Republic of Kenya

Water Resources Management Authority

WATER ALLOCATION PLAN - NAIVASHA BASIN

2010 - 2012

14th June 2010

EXECUTIVE SUMMARY

Lake Naivasha is a unique wetland of international importance (a Ramsar Site) which supports important economic activities including intensive horticultural and floricultural production, livestock production, tourism, geothermal power generation, tourism and service industries. This presents an immense challenge in the management of the lake so that the lake and its associated resources are used in a sustainable way. Current indications are that all is not well. The combined impact of high (and as yet unlimited) abstraction, high nutrient loading, loss of aquatic vegetation (due to introduced species) and loss of terrestrial lakeshore vegetation has resulted in lower lake levels and a higher risk of the lake becoming eutrophic. The long term sustainability of the lake and the economic activities that it supports are at serious risk (Harper *et al* 2004).

The lake is part of a complex hydrological system involving the surface water and groundwater systems, land use practises in the catchment and riparian areas, abstraction of both the surface and ground water resources and chemical and nutrient loading of the water resources.

While recognising the complexity of the hydrological processes within the entire Naivasha basin (lake and catchment areas, Map 1, Appendix A), the Water Allocation Plan (WAP) essentially focuses on one dimension, namely quantity, and focuses on aspects of water allocation and water abstraction.

The WAP is a rational and acceptable framework for the allocation and abstraction of the water resources from the entire Naivasha Basin. The WAP attempts to address the inherent tension in a water resource limiting situation between the need to protect the environment and basic human rights of access to the water resources and consumptive use of the resource for economic development.

The WAP sets out the guiding principles that guide the formulation, implementation and further revisions to the WAP. The WAP has been formulated using available information on the hydrology and water use. The accuracy of the data has been a constraint in the formulation of the plan and it is expected that future revisions of the plan can be made on the basis of more accurate and comprehensive data.

The WAP has adopted an approach which principally aims to bring abstraction into compliance with amounts allocated on permits and at the same time aims to meet the overall objective of reducing total allocation by 10% by 2012.

Water Allocation

The WAP presents three cases when decisions regarding allocation and abstraction are handled. These are:

1. A new application for water permit;
2. Existing abstractor with an authorisation seeks to obtain a permit;
3. Existing abstractor with permit seeks to renew or amend the permit.

For each of these cases the WAP proposes how the application should be handled depending on the water source in question. These decisions are being made by the WRUA (providing comments), the CAAC and WRMA. The WAP therefore sets out how all these bodies should approach the decision and be held accountable for deviations from this plan.

Abstraction Restrictions

Water resource availability is a variable that changes with rainfall. It is therefore important that abstractions are scaled according to availability of the resource. Water allocation is also tied to the availability of the resource. The WAP therefore sets out the level of abstraction permitted for each state of the resource for different water bodies, as shown by the table below.

COLOUR CODING ZONES ON ABSTRACTION RESTRICTIONS & RESERVE WATER	**WATER RESOURCE STATUS i.e. PERIODS WHEN**		
	RIVERS FLOWS.	**Lake Naivasha levels metres above mean sea level.**	
		LAKE WATER	**GROUNDWATER WITHIN CONSERVATION AREA**
Green i.e. Satisfactory. *Abstractions allowed up to permit limits.*	**Higher than Q80.**	**Higher than 1885.3**	**Higher than 1885.3**
Amber i.e. Stress. *Slight abstraction restrictions imposed***.**	**Between Q80 and Q94.** Abstractions allowed:- 1. domestic and public water supplies. 2. Others cease to pump from water bodies and revert to their 90 day storages.	**Between 1885.3 and 1884.6** Abstractions allowed:- 1. domestic and public water supplies. 2. Others draw 75% of their water use.	**Between 1885.3 and 1884.6** Abstractions allowed:- 1. domestic and public water supplies. 2. Others draw 75% of their water use.
Red i.e. Scarcity. *Severe abstraction restrictions imposed.*	**Between Q95 to Q96.** Abstractions allowed:- 1. domestic and public water supplies draw 50% of their water use. 2. Others continue to draw from their 90 day storages.	**Between 1884.5 to 1882.5** Abstractions allowed:- 1. domestic and public water supplies draw 75% of water used. 2. Others draw 50% of their water use.	**Between 1884.5 to 1882.5** Abstractions allowed:- 1. domestic and public water supplies draw 75% of water use. 2. Others draw 50% of their water use.
Black i.e. Reserve. *Full protection; surface water uses restricted to basic human / livestock needs and nature (ecosystem) only.*	**Lower than Q96.** Abstraction allowed:- 1. domestic and public water supplies draw amounts for basic body needs only i.e. 25 litres per person / livestock unit per day.	**Lower than 1882.5.** Abstraction allowed:- 1. domestic and public water supplies draw amounts for basic body needs only i.e. 25 litres per person / livestock unit per day.	**Lower than 1882.5.** Abstraction allowed:- 1. domestic and public water supplies draw 75% of water use. 2. Others draw 50% of their water use.

Note: Q80 and Q95, Q96 are determined from hydrological records and are different for each river.

Compliance and Enforcement

The WAP recognises its grave weakness which is lack of compliance to and enforcement of the plan. With respect to compliance, the WAP proposes three key areas to be addressed, namely:

- Removing barriers to compliance (e.g. lack of knowledge regarding WAP and how to comply with them) and promoting the principles of rules;
- Overcoming factors that encourage non-compliance (e.g. lack of public support for, or misunderstanding of, water resources management objectives);
- Raising awareness of the benefits of complying with the rules and the potential consequences of not complying.

With respect to enforcement the approach has focused on three aspects, namely:

- Mechanisms for reporting infringements to the WAP;
- Action against violators;
- Penalties and restrictions on violators;

The WAP proposes a system of 'two yellow cards followed by a red card'. Essentially each WRUA needs to propose a "referee" – someone respected across all stakeholder groups and who is willing to play the role of enforcer for the WRUA – who investigates reports of violations. Each case results in a higher level of scrutiny and punitive action being taken by the WRUA and also finally with WRMA.

Revisions to WAP

The initial WAP is applicable for an initial three year period 2010 to 2012. It is foreseen that the WAP would be evaluated and revised subsequently after each five year period. The WAP sets out a mechanism for dealing with suggested changes should they be required within each review period.

Conclusions

The WAP sets out a framework for making water allocation and water abstraction decisions with respect to the water resources within the Naivasha Basin. The benefits of the WAP can only be realised if stakeholders work collectively towards implementing the plan.

TABLE OF CONTENTS

ACRONYMS

CAAC	Catchment Area Advisory Committee
CBO	Community Based Organization
CMS	Catchment Management Strategy
EMCA	Environmental Management and Coordination Act
GCAs	Groundwater Conservation Areas
GIS	Geographical Information System
GoK	Government of Kenya
GPS	Global Positioning System
GW	Groundwater
IWRM	Integrated Water Resource Management
LNMIC	Lake Naivasha Management Implementation Committee
LNGG	Lake Naivasha Grower's Group
LNMP	Lake Naivasha Management Plan
LNRA	Lake Naivasha Riparian Association
KES	Kenya Shillings
MWI	Ministry of Water and Irrigation
NEMA	National Environmental Management Authority
NWRMS	National Water Resource Management Strategy
RGS	Regular Gauging Stations
RVCA	Rift Valley Catchment Area
RVWSB	Rift Valley Water Services Board
SCMP	Sub-Catchment Management Plan
SW	Surface water
TOR	Terms of Reference
TOT	Time of Travel
WAP	Water Allocation Plan
WRM	Water Resource Management
WRMA	Water Resource Management Authority
WSB	Water Service Board
WSP	Water Service Provider
WSTF	Water Services Trust Fund

DEFINITION OF TERMS

Various terms are explained to ensure a common understanding:

An “aquifer” is a geological formation containing sufficient saturated permeable material to yield significant quantities of water to boreholes or springs

The “aquifer system” in this study refers to the totality of all aquifers within the Naivasha basin.

“Beneficial use” refers to benefits that derive from the use of the water resources. Beneficial use covers ecological, domestic, economic, recreational and other benefits.

The “precautionary principle” means if scientific information is inadequate for decision making, this shall not prevent the implementation of measures to manage and conserve natural resources.

“Recharge” is the entry of water into the ground from rainfall, streams, swamps, lakes or irrigation that eventually reaches an aquifer or aquifer system.

The “Reserve” is the quantity and quality of water required to satisfy basic human needs for all people who are or may be supplied from the water resource; and to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the water resource.

“Water allocation” is the process of apportioning water to different uses and users.

“Water abstraction” is the process of removing water from a water resource for an intended use.

1 INTRODUCTION

Lake Naivasha is a unique wetland of international importance (a Ramsar Site) which supports important economic activities including intensive horticultural and floricultural production, livestock production, tourism, geothermal power generation, tourism and service industries. This presents an immense challenge in the management of the lake so that the lake and its associated resources are used in a sustainable way. Current indications are that all is not well. The combined impact of high (and as yet unlimited) abstraction, high nutrient loading, loss of aquatic vegetation (due to introduced species) and loss of terrestrial lakeshore vegetation has resulted in lower lake levels and a higher risk of the lake becoming eutrophic. The long term sustainability of the lake and the economic activities that it supports are at serious risk (Harper *et al* 2004).

This risk calls for concerted efforts by all stakeholders to implement effective water and catchment conservation and management activities. The lake is part of a complex hydrological system involving the surface water and groundwater systems, land use practises in the catchment and riparian areas, abstraction of both the surface and ground water resources and chemical and nutrient loading of the water resources. Additionally, many of these factors are changing rapidly.

