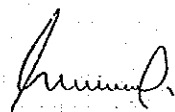


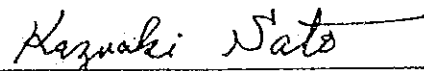
添付資料 2 . M / M

MINUTES OF MEETINGS  
ON  
SCOPE OF WORK  
FOR  
THE STUDY  
ON  
THE NAKURU SEWAGE WORKS REHABILITATION AND EXPANSION PROJECT  
IN  
THE REPUBLIC OF KENYA  
AGREED UPON BETWEEN  
MINISTRY OF LOCAL GOVERNMENT  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY

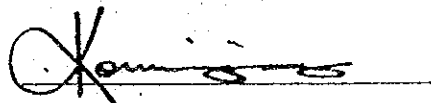
NAIROBI, JANUARY 27, 1993



MR R.K.A. SIELE  
PERMANENT SECRETARY  
MINISTRY OF LOCAL GOVERNMENT  
P.O. BOX 30004  
NAIROBI



DR. KAZUAKI SATO  
LEADER  
PREPARATORY STUDY TEAM,  
JAPAN INTERNATIONAL  
COOPERATION AGENCY



DR W. KOINANGE  
PERMANENT SECRETARY  
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P.O. BOX 30007  
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In response to the request of the Government of the Republic of Kenya, the Government of Japan decided to conduct a Development Study on Nakuru sewage works rehabilitation and expansion project (hereinafter referred to as "the study"). Accordingly, the Japan International Co-operation Agency (hereinafter referred to as "JICA") dispatched a preparatory study team headed by Dr. Kazuaki SATO (hereinafter referred to as "the JICA team") to the Republic of Kenya from January 17 to January 30, 1993 to conduct a preparatory study for the Study.

The JICA Team in collaboration with Kenyan officials carried out a field visit to the Nakuru Municipality and the Lake Nakuru National Park from January 21 to 23 and held a series of discussions with the officials of relevant Ministries and agencies of the Republic of Kenya (hereinafter referred to as "the Kenyan Team"). A summary of the field visit is attached as Annex 1. Meetings were held on January 20, 25 and 26 at the Ministry of Local Government. The list of attendants is attached in the Annex 2. Through those discussions, the JICA Team and the Kenyan Team agreed on the Scope of Work. The main points discussed and agreed by both sides in the meetings are as follows:-

1. Understanding of the framework of the Project Implementation

Both the JICA Team and the Kenyan Team confirmed that the framework of the project implementation had been already agreed upon between the two Governments of Japan and Kenya through diplomatic channel. Of which agreement, the objective of this development study was defined to carry out a feasibility study for rehabilitation and expansion of existing sewage works for the purpose of treatment of water discharged through the existing sewer system.

Note: The term "sewage works" used in this minutes and in the Scope of Work means "sewer system and sewage treatment plant".

2. Urgency of the Study

Both teams confirmed the following:-

- i) The present sewage have been operating under overload conditions. And in view of the expected increase in water volume upon commencement of water supply from Greater Nakuru Water Supply there is urgent need of expanding and rehabilitating the existing sewage works to improve the effluent quality.
- ii) The study should not take long time unnecessarily so that the next step toward realization of the Project can be taken as soon as possible.

3. Objective of the Study

The objective of the study is agreed as described in the article II of the Scope of Work basing the understanding on the position of the Study described in 1 and 2 above.

#### 4. Scope of the Study

- 1) The JICA Team explained and proposed basic policy on how the following items will be dealt with in the Study:-
  - Scope for rehabilitation and expansion of the existing sewage works facilities
  - Unsewered areas in the Nakuru Municipality
  - Industrial wastewater
  - Wastewater effluent quality standards
  - Wastewater effluent evaporation pond and reuse
  - Scope of EIA
  - Relation with detailed design of wastewater lagoon system by OECF Funds
  - Accuracy of Preliminary Design
  - Scope of recommendations
  
- 2) The Kenyan Team expressed their following concerns to be looked into in the study:-
  - Conformity with Ramsar convention requirement
  - Major pollution contributors other than effluent from sewage works
  - Effluent from Egerton University (located outside the Municipality)
  - Expansion of sewer system to presently unsewered area
  - Improvement of sanitary conditions at unsewered area
  - Effect on the Lake Nakuru by inflowing pollutant load and water
  - Set-up of effluent monitoring system
  - Capacity of sewage works to consider future connections
  - Handling of storm run-off
  
