



# **Water Resources Authority**

## ***Ewaso Ngiro North Basin Area***

# ***MANAGEMENT GUIDELINES FOR GAZETTEMMENT OF KABEERE SPRINGS***

***November 2021***



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To all we say thank you.

Regional Manager

*Ewaso Ngiro North Catchment Area*

NANYUKI

## Acronyms

|         |   |  |
|---------|---|--|
| AEZ     | - | Agro-Ecological Zone                                   |
| b.g.l   | - | Below Ground Level                                     |
| CMS     | - | Catchment Management Strategy                          |
| ENNCA   | - | Ewaso Ngiro North Catchment Area                       |
| KFS     | - | Kenya Forest Service                                   |
| m.a.s.l | - | Meters Above Sea Level                                 |
| MoA     | - | Ministry of Agriculture                                |
| MoL     | - | Ministry of Lands                                      |
| NEMA    | - | National Environment Management Authority              |
| NRM3    | - | Natural Resources Management, Modelling and Monitoring |
| NWRUA   | - | Ngusishi Water Resources Users Association             |
| RGS     | - | Regular Gauging Station                                |
| ToR     | - | Terms of Reference                                     |
| WDC     | - | WRUA Development Cycle                                 |
| WRM     | - | Water Resources Management                             |
| WRMA    | - | Water Resources Management Authority                   |
| WRUA    | - | Water Resources Users Association                      |

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# 1 Introduction and Background Information

## 1.1 Introduction

A catchment area is defined as the land from which water naturally flows into a water course. The status and conditions of a catchment determines the reliability, quantity and quality of its water yields. A catchment area acts like a water storage facility where during the rains, the vegetation cover allowing the water ample time to percolate deep down and move as a sub-surface flow to recharge the rivers and springs. This sub-surface flow is slow resulting in rivers from a well-maintained catchment having higher base flows even during the dry season. In poorly maintained and degraded catchment, the rainfall results in the rapid surface runoff which is channelled into the river courses, resulting in flash-floods. Since there is little storage in such a catchment, the rivers originating from such catchment will not be able to sustain their base flows during the dry season.

Catchment areas are thus a vital component in water resource management and they should be formally delineated, gazetted, protected from encroachment and pollution and managed sustainably to maintain their ecological integrity.

### 1.1.1 Legal Framework for Catchment Protection:

Because of its nature, environmental management and protection in general and catchment protection and management in particular falls within the mandate of many institutions. Catchment protection is therefore, a cross-cutting issue which is spread over several legislations, which have a bearing on the environment and/or natural resources management. These legislations include:

i). ***Constitution of Kenya.***

Article 66 deals with land and provides that the State may regulate the use of any land, or any interest in or right over any land, in the public interest.

Article 69 deals with the environment and natural resources including the sustainable exploitation, utilisation, management and conservation and the

equitable sharing of the accruing benefits. Article 69 (2) states that it is the duty of every person to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

The Article 70 deals with the enforcement of environmental rights by any person.

ii). ***Water Act 2016***

Section 22 provides that where the Authority is satisfied that special measures are necessary to protect catchment area or part thereof, it may, with the approval of the Minister, by order published in the Gazette declare such an area to be a protected area.

The Authority may impose such requirements, and regulate or prohibit such conduct or activities, in or in relation to a protected area that the Authority may think necessary to impose, regulate or prohibit for the protection of the area and its water resources.

Under Sections 23 of the Act, the Authority may identify a catchment area, part of a catchment area or water resource to be identified as areas to be Protected or designated as Groundwater Conservation Areas if the Authority is satisfied that doing so is necessary for the protection of the water resource and its multiple uses. The Authority shall, in conjunction with relevant institutions and stakeholders, establish management rules or plans that shall apply to each Protected Area or Groundwater Conservation Area.

iii). ***Water Resources Management Rules 2007***

Part IX section 116 - 120 provides for the determination of the riparian land, which as defined in Part I of these rules does not imply a change of ownership but imposes management controls on land use for water resource quality as defined in these rules.

This part deals extensively with the management of the riparian land including its management, activities that are allowed or proscribed within the riparian land.

The Authority shall undertake Public Consultation with respect to the establishment of areas to be Protected or designated as Groundwater Conservation Areas and the management rules or plans that shall apply with respect to these Areas.

*iv). Relevant Sustainable Development Goals (SDGs)*

**Target 6b.** Support and strengthen the participation of local communities in improving water and sanitation management

**Target 6.3** - By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

**Target 6.6:** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

***1.1.2 Background information on Kabeere Springs:***

Ngusishi sub catchment is a water scarce area and the available surface water sources are mainly Kabeere springs, Batian springs and Muthuri springs. Kabeere springs contribute approximately 50% of the discharge of Ngusishi river and thus the protection and conservation of its catchment is critical to the ecological sustainability of the river.

