

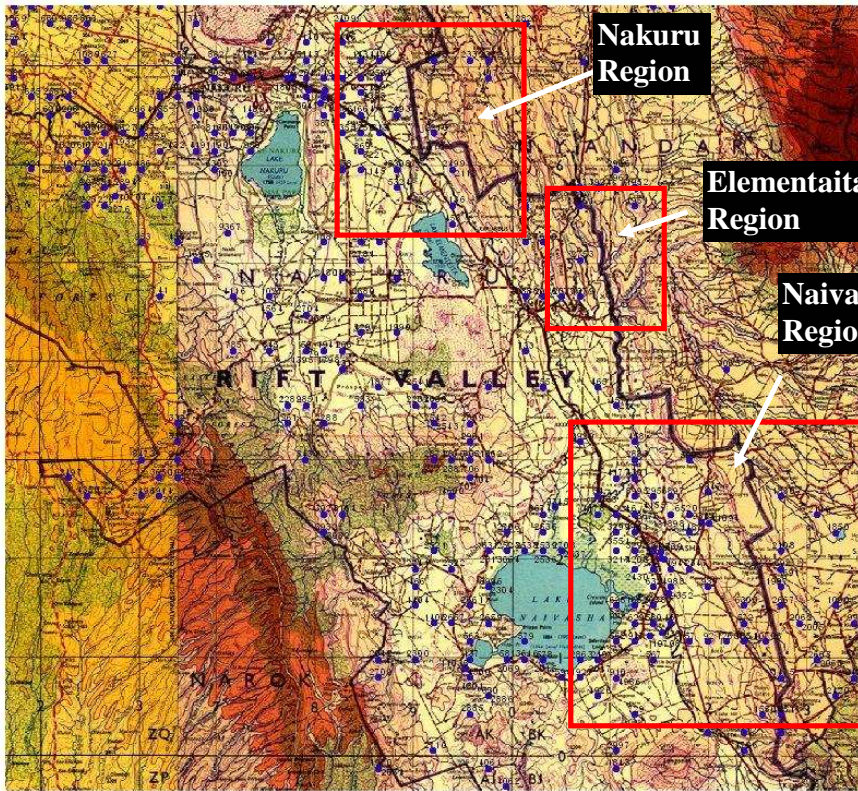
<p>Field Mission No. 1</p> <p>Project Title: Vulnerability of Groundwater in the Lakes Naivasha-Elementaita-Nakuru Watershed, Kenya Rift</p> <p>Team Leader: Prof. Justus O. Barongo</p>	<p>Progress Report No. 1</p> <p>Period: 1st March – 24th May, 2006</p> <p>Project Title: Vulnerability of Groundwater in the Lakes Naivasha-Elementaita-Nakuru Watershed</p> <p>Team Leader: Prof. Justus O. Barongo</p>
<p>Period: 18th May – 23rd May, 2006</p> <p>Participants:</p> <p>Researchers: (1) Prof. Justus O. Barongo (2) Mr. Onyango (on behalf of Mr. Charles Irungu)</p> <p>Students: Mr. Ezekiel Kemboi Mr. John A. Ogalo Mr. Demis Alamirew Mr Paul Manan Mubinya Ms. Immaculate Simiyu</p> <p>Daily Workers and Dates Worked: Mr. Richard Rop & Mrs. Bancy Chege – 19th – 21st May, 2006 Mrs. Bancy Chege & Mr. Dominic Wambua – 22nd May, 2006 Mr. Dominic Wambua – 23rd May, 2006</p>	<p>Specific Objectives</p> <ol style="list-style-type: none"> (1) To identify the MSc and PhD students to be included in the project (2) To contact relevant government ministries, departments and other institutions and requested for available data from the project area (3) To collect the data requested for in (2) above (4) To seek authority from the Kenya Ministry of Water and Irrigation to allow the research team to have access to all boreholes and other sites of interest in the project area through assistance from their regional offices. (5) To prepare a budget of all the required equipment, computing facilities and sampling materials (6) To approach companies selling the required items in (5) and obtain quotations for each item (7) To submit the quotations to CIFEG for necessary action. (8) To plan the dates and activities of the first field mission (9) To conduct the first field mission <p>Expected results of the period</p> <ol style="list-style-type: none"> (1) To have the identified MSc and PhD students prepare their concept papers on the projects they will carry out for their dissertations (2) To have the Ministry of Water and

Irrigation fully support the Mawari project and avail access to their archived data in the main and regional offices and also to assist in obtaining easy access to sensitive areas in the field during the field-work.