While recognising the complexity of the hydrological processes within the entire Naivasha basin (lake and catchment areas, Map 1, Appendix A), the Water Allocation Plan (WAP) essentially focuses on one dimension, namely quantity, and focuses on aspects of water allocation and water abstraction.

The WAP is a rational and acceptable framework for the allocation and abstraction of the water resources from the entire Naivasha Basin. The WAP attempts to address the inherent tension in a water resource limiting situation between the need to protect the environment and basic human rights of access to the water resources and consumptive use of the resource for economic development.

The WAP is intended to compliment other plans and efforts by stakeholders to strengthen the management of the water resources of the Naivasha Basin.

1.1 Justification for a Water Allocation Plan

Currently there are no agreed limits to the total abstraction from the lake, aquifers or rivers within the Naivasha Basin. The net result is that total allocation and total abstraction of the water resources has been increasing with significant impacts - river flows in the upper catchment areas have diminished or ceased periodically in various cases, lake levels have fallen, aquifer flows and quality have been impacted, etc. Without any limits in place, allocation of the resource will continue to increase in response to the increasing demand. This may result in any of the following consequences:

- The Reserve may be violated in terms of either quantity or quality or both. This primarily affects those that rely directly on the water resource for their water supply. Violation of the Reserve can be considered as a violation of someone's basic human right;
- Non-optimal allocation of water resources to inefficient uses of water;
- Water use conflicts increase due to insufficient water resource availability, non-equitable allocation, etc;
- Bad publicity for the horticultural and floricultural export industry which may be seen to be over exploiting the water resources to the detriment of other water users;
- Loss of export markets (for agricultural products) and tourism potential due to the bad publicity associated with economic activities around the lake;
- Severe negative impacts on the social and economic well being of all those dependent on the water resources;
- Local pastoralists would be negatively affected through the loss of a traditional drought reserve.

While this may pose a rather dire picture of the consequences of poor water allocation, the risk is real and the stake in terms of the environment, investment, and social consequences is large.

It is therefore important that all stakeholders focus on the mutual benefits gained by agreeing on and complying with a water allocation plan.

1.2 Development of the Water Allocation Plan

The process of developing the Water Allocation Plan was started in 2005 by the Lake Naivasha Growers Group (LNGG) who engaged consultants and participated in the development of the initial WAP which was submitted to WRMA in 2007. This draft has been exposed to stakeholders and revised to form the current version.

The process of developing the WAP has included a review of the relevant hydrological data, the state of the groundwater aquifers, and has made deliberate efforts to ensure the participation of stakeholders from around the lake and from the catchment areas. The formation and establishment of WRUAs has been part of this effort. Numerous meetings and workshops have been held in which the WAP has been presented and discussed. The stakeholders groups that have been consulted during the formulation of the WAP include:

- Ministry of Water and Irrigation;
- WRMA;
- Government Departments (Fisheries, Agriculture, Livestock, Social Services);
- CAAC;
- WRUAs from the lake and catchment areas;
- LNGG;
- LNRA;
- KWS;
- Tourism Operators;
- Fishing Groups;
- KenGen;
- Pastoralists from around Lake Naivasha;
- Farmers from around lake and catchment area;
- Research Institutions (e.g. ITC);
- NGOs (e.g. WWF);
- Water Service Board;
- Water Service Providers (e.g. NAWASCO) and community managed water projects;
- Members of Parliament;
- CBOs;
- Consultants (e.g. Rural Focus Ltd, Aquasearch Ltd);

1.3 Scope of WAP

The WAP covers the Naivasha Basin which is composed of a number of sub-catchments, namely:

- Malewa river;
- Gilgil river;
- Karati river;
- Lake Naivasha (includes the land area contributing to the lake);

The WAP applies to all stakeholders and water users in respect of the allocation and use of the water resources derived from the Naivasha Basin.

2 BACKGROUND

This section presents essential components of the policy, legislative and information context which have influenced the development of the WAP.

2.1 Policy Framework

Key elements of the Water Sector Reforms were captured in the Policy Paper (Sessional Paper No. 1 1999). Key shifts in policy included:

- Separation of functions;
- Decentralisation;
- Commercialisation of services;
- Community and private sector participation;

2.2 Legislative Framework

The Water Act 2002 captured the policy shifts and superseded the former Water Act (Cap 372). The Water Act 2002, and the subsequent subsidiary legislation in the form of the Water Resources Management Rules (2007) introduced a number of significant features that are noted below.

1. Institutional Framework. The Water Resource Management Authority (WRMA) is mandated as the lead agency in water resources management. WRMA has a decentralised organisational structure. The Naivasha Basin falls in the Rift Valley Catchment Area, with a regional office in Nakuru. However local management is undertaken by the Sub-regional Office, located in Naivasha town;
2. Government as custodian of water resources. The water resources are managed by the government in trust for the people of Kenya. Water resources are allocated for use through a system of permits for which a user must apply;
3. Stakeholder participation. Stakeholder representation and inclusion in water resource management is reflected in the Catchment Area Advisory Committee (CAAC) on catchment wide issues and the Water Resource User Associations (WRUAs) at the sub-catchment level. The CAAC is a statutory body whereas the WRUA is a voluntary body. In an effort to improve public participation, the permit approval process involves obtaining comments from WRUAs and in some cases also from the CAAC;
4. Strategies for Water Resource Management. MWI has developed the National Water Resources Management Strategy (NWRMS) which sets out a broad approach towards water allocation. WRMA, with stakeholder participation, has developed a Catchment Management Strategy (CMS) for the management of the water resources and catchments areas within the Rift Valley Catchment Area. The CMS sets out priorities and arrangements for water allocation plans and for the involvement of WRUAs in water resource management;
5. Water Use Charges. A system of water use charges has been introduced which requires water users in certain permit classes to pay for raw water on the basis of water abstracted. The water use charges serve three primary functions: (i) to improve efficiency in water use, (ii) to provide WRMA with data on water use and (iii) generate revenue to support water resource management activities;
6. Reserve. Guideline criteria for determining the quantity component of the Reserve have been developed by WRMA. Violations of the Reserve are accorded higher priority to other complaints and there are obligations on WRMA to respond within 48 hours in such cases;
7. Priority of water uses in water allocation. Once the requirements of the Reserve have been met, the water resources can be allocated through the permitting system. Domestic uses have priority over all other uses. No further prioritisation of water uses has been established.

2.3 Water Resource Management of Naivasha Basin

The development of the WAP has taken place during a period of significant water sector reforms in Kenya which have seen new legislation and institutions being established. While this has provided an enabling environment for the development of the WAP, establishment of WRUAs and the creation of space for stakeholder participation, there have remained a number of constraints perpetuated from the earlier period of weak water resource management. These include:

- Poor and inaccurate hydrological records. For the WAP, emphasis has been placed on the data period 1940-1980 for which data is more reliable and the impact of abstraction is less significant;
- Lack of information on actual water abstraction. Estimates from research documents, although varied, provide the only useful information;
- Weak permit data. Many cases exist where permits do not exist, significantly underestimate abstraction, have expired or where the application only obtained an Authorisation. The net result is that the permit data cannot be used to provide an estimate of actual abstraction. While WRMA is addressing this situation, the lack of reasonable permit records have proved to be a significant constraint in the WAP development;
- Poor compliance. Water users have historically consistently failed to comply with the conditions of their permits. WRUAs are now expected to support the compliance process;
- Weak enforcement. The government has lacked the resources and political will to enable proper enforcement of water laws. While the lack of resources continues to be a major constraint, WRMA has placed new emphasis on enforcement of the water laws;

In summary, this WAP has been developed in the context of major information constraints. As a result, this WAP will require revision as experience and more accurate information become available.

3 OBJECTIVES, OUTPUTS AND INDICATORS

This section sets out the objectives of the WAP and defines specific outputs for WAP implementation and adoption.

The goal of the WAP is: *to establish a reasonable and practical framework for water allocation and water abstraction within the Naivasha Basin, which has been agreed and adopted by stakeholders, which is anchored in current policy and legislation, and which aims to safeguard the natural ecosystems from over abstraction while supporting multiple demands on the water resources.*

The following objectives have been established in relation to the WAP adoption and implementation.

Table 1: Objectives and Outputs of the Naivasha WAP

Objective	**Indicator**	**Means of Verification**	**Comments**
1. By Dec 2012, total annual water abstraction from Naivasha Basin decreases by 10% from 2010 baseline	Total abstraction (MCM/YR) for all Category B, C and D water users	Water use data submitted to WRMA	Water use efficiency survey conducted within entire basin by end of 2010
2. Effective communication on WAP conducted	No. of water users familiar with WAP	WRUA survey & reports	
	No. of WAP Billboards	WRUA Report	Requires $$
3. Compliance to WRM Rules improved	% of volume abstracted over volume permitted	Water use efficiency survey and water use records	Water user baseline established by water use efficiency survey
	No. of Cat B, C & D water users with meters and submitting water use data	WRUA and WRMA records	
4. Effective enforcement of WAP	No. of reported cases of WAP violation in which action is taken	WRUA Reports	
Outputs	**Indicator**	**Means of Verification**	**Comments**
1. Water Use Efficiency Survey	Proportion of basin surveyed	Survey Reports	Requires financial & technical support
2. Notices of Resource Availability installed and updated as required	No. of notices	WRUA Report	Requires financial & technical support
3. 100% of (Cat. B, C & D) water users obtain permit under new water rules by 2012	No. of permits issued by WRMA	Permit Register	Water user baseline established by water use efficiency survey
4. 100% of (Cat. B, C & D) water users install master water meter and submit water use data by 2012	% of water users with meters % reliably submitting water use data	WRUA and WRMA records	
5. Monitoring of abstraction by WRUA during restriction periods in conformity with WAP	WRUA monitoring activities	WRUA Reports	

4 UNDERLYING PRINCIPLES

This section sets out the principles agreed as part of the WAP. These principles can serve to guide the decisions that need to be made in cases where the WAP lacks sufficient detail.