The river supports numerous large-scale horticultural farms and subsistence farming, livestock and wildlife. The population dependent on Kabeere springs is approximately 8,239 people and a livestock population of 2,331 Livestock Units.



### ***1.1.3 Rationale for Catchment Protection through Gazettement;***

Kabeere springs constitute one of the three main sources of water for Ngusishi river, the others being Muthuri and Batian springs. The springs is threatened with destruction due to human activities carried within the area as it is wholly situated within a private land whose owner has freehold Title Deed for it. Initially, the area had been set aside for public use as a water catchment but was later alienated as private land. The Ngusishi river riparian community has severally complained of the ongoing destruction resulting in diminishing water flows. The complaints have been addressed by WRMA and other stakeholders within the catchment without success mainly because the land owner has not fully appreciated the importance of safe-guarding the springs' catchment. To stop further destruction and ensure proper conservation and protection of the springs' catchment, WRMA, community and other key stake-holders recognised the need for Gazettement of the land. In this regard, a stakeholders' meeting was convened on 19th – 20th May 2010 to build consensus on the way forward. The meeting unanimously agreed that the protection of the springs was a top priority in order to assure the riparian community and other stakeholders of adequate and sustainable water resource availability.

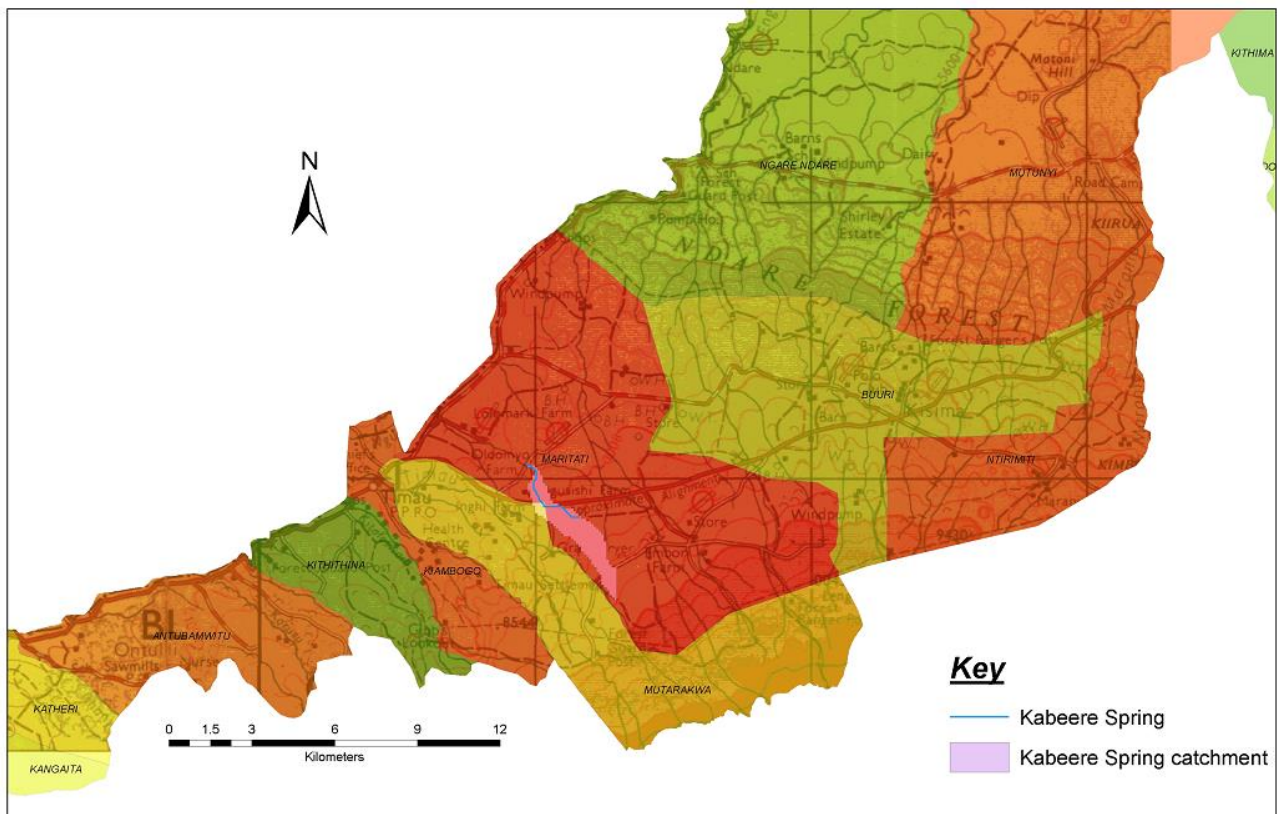
ENNBA's CMS (2014 - 2022) has recognised the need to protect the springs and increase their yield. This will be achieved through the implementation of the following strategies:

- i).* Sensitisation of the user community on the need to protect the springs to ensure sustainable yield;
- ii).* Development of an action plan to protect the catchment and their rehabilitation;
- iii).* Participatory mapping of the protection zones around the springs with the community;
- iv).* Apply the law to protect springs (enforcement for wetlands/riparian/springs protection);

In addition, Part XI of WRM Rules section 123 - 125 sets out the process and procedure for the identification of an area as a protected or groundwater conservation area. This is the procedure used in coming up with this Gazettement document for the Kabeere springs.