- (3) To collect the basic maps – topographical, geological, hydrological, hydrogeological – of the area for use in the first field mission.
- (4) To get full knowledge of the types of equipment, computing hardware and software, sampling materials, etc., needed for the project and request for their quick purchase ready for research work.
- (5) To obtain, through the first field mission, first hand information on the field conditions, boreholes sites, laboratory facilities available and ease of accessibility to sites of interest to this project in government and private properties in the project area.

Objectives of the Mission	Scientific Activities
<p>(1) To contact various authorities in the project area, including the Kenya Ministry of Water and Irrigation regional offices, other relevant authorities and large and small-scale farmers in the area and seek their permission and goodwill to carry out field studies in the research area.</p> <p>(2) To carry out actual sampling of waters and hydrogeological, geological and topographic studies.</p> <p>(3) To investigate and select sites for detailed studies in future field missions.</p> <p>(4) To train the five MSc. students on field techniques used in carrying out hydrological, hydrogeological and geological mapping, water sampling procedures and also to familiarize them with the various conditions and challenges related to field work in general.</p>	<p>• Researchers involved</p> <p>Name Role</p> <p>Prof. Justus O. Barongo Team Leader</p> <ul style="list-style-type: none"> ➤ Convened and chaired meetings of team members to discuss scientific matters related to the project. ➤ Led the team to identify MSc and PhD students to be involved in the project. ➤ Advised the students on how to prepare their concept papers on the topics of their choice. ➤ Led the team in preparing the first budget and obtaining quotations from various firms. ➤ Investigated and advised the team on where and how to obtain archived scientific data on lithology, structures, hydrology, hydrogeology and groundwater modelling of the project area. ➤ Led the team in making preparations for the first field mission. ➤ Participated in the first field mission
<p>Area of Investigation</p> <p>The general area of investigation is the <u>Lakes Naivasha-Elementaita Nakuru Watershed</u>. We worked in three regions within this area as follows:</p> <p>(1) The Nakuru urban and peri-urban region – Visited the Water Resources Management Authority of the Kenya Ministry of Water and Irrigation regional offices and Water Analysis Laboratory, various borehole sites in town and outside town, sewage treatment plant and took water samples and took measurements of depth to water table, domestic and industrial waste dumping site, Catholic Diocese of Nakuru and were taken round the bone char processing plant for fluoride treatment of borehole waters.</p> <p>(2) The Lake Elementaita region – took water samples from Lake Elementaita and from one newly constructed private borehole near the lake where we also took measurement of depth to the water rest level in this borehole.</p> <p>(3) The Naivasha urban and peri-urban region – Visited the Water Resources Management Authority of the Kenya Ministry of Water and Irrigation regional offices in Naivasha town. We took water samples and measured depth to water rest levels in boreholes in two privately owned flower farms. We also visited the Naivasha sewage water treatment plant and took water samples from the plant.</p> <p>The following figure shows the three regions in which we carried out the fieldwork (NB: The blue dots are the existing boreholes):</p>	<p>Dr. Daniel O. Olago</p> <ul style="list-style-type: none"> ➤ Investigated and advised the team on where and how to obtain archived scientific data on isotopes, ➤ soil/water chemistry, geochemistry meteoric waters and base flow studies in the project area. ➤ Advised the students on how to prepare their concept papers on the topics of their choice. <p>Dr. Simon M. Onywere</p> <ul style="list-style-type: none"> ➤ Investigated and advised the team on where and how to obtain archived scientific data on soils, land use cover, biodiversity, lithology, structures, hydrology, hydrogeology, pollution studies in the project area. ➤ Advised the students on how to prepare their concept papers on the topics of their choice. <p>Dr. Patrick Gicheru</p> <ul style="list-style-type: none"> ➤ Investigated and advised the team on where and how to obtain archived scientific data on

Borehole ID



soils, land use cover, biodiversity, isotopes, soil/water chemistry, geochemistry, meteoric water, base flow studies in the project area. Advised the students on how to prepare their concept papers on the topics of their choice.

