

The selected laboratory equipment and apparatus are shown in Table 3-11.

**Table 3-11 Major Laboratory Equipment and Appurtenant Accessories**

No.	Name	Number of Units	Specification
1.	Low Temperature Incubator	1	BOD
2.	Drying Oven	1	ss, etc.
3.	Laboratory Furnace	1	- ditto -
4.	Water Bath	1	general use
5.	Aspirator	2	- ditto -
6.	Air pump	1	- ditto -
7.	Centrifuge	1	reparation of ss
8.	Spectrophotometer	1	measuring suspended material
9.	Atomic Absorption / Flame Spectrophotometer	1	measuring heavy metal
10.	Microscope	1	observation
11.	Plankton Counter	1	measuring plankton
12.	Laboratory PH/ORP Conductivity Meter	1	measuring temp., PH, ORP conductivity
13.	Autoclave	1	sterilization
14.	Balance	1	general use
15.	COD Reflux Apparatus	1 set	measuring COD density
16.	TKN RefluApparatus	1 set	measuring water quality
17.	Current Meter	2	measuring water velocity
18.	Water Distillation Unit	1	general use
19.	Refrigerator	2	- ditto -
20.	Pair of Binoculars	1	- ditto -
21.	Automatic Sampler	1	- ditto -
22.	Inflatable Rubber Boat	1	- ditto -
23.	Lake Level Gauge	4	- ditto -
24.	Sampling Bottle	1 set	- ditto -
25.	Ice Box	3	- ditto -

### 3.3.8 Operation and Maintenance Equipment

The existing operation and maintenance equipment are far from satisfaction. They must be strengthened in order to ensure a sustained operation and function of the completed Project. In due consideration of the natures and features of the project facilities and in the

light of the basic guidelines for operation and maintenance, the required equipment has been selected as listed up in Table 3-12. These equipment shall be kept and maintained under the WSD. In addition, it is also proposed to supplement some workshop equipment in order to facilitate the daily operation and maintenance work.

**Table 3-12 List of Operation and Maintenance Equipment**

Item No.	Items	Unit	Quantity
<b>A.</b>	<b>Workshop Equipment</b>		
(1)	Tool box with assorted tools	lot	1
(2)	Electric angle grinder, 8 inch	set	1
(3)	Drill bits, 2 to 12 mm dia. with stand	set	1
(4)	Portable electric blower, 50 cm dia..	set	1
(5)	Gear puller	set	1
(6)	Tap and dies. M2 to M12 fine thread	set	1
(7)	Gas welding set	set	1
(8)	Engine generator/welder	set	1
(9)	Electric tool box with assorted tolls	lot	1
(10)	Drilling machine	set	1
(11)	Air compressor	set	1
(12)	Vice	set	1
(13)	Chain block	set	1
(14)	Hydraulic jack	set	1
(15)	Shelf with rock	set	1
(16)	Gate crane, movable type	set	1
<b>B.</b>	<b>Operation and Maintenance Equipment</b>		
(1)	Mud pump, Dia. 100 mm, 1.2 m <sup>3</sup> /min., H=10 m	set	3
(2)	Generator for the above, 8 KVA	set	2
(3)	Truck with 1 ton crane	unit	1
(4)	High pressure sewer cleaner, 4 ton vehicle	unit	1
(5)	High pressure sewer cleaner, vacuum car, 4 ton	unit	1
(6)	High pressure sewer cleaner, water tanker, 4 ton	unit	1
(7)	Plug for water stop, 225, 300, 375 mm, 2 each	nos.	6
(8)	Pick up truck, 1 ton	unit	2
(9)	Tractor shovel with back-hoe attachment, 0.4 m <sup>3</sup>	unit	1
(10)	Dump truck, 6 ton	unit	2
(11)	Gas mask	set	6
<b>C.</b>	<b>Testing Apparatus for Existing Njoro Laboratory</b>		
(1)	Aspirator	no.	1
(2)	Air pump	no.	1
(3)	Portable pH meter	no.	1
(4)	Portable DO meter	no.	1
(5)	Portable conductivity meter	no.	1
(6)	Portable ORP meter	no.	1
(7)	Balance	no.	1
(8)	Analytical balance	no.	1
(9)	Automatic sampler	no.	1
(10)	Sampling bottles	set	1
(11)	Glassware & other accessories	lot	1

(Data source : Study Team)

### **3.4 Implementation Plan**

#### **3.4.1 Construction Condition**

This clause describes generally the current and prevailing conditions for construction fields in Kenya, which will affect the Project's construction works. A basic consideration for construction planning is also stipulated briefly referring to the collected data and interview survey in Nairobi, Nakuru and Gilgil in September 1993.

##### **(1) Construction contractors**

Construction contractors in Kenya will be broadly divided into foreign capital group and domestic capital group (mostly Indian). The number of construction contractors is approximately 300 under the member of Kenya Construction Contractors Association comprising general contractor, electrical works, installation and or erection, survey and inspection works as of January 1992 according to the JETRO report. The contractors in Kenya are registered in the following Ministries respectively.

- Ministry of Works, Housing and Physical Planning
- Ministry of Transport and Communications
- Ministry of Water Development

##### **(2) Labour force**

Required common, semi-skilled and skilled labourers including heavy equipment operators could be recruited in and around the site since the site is located in Nakuru municipality. However some of technicians or skilled workers would be required from abroad.

##### **(3) Construction equipment**

Middle to light class of standard type of construction equipment will be required for execution of construction works of this Project. No production plant could be found in Kenya for these kind of construction equipment. Generally, construction equipment is imported from abroad. These kind of equipment which will be required for the project's construction works are available in Kenya with rental or lease basis through supplier's agents or civil engineering contractors. Generally, lease or rental cost is high due to depressed market of mechanized construction as well as supply of spareparts and less standardization of construction equipment, according to the site survey and investigation held for this Project.

(4) Construction material

Major construction materials required for the project, its availability and source of the material are summarized in Table 3-13.

**Table 3-13 Availability/Source of Construction Material**

Material	Availability/Source
portland cement	available at Nairobi/Mombasa - product by 2 companies - supply through 4 companies - bulk or 50 kg bag - Kenya standard KS 02-21
coarse aggregate	available at Nakuru
fine aggregate	available at Homa bay/Kisumu
re-bar, round	available at Nairobi/Mombasa
re-bar, deformed	available at Nairobi/Mombasa
formed steel	available at Nairobi/Mombasa
timber	available at Nakuru
precast concrete pipe	available at Nairobi
fuel	available at Nakuru
lubricants	available at Nakuru/Nairobi
bitumen	available at Nairobi

There is no suitable sand and gravel deposit in the vicinity of the project site. It is identified that fine aggregate was transported from the Homa Bay in Kisumu 180 km west of Nakuru for the construction of Grain Silo project and Nakuru water supply project.

(5) Transportation plan

It is identified that local transportation network by domestic and private agencies using trucks or trailers as well as Kenyan national railway system from Nairobi or Mombasa to Nakuru in daily basis is available. The Mombasa port is famous and reliable to handle sea cargoes in east Africa. The project cargoes to be imported from abroad will be unloaded in this Mombasa port, and will be transported to the site by truck, trailer or railway. The distance to the site is as follows.