### 1.2 Location and size of area to be gazetted

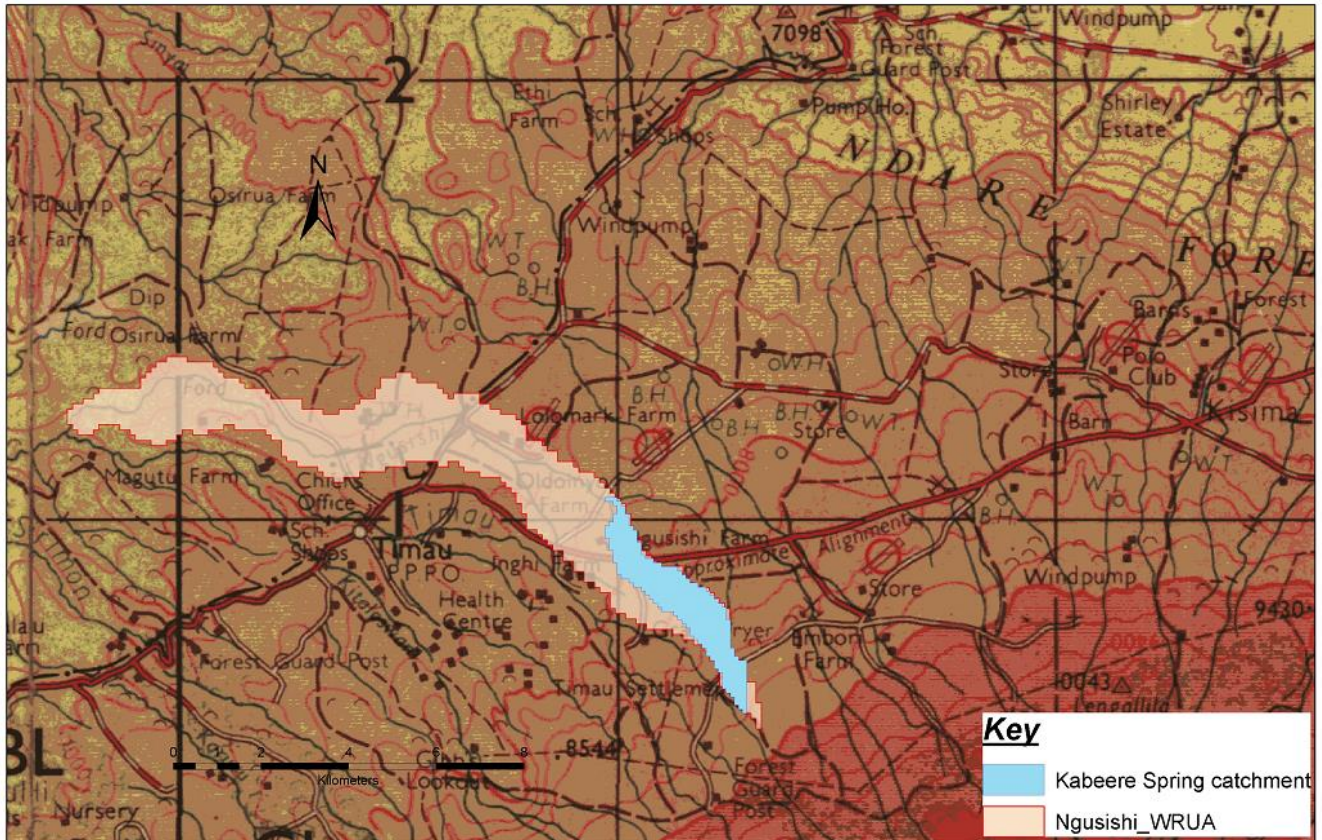
The area identified for Gazettement is commonly known as Kabeere Springs. It is located in Kabubungi area of Ngusishi location in Timau Division, Buuri East Sub County, Meru County within the Upper Ewaso Ngiro Sub Region. The land area to be protected is approximately 5 acres (2.02 Hectares) and is shown in the map below.



