	Burguret	277702	9991324	27.77
Kennedy Kinoti		Portable Pump	Burguret	277675	9991378	26.91
James Kinyua Mundia		Portable Pump	Burguret	277459	9991513	27.71
Macharia		Portable Pump	Burguret	276540	9991594	67.84
Robert Muriithi/Waithaka		Portable Pump	Burguret	273900	9993910	29.00
William Niorogе	23551	Portable Pump	Burguret	273841	9994847	31.08
Lawrence Munyiri		Portable Pump	Burguret	273706	9993925	10.41
Mwangi wa Nyamu		Portable Pump	Burguret	273426	9994819	9.78
Isiah Kiragu		Portable Pump	Burguret	273361	9994738	7.74
Dickson Waciuri		Portable Pump	Burguret	273018	9995123	6.94
Fredrick Kariuki Paul	24511	Portable Pump	Burguret	272562	9996013	5.91

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Wathituga W.P.		Furrow	Burguret	272012	9997360	1,300.24
Maina Kariuki		Portable Pump	Burguret	271895	9998147	10.91
JOSIAH WACHIRA		Portable Pump	Burguret	275224	9991724	8.87
KAMANDE		Portable Pump	Burguret	275221	9992065	6.77
MUNUHE		Portable Pump	Burguret	274778	9992576	5.72
JACKSON KAMUNDIA		Portable Pump	Burguret	274284	9992951	8.27
PATRICK MATTHEW		Portable Pump	Burguret	272871	9996305	8.53
PAUL MWANGI KAMUNDIA		Portable Pump	Burguret	272616	9996459	9.88
ALAN MAINA		Portable Pump	Burguret	272530	9996527	10.19
MAINA		Portable Pump	Burguret	272479	9996595	6.51
WANJAU		Portable Pump	Burguret	272326	9996697	6.10
Wagusiru (DOD)	20173	Furrow	Rongai	291716	9992094	1,556.77
Christopher K. Mwai	23539	Portable Pump	Rongai	286207	9994171	7.50
Ol Paieta (Sweet Waters Camp)	1508	Fixed Pump	Rongai	275727	9998533	233.20
WAIGWA NGATIA	26292	Portable Pump	Rongai	282077	9995436	8.82
FELIX WOTUKU	15574	Portable Pump	Rongai	282763	9995293	37.31
HARRIS WILLIAMSON	460	Portable Pump	Rongai	283001	9995072	17.58
SAMMY KIHARA		Portable Pump	Rongai	281164	9995084	9.19
DAVID RIBUTHI		Portable Pump	Rongai	282861	9995195	14.97
WILLIAM GITHUI		Portable Pump	Rongai	282960	9995109	11.69
FRANCIS NGUGI GATONYE		Portable Pump	Rongai	282953	9995116	23.50
MWANGI	25562	Portable Pump	Rongai	279565	9995264	23.95
SIMON KARURU		Portable Pump	Rongai	279601	9995264	33.54
WARUTERE	1511	Portable Pump	Rongai	280141	9995046	28.48
MARTIN MIGWI		Portable Pump	Rongai	280425	9994959	13.34
CHRISTOPHER MUTHUI	8334	Portable Pump	Rongai	278379	9996198	47.38
MARY		Portable Pump	Rongai	279621	9995255	38.45
MICHAEL WANGONDU		Portable Pump	Rongai	276493	9997774	9.65
DAVID KIMONDO		Portable Pump	Rongai	282642	9995322	20.80
JOHN KAMANGU	25102	Portable Pump	Rongai	281264	9995201	39.60
FREDERICK KINGORI		Portable Pump	Rongai	283008	9995066	32.53
CHARLES MWANGI	25562	Portable Pump	Rongai	281247	9995172	11.78
KAMUHIA		Portable Pump	Rongai	281844	9995463	29.16