Nakuru - Nairobi : 157 km

Nakuru - Mombasa : 650 km

### 3.4.2 Implementation Method

It is planned that the project will be implemented in 2 stages, each of which composes of the detailed design tender and construction works with the following components under the management and supervision of the Ministry of Local Government in collaboration with the consultant aided by Japanese Grand Aid. Each stage composes of the detailed design, tender and construction works.

#### <1st stage>

Detailed design, tender and construction of the following facilities.

- Town STW including existing sludge treatment
- Sludge drying bed
- Stormwater retention pond and drainage channel
- Control house
- Water quality testing laboratory
- Procurement of water quality testing equipment
- Procurement of operation and maintenance equipment for sewage facilities

#### <2nd stage>

Detailed design, tender and construction of the following facilities.

- Njoro STW including existing sludge treatment
- Sludge drying bed
- Mwariki sewage pumping station

The design works are commenced after Exchange of Notes (E/N) is concluded between both Governments of GOK and GOJ.

#### (a) Time schedule

The schedule proposes taking the following factors into consideration.

- to realize the proposed system in an early time to improve effluent condition
- to minimize the construction cost
- to conduct earthwork in dry season

The construction period is 22.5 months with 2 stages implementation for whole project's works as broken down for respective work components.

Town STW	:	11.5 months (1st stage)
Njoro STW	:	11.0 months (2nd stage)
Mwariki pumping station	:	5 months (2nd stage)
Water quality testing laboratory	:	8 months (1st stage)
Procurement of O&M equipment	:	8 months (1st stage)

(b) Milestone

Town STW

The rehabilitation and expansion works for Town STW is scheduled to be conducted by two (2) steps within 11.5 months.

An important milestone is the time for taking over of 3,200 m<sup>3</sup>/day line which is to be completed in due time from the commencement so that the remaining 3,400 m<sup>3</sup>/day line would be started the construction.

The stormwater drainage channel is scheduled to complete in an early time to achieve effluent from existing Town STW for the execution of rehabilitation of existing ponds with dry condition.

It is required that sedimented sludge of existing ponds should be treated before commencement 3,400 m<sup>3</sup>/day line.

Njoro STW

The construction of stabilization ponds will be carried out through whole work period of 11.0 months. However, the following milestone is to be taken for attention:

- to divert the effluent to 6,000 m<sup>3</sup>/day ponds system in the commencement time of construction.
- to construct rock filter and grass plots to be connected 6,000 m<sup>3</sup>/day system in early stage, so that excavated soils could be utilized as the embankment materials for Town STW works.
- to complete treatment work for existing sedimented sludge within 3 months in early stage of construction works.

Water quality testing laboratory

A proposed laboratory building is scheduled to complete in the middle of 1995.

A lot of testing apparatus is scheduled to deliver GOK at site in the middle of 1995.

O & M equipment

The proposed O&M equipment is planned to deliver to GOK in early stage since insufficient of O&M work performance due mainly to shortage of these kind of equipment.

### 3.4.3 Construction and Supervisory Plan

#### *Consturuction Plan*

##### (1) General

Major works are the construction of Town and Njoro sewage treatment works on the rehabilitation and expansion.

Based on the required construction items with its work volume and weather conditions in Nakuru as well as on the economic point of view, the construction works shall be commenced as early as possible after clearance of necessary procedures.

##### (2) Preparatory works

###### Access/construction roads

All construction site is accessible, clear of obstruction and close to Nakuru, so that no special off-site work has to be taken to carry out by the contractor to effective mobilization.

Only inner access/construction roads within Town and Njoro STWs will be necessary for the construction works.

###### Power supply

Required electric power for mechanical and electrical works will be supplied by existing line of 220 V at Town STW, Njoro STW and Mwariki pumping station. Consultation is necessary to The Kenya Power and Lighting Company for installations to meet the demand under this project.

###### Water supply

Town and Njoro sites are currently served with piped water from the municipal water supply. Site offices, workshops, concrete works and others will be supplied by supply lines extended from this line.

###### Resident engineer's office

One (1) resident engineer's office will be provided at Town STW having approximately 30 m<sup>2</sup>.

#### Contractor's site office

Contractor's site office with 200 m<sup>2</sup> in floor area will be provided at both Town and Njoro STW's sites. The offices will be removed after completion of the project.

#### Motor pool, repair shop and warehouse

A motor pool and repair shop are planned to be provided at Town and Njoro STW. Site warehouse will be provided also both Town and Njoro with certain floor space.

#### Quarter for resident engineer

One (1) resident engineer's quarter will be provided in the Nakuru city.

#### Quarter for contractor's staff

Quarter(s) for contractor will also be provided in the Nakuru city.

#### Communication

Public telephone system is currently serving at Town and Njoro STW and will be expanded for communication purpose for the construction execution.

#### Laboratory for construction work

A small scale laboratory will be necessary either the site of Town or Njoro during construction period to enable routine tests for earthwork.

### (3) Mwariki Sewage Pumping Station

Since small scale of house, the construction works will be carried out by manual force with support of some equipment such as truck for materials transportation. Existing sewer pumps consisting 3 units and 7.5 kW having 1.5 m<sup>3</sup>/min. The new pumps should have cutter model blade. Automatic operation system is designed for these three (3) unit of pumps providing a set of control board and panel. A set of lifting apparatus is also planned to replace to which existing steel frame will be equipped for maintenance work of the pumps. The works will be conducted in 2nd stage.

### (4) Town STW

#### (a) General

This Town STW is planned to rehabilitate and expand to 6,600 m<sup>3</sup>/day provided four (4) sewage treatment processing lines which two (2) lines is to connect to the existing STW with 3,400 m<sup>3</sup>/day in capacity, in 1st stage. The construction of Town STW will be a critical path work of the project, and it's



major work is the construction of various kind of ponds with related structures.

(b) Topography and site geology

The ground elevation of Town treatment site ranges from 1,764 m to 1,787 m. The gradient of the ground surface ranges 1:70 to 1:50 and flat land with gentle slope. Proposed expansion area is partially occupied by the Nakuru national park and covers by bush and small shrubs.

Soil type of Town STW site investigated is summarized in Table 3-14.

**Table 3-14 Soil Type of Town STW Site**

Borehole No.	Depth (GL.m)	Elevation (m)	Soil Type
1	- 5.0	1762	silt
	-10.0	1757	silt
	-15.0	1752	pozzolanic ash
2	-5.0	1773	sand
	-10.0	1768	silt
	-15.0	1763	tuff

The sub-surface geological condition of Town sewage work site is broadly sedimented up to a depth of 3 m with volcanic silt. Each sedimentary layer is considered to be well compacted or tight form and indicates N value of 10 to 20. The permeability coefficient is  $1 \times 10^{-4}$  to  $10^{-3}$  cm/sec in silt layer and  $1 \times 10^{-6}$  cm/sec in pozzolanic ash layer. It is judged that the site is suitable to construct the contemplated ponds and soil are usable for the embankment material with appropriate compaction. However, sandy soil layer with N value of 4 to 5 exists at the depth of 3 m below the ground surface and has a comparatively high permeability coefficient in the order of  $1 \times 10^{-3}$  cm/sec. Resulting from assessment of soil properties, silt available at the Town site could be used as embankment material.