1. The water resources are *finite and valuable*. This implies that there are insufficient resources to meet ever increasing demands and therefore choices will have to be made on who should be allocated the resource and on what conditions. The value of the resource implies that the resource should be allocated for beneficial use;

2. The water resources are *vulnerable* to over allocation, over abstraction and degradation. This implies that there is a tangible *risk* to the environment, economy and social well being if the WAP is not complied with. It is in the public interest to adopt and comply with the WAP to set in place a controlled mechanism for the allocation and abstraction of water resources.

3. The *precautionary principle* implies that decisions can or indeed must be made even where information is incomplete in relation to;
    - taking preventive action in the face of uncertainty;
    - shifting the burden of proof to the proponents of an activity;
    - exploring a wide range of alternatives to potential harmful actions;
    - providing for public participation in decision making.

4. Revisions to the WAP are contingent on *stakeholder participation*. Participation of water users requires proactive steps to ensure that disadvantaged groups are informed and able to articulate their concerns and interests;

5. *Water use conflicts* cause social and economic disruption. Inequitable allocation or access to the water resources provides fertile ground for water use conflicts. The WAP seeks to mitigate conflicts by setting out a framework agreed by the stakeholders for water allocation and abstraction;

6. *The Reserve* commands the highest priority in terms of water allocation. This implies that in the context of a very severe drought, even domestic water supplies may need to be rationed;

7. *Equity*. This is difficult to define precisely as it can often have different meanings for different stakeholders. Essentially equity implies that there should be a fair balance between environmental, livelihood and commercial benefits. Additionally it implies that new water users should be eligible for water allocation, depending on the priority attributed to their needs.

8. The WAP should minimise *social and economic disruption*. This implies that changes that need to be implemented to bring compliance to the WAP or future changes in the WAP should provide for a transition period to enable social and economic adjustments to be made. Essentially this implies that existing lawful and beneficial use of the water should not be quickly, arbitrarily or unnecessarily curtailed;

9. Revisions to the WAP require *negotiation and respect* between different stakeholders. The process of negotiation requires informed and mandated representatives of stakeholder groups and adequate time and fora for negotiation to take place;

10. There is a need for *future revisions* to the WAP. The development of the WAP is made in the context of the priorities, understanding and information available at the present time. As better information and understanding is gained, or priorities change, then the WAP should be revised to reflect these developments.

5 WATER BALANCE

This section presents a discussion on the water balance and the implications for the WAP.

5.1 Water Balance Concept

The water balance concept is based on an assessment of water resource availability and the water demands (including environmental demands) and determining whether there are sufficient resources to support all water demands within the basin. The water balance is a planning tool in that it allows future scenarios of demand to be evaluated against current or future estimates of water resource availability.

The water balance therefore conceptually provides boundaries for water allocation thereby safeguarding the Reserve.

5.2 Water Balance Analysis

Water resource availability and water demands have been assessed for the Naivasha Basin. Details with respect to the domestic demand are provided in Table 2. These details indicate that domestic demand will outstrip normal water resource availability on the Gilgil and Malewa rivers in 2031, implying that storage for domestic supplies are required and allocation of flood flows to domestic uses is also required.

Table 2: Availability vs Domestic Demand (units m^3/day)

RESOURCE AVAILABLE FOR ALLOCATION	**Gilgil Total**	**Turasha**	**Malewa**
Reserve	1,469	39,658	58,320
Normal Flow	3,974	24,105	38,534
Flood Flow	9,591	67,911	123,984
Domestic Demand			
2006	1,357	15,626	30,939
2016	3,343	18,695	36,769
2031	4,371	22,989	44,757
Water Balance with respect to Normal Flow			
2006	2,617	8,479	7,595
2016	631	5,410	1,765
2031	-397	1,116	-6,223

Source: Rural Focus (2006)[1]

The water balance analysis is limited due to information gaps, specifically in relation to groundwater recharge, criteria for lake abstraction and irrigation demand. In the final analysis, the WAP needs to know what are the limits for total water allocation for a specific resource.

Table 3 below provides the results of the analysis for rivers, showing availability of resources versus **existing allocations** (based on old permit records from MWI).

[1] Development of a Water Allocation Plan for Naivasha Basin, Phase 1 Report, Techncial Options. March 2006.

Table 3: Availability vs Allocated Resources

	GILGIL RIVER			TURASHA RIVER	MALEWA RIVER
Station Number	2GA03	2GA06		2GC04	2GB01
Station Name	Gilgil	Little Gilgil	Gilgil Total	Turasha	Malewa
Catchment Area (km^2)	151.38	21.78	370.26	723.37	1,563.31
FLOW THRESHOLDS (m^3/day)					
Q95	259	1,210		39,658	58,320
Q80	3,974	1,469		63,763	96,854
Q50	13,133	1,901		131,674	220,838
RESOURCE AVAILABLE FOR ALLOCATION (m^3/day)					
Reserve	259	1,210	1,469	39,658	58,320
Normal Flow	3,715	259	3,974	24,105	38,534
Flood Flow (m3/day)	9,159	432	9,591	67,911	123,984
RESOURCE ALLOCATED IN PERMITS (m^3/day)					
Reserve					
Normal Flow			3,819	25,890	3,076
Flood Flow			9,212	6,161	8,225
RESOURCE BALANCE FOR FURTHER ALLOCATIONS (m^3/day)					
Reserve			1,469	39,658	58,320
Normal Flow			155	-1,785	35,458
Flood Flow			379	61,750	115,759

Source: Rural Focus (2006)[2]

Table 3 indicates an over-allocation of the normal flows for the Turasha river, while all other rivers show a positive balance. In reality it is known that the Giligil River and parts of the Malewa river experience periods of very low flow, in which the reserve is not being respected. The same can be said of the lake when levels drop very low.

The implication from the water balance analysis is that over abstraction, rather than over allocation, is a more dominant factor in causing violations of the Reserve. Therefore the WAP addresses compliance to the water permit conditions which is a feature of how water is used in addition to supporting the water allocation decisions.

The approach has therefore been to focus on determining conditions for water allocation decisions, determining abstraction restrictions and setting out a process for developing the information required for future WAP revisions.

In future, when better information is available both on up-to-date allocations and actual abstractions, then the water balance analysis can be updated.

[2] Development of a Water Allocation Plan for Naivasha Basin, Phase 1 Report, Techncial Options. March 2006.

6 WATER ALLOCATION

This section provides the rules governing water allocation within the Naivasha Basin. These rules are consistent with the WRM Rules (2007).

At present there is insufficient data regarding actual abstractions and too many inaccuracies in the allocation information to provide any absolute restrictions in terms of new permit applications. The approach has therefore been to provide a framework for water allocation decisions which looks at the different cases of whether a new water allocation is being made or whether the decision is orientated towards bringing an existing water user into compliance.

It is noted that the allocation decision is made when there is a new applicant for a water permit, or when an existing permit is being renewed or amended. The allocation decision is not normally an issue when someone has an Authorisation and is seeking a Permit. However, in the current situation where existing authorisations may be grossly inconsistent with actual or proposed abstractions, procedures have to be set out to handle such cases.

The scale of allocation has an impact on the category of permit. Details are provided in Appendix B based on WRMA Permit Thresholds.

6.1 General Allocation Rules applicable to New Water Permit Applications

The general allocation rules set out any conditions that apply in allocating water and typically apply for new applications for water permits (Table 4). The rules depend on the type of water body that water is being allocated from.

Table 4: Conditions for Water Allocation

Water Body	Intended Water Use	Condition for Water Allocation
All water bodies	Any	Installation of master water meter and lockable controlling device
	Domestic and public supplies	No limitations as long as intended beneficiaries are within Naivasha Basin. Abstraction for use outside the Naivasha Basin can only be permitted for state schemes as defined in the Water Act 2002 and only where alternative resources have been proved to be unavailable and after approval of the Environmental Impact Assessment.
	Irrigation & other commercial uses	Abstraction for use outside the Naivasha Basin can only be permitted for state schemes as defined in the Water Act 2002 and only where alternative resources have been proved to be unavailable and after approval of the Environmental Impact Assessment.
Aquifer within GCA (borehole development, shallow well)	Any	Check compliance with GCA conditions in terms of whether intended activity is consistent with GCA zone. Every borehole must be inspected and the installed pump capacity tested by WRMA.
	Any	Maximum daily allocation (m^3/day) not to exceed 25%[3] of tested yield as measured from test pumping[4].
	General irrigation	No further increase in water allocation permitted for