MUMBI MWANGI		Portable Pump	Rongai	282990	9995082	13.15
JOSEPH MWANIKI		Portable Pump	Rongai	281678	9995454	16.01
BENARD GITHINJI		Portable Pump	Rongai	281264	9995201	28.73
RAPHAEL KARIYA		Portable Pump	Rongai	281193	9995116	16.41
SULEIMAN MURAGE MATU		Portable Pump	Rongai	282642	9995322	46.67
BEN MUKIRI		Portable Pump	Rongai	285768	9995016	13.04

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JOSEPH NGARE		Portable Pump	Rongai	285710	9995105	34.45
MICHAEL NJAMA		Portable Pump	Rongai	284542	9994947	16.26
JOHN KAHUTHU NJINGU	23951	Portable Pump	Rongai	284202	9994852	71.96
NGARE MUHEHU		Portable Pump	Rongai	285599	9995148	9.33
JOSEPH MATHENGE		Portable Pump	Rongai	285555	9995393	10.54
FRANCIS KAMAU NGUGI		Portable Pump	Rongai	285599	9995148	14.33
PAUL NGATIA	26292	Portable Pump	Rongai	284028	9994851	26.18
DAVID KINYUA KARUGU	23250	Portable Pump	Rongai	284212	9994862	18.93
KARIMI GITHUI		Portable Pump	Rongai	284212	9994862	20.62
KINGORI		Portable Pump	Rongai	284212	9994862	15.84
MAINA NDEGWA		Portable Pump	Rongai	284168	9994972	20.96
MWANGI		Portable Pump	Rongai	279496	9995463	52.16
STEPHEN NGATIA		Portable Pump	Rongai	285392	9995343	27.57
Mukaro wa Soweto		Furrow	Rongai	278046	9996440	24.33
BEN WACHIRA MURIITHI		Portable Pump	Rongai	277996	9996284	13.56
CHARLES KARIUKU		Portable Pump	Rongai	277048	9996799	9.67
JOHN MWANGI		Portable Pump	Rongai	276532	9997500	15.33
JULIUS MURAGE		Portable Pump	Rongai	276491	9997644	38.50
LYDIA WAMBUI		Portable Pump	Rongai	276244	9998139	17.24
NANYUKI F. STN	4765	Furrow	Nanyuki	292281	9993157	432.00
MWEA B		Gravity Pipe	Nanyuki	291736	9993703	10.80
KAAGA		Gravity Pipe	Nanyuki	291588	9993883	10.80
DOUGLAS MUTAI		Gravity Pipe	Nanyuki	291301	9994205	1,468.80
HUKU W.P	20002	Gravity Pipe	Nanyuki	291290	9994217	1,036.80
WILLIAM HOLDEN W.F.	23377	Fixed Pump	Nanyuki	290024	9995955	51.84
CATHOLIC MONASTERY	784	Fixed Pump	Nanyuki	289419	9996553	69.12
MAAKA GREEN WATER PROJECT		Gravity Pipe	Nanyuki	289251	9996626	0.00
JOSEPH MATHAI		Fixed Pump	Nanyuki	287024	9998424	0.00
JOHN GICHUKI		Fixed Pump	Nanyuki	286765	9998740	0.00
DEHOLMES	9874	Fixed Pump	Nanyuki	287010	9998742	129.60
J. KOBIA		Portable Pump	Nanyuki	286891	9998892	10.80
GEORGE K.W		Fixed Pump	Nanyuki	286788	9998980	64.80
MAJOR GEN. WAWERU		Portable Pump	Nanyuki	286794	9998982	10.80
SOLOMON WACHIRA		Fixed Pump	Nanyuki	286994	9999039	21.60
JOSEPH KIMANI WARUI		Portable Pump	Nanyuki	286720	9999116	64.80
CHRISTOPER KARUMBA		Fixed Pump	Nanyuki	286727	9999185	129.60
MAJOR GEN. WAWERU		Portable Pump	Nanyuki	286630	9999245	172.80
WILSON THEURI KIMURI		Portable Pump	Nanyuki	286491	9999501	43.20
MRS NDERITU		Fixed Pump	Nanyuki	286494	9999512	777.60