Mr. Charles N. Irungu

➤ Investigated and advised the team on where and how to obtain archived scientific data on hydrology, hydrogeology, isotopes, soil/water chemistry, geochemistry, meteoric water, base flow, pollution studies in the project area

Advised the students on how to prepare their concept papers on the topics of their choice. Participated in the first field mission through an assistant, a Mr. Onyango.

Dr. Wilber Ottichilo

Investigated and advised the team on where and how to obtain archived scientific data on soils, land use cover, biodiversity and pollution studies in the project area.

➤ Advised the students on how to prepare their concept papers on the topics of their choice.

Prof. Twesfaye Korme

➤ Investigated and advised the team on where and how to obtain archived scientific data on lithology, structures, hydrology, hydrogeology, groundwater modelling studies in the project area.

➤ Advised the students on how to prepare their concept papers on the topics of their choice.

Day to day activity

Since this was the first mission to the field, we all stayed together as one team to familiarize ourselves with the field conditions of the area and take scientific measurements together as part of the training for the students in particular. In order to locate the various boreholes sites in the area and to get permission to access them, we engaged two technicians from the Nakuru regional offices of the Water Resources Management Authority and later another technician from their Naivasha offices as our field assistants. These assistants were with us throughout the period of the field work and were greatly helpful. They made our work easy and successful. The following is the detailed account of the day to day activities we carried out.

□ Thursday, 18th May, 2006

• Morning:

- Collected the dipper, GPS and pH meter from the Ministry of Water and Irrigation headquarters in Nairobi,
- Collected geological hammers, topographic and geological maps and other relevant tools the Department of Geology., University of Nairobi
- Hired the field car and collected field allowances from

Summary of the first field activity

- Collected water samples from various borehole sites in the Lakes Naivasha-Elementaita-Nakuru watershed (our first 'Project Area').
- Measured depth to water rest levels in those boreholes.
- Carried reconnaissance geological and hydrogeological mapping in the project area.

IFRA office, Nairobi.

- **Afternoon**

- Traveled from Nairobi to Nakuru town which was main base of operations (located near the northern edge of the Naivasha-Elementaita-Nakuru Watershed – the so-called ‘Project Area’)

□ **Friday, 19th May, 2006**

- **Morning**

- Made first visit to the Nakuru regional offices of the Water Resources Management Authority where we were met by the Provincial Geologist, Mr. Mutai. We explained to Mr. Mutai the purpose of our mission who then took us to the office of his boss, a Mr. Matagaro who is the Regional Director of Water Resources Management Authority, Rift Valley Province. After introducing ourselves to Mr. Matagaro, we explained to him the purpose of our visit and the kind of assistance we required from him and his team. We particularly emphasized to him that the research would be of great benefit to the people and the government and therefore we needed their maximum cooperation in the project and therefore avail to us easy access to their archived data, water analysis laboratory facilities, any available equipment, etc. After listening keenly, he welcomed us to the Province and offered to assist us in every way possible to see that the project proceeds smoothly. Consequently, he asked Mr. Mutai to take care of our needs from the Authority during the period of our field mission and avail to us the data we needed and also introduce us to other members of his team who could be of further assistance to us.

- As a result, Mr. Mutai took us first to the office taking care of all the hydrogeological data and introduced us to a Mr. Okemwa who is the custodian of the data. Mr. Okemwa offered to assist us with any data available. Mr. Mutai then took us to the the Authority’s Water Analysis Laboratory and introduced us to two laboratory technicians - a Mr. Richard Rop and a Mrs. Bancy Chege who explained us at length the various types of analyses they carry out. They also explained to us the various boreholes in the whole of the Rift Valley province which are under the custody of the Water Resources Management Authority and to which they have unlimited access. On our own

- The MSc students in the project got field training on hands-on procedures of collecting water samples and carrying out in situ measurements with various instruments.