(c) Civil works

The construction works for Town STW will be conducted by two (2) steps; firstly, two (2) treatment processing lines for 3,200 m<sup>3</sup>/day (as expansion) will be constructed, secondly, remaining two (2) lines for 3,400 m<sup>3</sup>/day (as rehabilitation) will be constructed due to no suspend of effluent treatment is required by Town STW. The stormwater retention pond and drainage channel is planned to construct in about 6 months in early stage. The embankment

will be carried out in parallel with the excavation work without leaving embankment materials and to avoid excessive moving. Maximum embankment height is approximately 4.0 m. The embankment material will mostly be obtained from the excavation of ponds within the Town STW work site. However, it is shortage of embankment materials at Town STW works as follows.

Embankment	290,000 m <sup>3</sup> bank measure
Excavation	259,000 m <sup>3</sup> bank measure
Balance	- 31,000 m <sup>3</sup>

A shortage volume of 31,000 m<sup>3</sup> will be transported from Njoro STW works.

It is confirmed that more than 95% of the dry density is ensured when the silt with natural moisture contents ( $W_n = 50\%$ ) is compacted at an appropriate compaction degree. Thus it is considered the most appropriate to compact the soil at the state of natural moisture content but when the embankment is subject to flood water the embankment subsidence occurs in most cases. Hence to avoid the such problem it will be required to provide water tanker to spray water while executing compaction.

Concrete works in the ponds will be carried out once the construction of embankment is complete. Concrete works for the storm water drainage channel will be carried out concurrently with the ponds construction.

Rock filter materials is planned to obtain by purchasing from rock supplier in Nakuru at site delivery basis with the required size of 10 to 20 cm. According to the materials investigation, quarried rock are being produced in Nakuru with the distance of 5 km from Town STW.

Grass (Kikuyu grass) for grass plots facility will be obtained from farmers or material suppliers by providing 11 tons dump truck for transportation. Source of Kikuyu grass is in and around Nakuru municipality which distance from the Town STW site varies 3 to 50 km according to the site survey. The works will be carried out in rainy season as much as possible.

No dredging of existing ponds was done since commencement of operation at Town STW. Total sedimentation volume estimates at 6,100 m<sup>3</sup> in wet condition or 1,500 m<sup>3</sup> in dry condition for four (4) ponds. The works are planned to be carried out in two (2) steps provided temporary and small scale ring dike as for the drying bed for dredged sludge viewing from environment. Pump dredge by 1.5 m<sup>3</sup>/min. capacity mud pumps will be applied for

dredging of sedimented sludge to pump up into the temporary ring dike, and 11 tons dump truck is planned to transport disposal to the dumping site of the edge of Menengai forest selected by the GOK. The hauling distance estimates at 14.0 km approximately.

(d) Building works

A reinforced concrete type control house composes an office, workshop, warehouse, kitchen and lavatory with 20 m x 6 m width. This house will be constructed using local produced materials, and local workers mostly provided for supporting equipment for materials transportation and lifting works for erection works.

(e) Mechanical and electrical works

Mechanical and electrical works in the Town STW are summarized as follows;

- procurement and installation of machinery which is to be rehabilitated; such as drain pumps, control cabinets and others,
- supply of spareparts,
- rehabilitation of steel hatch cover,
- setting the electrical power cables and distribution board at the control and staff houses, and
- other minor mechanical and electrical works.

Several items of machinery will have to be procured from abroad. The mechanical and electrical works will be conducted in parallel with other civil works, and to meet with the building works by mostly local technician.

(5) Njoro STW

(a) General

The stabilization ponds of Njoro STW with treatment capacity of 6,000 m<sup>3</sup>/day is being constructed and be expected to complete in September 1994 which was started in the early 1994. The treatment capacity of Njoro STW will thus become 9,600 m<sup>3</sup>/day after completion of 2 systems (3,600 & 6,000 m<sup>3</sup>/day) with 4 treatment lines. The rehabilitation and expansion of Njoro STW will be conducted in 2nd stage. The construction of rock filter and grass plots to be connected to 6,000 m<sup>3</sup>/day are carried out in early stage to improve effluent conditions, and to obtain as for the embankment material for Town STW works.

(b) Topography and site geology

The sub-surface geological condition is quite similar to that of Town sewage work site. Soil type of Njoro STW site is given in Table 3-15.

**Table 3-15 Soil Type of Njoro STW Site**

Borehole No.	Depth (EL m)	Elevation (m)	Soil Type
3	-5.0	1,776	silt
	-10.0	1,771	silt
	-15.0	1,766	sandy silt
4	-5.0	1,766	silt
	-10.0	1,761	pozzolanic ash
	-15.0	1,756	silty sand
5	-5.0	1,763	sand
	-10.0	1,758	sand
	-15.0	1,753	sand

N value of sedimentary layer is 5 to 15 and permeability coefficient is  $1 \times 10^{-4}$  to  $10^{-6}$  cm/sec in silt layer. A comparatively loose sand layer as that of the Town site is also identified at the depth of 2.4 m from the ground surface. This layer is made up of volcanic sand which is composed uniformly of coarse grains having a weak cementation capacity and comparatively high permeability coefficient,  $1 \times 10^{-3}$  to  $10^{-5}$  cm/sec. attention is directed to prevent of seepage as same as the Town site. It is assessed that silt available at Njoro site can be used as embankment material from soil property test.

(c) Civil works

A work sequence will be as follows:

- 1) to construct rock filter and grass plots to be connected to 6,000 m<sup>3</sup>/day stabilization ponds.
- 2) to conduct earthwork other than existing ponds area from initial stage in parallel with the construction of rock filter and grass plots.
- 3) to divert the flow to 6,000 m<sup>3</sup>/day line after completion of rock filter and grass plots.
- 4) to continue earth work at existing ponds area

The proposed construction method for Town STW is applied principally for the Njoro STW works. Required embankment volume estimates 135,000 m<sup>3</sup> in bank measure. The embankment material could be obtained from the ponds excavation within Njoro STW and its balance is as follows.

Excavation	255,000 m <sup>3</sup> bank measure
Embankment	135,000 m <sup>3</sup> bank measure
Balance	+120,000 m <sup>3</sup>

An excessive soil from the excavation will be utilized as for the embankment materials for the Town STW works and land reclamation.

N value of the sedimentary layer in Njoro STW site is 10 to 20 and judged to be reliable foundation with sufficient bearing force for the embankment. Same kind of fleet for Town STW work is also planned to be applied for Njoro STW embankment work. Sedimented sludge volume estimates at 34,800 m<sup>3</sup> in wet condition and or 8,700 m<sup>3</sup> in dry condition. The dredging work is required to be carried out in initial stage in dry season, so that rehabilitation works of existing ponds could be achieved.

(6) Water Quality Testing Laboratory

A water quality testing laboratory is planned to construct in 1st stage adjacent to the existing training center of the Nakuru national park of KWS by reinforced concrete having 350 m<sup>2</sup> in floor area.

The building works will be carried out mainly by using local product materials, and by local technicians starting from initial stage.

*Supervisory Plan*

The project will be implemented under the supervision of the selected consultant in association with the UDD of Ministry of Local Government in 1st and 2nd stages upon establishment of the project office in Nakuru. An engineer from the consultant will be stationed in the project site throughout the construction works not only for the supervisory works but also advisory services on sewage influent control system into the existing STWs. The following consultant's staff will be appointed to supervise on his speciality to meet the progress and in due course.