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MRS NDERITU		Fixed Pump	Nanyuki	286467	9999525	69.12
G.K PRISONS		Gravity Pipe	Nanyuki	286251	9999821	751.68
PRISONS INTAKE		Gravity Pipe	Nanyuki	286257	9999835	777.60
KENYA RAILWAYS		Gravity Pipe	Nanyuki	286152	9999989	950.40
RAILWAYS		Gravity Pipe	Nanyuki	286152	9999989	950.40
MT KENYA PETROLEUM		Portable Pump	Nanyuki	286057	10000276	108.00
PATRICK GRATTON		Fixed Pump	Nanyuki	286130	10000359	21.60
HAMID KASSIM		Gravity Pipe	Nanyuki	286202	10000492	0.00
AHMED KASSIM		Furrow	Nanyuki	286184	10000516	60.48
JACK KIMURI		Portable Pump	Nanyuki	286059	10000834	129.60
JACK KIMURI		Portable Pump	Nanyuki	286059	10000834	129.60
TIMOTHY KARANJA		Gravity Pipe	Nanyuki	286045	10000910	25.92
JACK KIMURI		Portable Pump	Nanyuki	286044	10000952	0.78
JACK KIMURI		Portable Pump	Nanyuki	286044	10000952	0.78
M.E.R.R. (FOREST DEPT.)		Fixed Pump	Nanyuki	286098	10001357	432.00
BENSON MUTITU		Portable Pump	Nanyuki	286160	10002075	10.80
LIKII WOMEN GROUP		Gravity Pipe	Nanyuki	286153	10002393	17.28
NYANZA SPINNING	20412	Fixed Pump	Nanyuki	285020	10003764	172.80
ANN WOLLEN		Furrow	Nanyuki	284823	10003911	2,358.72
TRENCH FORROW		Furrow	Nanyuki	284823	10003911	1,987.20
TATHAM WALTER		Portable Pump	Nanyuki	284383	10004371	43.20
JENNIFER HORN		Furrow	Nanyuki	284338	10004697	17.28
ERICK JOHANSON		Portable Pump	Nanyuki	283949	10004994	717.12
NANYUKI RANCHING LTD		Fixed Pump	Nanyuki	283239	10006953	30.24
KIMURI FARM		Fixed Pump	Nanyuki	283022	10009054	3.46
WACHIRA MUNDIA		Portable Pump	Nanyuki	283022	10009054	129.60
KIAMA RUHENI	10005	Fixed Pump	Nanyuki	281918	10010393	64.80
SOLOMON NGARI		Portable Pump	Nanyuki	281181	10011058	21.60
BUTTON MBIRUIRU		Portable Pump	Nanyuki	280960	10011771	86.40
JOHN CARPETER		Fixed Pump	Nanyuki	280960	10011771	86.40
CUNNINGHAM		Portable Pump	Nanyuki	280924	10014304	3.46
RAPHAEL MITHAMO		Portable Pump	Nanyuki	280924	10014304	151.20
JOHN MUNUHE		Portable Pump	Nanyuki	280858	10014410	43.20
ABDULL POWELL		Fixed Pump	Nanyuki	280724	10014688	0.86
C. MAINA		Portable Pump	Nanyuki	280476	10015180	129.60
MWANGI MAINGI		Portable Pump	Nanyuki	280616	10016791	388.80
FRANCIS MBUTHIA		Portable Pump	Nanyuki	280434	10017896	302.40
PATRICK MACHARIA	23225	Portable Pump	Nanyuki	280044	10019183	172.80
PETER NJARAMBA		Portable Pump	Nanyuki	279711	10019308	43.20

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MARTIN WAHOME		Portable Pump	Nanyuki	279597	10019429	86.40
LOLTODO FARM	1538	Fixed Pump	Nanyuki	279519	10019451	216.00
GITHINJI/NJUKU		Portable Pump	Nanyuki	279232	10020220	86.40
BARAKA SCHOOL		Fixed Pump	Nanyuki	279255	10020222	43.20
JOSHUA KIBET		Portable Pump	Nanyuki	278565	10020910	64.80