(NB: Details are given in the report on the ‘First Field Mission’ in the first column of this document).

Laboratory Activities

- Submitted water samples collected in the first field mission to the Water Analysis Laboratories in the project area and Nairobi for analysis. Results are yet to be collected at a fee.

Training Activities

(1) MSc Students

- Five (5) already registered students are undergoing their MSc training – 3 at the University of Nairobi and 2 at Kenyatta University – in water related subjects from the project area.
- The names of the five MSc. Students, their universities of registration and titles of their research are as follows:

Name of Student

University where Registered

Title of Research

Ezekiel Kemboi

University of Nairobi

Application of aquifer media characteristics and vadoze zone influence on modeling of vulnerability to groundwater pollution in Lakes Naivasha-Elementaita – Nakuru watershed, Kenya Rift

John Ogalo

University of Nairobi

Use of *depth-to-water* table and *topography* in modelling vulnerability of groundwater to pollution in the Lakes Naivasha-Elementaita-Nakuru basin, Kenya Rift

Demis Alamerew

<p>request, and with Mr. Mutai's permission, the two technicians offered to serve as our daily field workers since they are conversant with the area, know the locations of all the boreholes we would like to visit and have unlimited access to the boreholes (both public and private).</p> <ul style="list-style-type: none"> ➤ Visited the Catholic Diocese of Nakuru (CDN) Water Programme Centre located within the Nakuru Municipality where we were met by one of the University of Nairobi Department of Geology MSc student, Ms. Marietta Mutonga, who is completing her fluoride MSc research project in the area around Lakes Bogoria and Baringo and who is partially supported by the CDN on this project. ➤ The CDN is currently engaged in providing rural people in the area around Lakes Baogoria and Baringo with clean water from boreholes. Unfortunately, they are finding the groundwater to be naturally contaminated by fluoride which is posing big pollution problem. In this regard, CDN Water Programme Centre has started a small project of using 'bone char' to remove the fluoride from groundwater. Our visit to the Center was therefore to see and learn how this is done. ➤ While we waited to be introduced to Mr. Hilary Korir, the Water Quality Advisor in the Centre, who was in a meeting with other visitors, Ms Mutonga took us to the bone char preparation plant where we were shown and explained how raw bones from cows are processed through very high temperatures and reduced to bone char which is used to extract fluoride from groundwater – a process known as defluoridation. ➤ We were then taken to the Centre's small but well-stocked Water Analysis Laboratory in which analysis of basic common elements, heavy metals and bacteria in water. We were met by Ms Nancy the Laboratory technician who showed us round and then explained to us the process of defluoridation which is carried out by the Centre. We then had the opportunity to meet and chat with other members of the Centre like Esther the Marketing Manager, Gertrude the Community Mobilization and Education Manager, Joshua the Accountant and Julius the Supervisor. ➤ Lastly, we had a chance to meet Mr. Hilary Korir, the Water Quality Advisor and the overall head of the CDN Centre who welcomed us to the Centre. We explained to him the purpose of our visit and our general mission in the Rift Valley. He then promised to give us the necessary cooperation in our work during that and future missions. <ul style="list-style-type: none"> • Afternoon 	<p>University of Nairobi Geology, hydrogeology and hydrostratigraphy of Lakes Naivasha-Elementaita-Nakuru basin, Kenya Rift</p> <p>Immaculate Simiyu Kenyatta University Anthropogenic impacts on groundwater resources in Naivasha urban and peri urban area, Kenya Rift</p> <p>Paul M. Mubinya Kenyatta University Assessment of groundwater quality in relation to surface water along the Lakes Naivasha-Elementaita-Nakuru basin, Kenya Rift</p> <ul style="list-style-type: none"> • The students have been advised/trained by the researchers in the team on how to write research concepts/proposals on their research topics. • The students have also been introduced to the field through the 'First Field Mission' of this project and subjected to the hands-on training on how to collect water samples and carry out other in situ measurements. • Work accomplished and perspectives: <ul style="list-style-type: none"> ○ The students have written their concept papers on the topics they are working on and are currently preparing their comprehensive proposals for their MSc dissertations on the same topics/titles. ○ They have collected water samples and taken in situ measurements in the field and the samples are being analyzed. ○ They are carrying out preliminary synthesis of the archived data relevant to their projects. <p>PhD Students.</p>