- Resident Engineer
- Civil Engineer
- Soil Specialist
- Mechanical/Electrical Engineer
- Building Engineer

#### 3.4.4 Procurement Plan

The procurement work of the project composes of 1) operation and maintenance equipment and tools, and 2) testing equipment for water quality testing laboratory including Njoro's one. These equipment and instruments are planned to deliver in 1st stage of the project implementation due to its urgent needs. Most of equipment and tools will be imported from abroad and transported to the Nakuru by trucks or trailer through the Mombasa port.

#### 3.4.5 Burden of the GOK

The GOK shall take the necessary measures described in Annex-1 of Appendix 4 and summarized as follows for smooth implementation of the project according to the discussion between the JICA and GOK dated January 18 and 19, 1994.

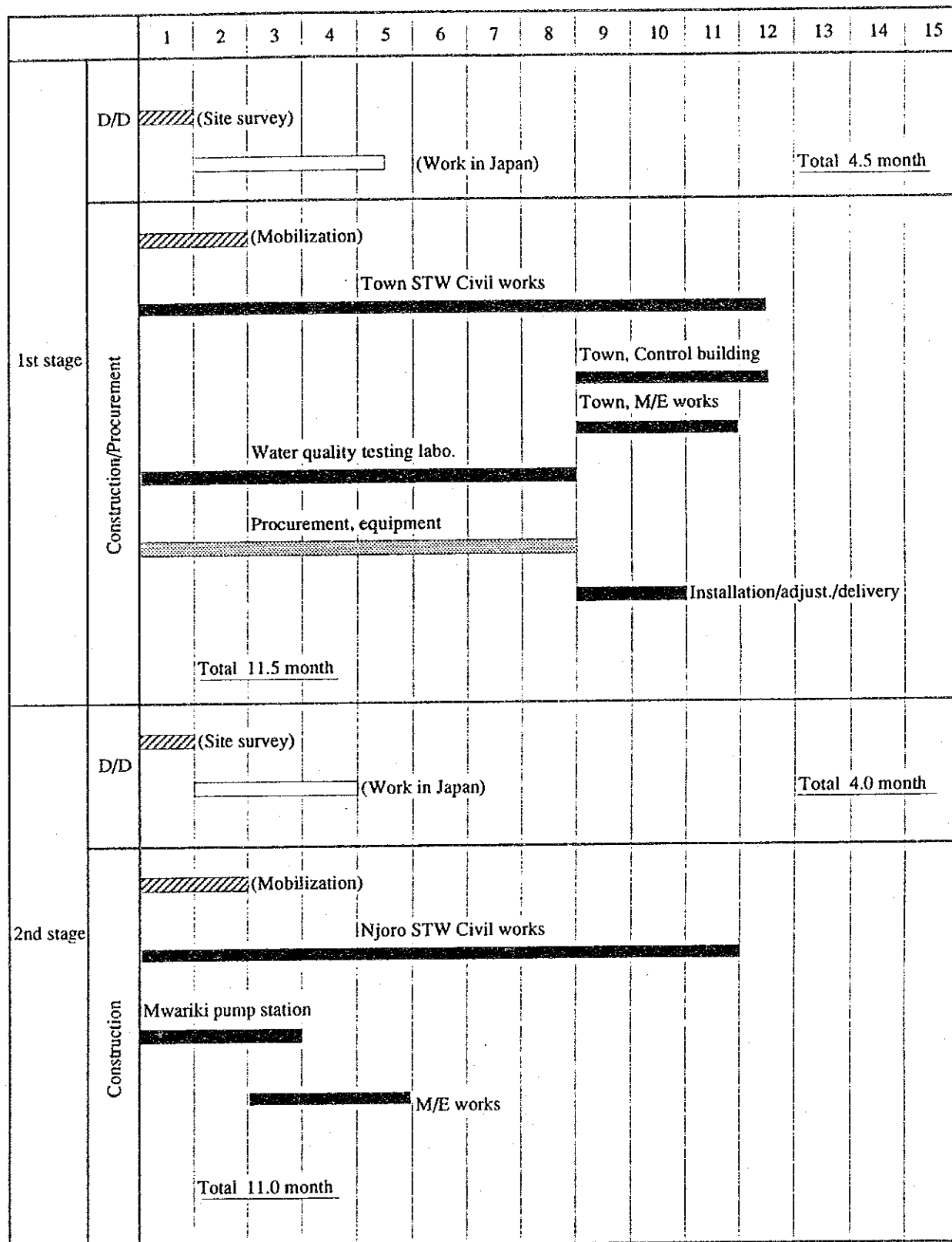
- (1) To secure the lands necessary for expansion
- (2) To bear all the expenses, other than those to be borne by the Grant. Major items are cost for relocation of inner roads and telephone lines, fences, entrance gates, and cost for general furnitures for water quality testing laboratory, control house in the Town STW and Mwariki pumping station. Estimated cost to be borne by the GOK is summarized as follows and tabulated in Appendix 5.

construction cost,	1st stage	:	Kshs	15,000,000
	2nd stage	:	Kshs	7,000,000
	sub total	:	Kshs	22,000,000
furnitures/materials,	1st stage	:	Kshs	4,500,000
	2nd stage	:	Kshs	1,000,000
	sub total	:	Kshs	5,500,000
	total		Kshs	27,500,000

- (3) To exempt Japanese nationals solely involved in the project from customs, duties, V.A.T., and other fiscal charges which may be imposed in the Republic of Kenya with respect to the supply of the products and the services under the verified contracts.
- (4) To ensure prompt unloading and customs clearance
- (5) To accord Japanese nationals, whose services may be required in connection with the verified contracts
- (6) To maintain and use properly and effectively the facilities constructed and the equipment provided under the Grant

In addition to the above, the GOK is strongly requested to select dumping site for sludge treatment generated after the completion of the rehabilitation and expansion works.

Figure 3-5 Implementation Schedule







## CHAPTER 4 PROJECT EVALUATION AND CONCLUSION

### (1) Evaluation and Conclusion

The Project will not only contribute to the alleviation of the pollutant loads in Lake Nakuru by increasing the sewage treatment capacity and improving the effluent quality but also make it possible to increase public water supply in the Nakuru Municipality to put GNWSP into actual operation.

It was planned that the sewage facilities to be constructed under this rehabilitation and expansion project will be operated and maintained satisfactorily by the Kenyan staff after their completion. Materials for the sewage facilities such as grasses for grass plots and stones for rock filters are available and replaceable by local ones.

It is foreseeable that positive impacts will greatly outweigh any potential negative impacts such as odor nuisance and sludge generation due to construction of waste stabilization ponds.

As a conclusion, it is considered that the implementation of the Project under Japan's Grant Aid is highly significant.

### (2) Recommendation

- 1) The sedimented sludge at the existing ponds of the Town and Njoro STWs should be treated at the dumping site selected by GOK.
- 2) The dumping site for the sludge generated by both STWs after the completion of rehabilitation and expansion works should be located outside the catchment area of Lake Nakuru.
- 3) GOK should bear the cost for fencing of STWs, general furniture for the water quality testing laboratory and others, which have been estimated at approximately Kshs 28.0 million in total as broken down in Appendix 5.
- 4) Monitoring and industrial effluent control should be realized as early as possible according to the Trade Effluent By-laws, by the Trade Effluent Control Unit of WSD which was recommended to be strengthened in the feasibility study. Monitoring of the activities for effluent control in Lake Nakuru should also be realized as early as possible.
- 5) Sludge from septic tanks in unsewered areas should be hauled to the sludge drying bed in the Town and Njoro STWs after the completion of rehabilitation and expansion works, and finally dumped at the site selected by GOK.