SIMON N NGAI		Portable Pump	Nanyuki	278697	10021362	108.00
NYAGUTHII KURIA		Portable Pump	Nanyuki	278672	10021447	54.00
MIANO KAROKI		Portable Pump	Nanyuki	278702	10021597	43.20
GEORGE N. KAMAU		Portable Pump	Nanyuki	278643	10021910	151.20
JAEL DAVIS		Portable Pump	Nanyuki	277735	10023969	51.84
MOGWOONI LTD	9020	Fixed Pump	Nanyuki	275779	10025719	21.60
KEN BROWN		Portable Pump	Nanyuki	274005	10028233	10.80
MONTE BROWN		Portable Pump	Nanyuki	273863	10028535	10.80
J.W SMITH	26546	Portable Pump	Nanyuki	273431	10028809	43.20
OL JOGI LTD MARURA FARM		Fixed Pump	Nanyuki	270667	10030385	43.20
OL JOGI LTD (KANDURUMOTO)	13862	Fixed Pump	Nanyuki	269040	10033895	216.00
Miarage W.P.	19920	Gravity Pipe	Likii	295257	9996906	824.61
Nanyuki T.W.S.	3313	Gravity Pipe	Likii	293943	9996348	8,309.13
Mt. Kenya Safari Club	7305	Furrow	Likii	293691	9993797	1,332.96
Don Hunt	8298	Furrow	Likii	293678	9993985	1,960.01
Kanqaita W.P.	2014	Gravity Pipe	Likii	291228	9998005	684.74
Mutwiri Mbogori		Portable Pump	Likii	289100	10000300	19.63
Black Trap		Portable Pump	Likii	288700	10001100	16.27
Nahashon Mwai	1069	Portable Pump	Likii	285367	10004031	42.16
Rachael Wangechi	14135	Portable Pump	Likii	285089	10004223	12.93
Mukima E.S.	1162	Portable Pump	Likii	283723	10006614	41.08
CHARLES WAHOME		Portable Pump	Likii	286054	10003859	10.56
Grace Nieri Mwaura		Portable Pump	Likii	286571	10003221	9.83
JOSEPH MUTHURANI		Portable Pump	Likii	287795	10002066	42.70
MBUTHI KURUTU		Portable Pump	Likii	288088	10001876	130.17
DAWA FARM		Fixed Pump	Likii	288261	10001635	153.28
Ontulili E. Stn.	5040	Fixed Pump	Ontulili	297900	10002300	18.73
Katheri W.P.	19938	Gravity Pipe	Ontulili	296831	10003058	699.76
Baitire Water Project		Gravity Pipe	Ontulili	296500	10003297	
Nyakairo W.P.		Furrow	Ontulili	295814	10003736	1,929.19
Nyakairo W.P.	23608	Gravity Pipe	Ontulili	295814	10003736	742.93
Mukuria W.P.	18744	Gravity Pipe	Ontulili	295278	10003786	611.09
Robin Davis		Furrow	Ontulili	294000	10003900	12.89
Samson Mbui		Portable Pump	Ontulili	292516	10004511	18.84

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Sheikh W.P	1586	Furrow	Ontulili	292009	10004850	2,315.43
Ontulili W.P		Gravity Pipe	Ontulili	291924	10004860	474.76
Peter Mahinda	14668	Furrow to Pipe	Ontulili	291792	10005271	10.65
Mwinyama W.P		Furrow	Ontulili	291550	10005200	1,803.63
Murungai Farm		Furrow	Ontulili	291500	10005700	540.19
Patrick Ngacha	20622	Portable Pump	Ontulili	291032	10006306	15.03
Peter Mahinda	17179	Furrow	Ontulili	290800	10006600	30.55
Mwaura		Furrow	Ontulili	290238	10007376	35.55
Paul Mwangi	22791	Portable Pump	Ontulili	289824	10007963	19.13
Joseph K. Mugambi (Mukima farm)	1503	Fixed Pump	Ontulili	288685	10008653	32.27