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<ul style="list-style-type: none"> ➤ Visited Kabatini boreholes site belonging to the Nakuru Water and Sewarage Services Company (NAWASSCO) – an autonomous Company supplying water to the Municipal Council of Nakuru. At Kabatini, we found a total six boreholes all of which were in operation (i.e. being pumped). ➤ Before we started any field measurements, Mr. Rop and Mrs Chege gave us a quick on how to use the various instruments we borrowed from their Water Analysis Laboratory in Nakuru such as the dipper, the water and the water sampling equipment, the GPS, etc. It was the first time some members of the team were using them. ➤ Then, with their assistance, we took in situ measurements of the water Electrical Conductivity (EC), Total Dissolved Solids (TDS), Alkalinity (pH) and Temperature(T) from five boreholes.. Next, we measured the locations and elevations of the five boreholes using the Global Positioning Systems (GPS). Lastly, we took measurements of the dynamic water rest levels in the five boreholes. The dipper was used for borehole 2 and 5, while the in situ water sample measurements were done for boreholes1, 2, 4 and 5. GPS measurements were carried out on all the boreholes. 	<ul style="list-style-type: none"> • Three (3) PhD students have been identified and have already prepared drafts of their concept papers. They are now preparing their comprehensive proposals for submission to CIFEG and to the University of Nairobi for registration. The students are not registered yet, but in order for them to be registered, they will seek sponsorship from CIFEG for tuition and living expenses. • The following is the list of the PhD students identified, proposed institution of registration (jointly with a yet-to-be-identified (French Institution) and title of their subjects of research in this project: <p style="text-align: center;">Name of PhD student Proposed Institution of Registration (jointly with a French Institution) Proposed Title of Research</p>
<p>□ Saturday 20th May, 2006</p> <ul style="list-style-type: none"> • Morning <ul style="list-style-type: none"> ➤ Collected our field assistants, Mrs. Bancy Chege and Mr. Richard Rop from the Water Resources Management offices ➤ Visited two wells along Nairobi-Nakuru highway which are managed by the Nakuru Water and Sewarage Services Company (NAWASSCO) for water supply within the Municipality. ➤ We passed by CDN but were unable to sample the borehole due to poor construction. No airline nor tap for sampling. The borehole is serialized as C 9364 and was drilled in January 1993. No data available. ➤ We then moved to Baharini Wells which are also managed by (NAWASSCO). The boreholes are situated to the south east of Nakuru town and are adjacent to a game reserve. The location are on a N-S trending faults of Rift Valley. • Afternoon <ul style="list-style-type: none"> ➤ We went to Lanet Armed Forces Barracks boreholes site. 	<p>Maritta Mutonga University of Nairobi Water chemistry of the Kerio Valley region, Kenya Rift</p> <p>Lydia Olaka University of Nairobi Groundwater vulnerability to contamination: systematic Mapping of the rock aquifers in the East African Rift system in Kenya</p> <p>Robert Magutu Wanjara University of Nairobi Application of numerical, isotope and geo-chemical modeling and GIS in characterization of the hydrogeology of a closed rift valley basin, Kenya: Implication to groundwater contamination</p>

Due to security reasons, we were unable to use a GPS. The well was also poorly constructed and has no airline

- Moved to Lanet/Taboga to a private borehole which was recently completed. The wells' first aquifer was struck at 36m. The second followed at 56m and the total depth is 70M. All these were covered in clays. Flouride level increases with depth i.e, from 1.5mg/l at 36m to 1.7mg/l at the completion of the well.