[3] 25% of daily tested yield is equivalent to 60% of tested yield pumped for 10 hours a day.
[4] Test pumping shall comprise a continuous and constant rate pumping test of not less than twenty four hours duration and recovery duration of not less than twenty hours, or as otherwise stipulated by WRMA

		existing original or supplementary permits to support expansion of irrigated area. Applications for water permits from new enterprises[5] would be subject to the normal water permit application process up to a cumulative limit[6] in any one year of not more than 250,000 m^3 per year. In addition, new applicants will be expected to utilise from the outset state of the art, industry standard efficient water use technologies including soil moisture monitoring.
Aquifer outside GCA (borehole development, shallow well)	Any	Maximum daily allocation (m^3/day) not to exceed 25% of tested yield as measured from test pumping.
Springs	Any	Allocated from normal flow (spring yields tend to be less responsive to rainfall)
River	Domestic	Allocated from normal flow
	Minor irrigation	Allocated from normal flow but limited to a maximum of 50 m^3/day per individual or 300 m^3/day gross from any individual abstraction point for multi-household schemes. Requirements above these limits to be treated as general irrigation.
	General Irrigation	Allocation from Flood Flow only. Offtake works to be compliant with self-regulating principles – this implies that storage is mandatory
	Livestock	Allocated from normal flow up to a maximum of 300 m^3/day in any one permit. Requirements above this to be allocated from flood flow, implying a requirement for storage.
	Other uses	To be decided on a case by case basis.
Lake Naivasha	Domestic	Subject to normal water permit application process
	Commercial use for livestock, tourism, power, other (except commercial irrigation)	Subject to normal water permit application process
	Commercial irrigation	No further increase in water allocation permitted for existing original or supplementary permits or existing farms to support expansion of irrigated area. Applications for water permits from new enterprises (see footnotes for definition) would be subject to the normal water permit application process up to a cumulative limit in any one year of not more than 250,000 m^3 per year. In addition, new applicants will be expected to utilise from the outset state of the art, industry standard efficient water use technologies including soil moisture monitoring.

[5] "New enterprise" specifically excludes operations on land that has been sub-divided, sold or leased to a third party for the purposes of creating an opportunity for a "new" enterprise.
[6] Equivalent to approximately 15-20 ha, depending on application rates. This limit would remain until the actual aquifer recharge rate has been established by WRMA.

6.1.1 Discussion

There is much interest in seeing a limit placed on new allocations, particularly for general irrigation. Indeed, this is desirable given the objective set out earlier to see by 2012 that overall abstraction has decreased by 10% from the 2010 baseline. However, it is recognised that at present there is insufficient information to support a total and indefinite ban on new allocations and furthermore, there are other economic, social and environmental hurdles that any prospective investor must overcome. It is felt that limiting any further increase in allocation to existing farms but leaving a window for new applicants for new farms will (i) allow existing farms to expand irrigated area only on the basis of improved water use efficiencies within their farms and (ii) will provide a limited window of opportunity for new enterprises (see footnotes for definition of new enterprise), subject to them entering the field with high water use efficient technologies. So although a limited expansion of irrigated area is possible, the majority of this must come from improvements in water use efficiency and only a small window for new enterprises has been made available. It is understood that water use efficiencies can be improved by 25-50% in existing farms and this would result in reduced overall abstraction from the hydrological system.

6.2 Case of Existing Abstractor seeking Permit on basis of existing or expired Authorisation

This case does not necessarily involve a decision regarding allocation, but rather deals with bringing the abstraction into compliance with the permitted allocation. The following procedure will apply (Table 5):

Table 5: Case of Abstractor seeking Permit on basis of Authorisation

Action By	Action required	Comment
Water User	Notify WRMA of intention to obtain permit and be advised of requirements prior to inspection. Submit WRMA Form 008, 009A or 009B (Completion Certificate)	Requirements will include fulfilment of conditions of authorisation: 1. Installation of master meter and controlling devise 2. Finalisation of works 3. Abstractions on rivers - making works compliant with self regulating principles (including storage if required)
WRMA	Inspects the site Determines the capacity of the system and checks consistency with authorisation Determine category of Permit	If WRMA finds significant inconsistencies when comparing the works, abstraction capacity, and/or water use with the authorisation, then the water user will be required to apply for amendment (WRMA Form 12) or be required to amend the works to be consistent with the authorisation. Where the user applies for amendment, consideration will be given by WRMA for existing investments.
Water User	Pays permit issuance fee	Amount depends on Category of Permit
WRMA	Issues Permit	

6.3 Case of Existing Abstractor seeking Permit Renewal or Amendment

The following procedure (Table 6) applies in the case of an existing abstractor and permit holder whose permit has expired or is inconsistent with current abstraction because the allocated amount is significantly above or below the normal abstraction volume.

Table 6: Case of Abstractor seeking Permit Renewal or Amendment

Action By	Action required	Comment
Water User	Apply to WRMA for renewal of permit (Form WRMA 011) or variation (Form WRMA 012) or transfer (WRMA Form 013) and pay requisite fees	Requirements will include fulfilment of conditions of authorisation or permit: 1. Installation of master meter and controlling devise 2. Abstractions on rivers - making works compliant with self regulating principles
WRMA	Inspects the site Determines the capacity of the system and checks consistency with permit Determine category of Permit	If WRMA finds significant inconsistencies when comparing the works, abstraction capacity, and/or water use with the authorisation, then the water user will be required to apply for amendment (WRMA Form 12) or be required to amend the works to be consistent with the authorisation. Where the user applies for amendment, consideration will be given by WRMA for existing investments.
Water User	Pays permit issuance fee	Amount depends on Category of Permit
WRMA	Issues Permit	

7 GROUNDWATER CONSERVATION AREAS

Groundwater resources contribute a significant proportion of abstraction within the basin (about 30% of mean annual basin abstraction and probably considerably more). This section summarises the conditions applicable to the different GCA zones. Further details are available from the GCA Report[7] (Rural Focus 2007).

The proposed GCA (See map in Appendix A) covers all that land area lying below 2000 metres above mean sea level, plus all of urbanised Naivasha Town and the municipal landfill located south of the Town. The GCA is sub-divided into five sub-areas, each of which has its own particular emphasis in terms of management and operating rules.

Table 7: GCA Zones

Zone	Area (km2)	Description	Details	Action	Monitoring
1	9.89	Public water supply	RVWSB Karati River compound; and the Naivasha Water and Sewerage Company boreholes at AIC, the Police Lines and at the former District Water Office	Wellhead protection zone (50 m radius/BH) 50 TOT resource protection zone	Abstraction Level Chemistry
2	279.0	North Lake	Intensive horti/floricultural developments, supported primarily by groundwater abstraction	Wellhead protection zone (10-25 m radius/BH) 50 TOT resource protection zone	Abstraction Level Chemistry
3	54.8	Mirera-Karagita	Mirera, Karagita settlement areas	Wellhead protection zone (10 m radius/BH) 50 TOT resource protection zone	Abstraction Level Chemistry
4	165.9	Remaining Area	All area not covered in zones 1,2,3 and 5		Abstraction
5	1.8	Municipal Landfill	See map	750 m radius exclusion zone	Drill new monitoring

The conditions of GCA do not principally affect the level of abstraction but rather deal with issues of whether the proposed borehole is appropriately located, any conditions that need to be followed during borehole development, any monitoring requirements and any issues related to land use activities that might impact existing or future boreholes within specific zones of the GCA.

The proposed GCA has the following impacts:

- Any proposed borehole within the GCA should be checked to determine which zone it is in. The application should then be assessed against the GCA conditions (on proximity to other boreholes or land use, development, abstraction and monitoring) for the relevant zone. Any specific conditions should be stated in the Authorisation to Construct and/or within the Permit.
- The water user and the WRUA should take note of the monitoring conditions and ensure compliance to same.

The allocation decisions with respect to aquifer exploitation are covered in Section 6.

[7] Development of a Water Allocation Plan for Naivasha Basin, Groundwater Conservation Areas and Protection Strategies, July 2007.

8 WATER ABSTRACTION RESTRICTIONS

This section sets out restrictions on abstraction that come into effect when water resource availability reduces. These restrictions are required because, despite the allocation rules, the variability of the water resources means that abstraction must be restricted to safeguard the Reserve which is the water set a side for basic human needs and environmental requirements.

8.1 General Concept

The general concept is based on three zones representing different conditions of resource availability (Figure 1). The thresholds between the different zones are specific to each water resource and the restrictions may be different depending on the type of water use.

The WRM Rules identify three states related to resource availability for rivers, namely:

- Reserve – this would occur 5% of the time;
- Normal flow – this occurs 15% of the time;
- Flood flow – this occurs 80% of the time.

These principles have been adopted with respect to the lake in defining four zones such that the probability of occurrence is broadly similar to that of rivers. In the case of rivers, the thresholds (Q96, Q95 and Q80) are developed for each river based on an estimate of the naturalised flow record. In the case of Lake Naivasha, the thresholds have been determined on the basis of simulated records based on a "no-abstraction" water use scenario (equivalent to the naturalised record) applied to the 1940-1980 data set and simulated using the Lake Naivasha Water Balance Model (ITC/Mbui, and further developed by Rural Focus Ltd).