**Fig.1. Location of Kabeere Springs and its catchment**

#### 1.2.1 Watershed area;

The area that contributes surface run-off to the springs has been delineated through the use of ArcGIS software. The area measures 3.89 square kilometres (389 hectares) out of the 31.8 km<sup>2</sup> of the Ngusishi river catchment area as shown below:



**Fig.2.** Location of Kabeere Springs catchment within Ngusishi river catchment

### **1.2.2 Physiography, climate and rainfall;**

#### **a) Physiography**

The lowest point of the catchment area is at coordinates E037.29205, N 00.09009 (37N 309920 UTM 9962) and at an altitude of 2440 m.a.s.l. The catchment is leaf shaped and extends upstream in south easterly direction with a length of 5.2 kilometres (see the map above).

The altitude of Ngusishi river sub-catchment ranges from 4100 m.a.s.l in the upper parts of the sub-catchment to 1800 m.a.s.l at the outlet. The slope ranges between 3% to 17% with the steeper slopes found on the upstream part within the slopes of Mount Kenya. The catchment drains in a northerly direction from the high Mt. Kenya ridge to the northern lowlands of Nanyuki plains, where it joins with the Timau river at the foot of the sub-catchment.

#### **b) Climate**

The monthly mean temperatures range between 7.6° C in the high cooler areas to 22° C at the lower parts (Berger, P. 1989, Kihara, F. 1997). This catchment has a rapid highland to lowland climatic transition with the larger part being a semi-arid environment. Exploitation of this perennial river, has been increasing with time as the demand for water increases resulting in poor water availability during the dry season.

The Ngusishi catchment lies within the agro ecological zones (AEZ) III to V in the following proportions, 1%, 77% and 22% respectively In general the area is characterized by low amount of rainfall which can be attributed to its being located on the leeward side of Mt. Kenya. 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 (mean of 1100 mm) and decreases gradually downwards through the savannah and alpine zones to the semi-arid Laikipia Plateau (mean of 700 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. Rainfall is therefore low in amount and is poorly distributed in time and space (LRP, 1996).

*c) Vegetation;*

The vegetation on the Mount Kenya slopes on which the Ngusishi catchment lies exhibits a strong zonation characteristic. As one moves down the mountain, the following vegetations are encountered:

1. Alpine belt
2. Ericaceous belt
3. Mountain forest belt
4. Savannah belt
5. Pastoral belt

The catchment lies within the savannah and pastoral belts where the main natural vegetation types are bush land/grasslands and open grasslands

*d) Current land use and its adverse impacts,*

The area adjacent to the springs eye has been cleared of the vegetation and is currently under cultivation with vegetables and other food crops. The potential future use for the area will basically consist of the activities with no impact on the vegetation.

The cultivation of the area around the springs eye has had an adverse impact on the water quality and quantity. The clearing of the vegetation around the springs has resulted in poor quality water while the use of agricultural chemicals (fertilisers and pesticides) is affecting water quality.

## **2 Current Situation Analysis**

### *2.1 The vulnerability of the water resource*

Ngushishi river has a Regular Gauging Station (RGS) 5BE19 located at E037.26100 and N00.10000 coordinates. The available data is for the period 1959 – 1963 and no rating curve is available. The station has a poor control and the rating for the station is difficult because of the unstable banks.

Ground Water availability in the area is highly varied. Most of the area has ground water yield potential ranging between 60 l/min to 650 l/min and is of good quality. The ground water system feeds into the surface drainage system of the Ngushishi river through the numerous springs that exist in the area. The analysis of existing borehole data indicate an average water struck level is approximately 90 m.b.g.l. with sufficient transmissivity and storage being provided by the saturated sediments/riverine aquifer system (NRM3 2002).

The encroachment on the riverine land through cultivation and the clearing of vegetation in the upper areas of the catchment has resulted in the lowering of the water table and a decrease in the yield of the springs. Though no clear data exist, the yield of boreholes in the area is also decreasing as their density increases.

In order to have a clear understanding of the water resources availability in the Ngusishi catchment, the available data has been used and collated with the data of the neighbouring catchments with similar characteristics, such as Timau, whose regular gauging station (5BE06) has long term data between 1944 and the present.

According to the correlation between Ngusishi and Timau sub-catchments, the following scenario on surface water availability emerges:

| Probability of non-exceedance % | Probability of exceedance % | Flow m <sup>3</sup> /s | Flow m <sup>3</sup> /day | Available for allocation m <sup>3</sup> /day | Days nos      | Total volume Million m <sup>3</sup> | Volume per year Million m <sup>3</sup> |
|---------------------------------|-----------------------------|------------------------|--------------------------|--|---------------|-------------------------------------|--|
| 99                              | 1                           | 9.197                  | 794,579                  |  | 3.65          | 2.90                                | 55.8                                   |
| 95                              | 5                           | 2.480                  | 214,264                  |  | 18.25         | 3.91                                | 52.9                                   |
| 90                              | 10                          | 1.332                  | 115,095                  |  | 36.50         | 4.20                                | 49.0                                   |
| 85                              | 15                          | 0.844                  | 72,895                   |  | 54.75         | 3.99                                | 44.8                                   |
| 80                              | 20                          | 0.575                  | 49,670                   |  | 73.00         | 3.63                                | 40.8                                   |
| 75                              | 25                          | 0.433                  | 37,435                   |  | 91.25         | 3.42                                | 37.2                                   |
| 70                              | 30                          | 0.353                  | 30,523                   |  | 109.50        | 3.34                                | 33.7                                   |
| 65                              | 35                          | 0.300                  | 25,887                   |  | 127.75        | 3.31                                | 30.4                                   |
| 60                              | 40                          | 0.258                  | 22,281                   |  | 146.00        | 3.25                                | 27.1                                   |
| 55                              | 45                          | 0.223                  | 19,233                   |  | 164.25        | 3.16                                | 23.8                                   |
| <b>50</b>                       | <b>50</b>                   | <b>0.191</b>           | <b>16,528</b>            | <b>9,831</b>                                 | <b>182.50</b> | <b>3.02</b>                         | <b>20.7</b>                            |
| 45                              | 55                          | 0.164                  | 14,210                   |  | 200.75        | 2.85                                | 17.7                                   |
| 40                              | 60                          | 0.141                  | 12,149                   |  | 219.00        | 2.66                                | 14.8                                   |
| 35                              | 65                          | 0.123                  | 10,647                   |  | 237.25        | 2.53                                | 12.2                                   |
| 30                              | 70                          | 0.105                  | 9,101                    |  | 255.50        | 2.33                                | 9.6                                    |
| 25                              | 75                          | 0.091                  | 7,899                    |  | 273.75        | 2.16                                | 7.3                                    |
| <b>20</b>                       | <b>80</b>                   | <b>0.078</b>           | <b>6,697</b>             | <b>5,409</b>                                 | <b>292.00</b> | <b>1.96</b>                         | <b>5.1</b>                             |
| 15                              | 85                          | 0.061                  | 5,280                    |  | 310.25        | 1.64                                | 3.2                                    |
| 10                              | 90                          | 0.037                  | 3,220                    |  | 328.50        | 1.06                                | 1.6                                    |
| <b>5</b>                        | <b>95</b>                   | <b>0.015</b>           | <b>1,288</b>             | <b>0</b>                                     | <b>346.75</b> | <b>0.45</b>                         | <b>0.5</b>                             |
| 1                               | 99                          | 0.001                  | 129                      |  | 361.35        | 0.05                                | 0.1                                    |

Table.1. Surface water availability for Ngusishi river

The above correlation is consistent with the estimates carried out under the NRM<sup>3</sup> (2002) which gave a flow of 6,036 m<sup>3</sup>/d from the springs.

## 2.2 The water resource quality objectives and the current status of the water resource

According to the ENNBA CMS (2014 - 2022) Ngusishi sub-catchment can be classified as of high Livelihood importance. The area has predominantly rural characteristics i.e. rural and scattered settlements with varying population density

and small scale subsistence - orientated economic activities that include cultivated agriculture and livestock rearing. This category targets protection of water resources to ensure livelihood of rural population.

Sustainable water resources management in the sub-catchment will focus on cooperation with Ngusishi WRUA and other stakeholders within the sub-catchment.

### ***2.3 The class of the water resource***

The Ngusishi sub-catchment can be classified as “Alert” as the available water is at times not adequate to meet the authorised allocations. In terms of water resource quantity, the reserve has been violated in the Ngusishi river sub-system especially in the lower reaches towards its confluence with the Timau system. The WRUA in collaboration with other stakeholders has pegged the riparian land with the consent of the land owners and tree planting is in the process with 12 kilometres out of the total length of 21 kilometres planted. The water is of relatively good quality with both human and livestock taking the water directly without any apparent negative health impacts.

### ***2.4 Present and Projected Water demand***

According to household survey carried out by the Ngusishi WRUA in 2007, the distribution of households within the water projects abstracting water from the Kabeere springs was as follows:

|                   |                 |
|-------------------|-----------------|
| Kabubungi A       | 45 Households;  |
| Kabubungi B       | 36 Households;  |
| Kongoni community | 273 Households; |
| Wiyumiririe       | 400 Households; |
| Ranch             | 1               |

Assuming an average household size of 10 persons, the current total population dependent on Kabeere springs is approximately 8,239. On average, each household has 1 grade and 1 indigenous cow and 3 shoats bringing the total livestock population to 2,331 Livestock Units (includes livestock from the Ole