- 3) Taking into account the confirmation on 1, 2 and 3 mentioned above and to maintain the effectiveness of the project, both Teams agreed on the following:-
  - a. The scope for rehabilitation and expansion plan and preliminary design of existing sewage works will be limited in principle to the existing sewerage area as per agreement at the diplomatic level.
  - b. Investigations and evaluation of the present situation of individual household wastewater disposal methods will be made in the Study. Basic policy and recommendations for the necessary measures to be taken, if any, will be incorporated in the Report.
  - c. Planning of each individual industry pre-treatment will not be included in the Study. However, general problems in industrial wastewater flowing into public sewage works will be studied and recommendations for countermeasures will be made.
  - d. Investigation on pollution caused by storm water run-offs will be made and necessary countermeasures to be taken will be recommended.
  - e) Items of water quality survey will include not only organic matter but also heavy metals and nutrients.

- f. Target standard values for the treated effluent quality shall be made available by the Kenyan side. It will be decided upon, taking into account Kenyan standards, by-laws and regulations considering adaptable treatment methods, physical, technical and financial conditions at the site.
- g. The possibility of practical measures for partial evaporation and reuse of effluent from the sewage treatment plants will be studied.
- h. Close coordination will be required between the lagoon works to be undertaken by Ministry of Water Development and the Works under the Development study.

Ministry of Local Government will give up-to-date information to JICA on the extent of lagoon works.

Duplication of works and details between the two teams should be avoided.

- i. Accuracy of preliminary design and its cost estimation shall be such that is sufficient to properly appraise the project financing.
- j. Scope of recommendations in the study covers not only those for matters directly related to sewage work but also for necessary measures for sanitation and environmental conservation.
- k. The Interministerial Working Group on Nakuru Sewage Works project will continue addressing itself to the policy issues necessary for harmonising the development and protection of environment in Nakuru area, and also giving guidance to interested parties.

ANNEX I

NAKURU SEWERAGE PROJECT

JOINT FIELD SURVEY BY JICA AND GOK OFFICIALS  
BETWEEN 21ST JANUARY TO 23RD JANUARY, 1993

PARTICIPANTS

Y. TERANISHI	-	JICA TOKYO
M. MORIMOTO	-	RES. REP. JICA KENYA
K. SATO	-	LEADER JICA MISSION
M. YAMADA	-	MEMBER " "
S. SATA	-	" " "
H. MORITA	-	JICA MOWD
M. FUJITA	-	" "
P. W. KARANI	-	MOWD
J. N. MAINA	-	MOWD
J. M. MBURUGU	-	KWS
DR. F. K. WAWERU	-	"
A. M. MAYOLI	-	"
R. M. NDETEI	-	"
M. M. MAHAMOUD	-	NWCPC
I. O. OLONJE	-	"
F. MUTAI	-	"
G. J. MBUTHIA	-	TOWN ENG. NAKURU M.C.
OMENDO	-	TREATMENT WORKS MANAGER
MURAYA	-	TREATMENT TECHNICIAN N.M.C.
DR. MAUNDU	-	MOH - N.M.C.
J. A. MBACIO	-	DEPUTY TOWN CLERK N.M.C.
F. J. MULLI	-	MOLG

The field Survey started with a courtesy call on the Town Clerk, Nakuru Municipal Council Council at 2.00 p.m. on 21st January, 1993.

The Team then visited various places including:-

- Conventional Treatment Works
- Njoro waste stablization works
- Mwariki Estate
- Tannery
- Union Carbide
- Milling Corporation
- Kenya Corporation
- Kenya Cremaries Corporation
- Provincial Hospital Nakuru
- Retail Market
- Open air garage (near Retail Market)

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- A tour around Lake Nakuru and specifically water entry points
  - River Njoro (Mouth)
  - Sewerage entry point in River Njoro
  - River Makalia
  - River Nderit
  - River Ngosur (System)
  - Hippo point 2
  - Hippo point 1
- Solid waste Disposal area

#### INFORMATION AND OBSERVATIONS

The team received information from different people working for various organisations in Nakuru. Observations were also made in course of the tour.