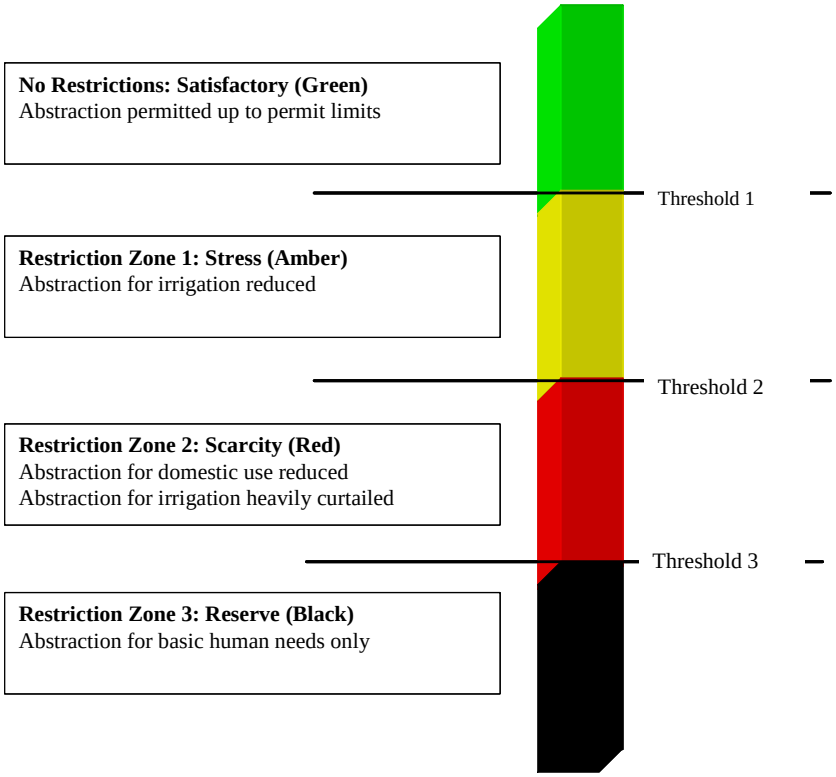


Figure 1: Abstraction Restriction Zones

Discussion

1. Although it is recognised that groundwater availability does not fluctuate according to season in the same way as it does for surface water, it is recommended that groundwater abstraction be treated equally with lake abstraction, in recognition of the long term hydrological interaction between the different water sources. Treating groundwater equally with lake abstraction provides a deterrent to switching from surface to groundwater purely for the short term (drought period). In addition this approach promotes a longer term better efficiency basis to the utilisation of groundwater and in addition, promotes a collective response to the drought situation.
2. There has been concern that the method of establishing the thresholds does not adequately consider changes in the depth-volume relationship of the lake which is thought to be changing due to sediment inflows to the lake. If available, up-to-date bathymetric data can be used to redefine the thresholds in future versions of the WAP.

8.2 Rules for Water Abstraction Restrictions

The general concept of three zones was modified slightly for the lake to include a zone (black zone), below 1882.5m, in which abstraction for irrigation would be curtailed entirely. The threshold for this zone was set arbitrarily as 1882.5m or approximately 1 m depth of water. It is noted that the majority of the irrigation abstraction from the lake would not be feasible if the lake level reduced to 1882.5 due to the distance between abstraction point and shoreline.

The rules for water abstraction restrictions are presented in Table 8.

Table 8: Rules for Water Abstraction Restrictions

COLOUR CODING ZONES ON ABSTRACTION RESTRICTIONS & RESERVE WATER	**WATER RESOURCE STATUS i.e. PERIODS WHEN**		
	RIVERS FLOWS.	**Lake Naivasha levels metres above mean sea level.**	
		LAKE WATER	**GROUNDWATER WITHIN CONSERVATION AREA**
Green i.e. Satisfactory. *Abstractions allowed up to permit limits.*	**Higher than Q80.**	**Higher than 1885.3**	**Higher than 1885.3**
Amber i.e. Stress. *Slight abstraction restrictions imposed.*	**Between Q80 and Q94.** Abstractions allowed:- 1. domestic and public water supplies. 2. Others cease to pump from water bodies and revert to their 90 day storages.	**Between 1885.3 and 1884.6** Abstractions allowed:- 1. domestic and public water supplies. 2. Others draw 75% of their water use.	**Between 1885.3 and 1884.6** Abstractions allowed:- 1. domestic and public water supplies. 2. Others draw 75% of their water use.
Red i.e. Scarcity. *Severe abstraction restrictions imposed.*	**Between Q95 to Q96.** Abstractions allowed:- 1. domestic and public water supplies draw 50% of their water use. 2. Others continue to	**Between 1884.5 to 1882.5** Abstractions allowed:- 1. domestic and public water supplies draw 75% of water used.	**Between 1884.5 to 1882.5** Abstractions allowed:- 1. domestic and public water supplies draw 75% of water use.

	draw from their 90 day storages.	2. Others draw 50% of their water use.	2. Others draw 50% of their water use.
Black i.e. Reserve. *Full protection; surface water uses restricted to basic human / livestock needs and nature (ecosystem) only.*	**Lower than Q96.** Abstraction allowed:- 1. domestic and public water supplies draw amounts for basic body needs only i.e. 25 litres per person / livestock unit per day.	**Lower than 1882.5.** Abstraction allowed:- 1. domestic and public water supplies draw amounts for basic body needs only i.e. 25 litres per person / livestock unit per day.	**Lower than 1882.5.** Abstraction allowed:- 1. domestic and public water supplies draw 75% of water use. 2. Others draw 50% of their water use.

** Q80, Q95 and Q96 are determined from hydrological records and are different for each river.*

9 COMPLIANCE PLAN

This section sets out a plan to bring water users into compliance with the WAP.

9.1 Approach

WRMA will work collaboratively with the WRUAs and water users to protect the interests of legal water users. WRMA is committed to resolving competing claims for water use in ways that sustain the environment and support economic growth.

Compliance will be sought by education and encouragement wherever possible, but, where appropriate, enforcement measures will be used.

WRMA shall promote compliance by:

- Removing barriers to compliance (e.g. lack of knowledge regarding WAP and how to comply with them);
- Overcoming factors that encourage non-compliance (e.g. lack of public support for, or misunderstanding of water resources management objectives);
- Raising awareness of the benefits of complying with the rules and the potential consequences of not complying.

9.2 Communication

The system of water abstraction restrictions can only function if two conditions are met:

1. Water users are given adequate information regarding the state of the resource and the likely onset of the restriction condition;
2. Water users respond to the information and comply with the restriction conditions. This second aspect requires monitoring and enforcement.

In order to provide water users with adequate information, the following action is required:

- Sufficient staff gauges measuring water levels placed on each water resource. This should be undertaken by WRMA and the WRUAs. This is captured in the compliance plan;
- WRUAs to monitor the staff gauges and provide WRUA members and other water users with information regarding (i) the current state of the resource (i.e. which restriction zone applies) and (ii) the likely onset of any change in the restriction zone (i.e. a forecast of future resource conditions). This information to be provided:
    - on email;
    - on public billboards;
    - through periodic notices in the national newspapers;
    - through SMS technology.

Information regarding the current state of the resource is obtained from the staff gauges. At present there is no basis for forecasting future resource conditions. This is a research topic that needs to be pursued by research stakeholders.

9.3 Actions Required to Build Compliance

The actions set out in Table 9 are proposed to develop compliance to the WAP.

Table 9: Compliance Plan

Action	Target	Deadline	Comment
Monitoring Water Resource Availability			
Assessment of water resource monitoring network and establish any gaps in network or rating equations	Staff gauges and Q96, Q95, Q80 thresholds clearly defined	By 31st July 2011	By WRMA
Communication System			
Awareness campaign on Water Allocation Plan	4 National Newspaper adverts 4 radio advertisements in local radio stations	By 31st December 2010	By WRMA
Finalisation of Public Notification System for Resource Availability	4 Public Billboards around Lake Naivasha and within each river sub-catchment	By 31st December 2010	To be undertaken by WRUAs
	Forecasting model for future resource state	By 31st December 2012	Action by research institutions
	4 newspaper notices per year	Each year	To be undertaken by WRUA
Building Compliance			
Water users register with WRMA by applying for, renewing, or amending allocation	100% Category C and D Water Users	By 31st December 2010	By water users
	100% Category B	By 31st December 2011	By water users
Conditions of Authorisations			
Installation of Measurement Device and Lockable Controlling Device	100% Category C and D Water Users	By 31st December 2011	By water users
	100% Category B	By 31st December 2012	By water users
Assessment of all Category C & D water users on rivers to establish application of self-regulating principles	100% Category C & D water users assessed	By 31st December 2010	By WRUA
Monitoring Water Use			
Water use data being routinely submitted	100% coverage on category B, C and D water users	By 31st December 2012	Water users
Monitoring Water Allocation			
WRUA comments on	100% permit	By 31st July 2010	Action by WRMA and

permit applications	applications, renewals, transfers and amendments shared with WRUA		WRUAs
Monitoring Compliance to Water Abstraction Restrictions			
WRUA undertakes monitoring inspections during restriction periods	Each WRUA to sample 25% of Cat. B, C or D water users during each red or black restriction period	Within 4 weeks of start of restriction period	By WRUA
Financing Compliance Plan			
WRUAs and WRMA to develop budget and solicit funds for WAP implementation	Adequate funds secured	By 31st December 2010	By WRUA and WRMA

10 ENFORCEMENT PLAN

This section sets out the arrangements for enforcement of the WAP. It is recognised that there are various actions that the individuals (whether water users or not), WRUAs and environmental groups can undertake prior to engaging WRMA who can bring the force of the law to bear.

The enforcement plan touches on:

- Mechanisms for reporting infringements to the WAP;
- Action against violators;
- Penalties and restrictions on violators;

10.1 Approach

The basic approach is “three strikes and you are out” or “two yellow cards followed by the red card”. The timeframe is the period of the WAP, so at the end of the period for each WAP, all water users start with a clean slate. Enforcement of the WAP is seen as a primary responsibility of the WRUA as the WRMA has the overall responsibility to see compliance to all the water regulations. A “name and shame” approach has been adopted as it is hoped that most water users would be embarrassed to be singled out and see their names appearing in the newspaper in respect of violations to the agreed WAP.