Naishu Ranch). The water demand for current (2010), future (2020) and ultimate (2030) is tabulated herebelow:

| <i>Year</i>                | <i>Current (2020)</i> | <i>Future (2030)</i> |
|----------------------------|-----------------------|----------------------|
| Population                 | 11,073                | 14,881               |
| Demand (Human) (m3/d)      | 553.637               | 744.042              |
| Livestock Units            | 2,331                 | 2,331                |
| Demand (Livestock) (m3/d)  | 116.557               | 116.557              |
| Irrigation (m3/d)          | 432.000               | 432.000              |
| <b>Total Demand (m3/d)</b> | <b>1,102.194</b>      | <b>1,292.599</b>     |

**Table.2. Current and Projected Water Demand from Kabeere Springs**

From the above figures, the average water demand from Kabeere springs currently stands at 1,292.6 m3/d. However, the monitored abstraction from the springs currently stand at approximately 1,938 m3/d showing that an unaccounted abstraction of 645.5 m3/d

According to water resource monitoring on the Kabeere springs, the average discharge from the springs currently stands at 2,808 m3/d, with a reserve of 644 m3/d resulting in an allocatable flow of 2,164 m3/d. When the net abstraction of 1,938 m3/d is catered for, the water balance from the springs is approximately 226 m3/d.

## **2.5 Land uses and their potential impact on the water resources**

### **2.5.1 Human settlement**

Though there is an upcoming formal human settlement, there are no centralised solid and liquid waste disposal facilities. The settlement around the springs will have a major impact on it because of the pit latrines constructed. When in use, there is likelihood of bacterial contamination of the groundwater feeding the springs. In addition, when they get filled up, they may end up draining the raw sewage into the water resource. There is also the clearing of the land for settlement leaving the soil bare leading to erosion. The riparian is left unprotected causing the collapse of river banks and siltation occurrence



There are also people defecating around the springs which poses a major health problem and may end up spreading diseases like cholera and typhoid.

The solid waste generated can impact negatively directly or indirectly on the resource quality.

### ***2.5.2 Agriculture***

Agro-chemicals from crop and animal spraying and fertilizers may end up being discharged into the springs. Possibilities do also exist for the same chemicals to turn the soil acidic/alkaline, and affect the growth of vegetation around the springs

### ***2.5.3 Livestock***

The inhabitants of the area practice the free-range livestock rearing method where the animals are left to fend for themselves. The animals are watered directly from the springs resulting in trampling of the springs' eye, destruction of riverine vegetation, increased soil erosion and water pollution.

### ***2.5.4 Exotic Species of Plants***

There exist numerous exotic species of trees which are unsuitable in a water catchment area, especially near springs' eye, which include the blue gum trees.

## **3 Rehabilitation of the area**

### ***3.1 Development of a Plan of Action to rehabilitate the land;***

According to the relevant legal framework as discussed in Sub-Section 1.1.1 above, protected areas can be used by the neighbouring community in a sustainable manner. The activities to be undertaken within the protected area are those with zero impact on its ecological status and integrity. The following activities are specifically proscribed in a protected area:

- i).* Tillage or cultivation
- ii).* Clearing of indigenous trees or vegetation
- iii).* Building of permanent structures (especially boreholes and houses)
- iv).* Disposal of any form of waste

- v). Excavation of soil or development of quarries
- vi). Planting of exotic species that may have adverse effect to the water resource

### 3.2 Water Use Plan

The objective of this water use plan is to protect the long-term water storage and supply capacity of the springs by controlling encroachment and degradation of the catchment.

#### Actions

- *Establish the water balance.*
- *Develop water allocation plan for the Ngarelen springs.*
- *Improve Water use efficiency (introduction of technologies)*

| <i>Activity</i>   | <i>Sub-activity</i>   | <i>Timeframe</i> | <i>Cost</i>      | <i>Responsibility</i> |
|---|---|------------------|------------------|-----------------------|
| Establish the water balance                                 | Assess demand and availability  | 2021             | 500,000          | WRA, WRUA             |
| Develop water allocation plan for the Ngarelen springs.     | Develop Water allocation Plan   | 2021             | 1,000,000        | WRUA, WRA,            |
|   | Implement water allocation plan   | continuous       | 2,000,000        | WRA, WRUA             |
|   | Enforce permit conditions   | continuous       | 1,500,000        | WRA, WRUA,            |
| Enhance Water use efficiency (introduction of technologies) | Sensitization and model water use units - irrigation, domestic<br>Demonstration on efficient water use technology | Continuous       | 2,000,000        | WRA, WRUA,            |
| <b>Total</b>  |   |                  | <b>7,000,000</b> |                       |

### 3.3 Springs Protection Plan

The objective of the protection plan is to protect Kabeere springs by encouraging activities that enhance both water quality and quantity while discouraging activities that cause the spring's catchment to deteriorate.