□ **Sunday 21st May, 2006**

• **Morning**

- Visited the Nakuru Sewerage Plant that serves the town centre and the free area localities in Nakuru. We were accompanied by Mrs Bancy Chege and Richard Rop. We were shown and explained the sewage water treatment procedures and how the effluent is discharged into Lake Nakuru after treatment. We collected the water samples for lab analysis and measured the EC, TDS and pH of the treated waters.

• **Afternoon**

- We visited the Mereroni river located between Lakes Nakuru and Elementaita.
- We then visited Lake Elementaita and collected the lake water samples.
- Then we visited a newly constructed borehole near Lake Elementaita belonging to Crescent Construction Company and carried out EC, TDS, Temperature and pH measurements, collected water samples and logged the borehole. We also used the dipper to measure the water rest level in the borehole

□ **Monday 22nd May, 2006**

• **Morning**

- Visited the Water Resources Management Authority offices to collect the archived data. We were received by Mr. Okemwa, the geologist who is also the custodian of all the regional hydrogeological data. He gave us the groundwater water monitoring data which they have been collecting for nearly two years from some boreholes in the Rift Valley Province. He promised to avail to us any data they will be collecting in future.
- Visited Nakuru Domestic and Industrial Waste Dump Site

– a solid waste, organic and inorganic waste and even industrial chemical waste disposal site. We studied the positioning and the sketch of the study area in relation to the road, the lake and the town centre. We were accompanied and assisted by Mrs. Nancy Chege and Mr. Dominic Wambua, a geologist from the Naivasha office of the Water Resources Management Authority, who was to introduce us later to the Naivasha Water Resources Management Authority regional office where he is normally based.

- We then traveled to the top of the Menengai crater to take a bird's eye view of Nakuru town and the settlement areas around it. We also took time to study the local geology, structure and topography from which we could get a clear understanding of the possible distribution of the aquifer systems in the area in general.

- **Afternoon**

- We traveled to Naivasha town and on arrival, we went straight to the Water Resources Management Authority offices located there. Mr. Wambua introduced to some of his colleagues and gave us a short briefing of the work they do and the areas they cover. Then, under the guide of Mr. Wambua, we proceeded to two flower farms next to Lake Naivasha to book an appointment for visits the following day. The two farms we booked an appointment with are Panda Flower Farm and De la mere Farm. After booking the appointments, we finished the day's work by visiting the Naivasha Sewerage Plant where we were received by the staff on duty who showed us around and explained to us the sewage water treatment procedures. .

□ **Tuesday 23rd May, 2006**

- **Morning**

- Visited Panda Flowers Farm. At the farm, we were taken to two boreholes – boreholes 3 and 5 - where we did the in situ measurements and collected water samples. Water from the green houses in a trench was also measured for the in situ measurements, for comparison with the borehole water, the water was subsequently sampled.
- We then moved to De la Mere farm, where we did the in situ measurements of a single borehole.
- Started our final journey from Naivasha back to Nairobi at about 11.00 am.

- On our way to Nairobi, we stopped at the Karati River, collected water samples and did the in situ measurements of water.
- Arrived in Nairobi at about 1.00 pm and took all the water samples we brought from the field to the Ministry of Water and Irrigation Laboratories in Nairobi for analysis

Scientific Synthesis and Proposed Laboratory Analysis

As explained above, water samples were collected from various boreholes, rivers, sewerage systems and a lake. Some of the samples were left at the Water Analysis Laboratory of the Water Resources Management Authority, Naivasha, and others were brought to the Nairobi Water Analysis Laboratory of the Authority analysis. We requested for the following types of analyses to be carried out:

Physical/Chemical Water Analysis

PARAMETERS UNIT

pH
pH scale

Colour
mgPt/l

Turbidity
N.T.U.