Waniohi Waweru	10879	Portable Pump	Ontulili	288098	10008996	13.46
Esther W. Karani	21636	Portable Pump	Ontulili	286304	10001917	15.37
Mutiriri W.P		Furrow	Ontulili	285642	10009725	1,101.10
Nyakumu W.P		Furrow	Ontulili	285311	10013629	1,145.45
Fredrick Ngatia Mwangi	20822	Portable Pump	Ontulili	284035	10006019	11.15
Kanqaita Famers		Furrow	Ontulili	297246	10002715	
TIMOTHY HOBBS		Fixed Pump	Ontulili	289145	10008481	107.33
MURUNGAT FARM		Portable Pump	Ontulili	289147	10008481	20.29
Jackson Angaine		Furrow	Konqoni	301149	10004156	6.64
Kalalu W.P.		Furrow	Konqoni	297100	10006600	1,078.97
Mukora W.P.	22786	Gravity Pipe	Konqoni	297100	10006600	1,245.02
Nyariqinu		Furrow	Konqoni	292100	10005100	816.71
Muqumo Farmers		Furrow	Konqoni	294939	10009024	1,285.33
HOMEGROWN LTD SIRIMON FARM	27890	Fixed Pump	Konqoni	299456	10006400	
HOMEGROWN LTD (Ibis Gorge)	27763	Fixed Pump	Konqoni	299456	10006400	
John Wamai		Portable Pump	Konqoni	293750	10008200	
John Kinyua Kiguova		Portable Pump	Konqoni	296100	10007540	
Sirimon W.P.		Gravity Pipe	Sirimon	304100	10003100	631.15
Siraji W.P.	27489	Fixed Pump	Sirimon	309500	10007800	362.69
Kanqau W.P		Hyram Pump	Sirimon	302700	10005010	423.57
Ngenia W. Supply		Gravity Pipe	Sirimon	299200	10007400	647.20
Peter Makuno	15338	Portable Pump	Sirimon	299000	10007500	15.23
George Alexander Webb	9306	Portable Pump	Sirimon	299000	10007500	13.92
Gakeo W.P.	1182	Furrow	Sirimon	297200	10008800	1,427.84
Umande Primary	17478	Fixed Pump	Sirimon	296940	10009168	11.17
Kuqa na Gwika W.P.		Gravity Pipe	Sirimon	295913	10009649	472.01
Said Mohhamed Amin	9788	Fixed Pump	Sirimon	294331	10010635	18.86
Umande Town W.S	13113	Fixed Pump	Sirimon	294278	10010670	
Mworoqa W.P.	13593	Furrow	Sirimon	293820	10010759	7,566.89

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Munyi		Fixed Pump	Sirimon	291105	10011375	111.44
Stanley Kinga		Portable Pump	Sirimon	290594	10012116	13.36
Akorino W.P.		Fixed Pump	Sirimon	290576	10012081	1,606.05
M.C.K.KINJOGU WATER PROJECT	27359	Gravity Pipe	Sirimon	305252	10001190	
MWENDANTU MATHITHIO		Gravity Pipe	Sirimon	304900	10003760	
Mbere		Portable Pump	Sirimon	287900	10014350	
Njoroma		Portable Pump	Sirimon	288400	10013800	
Mbugua		Portable Pump	Sirimon	288500	10013700	
Gitonga		Portable Pump	Sirimon	289500	10013200	
Njoroge		Portable Pump	Sirimon	294300	10010800	
Maina Wamai		Portable Pump	Sirimon	294650	10010700	
Kamau		Portable Pump	Sirimon	294960	10010700	
Karobia		Portable Pump	Sirimon	295800	10009700	
Sirimon		Furrow	Sirimon	296360	10009600	
Kariuki		Fixed Pump	Sirimon	296800	10009220	
Rumuri		Fixed Pump	Sirimon	297200	10008900	
Munyi		Portable Pump	Sirimon	294046	10010725	