- 6) The "Wastewater Standards for Discharge into Lake Nakuru" and "Trade Effluent Standards for Discharge into Public Sewers" of GOK should be reviewed with regard to such parameters as CODcr, nitrogen, heavy metals, toxic material, and carcinogenic.
- 7) The urban and regional development plan for the catchment area of Lake Nakuru should be reviewed and adjusted by IWG before its realization in terms of water pollution control in the lake.
- 8) Improvement of water distribution lines, increase of the number of water meters and decrease of water losses in the Nakuru Municipality are necessary for ensuring appropriate measurement and construction of sewage facilities.

## **Appendix 1**

### **Member List of Survey Team**

- 1. MR. K. YAMAZAKI: NIPPON KOEI CO., LTD**
- 2. MR. Y. INABE: NIPPON KOEI CO., LTD**

**Appendix 2**

**Survey Schedule**

**March 25, 1994 to May 31, 1994 at Japan**

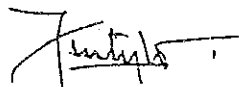
### **Appendix 3**

#### **Minutes of Meeting on Draft Final Report for the Feasibility Study**

MINUTES OF THE MEETINGS  
ON  
DRAFT FINAL REPORT  
FOR  
THE STUDY (FEASIBILITY STUDY)  
ON  
THE NAKURU SEWAGE WORKS REHABILITATION  
AND EXPANSION PROJECT  
IN  
THE REPUBLIC OF KENYA

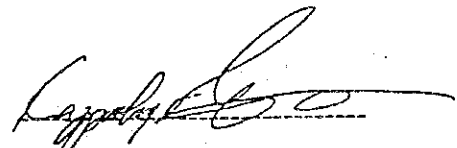
BETWEEN  
MINISTRY OF LOCAL GOVERNMENT  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY

NAIROBI, JANUARY 20, 1994



ENGR. F. J. MULLI  
STUDY COORDINATOR

MINISTRY OF LOCAL  
GOVERNMENT



MR. K. ENDO  
LEADER, STUDY TEAM

JAPAN INTERNATIONAL  
COOPERATION AGENCY

## MINUTES OF THE MEETINGS

### A INTRODUCTION

The meetings were held at Cianda House and Jogoo House on 17 th and 18th January 1994.

### B PRESENTATIONS AND DISCUSSION

Presentations on the following four key subjects were made by both Japanese and Kenyan Study Team members followed by intensive discussion .

- 1) Water Pollution Control Plan
- 2) Preliminary Design of Facilities
- 3) Institutional Support
- 4) Environmental Impact Assessment

### C CONFIRMATION OF THE KEY ISSUES

#### C1. SEWAGE GENERATION FACTOR

Sewage generation factor is 55% at present and the sewer connection ratio is 85%. It is forecasted that sewer connection ratio will increase to 92%, the sewage generation factor to 60% and total sewage generation after additional water supply at 16,137 m<sup>3</sup>/day.

#### C2. WATER POLLUTION CONTROL PLAN

Both Kenyan and Japanese sides agreed that the proposed Water Pollution Control Plan is rational and efficient. The Government of Kenya has confirmed the significance of non-structural measures and will take immediate action particularly for the implementation and enforcement of Trade Effluent By-laws for achieving the target standards. Considering the urgency of the countermeasures, sewage treatment works will be designed for an influent BOD (biochemical oxygen demand at five days at 20 degrees centigrade) concentration of 800 mg/L though the target standards cannot be met in the short-term.

The urgent need for establishing the proposed Water Quality Testing Laboratory was stressed for implementation of Trade Effluent By-Laws and Lake Nakuru monitoring. This is because the design and operation concept is based on realization of both structural and non-structural measures.

The following minor modifications are agreed:

- i) The last paragraph on page 10 of Executive Summary be amended as follows:
  - (2) It is recommended that the Trade Effluent By-Laws be implemented urgently."
- ii) One of the monitoring points for lake water quality be possibly located in the middle of the lake.

### C3. SLUDGE DISPOSAL SITE

It was agreed that the sludge from Njoro and Town sewage treatment works need to be disposed at a location out of the Lake Nakuru catchment without causing secondary pollution. The disposal site is to be made available by the Government of Kenya before the commencement of construction. Septage is proposed to be treated at the drying beds of sewage treatment works and hauled to the disposal site. However, depending on the distance of the disposal site direct disposal will be considered.

### C4. INDUSTRIAL SLUDGE DISPOSAL SITE

Presently industrial sludge and refuse are disposed together with domestic refuse. With the implementation of Trade Effluent By-Laws additional industrial sludge is expected to be generated. An alternative site is to be designated by the Government of Kenya for industrial sludge containing toxic materials.

### C5. DESIGN OF FACILITIES

It was confirmed that the design of facilities are accepted in principle. Design criteria of rock filters and grass plots are used from the reported design values of full-scale facilities and adequate built-in safety factor. Operation and maintenance

FM.





Possibility of re-routing sewers to avoid Mwariki Pumping Station was discussed. However, proposed rehabilitation was agreed because of technical feasibility.

MCN requested that portable detectors for hydrogen sulphide and inflammable gases be included in the operation and maintenance equipment if available. Hydrogen sulphide detector was used by the Study Team and MOLG will take necessary steps to obtain it from JICA.

Possibility of fish culture in the waste stabilization ponds was discussed. However, it was indicated that the fish will not be fit for human consumption.

Re-use of treated wastewater was discussed and it was agreed that more description to be made in the Final Report.

Water loss due to evaporation and infiltration in the sewage treatment works will also be reported in the Final report.

#### C6. ORGANISATION OF WSD

Proposed organisation for WSD is accepted and vital for the operation and management of the proposed facilities. The Government of Kenya will take necessary steps for its realisation.

Actual budget allocation for sewerage sector was too small compared to the revenue and not sufficient for operation and management. It is confirmed that MCN allocates sufficient fund for sustained operation and maintenance of the sewerage system.

#### C7. ENVIRONMENTAL IMPACT ASSESSMENT

It was confirmed that the Environmental Impact Assessment for the proposed project is sound and no detrimental effects are foreseeable.

#### C8. LAND FOR PROPOSED FACILITIES

It was reconfirmed that the land required for the facilities under this project will be made available by Government of Kenya in due time for the smooth implementation of the project.

FH

C9. DRAFT FINAL REPORT

It was noted that the Draft Final Report has been accepted in principle and any written comments required to be submitted to JICA Head Quarters by 15th February 1994.