The WRUA would therefore invite WRMA in cases where it cannot obtain compliance by a WAP violator.

It is assumed that the majority of violations will occur in regard to the application of abstraction restrictions as there is more open sharing of information regarding allocation decisions through the WRUA commenting on permit applications.

10.2 Reporting Violations

Violations of WAP conditions must be reported in writing by any individual, organisation, WRUA or WRMA. The report can be anonymous. Each report will in the first instance be directed to the relevant WRUA and must contain the following information:

- Name;
- Place/location;
- Water body;
- Nature and time of violation.

Typical violations include:

- Lack of or tampering with master meter and controlling device;
- Lack of proper water use data;
- Restricting access to WRUA inspector;
- Abstraction in excess of permitted amount;
- Failure to comply with Water Allocation Plan during restrictions periods;
- Unauthorised modification to abstraction works and/or equipment;
- Modification of the water course or channel;
- Abstraction without valid permit.

10.3 Investigating Violations

Each WRUA will appoint a person or persons to be the Investigating Officer ("Referee") – someone mandated and facilitated to investigate WAP violations on behalf of the WRUA.

The procedure to be followed is:

- WRUA to notify investigating officer of reported violation within 1 week of receiving report;
- Investigating officer to undertake investigation within 2 weeks of receiving report and submits report to WRUA committee with recommendations.

10.4 Taking Appropriate Action

Clearly the action will depend on the severity of the violation. If the violation is considered severe enough to warrant a "card" then the following action will be taken:

- 1st Yellow Card: Written instruction from WRUA to water user to cease the violation within 2 weeks. WRUA follows up with inspection;
- 2nd Yellow Card: Written instruction from WRUA to water user to cease the violation within 2 weeks. Notice is copied to all WRUA members. WRUA follows up with inspection;
- Red Card: Written instruction from WRUA to water user to cease the violation within 2 weeks. Notice is copied to all WRUA members, WRMA and a notice is placed in national newspaper. WRUA follows up with joint inspection with WRMA;

WRMA will then take official action against the violator if no remedial action has been taken. Action by WRMA may include:

- WRMA issuing an Order (process is set out in WRM Rules);
- WRMA confiscating equipment and/or blocking the illegal activity (e.g. locking pump house or controlling device);
- WRMA suspending or revoking permit;
- Prosecuting the offender who, if found guilty, would be liable for a fine, imprisonment or both.

10.5 Review and Reporting

At the end of each year the WRUA will prepare a report stating the number of reported violations and the action taken. This report will be included in the Chairman's Report during the AGM.

10.6 Penalties for Violation

WRMA will follow the WRM Rules in respect of penalties for violations of the WRM Rules.

Each respective WRUA may consider introducing penalties on their members for violations as part of their bylaws. Options for penalties may include:

- Financial penalties (varied according to whether it is a yellow or red card warning);
- Restrictions on water use;
- Imposed community service obligations.

11 ROLES AND RESPONSIBILITIES

This section lays out the roles and responsibilities of different stakeholders with respect to the implementation of the WAP.

Table 10: Roles and Responsibilities of WAP Stakeholders

Stakeholder	Role	Responsibility
WRMA	Lead agency responsible for water resource management	• To facilitate the adoption of the WAP through Public Consultation; • Publish and disseminate Final WAP; • To follow WAP in determining permits; • To enforce conditions of WAP; • To facilitate acquisition and sharing of data for WAP review; • To facilitate WAP review after 3 years;
Catchment Area Advisory Committees	To advise WRMA on the management of water resources	• To follow WAP in its advice to WRMA regarding permit allocations; • To monitor implementation of WAP;
WRUAs	Represent WRUA members and channel participation in water resource management	• To communicate terms of WAP to WRUA members and other water users • To enforce conditions of WAP;
Water Users	Utilise water resources in a responsible and legal manner	• To comply with water permit conditions and WRM Rules; • To comply with conditions of WAP;
Rift Valley Water Service Board	Licensed by WASREB to develop water service and sewerage systems to be operated by licensed WSPs	• Ensure that licensed WSPs comply with terms of WAP;
Floricultural and Horticultural Certification Agencies	Set industry standards of best practise and certify compliance to these standards	• Establish compliance to WAP as a criteria for certification
Environmental NGOs	Advocate policies and implement projects for the better conservation and management of the natural environment	• Support compliance to and enforcement of WAP; • Support acquisition and sharing of data for WAP review; • Support WRUA participation in WRM;
Researchers	Promote understanding on the socio-economic and natural ecosystems	• Support acquisition and sharing of data and information for WAP review;
Buyers of Floricultural and Horticultural Products from Naivasha Basin	Develop export markets for floricultural and horticultural products	• Make compliance to WAP conditional to market access; • Reward compliance to WAP; • Support development of drought contingency fund;
GOK Ministries and Agencies (e.g. NEMA, Min. of Ag, etc)	Statutory bodies responsible for socio-economic development	• Ensure that projects are consistent with terms of WAP

12 PROCESS FOR REVISING WAP

Revisions to the WAP are expected given changes in the human and natural environment and emerging information on the availability and use of the water resources. This section sets out the procedures to be adopted when revisions to the WAP are deemed necessary or at the end of each period.

It is proposed that the first WAP (2010-2012) be review after three years. However it is expected that subsequent WAPs may be reviewed after each 5 year period.

12.1 Incremental Changes to WAP

It is important to recognise that the custodian of the WAP is WRMA. Therefore proposed changes to the WAP must be channelled through WRMA.

Proposals for changes to the WAP can be initiated by an individual water user and/or WRUA. The proposal must be submitted in writing to WRMA, stating the following:

- What part of the WAP requires amendment;
- A discussion on the alternative options, providing supporting details;
- A recommendation regarding which alternative is considered preferable.

On receiving a proposal for amendment, WRMA will review the proposal within 2 months and will send the proposal with the WRMA comments to all the WRUAs within the Naivasha Basin within 3 months of receiving the proposal and a copy to the CAAC. WRMA can propose one of three courses of action:

1. The proposal is not supported by WRMA and WRMA does not recommend further action on the proposal;
2. The proposal has merit and WRMA recognises the need to take action quickly and therefore invites all WRUAs to a meeting to discuss the same within 3 months of receiving the proposal;
3. The proposal has merit but WRMA recommends deferring discussion until a number of issues have accumulated or placing the issue within the agenda of another WRUA-wide meeting.

If WRMA and the WRUAs form an agreement that certain provisions within the WAP require amendment and have agreed what those changes should be, then the WAP can be amended and endorsed by the CAAC.

In this case, WRMA would need to place an advertisement in the newspaper to ensure widespread notification of the changes to the WAP.

12.2 Evaluation and Review of WAP

At the end of the period of the WAP, WRMA, with WRUA support, should commission a detail evaluation of the WAP covering aspects of:

- Objectives and indicators;
- Conditions;
- Compliance;
- Enforcement;
- WAP monitoring and review process.

The evaluation would provide a basis for detailed, and if required, substantial revisions to the WAP.

12.3 Preparations for Revising WAP

The WAP will require amendment as additional information becomes available. However, WRMA, the WRUAs, the water users and other stakeholders have a responsibility to see that additional information is collected and made available to the WAP review process. There are key areas where additional information is required and can make significant contribution towards the WAP review process. These are discussed briefly below.

12.3.1 Water Use Efficiency Survey

At present there is a gap of information regarding detailed information on abstraction and water use within the entire basin. It is proposed that the WRUAs will initiate comprehensive field based abstraction and water use survey. The terms of reference for the survey revolve around:

- Details on abstractor;
- Details on water use activity (production information and systems);
- Details on abstraction works, meters, controlling device, number of intakes, boreholes etc;
- Details on quantity of abstraction;
- Details on water demand management (weather stations, soil moisture monitoring);
- Details on all authorisations and permits.

12.3.2 Hydrological Data

WRMA is making a concerted effort to update the hydrological monitoring network. This includes making investments in the gauging stations and local gauge readers.

In addition, WRMA has invested in the MIKE BASIN/Temporal Analyst Enterprise software suite which provides a platform for data management and analysis. This means that WRMA should be able to provide revised flow duration curves for river flows. The flow duration curves are significant to the WAP as these define thresholds between different resource availability zones.

12.3.3 Permit and Water Use Data

WRMA has invested in the development of a Permit Database to support the management of permit and water use data. In effect this means that allocated amounts and actual abstraction can be quickly compared through the functionality of the Permit Database.

12.3.4 Water Allocation Efficiency

Water allocation efficiency looks at whether the water is being allocated and used by the most efficient user. Efficiency needs to be defined and generally captures public interest or benefit. A common indicator for efficiency of allocation would be economic returns per cubic metre. A more socially orientated indicator may be the number of people employed per cubic metre. Other indicators that capture environmental impacts could also be used. The concept here is that in the context of a limited resource, the water should be allocated to those types of uses that maximise the benefits.

The application of water allocation efficiency requires a substantial amount of data on the economic returns. At this point, economic returns have not been factored into the way in which water is allocated but future information and methodologies should be considered.

12.3.5 Water Demand Management

The main question is ‘how can water users be made to use the water more efficiently or how can the water demand be reduced’.

In the context of limited availability of resources, it is important to find ways of using the water more efficiently to free up water for the Reserve. Various options are available and these are briefly mentioned below.