Timau W.Supply		Gravity Pipe	Logilado	310898	10002454	2,641.90
Muguna W.P.		Gravity Pipe	Logilado	310898	10002454	644.44
Mwendwa W.P.		Gravity Pipe	Logilado	308600	10003600	876.96
Angaine Furrow	10880	Furrow	Logilado	307779	10006925	324.24
Marete Nganga	16231	Hyram Pump	Logilado	307421	10007216	18.27
Peter Mboggori	9123	Portable Pump	Logilado	307229	10007233	15.86
Nathan Mungania	4129	Portable Pump	Logilado	307085	10007277	11.65
Francis M'Muriithi		Portable Pump	Logilado	306830	10007509	12.64
AGNES GRACE		Portable Pump	Logilado	305894	10008028	33.84
Mwenda W.P.		Gravity Pipe	Teleswani	312945	10002474	608.54
Kithithina Umoja W.P.		Gravity Pipe	Teleswani	308626	10002720	955.51
Mukuria Kiambogo W.P		Gravity Pipe	Teleswani	308483	10003149	975.29
Mwendantu W.P.		Gravity Pipe	Teleswani	308281	10001712	597.81
Mwendwa W.P.		Gravity Pipe	Teleswani	307587	10001838	693.89
Mugachia Kamanga		Portable Pump	Teleswani	306863	10004298	16.74
Kongo Gacheke W.A.		Furrow	Teleswani	306464	10005328	987.26
Muthoni Macharia	22824	Portable Pump	Teleswani	306821	10003824	13.51
Charles Kimathi Mutea		Gravity Pipe	Teleswani	306133	10006181	17.05
Kariuki Muchiri	22790	Portable Pump	Teleswani	306626	10004884	34.88
Kentrout L.T.D.	1437	Furrow	Teleswani	305402	10007399	40.07
Bill Arnold BlackBeard	12710	Furrow	Teleswani	304916	10007797	50.94
Jackson Wahome	20466	Portable Pump	Teleswani	304811	10002342	21.59

OWNER	Permit	SystemDescription	RiverName	LAT	LONG	Abstr
Alex Chege Kangethe	10309	Portable Pump	Teleswani	304800	10000700	40.78
Ngwataniro W.P		Gravity Pipe	Teleswani	304657	10008038	395.51
Timau Catholic Church	15983	Furrow	Teleswani	304508	10008212	697.10
Timau Catholic Mission (Timau W.P.)	13539	Gravity Pipe	Teleswani	304635	10008929	1,060.28
Johnson Broun		Portable Pump	Teleswani	304434	10008377	11.05
Ann Nyokabi Ngure		Portable Pump	Teleswani	304324	10008455	11.15
Mia Moja W. Ass.	286	Gravity Pipe	Teleswani	303354	10009131	583.83
Kamunyaka W.P.		Furrow	Teleswani	303146	10009164	11,843.52
Miriti Mirungu W.P.		Gravity Pipe	Teleswani	302945	10009178	31.35
Peter Waithaka	22727	Portable Pump	Teleswani	302824	10009305	24.03
George Mwai		Portable Pump	Teleswani	302603	10009466	11.84
Wakabi Karania	19706	Portable Pump	Teleswani	302496	10009707	24.78
Joseph Wahome		Portable Pump	Teleswani	302489	10009881	37.11
Daniel Mathai	22794	Portable Pump	Teleswani	302456	10010069	16.27
Felix Wamatu		Portable Pump	Teleswani	302241	10010243	21.51
Mutarakwa W.P		Gravity Pipe	Timau	311372	10003024	612.14
Siraji Ltd.	22393	Fixed Pump	Timau	311075	10007346	
Ngushishi Centre W. Supply / Siraji		Gravity Pipe	Timau	311075	10007346	452.17