LIST OF PARTICIPANTS (17 JANUARY '94)

PRESENT	ORGANIZATION
Engr. F. J. MULLI	MOLG, CHAIRMAN
Mr. N.N. NYARIKI	MOLG
Mr. S.P.M. KIAI	MOLRRWD
Mr. B.G. KIBETU	MOLRRWD, MEMBER LOCAL STUDY TEAM
Mr. S.K. NGANO	MCN
Mr. S.K. CHELULEH	MCN
Mr. G.J. MBUTHIA	MCN
Mr. K. ENDO	JICA STUDY TEAM, LEADER
Mr. T. NAKA	JICA STUDY TEAM
Mr. K. SASAKI	JICA STUDY TEAM
Mr. M. FUJII	JICA STUDY TEAM
Dr. S. KUGAPRASATHAM	JICA STUDY TEAM

MOLG

MOLRRWD

MCN

JICA

WSD

: Ministry of Local Government

: Ministry of Land Reclamation, Regional  
and Water Development

: Municipal Council of Nakuru

: Japan International Cooperation Agency

: Water and Sewerage Department of MCN

LIST OF PARTICIPANTS (18 JANUARY '94)

PRESENT	ORGANIZATION
Engr. F. J. MULLI	MOLG, CHAIRMAN
Dr. K. SATO	ADVISORY COMMITTEE, CHAIRMAN
Mr. M. YAMADA	ADVISORY COMMITTEE
Mr. K. JINNAI	JICA H/Q, TOKYO
Mr. N.N. NYARIKI	MOLG
Mr. S.P.M. KIAI	MOLRRWD
Mr. B.G. KIBETU	MOLRRWD, MEMBER LOCAL STUDY TEAM
Mr. G.J. MBUTHIA	MCN
Mr. S.K. CHELULEH	MCN
Mr. H. YAMAGUCHI	JICA EXPERT, MOLRRWD
Mr. H. MORITA	JICA EXPERT, MOLRRWD
Mr. K. ENDO	JICA STUDY TEAM, LEADER
Mr. T.NAKA	JICA STUDY TEAM
Mr. K. SASAKI	JICA STUDY TEAM
Mr. M. FUJII	JICA STUDY TEAM
Dr. W. N. THITAI	JICA STUDY TEAM
Dr. S. KUGAPRASATHAM	JICA STUDY TEAM

MOLG

: Ministry of Local Government

MOLRRWD

: Ministry of Land Reclamation, Regional  
and Water Development

MCN

: Municipal Council of Nakuru

JICA

: Japan International Cooperation Agency

WSD

: Water and Sewerage Department of MCN

## **Appendix 4**

### **Minutes of Discussion on Urgent Portion of the Nakuru Sewage Works Rehabilitation and Expansion Project in the Republic of Kenya**

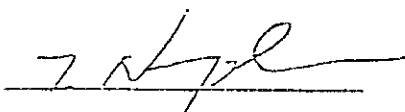
Minutes of Discussions  
on  
Urgent Portion  
of  
The Nakuru Sewage Works Rehabilitation and Expansion Project  
in  
The Republic of Kenya

Since May 1993, Japan International Cooperation Agency (JICA) has been conducting the Feasibility Study on the Nakuru Sewage Works Rehabilitation and Expansion Project in the Republic of Kenya ("the Feasibility Study" of "the Project", hereafter), which is scheduled to last until March 1994, in collaboration with the Government of the Republic of Kenya.

In the course of the Feasibility Study, JICA sent to Kenya a study team to explain and discuss the content of the draft final report in January 1994. The JICA team has had discussions with the Kenyan officials concerned from January 16 to 19 on the draft final report of the Feasibility Study. During the sessions, both sides also have discussed the urgent portion of the Project to be considered as the tentative scope of Japanese Grant Aid.

Attached sheets of this minutes show the results of discussions on the urgent portion of the Project.

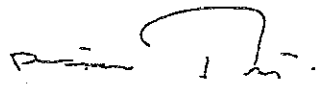
Nairobi, 21st January, 1994



Mr. Toshikazu NAGASHIMA  
Resident Representative  
of JICA in Kenya



Mr. Richard K. A. SIELE  
Permanent Secretary  
Ministry of Local Government



Mr. D. KIMUTAI  
Financial Secretary  
Ministry of Finance

## ATTACHMENT

### 1. Japanese Grant Aid System

- (1) The Government of Kenya has understood the system of Japanese Grant Aid explained by the team.
- (2) The Government of Kenya will take the necessary measures described in Annex-1 for smooth implementation of the project, in case Japanese Grant Aid is extended to the project.

### 2. Responsible and Executing Organization

- (1) The Ministry of Local Government will be assigned as the responsible and executing organization of the Project in case Japanese Grant Aid is extended to the Project.
- (2) After the completion of the Project, Nakuru Municipal Council will operate and maintain the facilities constructed and the equipment provided under the Grant Aid with its responsibility.

### 3. Condition of the Grant Aid Execution

The Kenyan side agreed the following prerequisites for execution of Japanese Grant Aid:

- (1) The Government of Kenya shall urgently implement the works for house connection between sewers and presently unconnected houses in the existing sewerage area with its responsibility;
- (2) Nakuru Municipal Council shall identify a new disposal site of sludge from Town and Njoro Sewage Treatment Works. The site must be outside the catchment of Lake Nakuru to avoid adverse effects to the environment of the lake and groundwater source.

Then, Nakuru Municipal Council shall inform the location of the site to the JICA Kenya Office by the end of March 1994, and shall secure the site before the commencement of construction of the Project.

- (3) Nakuru Municipal Council shall strengthen its Water and Sewerage Department in terms of budget allocation, staffing, and so on, according to the recommendation in the draft final report of the Feasibility Study.

#### 4. Urgent Portion of the Project

The Japanese side explained the urgent portion shown in Annex-2, which is derived from the results of the Feasibility Study, as tentative scope of Japanese Grant Aid.

The Kenyan side explained its opinion on the above explanation by the Japanese side that a Water Quality Testing Laboratory should be included into the urgent portion because:

The Feasibility Study of the Project recommends non-structural measures should be implemented in parallel with structural measures to achieve effective conservation of Lake Nakuru;

The vital non-structural measures will be enactment / enforcement of Trade Effluent By-Laws and long-term environmental monitoring of Lake Nakuru Basin by the Laboratory;

Consequently, the Laboratory is an essential component to realize the necessary pollution control of the lake.

#### 5. Further Schedule of the Grant Aid

- (1) JICA will conduct a basic design study in Japan on the urgent portion by utilizing the final result of the Feasibility Study after the Government of Japan and the Government of Kenya reach mutual agreement on the content of the urgent portion.
- (2) The result of the basic design study will be informed to the Government of Kenya through the JICA Kenya Office.
- (3) The Government of Japan will appraise the result of the basic design study to decide the final scope of the Grant Aid for the Project.