1. Water Use Charges. If a water user has to pay for the actual quantity of water that is abstracted from the resource, and the cost is significant in terms of the returns made from the water, then the user is more likely to reduce unnecessary abstraction. This will reduce wastage and provide an incentive for more water efficient technology;
2. Water efficient technology. With respect to irrigation, more efficient production can be made using efficient irrigation application systems (hydroponics, dripping water to root zone), applying irrigation water when a plant needs it, (i.e. using soil-water tensiometers) and generally being much more scientific about the quantity and timing of irrigation applications. The use of greenhouses and hydroponics is relevant although these technologies are more geared towards reducing agro-chemical usage;
3. Crop selection. A water user may select a crop with a lower water demand;

The results of the water use efficiency survey can be used to analyse various options for promoting water demand management.

13 WAY FORWARD

This section briefly looks at the way forward to make the WAP operational after the WAP has been adopted by WRMA, after consultation with the CAAC.

13.1 Making WAP Operational

The WAP will be put into effect once the WAP has been approved by the CAAC and WRMA. This implies that the WAP will be used in respect of decisions and actions by the WRUAs, CAAC and WRMA when considering water permit applications and dealing with water allocation decisions.

In order to make the WAP operational, the WRUAs will need to review their responsibilities within the WAP and plan and budget for these in terms of:

- Staff;
- Logistics for monitoring;
- Communication costs;
- Costs for baseline Water Use Efficiency Survey.

13.1.1 Supporting WRUAs

Many of the responsibilities for the implementation of the WAP fall on the WRUAs. While WRUAs have been established within the Naivasha Basin, many of the WRUAs require additional support to develop the capacity to be able to fulfil their roles effectively. Support to strengthen the WRUAs is required from:

- WRMA;
- WSTF;
- Development and environmental NGOs;
- Commercial sector (Champions of good practice);

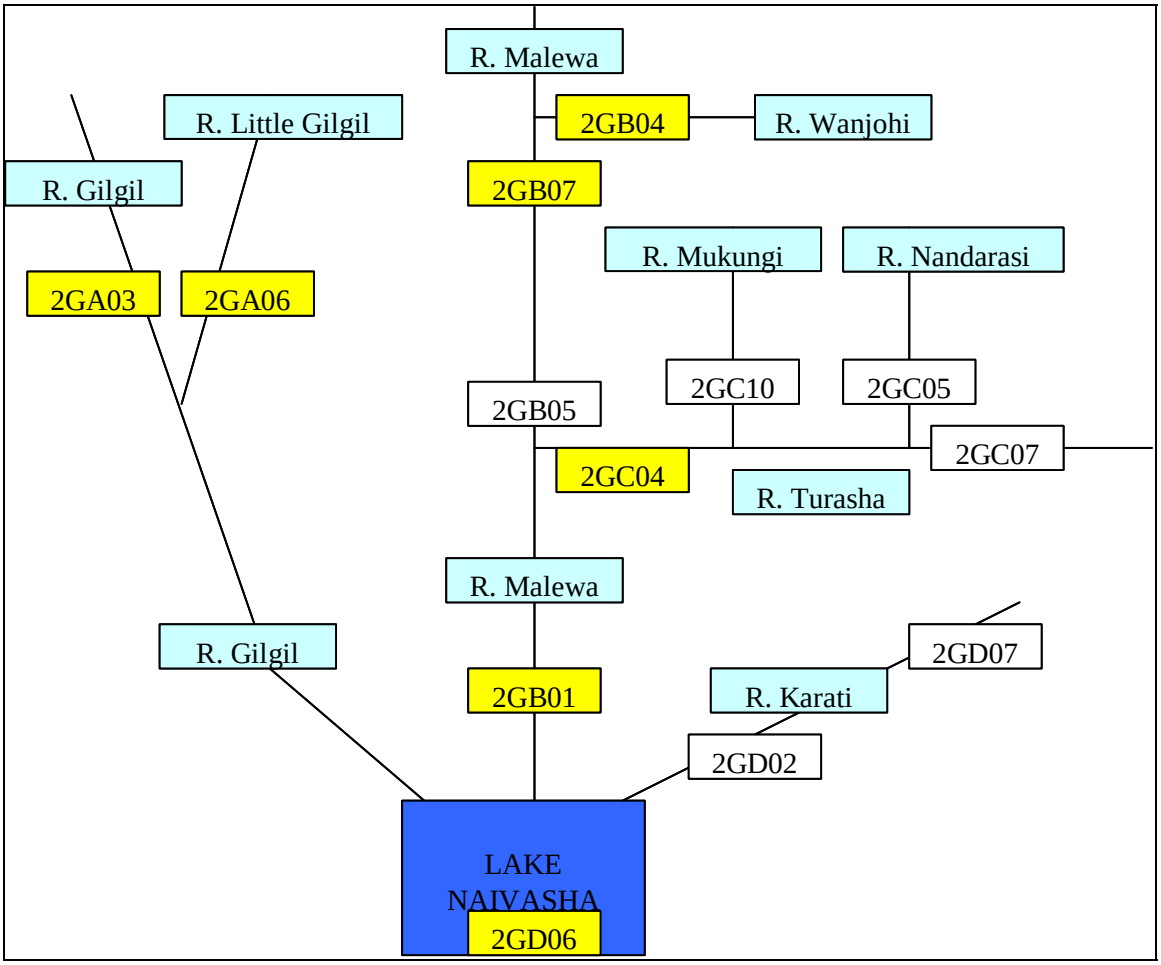
13.1.2 Financing WAP

The WAP is a framework for decision making and is therefore not a ‘one-off’ project requiring financing. It will require all the institutions involved (WRMA, CAAC and WRUAs) to have sufficient financial resources to cover their own activities and responsibilities. The institutions need to examine their responsibilities and budget accordingly.