Permanganate Value (20 min boiling)
mgO₂/l

Conductivity (250C)
μS/cm

Iron
mgFe/l

Manganese
mgMn/l

Calcium
mgCa/l

Magnesium
mgMg/l

Sodium
mgNa/l

Potassium
mgK/l

Total Hardness
mgCaCO₃/l

Total Alkalinity
mgCaCO₃/l

Chloride
mgCl/l

Fluoride
mgF/l

Nitrate
mgN/l

Nitrite
mgN/l

Ammonia
mgN/l

Total Nitrogen
mgN/l

Sulphate
mgSO₄/l

Orthophosphate
mgP/l

Total Suspended Solids
mg/l

Free Carbon Dioxide
mgCO₂/l

Dissolved Oxygen
mgO₂/l

TDS
mg/l

Silica
mgSiO₂/l

The analysis for the above parameters are being carried out at the Naivasha Laboratory. In addition, we requested the following analysis for heavy metals to be done at the Nairobi Laboratory:

**PARAMETERS
UNIT**

Heavy metals – Chromium, Cr
mg/l

Lead, Pb
mg/l

Mercury, Hg
mg/l

Copper, Cu
mg/l

Cadmium, Cd
mg/l

Zinc, Zn
mg/l

The following is the summary of results of the measurements taken in the field:

BOREHOLE LOCATION AND IDENTIFICATION NUMBER

EC
(mS/cm)

TDS
(mg/l)

pH

TEMP

(°C)

ALT (m)

WATER REST LEVEL (m)

Kabatini No. 4

1912

Kabatini No. 2

62.25

Kabatini No. 1

0.39

0.19

6.59

30.3

Kabatini No. 5

0.46

0.23

25.8

1910

61.85

Nawassco No. 5

0.81

0.41

7.4

30.5

89.88

Nawassco No. 6

0.72

0.36

7.70

29.2

1864

88.7

Baharini No. 7

0.59

0.29

7.12

28.4

1843

59.08

Baharini No. 9

1834

64.4

Armed Forces Training College – Lanet borehole

0.54

0.27

6.59

28.7

Tabuga-Lanet borehole

0.75

0.37

7.52

22.9

1969

Crescent borehole

71.04

Panda Flowers No. 5

Panda Flowers No. 3

Panda Flowers No. 2

0.68

0.34

7.3

1922

De La Mere Farm borehole

8.04

24.2

1910

RIVER/LAKE/SEWAGE

EC

(mS/cm

TDS

(mg/l)

pH

TEMP

(°C)

ALT.

(m)

Mereroni River

0.19

0.09

7.14

21

1880

Gilgil River

0.14

0.07

7.48

	19.9	
Karati River		
	0.18	
	0.09	
	7.65	
	17.0	
	1902	
Nakuru Sewerage Plant		
	0.98	
	0.51	
	8.41	
	25.1	
Nakuru Sewerage Plant		
	0.95	
	0.48	
	8.41	
	25.2	
	1789	
Lake Elementaita		
	34.06	
	17.03	
	9.69	
	1790	
Green house trench -Panada Flowers		
	2.83	
	1.41	
	7.19	
	20.3	
	1913	

Expected future mission	Scheduled activity for the next six months
<p>The expected future mission will be 'Field Mission 2 which is scheduled as follows:</p>	<p>The activity of for the next six months and its timetable is as follows:</p>
<p>Field Mission No. 2</p> <ul style="list-style-type: none"> • Date: 7th July – 31st July (25 days) • Objectives <ol style="list-style-type: none"> (1) To carry out detailed hydrological, hydrogeological, geological, structural, geophysical and geochemical mapping in the Lakes Naivasha-Elementaita-Nakuru Watershed (2) To collect water and soil samples from all the accessible and operating boreholes, rivers and the three lakes in the watershed for detailed analysis for assessing the degree of pollution. (3) To monitor water levels in boreholes on regular basis to gather data for dynamic hydrological studies. 	<p>Activity M J J A S O</p> <p>Analysis of water samples and interpretation of other data collected from First Field Mission and preparation of preliminary report</p>
<p>Statistical data</p> <ul style="list-style-type: none"> ➤ No. of cars use – 1 ➤ No. of kilometers covered – 689 ➤ Daily workers <ul style="list-style-type: none"> ○ Number of workers engaged daily in the first 4 days – 2 ○ Number of workers engaged daily in last day – 1 ○ Names of daily workers, their roles and cost: 	<p>Purchasing of equipment and computing hardware and software</p> <p>Development of database</p>
<p style="text-align: center;">Name Date Role Cost</p> <p>Mr. Richard Rop & Mrs. Bancy Chege 19th May, 2006 Assisted in getting permission and access to boreholes and other sites of interest; participated in training the students the field techniques of sampling and taking other scientific measurements using the instruments borrowed from the Water Resources Management Authority 2 persons @ KShs. 500.00 per person per day = KShs. 1000.00</p>	<p>Keying in of all attribute and spatial data</p> <p>Field Mission 2</p>