②



ANNEX-1 (Undertakings)

Necessary measures to be taken by the Government of Kenya in case Japanese Grant Aid is extended to the project are follows:

1. To secure the lands necessary for expansion of the sewage treatment works;
2. To bear all the expenses, other than those to be born by the Grant, necessary for the project, especially:
  - (1) to relocate the road, the telephone line and the fences which presently exists at the expansion sites of Njoro and Town Sewage Treatment Works,
  - (2) to improve the access road of the treatment works to protect trunk sewer,
  - (3) to construct new gates in case these are necessary as part of expansion of the sewage treatment works,
  - (4) to provide general furniture necessary for control houses of the sewage treatment works and the pumping station,
  - (5) to bear the commissions to Japanese foreign exchange bank for the banking services based upon the banking arrangement;
3. To exempt Japanese nationals solely involved in the Project from customs duties, V.A.T., and other fiscal charges which may be imposed in the Republic of Kenya with respect to the supply of the products and the services under the verified contracts. The custom duties, V.A.T., and other fiscal charges mentioned in this clause include and but not limited to the followings:
  - a. Import Duties and V.A.T. on goods procured or imported solely for the Project,
  - b. Training Levy,
  - c. Income Tax (for Non-Resident Japanese Nationals only),
  - d. Import Duties and V.A.T. on personal and house hold effects imported and purchased within first three months of first arrival in Kenya;
4. To ensure prompt unloading and customs clearance at the port of disembarkation in Kenya and prompt and safe internal transportation of the products provided under the Grant Aid;
5. To accord Japanese nationals, whose services may be required in connection with the verified contracts, such facilities as may be necessary for their entry into Kenya and stay therein for the execution of the Project;
6. To maintain and use properly and effectively the facilities constructed and the equipment provided under the Grant Aid; and
7. To dispose sludge of the sewage treatment works at newly secured site properly, especially with careful consideration to prevent environment of Lake Nakuru from pollution and other adverse effects.

ANNEX-2 (Urgent Portion of The Project)

1. Rehabilitation and Expansion of Facilities

(1) Town Sewage Treatment Works

- a. Storm Water Retention Pond (E), including drainage channel
- b. Inlet Works (E)
- c. Anaerobic Ponds (E)
- d. First Flush Pond (E)
- e. Facultative Ponds (E)
- f. Maturation Ponds (E)
- g. Rock Filters (E)
- h. Grass Plots (E)
- i. Pond Connection Pipes (E)
- j. Control House, including Office, Work Shop and Parts Storage (R)
- k. Mechanical and Electrical Equipment Works for existing STW, including supply of Spare Parts (R)
- l. Trickling Filter (R)
- m. Sludge Drying Bed (E)

(2) Njoro Sewage Treatment Works

- a. Inlet Pipes (R)
- b. Anaerobic Ponds (R)
- c. First Flush Pond (R)
- d. Facultative Ponds (R)
- e. Maturation Ponds (R)
- f. Rock Filters (E)
- g. Grass Plots (E)
- h. Pond Connection Pipes (R & E)
- i. Outlet Works (E)
- j. Sludge Drying Bed (E)

(3) Mwariki Sewage Pumping Station

- a. Submersible Pumps (R)
- b. Mechanical and Electrical Works (R)
- c. Control House (R)

2. Procurement of Equipment

(1) Operation and Maintenance Equipment for Sewerage System

- a. Workshop Equipment
- b. Operation and Maintenance Equipment

(2) Water Quality Testing Equipment for Njoro STW

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Remarks: (E) represents "expansion" or "newly constructed".  
(R) represents "rehabilitation" or "renewal" of the existing.

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\* The details of the above items are indicated in the draft final report of the Feasibility Study.

\* However, the final components of the Grant Aid Project will be decided by further study and appraisal of the Government of Japan.

## **Appendix 5**

### **Cost Estimate Borne by the Recipient Country**

Estimated Cost to be Borne by Kenya Side

Item	Q'ty	Unit Cost	Total	1st Stage	2nd Stage
<b>Construction Cost</b>					
(1) Relocate, inner roads	400 m	4,000	1,600,000	1,600,000	0
(2) Relocate, telephone line	700 m	500	350,000	50,000	300,000
(3) Electrified fence	4,000 m	1,800	7,200,000	5,400,000	1,800,000
(4) Mesh fence	4,000 m	1,400	5,600,000	4,200,000	1,400,000
(5) Improve access road	500 m	3,200	1,600,000	0	1,600,000
(6) Entrance gates	2 place	300,000	600,000	300,000	300,000
(7) Others	1 lot	-	5,050,000	3,450,000	1,600,000
Sub total			22,000,000	15,000,000	7,000,000
			(¥35,200,000)	(¥24,000,000)	(¥11,200,000)
<b>Furnitures/Materials</b>					
(1) Furnitures and etc. for water quality testing laboratory	1 lot	-	2,000,000	2,000,000	0
(2) Furnitures and etc. for control house in Town STW	1 lot	-	2,000,000	2,000,000	0
(3) Furnitures and etc. for Mwariki pumping station	1 lot	-	500,000	0	500,000
(4) Others	1 lot	-	1,000,000	500,000	500,000
Sub total			5,500,000	4,500,000	1,000,000
			(¥8,800,000)	(¥7,200,000)	(¥1,600,000)
<b>Total</b>			<b>27,500,000</b>	<b>19,500,000</b>	<b>8,000,000</b>
			(¥44,000,000)	(¥31,200,000)	(¥12,800,000)

## Appendix 6

### Questionnaire



## Questionnaire

April 2, 1994

### Key Components of Questionnaire:

- A. Water Quality Testing Laboratory,
- B. Dumping Site for Solid Waste,
- C. Operation and Maintenance Plan,
- D. Effluent Control By-laws,
- E. Major Undertakings (to be taken by each government),
- F. Exemption of Value Added Tax,
- G. Farming in the Town STW,
- H. Others.

#### A. Water Quality Testing Laboratory

##### (1) Management and Operation Structure

The Water Quality Testing Laboratory (the Laboratory) is recommended to establish and to be managed and operated in cooperation with MOLRRWD, MOLG and KWS, according to the JICA F/S Study Team (the Study Team).

Q1. Does the Government of Kenya (GOK) have an intention to establish a management and operation structure being recommended by the Study Team?

Q2. Does GOK have any detailed ideas or plans as to how the recommended management and operation works could be divided by the three agencies of MOLRRWD, MOLG and KWS?

##### (2) Personnel Allotment

Q. Does GOK have an intention to take any responsibilities of allocating and assigning necessary staff of 12 personnel, being recommended by the Study Team?

##### (3) Management Budgetary

Does GOK have an intention to take any responsibilities of allocating necessary budget which estimates Kshs 1.4 million approx. per annum to manage and operate the Laboratory? How about its budget allotment by the three agencies?

##### (4) Planned Construction Site

Q. Does GOK have an intention to take any responsibilities of obtaining and securing the planned site, being recommended by the Study Team, for the Laboratory adjoining to the gate to the national park? Also to ensure to provide potable water supply, electric power and telephone line at outside to connect to the laboratory?

##### (5) Environmental Monitoring Activities of KWS / WWF

Q. State the opinions of each GOK and WWF regarding the future relationship between the functions of the Laboratory being recommended by the Study Team and environmental monitoring activities being implemented by KWS / WWF.

##### (6) Outside Order of Water Quality Testing

Q. State GOK's opinion with regard on idea on outside order of water quality testing in certain portion.

## B. Dumping Site for Solid Waste

### (1) Disposal of Solid Waste

Selection and security of dumping site for disposal of solid waste with environmental consideration is a precondition of the Japanese Government's (GOJ) grant aid to GOK.

Q1. State on recent progress and realization schedule.

Q2. If the dumping site is already selected, state on location of the selected site indicating topographical profile with 1/2000 map and 5 m contour line and geological profile, present situation of the site indicating its land use showing houses, farm-land, well and river if exist, and reasons for site selection including environmental consideration.

## C. Operation and Maintenance Plan

### (1) Overall Organizational Structure

Q. In terms of sewage component, state if GOK has already some works done on institutional improvement of WSD and some concrete progress.