APPENDIX A

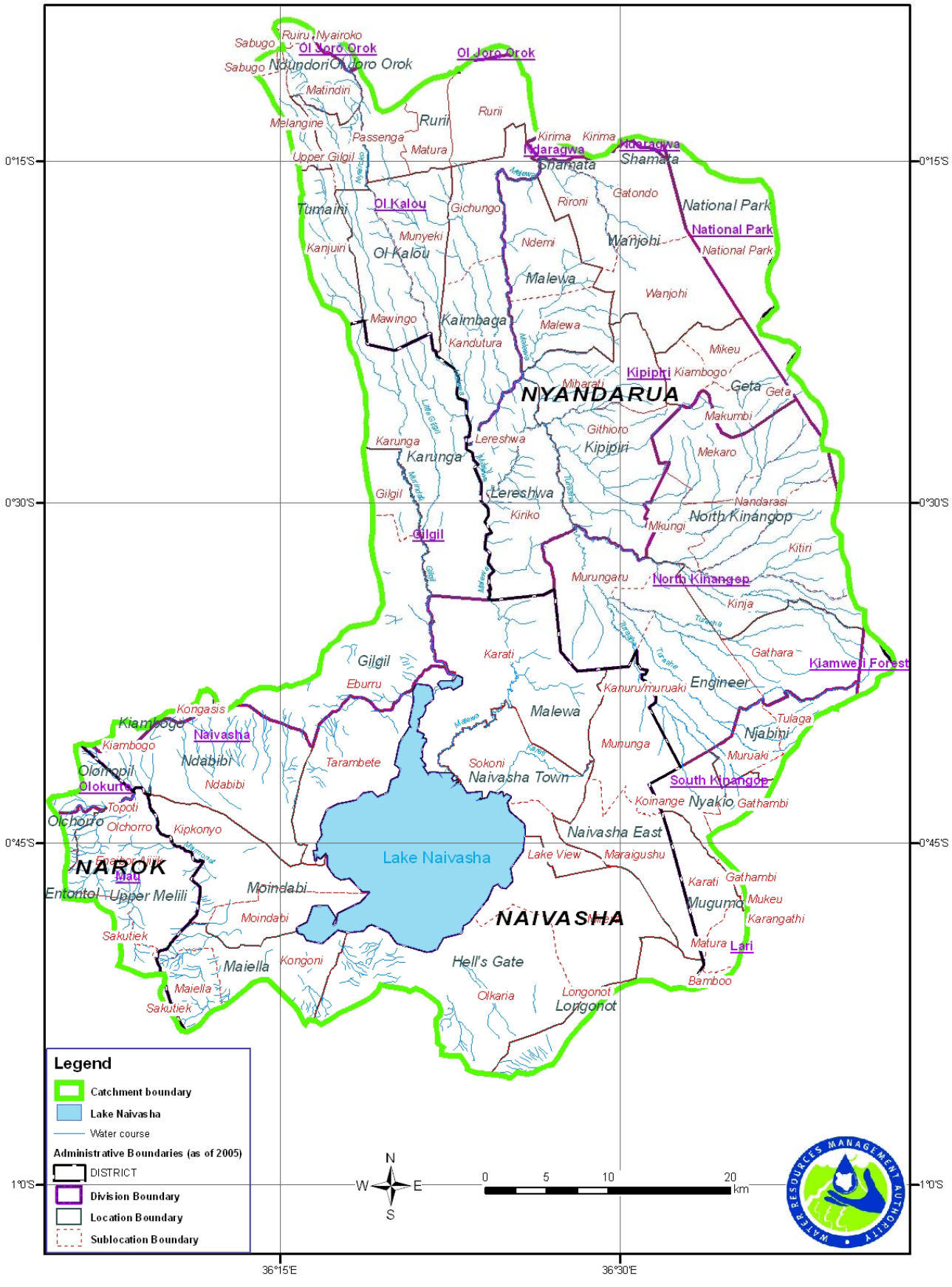
MAPS

1. Schematic of Naivasha Basin Drainage Pattern
2. Map of Naivasha Basin
3. Map of Groundwater Conservation Area

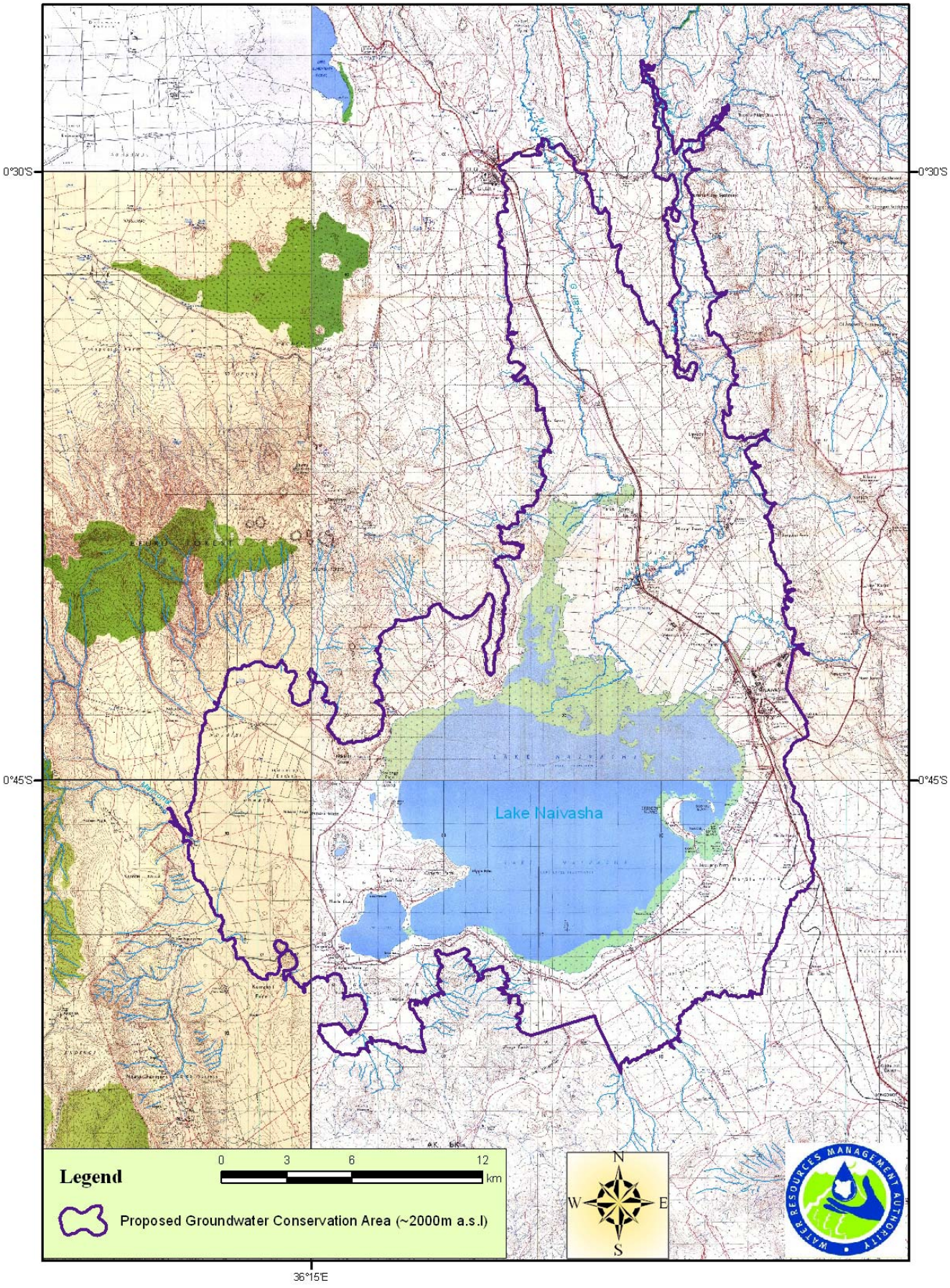


Schematic of Naivasha Basin Drainage Pattern showing Main Regular Gauging Stations (RGS)

NAIVASHA BASIN



PROPOSED GROUNDWATER CONSERVATION AREA



APPENDIX B

WATER PERMIT THRESHOLDS

(1) Introduction

It is recognized that each water use permit application should be well scrutinized and assessed against information regarding the resource, other abstractors and future demand in making water use allocation decisions. However, at present, WRMA is faced with having to make decisions on permits based on limited information on resource availability and actual use. The permit categories therefore provide a tool to manage the permit application, compliance and enforcement process.

(2) Permit Categories

The water resources management rules provides for four different categories into which water use permits shall be classified.

Table 1 – Water permit classifications

Category	Description
A	Water use activity deemed by virtue of its scale to have a low risk of impacting the water resource. Applications in this category will be determined by WRMA Regional Offices
B	Water use activity deemed by virtue of its scale to have the potential to make a significant impact on the water resource. Permit applications in this category will be determined by WRMA Regional Offices.
C	Water use activity deemed by virtue of its scale to have a measurable impact on the water resource. Permit applications in this category will be determined by WRMA Regional Offices after consideration by the CAAC.
D	Water use activity which involves either international waters, two different catchment areas, or is of a large scale or complexity and which is deemed by virtue of its scale to have a measurable impact on the water resource. Permit applications in this category will be determined by WRMA Regional Offices after consideration by the CAAC(s) and approval by WRMA Headquarters.

Note: Water use under category A shall not attract any water use charges

(3) Guiding Principles

Thresholds for permit categories have been based on the following guiding principles:

- The need for flexibility, so that different thresholds can be applied to different regions and sub-catchments in response to resource availability and state of the resource;
- The need to manage the task of issuing permits – so that permit applications for complex situations, overstressed or over-polluted sub-catchments or aquifers can receive adequate scrutiny and simple permit applications can be approved quickly and easily;
- The extent to which the permit conditions need to be enforced;

There are three themes that were used in establishing the thresholds, namely:

- Water Resource Status (Alarm, Alert, Satisfactory);
- Strategic importance;
- Practical workload (targets);

Each sub-catchment or aquifer was assessed to determine the resource status based on the criteria presented in Table 4.

Table 2: State of water resource classification

Category	**State of the resource**
Category 1	**ALARM**
Surface Water	Resource is periodically scarce Water reserve threatened
Groundwater	Water Quality or levels declining
Water Quality	Catchment severely degraded Pollution levels high Risk to human life is high
Conflicts	Potential for conflicts is high
Category 2	**ALERT**
Surface Water	Trend is towards scarcity
Groundwater	Trend is towards over abstraction
Water Quality	Declining trend in water quality
Conflicts	Ingredients for conflicts, e.g. ethnic, religious, language divisions
Category 3	**SATISFACTORY/CONCERN**
Surface Water	Water resource sufficient in quantity & quality
Groundwater	No measured impacts
Water Quality	Water Quality adequate, low risk
Conflicts	Low risk of conflict

On the basis of the state of the resource within an aquifer for groundwater, and sub-catchment for surface water, the thresholds shown in Table 3 (Surface water) and Table 4 (Groundwater) were made.

(4) Application of thresholds

All existing and new water permit applications shall be classified according to the approved thresholds. The class of the permit determines the fees to be paid and the level of approval.

(5) Amendments to the thresholds

No amendments shall be made to the approved thresholds unless the revised proposal has been approved by WRMA.

TABLE 3 - SURFACE WATER THRESHOLDS BY SUB-CATCHMENT AREAS IN NAIVASHA BASIN

	Thresholds in m^3/day				Sub-catchments covered
Category	**A**	**B**	**C**	**D**	
	Up to 20	20 to 500	>500 to 1000	> 1,000	**2GA** –(Murindati) Gilgil, Little Gilgil, and Kiriundu rivers **2 GB** – rivers Malewa, Wanjohi, Oleolondo, Nyairoko and their tributaries **2GC -** Turasha-(Mukungi, Kitiri, Sasini,Nandarasi,Kinja and their tributaries).
	Up to 20	20- 500	>500 - 2500	>2500	**2GD** - Lake Naivasha

TABLE 4 - GROUNDWATER THRESHOLDS BY AQUIFER IN NAIVASHA BASIN

Name	District(s)	Type	Remarks	Status	Threshold, m^3/d
STRATEGIC AQUIFERS					
Lake Naivasha lakeside	Nakuru	Alluvial (intergranular) & trachyte lavas (fissure)	Source for Naivasha Town; significant source of water for irrigated horticulture and industry. AGR strongly recommended.	**ALARM** Over-abstraction, declining water quality (pollution risk); geothermal recharge.	A: 20 B: > 20 – 99 C: 100 – 999 D: 1,000
POOR AQUIFERS					
Kinangop	Nakuru	Weathered volcanics (trachytes, basalts)	Limited demand for groundwater at present	**SATISFACTORY** Under-exploited: some WQ concerns	A: < 10 B: > 10 – < 20 C: > 20 – < 40 D: > 40
SPECIAL AQUIFERS					
Njoroi	Nakuru	Miocene-Pleistocene interbedded pyroclasts, lake beds and trachytic lavas (fissure & intergranular)	Key GW resource for commercial irrigation, other agriculture and institutions	**ALARM** Issue: inadequate quantity, poor quality: over-abstraction known to be taking place	A: 10 B: > 10 – 25 C: >25 – 50 D: > 50