Milimani A		Gravity Pipe	Timau	310800	10005300	742.75
Kiguru W.P.		Furrow	Timau	310310	10006229	9,641.55
Kiguru W.P.		Gravity Pipe	Timau	310310	10006229	903.63
Siraji	22518	Gravity Pipe	Timau	309833	10007412	891.98
Timau Furrow		Furrow	Timau	303900	10010100	3,100.90
David Wambugu Gitumbi	1145	Portable Pump	Timau	303548	10009757	24.70
E.L. Wivumiririe W.P.		Gravity Pipe	Timau	300653	10011496	151.84
Magutu Furrow	4468	Furrow	Timau	298703	10011292	2,091.17
Magiri M'Ringera	21277	Portable Pump	Timau	297114	10011774	27.34
Stanley Inoti	19770	Portable Pump	Timau	295191	10011747	40.12
David Mbogori	1867	Portable Pump	Timau	294916	10011926	22.94
Kiprotich Arap Rops (Koita Farm)	19035	Furrow	Timau	293587	10013007	2,722.15
Loldaiga upper	13594	Fixed Pump	Timau	292556	10013702	68.04
Kamwaki Ltd	3555	Furrow	Timau	292400	10013900	18.48
M'Muguika Imaita	21233	Portable Pump	Timau	291002	10014159	23.67
Ngusishi Farm	11967	Gravity Pipe	Timau	290400	10012500	1,552.33
John Mwiti	21243	Portable Pump	Timau	290046	10014505	58.43
Loldaiga Lower	2627	Hyram Pump	Timau	289385	10014240	186.64
Kihara Wairagu	15574	Portable Pump	Timau	286403	10014720	18.03
Joseoph N. Ndiritu	12850	Portable Pump	Timau	286403	10014720	34.71
Mugachia Kamanga	21309	Portable Pump	Timau	286403	10014720	13.69

OWNER	Permit	SystemDescription	RiverName	LAT	LONG	Abstr
Muramati Farm Coop Society	1185	Gravity Pipe	Timau	286000	10014300	411.75
Kimugandura Farmers	15499	Fixed Pump	Timau	282615	10014360	
STANLEY INOTI		Portable Pump	Timau	306256	10007666	29.53
Mlimani B.W.P.		Gravity Pipe	Ituiuri	311791	10004719	902.28
OlDonyo Farm (T) Ltd.	9821	Gravity Pipe	Ngushishi	310634	10010090	219.95
OlDonyo Farm (T) Ltd.	18459	Hyram Pump	Ngushishi	310138	10009217	139.68
Lolmarik Farm	21518	Gravity Pipe	Ngushishi	310490	10010098	685.59
M. Kabere M.Mbiiiwe		Fixed Pump	Ngushishi	310203	10008654	47.03
OlDonyo Farm (T) Ltd.	22394	Gravity Pipe	Ngushishi	310490	10010098	440.37
Supriano Kubai		Gravity Pipe	Ngushishi	310138	10009217	34.00
Major W. M. Mugambi		Gravity Pipe	Ngushishi	310138	10009217	35.46
Kibubungi W.P.		Gravity Pipe	Ngushishi	310138	10009217	183.73
Jecinta Nyoroka		Gravity Pipe	Ngushishi	310138	10009217	27.88
Zakayo Thiuru M'Ringera		Gravity Pipe	Ngushishi	309943	10009320	30.79
Waniugu Mwangi		Gravity Pipe	Ngushishi	309943	10009320	19.81
Joseph Kirua Iburi		Gravity Pipe	Ngushishi	309943	10009320	26.15
Inge Farm	1057	Furrow	Ngushishi	309917	10008265	113.49
Lolmarik Farm	4887	Furrow	Ngushishi	309394	10011022	548.98
Chumvi/F.I. Wiyumiririe W.S.		Gravity Pipe	Ngushishi	305276	10014052	175.72
Kibubunga W.P.		Hyram Pump	Ngushishi	310138	10009217	
Embori Farm		Gravity Pipe	Ituiuri	314726	10002945	475.30