### (2) Operation and Maintenance Budget

Q. State reliable reasons on how GOK could secure and provide necessary budget for annual operation costs.

### (3) Establishment of TECU

Q. State on concrete schedule for TECU to be established.

## D. Effluent Control By-laws

Q. State on concrete schedule to start to monitor of industrial effluents.

## E. Major Undertakings (to be taken by each government)

## F. Farming in the Town STW

Q. State on GOK's concrete scheme to regulate farming in the town STW.

## G. Others

Q1. Prepare for IWG's member list with present status.

Q2. State present conditions of WSD's existing operation and maintenance equipment in terms of operation and maintenance works.

Q3. State the progress of garbage trap installation at adjacent to existing STW by KWS or WWF.

Q4. Does GOK have any concrete plans for industrial sludge disposal site. If not, state on plans and schedule of it.



**Appendix 7**

**Reply on Questionnaire**

MINISTRY OF LOCAL GOVERNMENT

Telegrams: "AITHOCTTC", Nairobi

Telephone: Nairobi 22411 Ext. ....

When replying please quote:

Ref. No. .... File No. .... DPD 103/B/II/(76)  
and date



P.O. Box 30004

NAIROBI

18th April, 1994

Japan International Corporation  
Agency (JICA)  
Kenya Office  
P.O. Box 50572  
NAIROBI  
Attn: Mr. K. Makino

Dear, *Mr. Makino*

QUESTIONNAIRE ON THE NAKURU SEWERAGE WORKS  
REHABILITATION AND EXPANSION PROJECT

Follow up to your letter ref. 6-021(EJ) of 6th April, 1994 on questionnaires touching on various aspects of the above project, I forward herewith response on the issues concerned.

The answers are a supplement to the discussions held between JICA and MOLG officials on 13th April, 1994.

If further clarification and details are required, do contact us immediately.

Yours

*Sincerely*

Eng. F. J. Mulli  
for PERMANENT SECRETARY

Encls:

## QUESTIONNAIRE ON THE WATER QUALITY TESTING LABORATORY

The answers given below are in respect of the questions on various issues on Nakuru Sewerage Works Expansion and Rehabilitation Project, raised in questionnaire from JICA.

### 1. Organization and Management

The Government of Kenya is committed to ensuring that pollution of Lake Nakuru is controlled and minimized if it cannot be eliminated in total. The water quality testing Laboratory will be essential in monitoring pollution into the lake from Nakuru Municipality as well as from sources outside the Municipal jurisdiction. As such organization and Management necessary for achieving this will be established in line with the proposal of the feasibility study report by JICA and MOLG.

The three main organizations concerned with pollution control in Lake Nakuru namely: KWS, MOLG and MLRRWD will be incharge of various aspects and level of pollution control monitoring.

KWS; will be incharge of regular sampling at the lake.

MOLG/NMC: Will be incharge of regular sampling and testing at the treatment works, sampling of industrial effluent and ensuring compliance with Trade effluent standards before discharging sewerage into public sewers.

MLRRWD: Will carry out routine checks on sewerage effluent quality from the treatment works, testing Industrial samples from NMC sampling and monitor water quality of bodies outside the jurisdiction of both KWS and NMC that also might lead to pollution of the lake.

### 2. Staff Allocation:

Necessary and adequate staff with the relevant qualification will be recruited from Kenya Water Institute. The office of Provincial Water

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4/5

Engineer will supplement any shortfall in terms of management staff. The staff will have the qualifications identified in the report. It will also be appreciated for some of the staff to have further exposure in Japan on heavy metal testing and maintenance of the equipment to be provided.

3. Budgetary Provision:

The Budget for operation and maintenance of water quality Testing Laboratory will be met by the MOLG(NMC), MLRRWD, and KWS; 30%, 25% and 45% ratios respectively. Efforts will be made to identify other possible sources of finance to ensure continuity of operation without relying on Ministerial budgets.

4. Location:

Just like in the case of land for construction oxidation ponds, land will be made available for the Water Quality Testing Laboratory and the location will be as indicated in the feasibility study i.e. near the 1st gate to the Park and next to the KWS Education Centre. The necessary facilities viz. Telephone, Electricity and water will be provided.

5. Relationship between Monitoring Activities of the Laboratory and those of KWS/WWF:

Due to the nature of the areas of concern, KWS/WWF will continue with current monitoring activities and the Laboratory should assist in expanding the scope of monitoring which has been limited due to lack of adequate testing facilities. KWS and WWF are also involved in community based environment conservation activities which will be encouraged to continue and expand.

6. Dumping site

A dumping site has been identified at the edge of Menengai Forest. This will serve for the desludging of the existing oxidation ponds to allow reconstruction. Since the Municipality will require a long term

dumping site for solid wastes and sludge continuously desludged of the oxidation ponds more areas are being surveyed and should a new location prove convenient for both short and long term dumping, this will be adopted and the same will be communicated to JICA immediately.

The current site is on Government owned land which is easy for Nakuru Municipal Council to acquire as opposed to privately owned land whose acquisition will lead to considerable delays in realization of the project. This site is also at the edge of the Lake Nakuru Catchment, and there is no possibility of surface run-off finding its way back to the lake.

Site preparation in terms of access road and suitability in receiving the sludge will be necessary.

#### 7. Institutional Capacity Building:

WSD needs to be improved in manpower capacity and qualification in line with the recommendations of the feasibility report. Additional staff recruitment will start after 1994/95 budget in June, 1994. Recruitment for TECU personnel will also commence at the same time. This is in effort to ensure that by the time the trade effluent by-Laws become operational, the necessary staff is in position.

#### 8. Trade Effluent By-laws:

Trade effluent standards were harmonized in February, 1994 and a copy of the final draft was sent to the JICA Study Team together with comments on draft final Report for inclusion in the final feasibility study Report.

Final draft of the Trade Effluent by-Laws is awaiting Ministerial Consent after which it will be gazetted as a Legal Document. After gazettment the current industries will be given a grace period of 6 months to adjust their operation so as to comply with the Trade Effluent Standards for discharge into public sewers. It is expected that by the time the project is completed, it will be possible to start enforcing the Trade by-laws.

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6/1

9 Farming in the Town STW

This will have to stop. After the project such practice will not be tolerated.

10. Operation and Maintenance Equipment:

At the moment WSD of NMC has no major operation and maintenance equipment except two Peugeot 504, and one lorry which are not in good servisable conditions..

11. Garbage Trap by WWF

This has not been installed.

12. Members of IWG

Mr. E. K. Mongera	Director - Water Development
Mr. J. M. Mburugu	Kenya Wildlife Services
Mr. M. M. Nzomo	Ministry of Commerce and Industry
Mr. Onyango Namanya	Office of the President
Mr. M. Wanjohi	National Environmental Secretariat
Mr. M. M. Mahamud	National Water Conservation and Pipeline Corporation
Mr. E. Chege	Ministry of Water
Mr. J. N. Maina	Ministry of Water
Mr. T. W. Kibaki	Ministry of Water
Mrs J. K. Gichuhi	Ministry of Finance
Mr. J. M. Gicheha	Ministry of Local Government
Mr. J. G. Mbutia	Nakuru Municipal Council
Mr. F. J. Mulli	Ministry of Local Government









JICA