| <i>Activity</i>                | <i>Sub-activity</i>                               | <i>Timeframe</i> | <i>Cost</i> | <i>Responsibility</i>           |
|--------------------------------|---|------------------|-------------|---------------------------------|
| Gazettement of Kabeere Springs | Delineate and survey the spring's catchment area. | 2022             | 200,000     | WRA, County Lands & Survey Team |

|  |  |            |                  |                              |
|--|--|------------|------------------|------------------------------|
| Catchment Area   | Develop the Part Development Plan for the spring catchment                           | 2021       | 500,000          | WRA, SoK, Lands Department   |
|  | Create awareness on the status of the spring's catchment area.                       | Continuous | 300,000          | WRA, WRUA, County Government |
|  | Develop guidelines and conservation/protection plan through stakeholders' engagement | 2021       | 500,000          | WRA with all stakeholders    |
|  | Submit gazettelement instrument to the AG  | 2021       | 500,000          | WRA                          |
| Enforcement of Kabeere springs catchment guidelines and other legislations | Enforce Kabeere springs catchment management guidelines and relevant legislations    | Continuous | 2,000,000        | WRA, NGAO, County Govt       |
| <i>Total</i>   |  |            | <b>4,000,000</b> |                              |

### 3.4 Conservation/Protection Plan

The objective of the conservation plan is to maximize the yield of Ngarelen springs by promoting beneficial land and water management practices.

#### Actions

The conservation/protection plan proposes the following activities:

- Sensitization on catchment management
- Revegetation of the catchment area
  - Native Plant Propagation
  - Exotic species control
- Water storage enhancement to ease pressure on use of springs water
  - Rain water harvesting tanks
  - Water pans
- Regulating activities that may lead to pollution and destruction of the ecosystem (Grazing and cultivation)
- Controlling abstraction limits and observing of safe yields

- Controlling encroachment

| Activity                                      | Sub-activity   | Timeframe  | Cost              | Responsibility               |
|---|--|------------|-------------------|------------------------------|
| Re-vegetation of the catchment area           | Establish native Plant Propagation   | Continuous | 1,000,000         | WRUA, WRA, KFS               |
|   | Grow live fence on the boundary of the catchment.  | 1 Year     | 1,000,000         | WRA, KFS, WRUA               |
|   | Planting and growing of propagated seedlings (Watering and tending)                                | Continuous | 2,000,000         | WRUA                         |
|   | Exotic species control   | Continuous | 500,000           | WRUA                         |
| <b>Sub-Total</b>                              |  |            | <b>4,500,000</b>  |                              |
| Rain water storage enhancement.               | Installation of 20 10m <sup>3</sup> Rain water harvesting tanks in public institutions/public land | 1 Year     | 4,000,000         | WRA, and WRUA                |
|   | Construction of 2No. 10,000m <sup>3</sup> water pans   | 1 Year     | 10,000,000        | WRA, and WRUA.               |
| <b>Sub-Total</b>                              |  |            | <b>14,000,000</b> |                              |
| Controlling encroachment and review of grants | Review legality of titles and resolving  | Continuous | 2,000,000         | NLC, WRA, County Government. |
| <b>Sub-Total</b>                              |  |            | <b>2,000,000</b>  |                              |
| <b>TOTAL</b>                                  |  |            | <b>20,500,000</b> |                              |

### 3.5 Monitoring Plan

The objective of the monitoring plan is to collect water resources data and maintain a comprehensive database on the Ngarelen springs that provides information on water levels and quality of the spring's water.

#### Actions

- Establish a water quality and pollution control plan.
- Water sampling and analysis
- Establish a water resources database

| Action | Sub Activities | Time frame | Costs | Responsible |
|--------|----------------|------------|-------|-------------|
|--------|----------------|------------|-------|-------------|

|                             |  |            |                  |                      |
|-----------------------------|--|------------|------------------|----------------------|
| Water sampling and analysis | Collecting samples and taking to the lab in NRB.               | Continuous | 200,000          | WRA                  |
|                             | Conduct analysis of biological and physico-chemical parameters | Continuous | 500,000          | WRA                  |
| Capacity Building           | Capacity building on data collection and monitoring            | Continuous | 300,000          | stakeholders and WRA |
| <b>Total</b>                |  |            | <b>1,000,000</b> |                      |

### ***3.6 Establishment and operationalization of management structure***

#### ***3.6.1 Composition***

The gazetted area will be under a Management Committee composed of 1No. member from each of the following stakeholders:

1. Kenya Forest Service
2. County Government of Meru (Agriculture, Water)
3. Public Health Department, Meru County;
4. National Government Administration Officers, Meru County;
5. National Environmental Management Authority;
6. The Ngusishi WRUA;

WRA as the lead agency in water resources management, will be the Coordinator

#### ***3.6.2 Terms of reference***

The members appointed to the Management Committee will serve on the committee on Honorary basis as this will be a non-profit, non-commercial venture. Their Terms of References (ToR) will include but not limited to:

- Manage the catchment prudently on behalf of other stakeholders
- To submit quarterly reports to WRA - ENNBA on all activities carried out
- To develop by - laws and submit a copy to WRA - ENNBA

#### ***3.6.3 Mandate and responsibilities***

- Promote the conservation & protection of the catchment

- Promote equitable distribution of the resources within the catchment
- Promote socio-economic and environmental sustainability of the catchment

#### ***3.6.4 Financing;***

The Management Committee will be required to solicit for funding from well-wishers to supplement the income that will be derived from the activities permitted in a protected area. The sources of funds for the committee may include:

- Bee keeping
- Tree Nursery
- Well wishers / Donors
- WRMA/WRUA - (WDC)

#### ***3.6.5 Reporting linkages with Government Agencies/Departments and stakeholders***

The following are the proposed linkages between various stakeholders. The arrows indicate the direction of flow of information. The dotted lines indicate WRUA can also communicate directly to communities and vice versa.

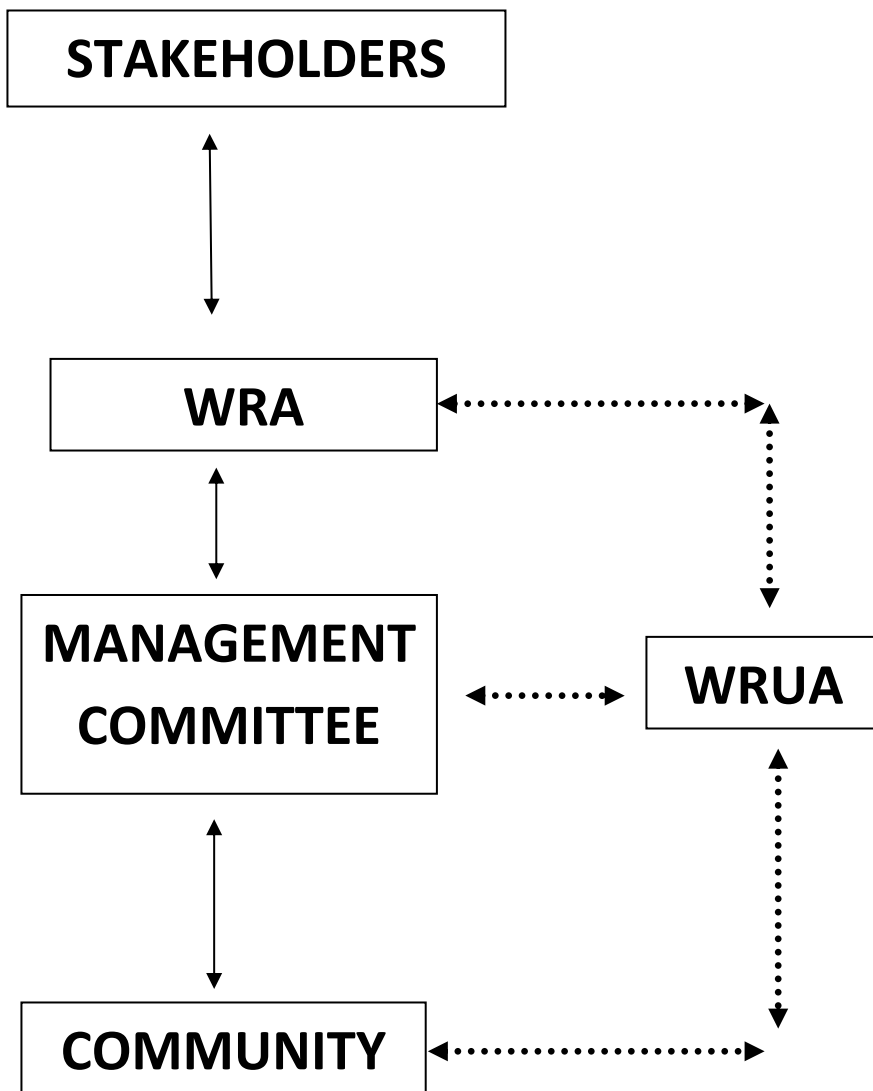


Fig.3. Reporting Linkages for the Management Committee

### 3.7 Monitoring and evaluation of implementation progress

The following table will be used for Monitoring and Evaluation to capture every detail of the progress.

| Activities | Implementation Schedule |          | Status (% completion) | Planned Cost Ksh. | Total expenditure to date | Source of funds | Output | Comments |
|------------|-------------------------|----------|-----------------------|-------------------|---------------------------|-----------------|--------|----------|
|            | start date              | End date |                       |                   |                           |                 |        |          |
|            |                         |          |                       |                   |                           |                 |        |          |
|            |                         |          |                       |                   |                           |                 |        |          |

Table.3. Monitoring and Evaluation template