<p>Mr. Richard Rop & Mrs. Bancy Chege 20th May, 2006 Assisted in obtaining permission and access to boreholes and other sites of interest; participated in training the students the field techniques of sampling and taking other scientific measurements using the instruments borrowed from the Water Resources Management Authority 2 persons @ KShs. 500.00 per person per day = KShs. 1000.00</p>	<p>Analysis and interpretation of archived and new field data</p>
<p>Mr. Richard Rop & Mrs. Bancy Chege 21st May, 2006 Assisted in obtaining permission and access to boreholes and other sites of interest; participated in training the students the field techniques of sampling and taking other scientific measurements using the instruments borrowed from the Water Resources Management Authority 2 persons @ KShs. 500.00 per person per day = KShs. 1000.00</p>	<p>Registration of new MSc and PhD students</p>
<p>Mrs. Bancy Chege & Mr. Dominic Wambua 22nd May, 2006 Assisted in obtaining permission and access to boreholes and other sites of interest; participated in training the students the field techniques of sampling and taking other scientific measurements using the instruments borrowed from the Water Resources Management Authority 2 persons @ KShs. 500.00 per person per day = KShs. 1000.00</p>	<p>Writing of First report</p> <p>Regional visit to Ethiopia</p>
<p>Mr. Dominic Wambua 23rd May, 2006 Assisted in obtaining permission and access to boreholes and other sites of interest; participated in training the students the field techniques of sampling and taking other scientific measurements using the instruments borrowed from the Water Resources Management Authority 1 person @ KShs. 500.00 per person per day = KShs. 500.00</p>	<p>Scientific Seminar</p>
<ul style="list-style-type: none"> ➤ Water samples collected: <ul style="list-style-type: none"> ○ No. of boreholes - 15 ○ No. of rivers - 3 ○ No of lakes - 1 ○ No. of sewerage treatment plants - 2 ➤ Depth to water rest level <ul style="list-style-type: none"> ○ No of boreholes - 7 ➤ Borehole elevation measurements <ul style="list-style-type: none"> ○ No. of boreholes - 6 ➤ Other in situ measurements (EC, pH, TDS, Temperature) 	<p>The following table shows a clear summary of the above schedule of activities:</p> <p>Activity Period</p> <p>Analysis of water samples and interpretation of other</p>

<ul style="list-style-type: none"> ○ No of boreholes - 8 ○ No. of rivers - 3 ○ No. of lakes - 1 ○ No. of sewerage treatment plants - 2 ➤ Reconnaissance geological mapping <ul style="list-style-type: none"> ○ Carried out observations along road cuts, river banks, etc., and took notes ➤ Reconnaissance hydrogeological mapping <ul style="list-style-type: none"> ○ Carried out observations on vegetation pattern, major fault patterns and river flow patterns to map distribution of aquifers beneath. 	<p>data collected from First Field Mission and preparation of preliminary report May, June, July</p> <p>Purchasing of equipment and computing hardware and software June, July</p> <p>Development of database June, July, August</p> <p>Keying in of all attribute and spatial data June, July, August, September</p> <p>Field Mission 2 July</p> <p>Analysis and interpretation of archived and new field data June, July, August, September</p> <p>Registration of new MSc and PhD students September</p> <p>Writing of First report July, August, September</p> <p>Regional visit to Ethiopia September – NB: This is tentative date</p> <p>Scientific Seminar October</p> <p>Purchases</p> <p>The purchases to be made during the next six months are those code-named <u>Requests K1, K3 and K4</u> which include equipment, computing hardware and software, water chemistry materials and analysis costs and stationary. These requests have already been submitted to CIFEG.</p>
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