##### (1) Conventional Treatment Works

The team was informed that conventional treatment works handles sewerage from the town and Lanet area. Design capacity was  $126\text{m}^3/\text{h}$  with a final filtered effluent BOD of  $50\text{mg}/\text{L}$ . However, the flow into the works is in the range:-

$240\text{m}^3/\text{h}$  between 7 and 9.a.m., between  $150 - 185\text{m}^3/\text{h}$  at about noon and about  $80\text{m}^3/\text{h}$  at night. During the wet season, the flow has been observed to be as high as  $400\text{m}^3/\text{h}$  leading to flooding of the intake.

BOD is in the range of  $450\text{mg}/\text{L}$  at the primary trickling filter, between  $110 - 200\text{mg}/\text{L}$  at the secondary trickling filter and between  $70 - 110\text{mg}/\text{L}$  in the final effluent.

The effluent from conventional works is led to stabilization facultive ponds. It was observed at the ponds that the flow speed - due to high volume, doesn't allow for much retention period and thus the sewerage from conventional works and overflow virtually flows straight into Lake Nakuru.

The capacity and efficiency of the clarifiers is fairly low - it has only two distribution arms and back flow of free air is low leading to depressed oxygen levels.

Storm drainage was said to contain lots of plastics, oils, garbage etc and especially at the onset of the first storm.

##### (ii) Njoro Sewerage Works

Njoro works receives sewerage from town which is conveyed through two pipes. In one pipe,  $600\text{mm}$  dia., all the flow is through gravity while in the other,  $450\text{mm}$  dia pipe, due to low ground levels a pumping station is inco-operated about  $500\text{m}$  from the intake.

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The intake is composed of Bar screens, a grid Chamber where the solids are scooped mechanically. It also has two shredders which are operated alternatively. An automatic flow recording machine was noted to have been out of order and the flow was calculated from the flow channel and flume data.

The design capacity of the treatment works is  $3600\text{m}^3/\text{day}$ . The daily average flow is between  $4000 - 6000,^3/\text{d}$  while wet season flow is in the range of  $8000\text{m}^3/\text{d}$ .

The treatment works system is composed of 2No. Anaerobic ponds with design retention period of 1.25 days, 12No. facultative ponds arranged in 3 parallel lines each with 4 ponds. The total retention period is 30 days. This was noted as long time which allows for considerable evaporation. At the aerobic pond stage - a lot of scum was noticed to have accumulated to a level of almost choking the system, hence reducing its capacity and retention period. Large plastic containers were also noticed and were said to be by-passing the screens at the intake, when the sewerage flow floods the intake.

The final effluent into river Njoro was noted to be under treated due to high volume of sewerage received compared to design capacity of the system.

There is also a small laboratory that enables sampling and carrying basic tests for sewerage received from both conventional and water stabilization treatment works.

The tests carried out are on BOD, settleable solids, temperatures, conductivity and dissolved oxygen. The BOD incubator can take only one sample at a time hence samples from the two treatment works are tested on alternative weeks.

(iii) Industries:

Of the industries visited

(a) The Tannery consumes  $15\text{m}^3/\text{d}$  of water. The effluent from their process is pre-treated before discharging into the Municipal sewerage reticulation system. The chemicals in use contained some amount of chromium.

(b) Union Carbide - their processing is mainly dry process. Nevertheless, some stages require washing out with ammonia and zinc chloride. The waste from the latter is either recycled or lead into a 15m deep soakage pit.

None of industrial waste finds its way into the Municipal sewers. The domestic effluent from canteen and toilets is connected into the sewer system.

(c) Kenya Creameries Corporation - consumes an average of  $300\text{m}^3/\text{d}$  of water which is discharged into Municipal sewer system without pre-treatment except for grease and oils trap.

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(d) Milling Corporation - The milling process is all a dry process. Domestic effluent is discharged in a septic tank. The company is located in unsewered area.

(iv) Provincial Hospital:

Has an inpatient capacity of 800 and total population was given as 2000 persons at any given time.

The hospital is connected to the Municipal sewer system for all its effluent.

(v) Retail Market:

Garbage is collected into Municipal garbage bins which are emptied by the Council. It was however observed that a lot of litter in form of papers and plastics is not collected hence would be gathered by surface water during rain season and into the storm drainage system.

(vi) Open Air Garage:

Oils and grease from Engine Servicing easily find their way in the storm drainage system. Surface run-off from this area was noted as a major source of pollution. Oils from the garages is also a source of heavy metals into Lake Nakuru.

(vii) Mwariki Estate:

Mwariki Estate is located in unsewered area. Sanitation is mainly through pit-latrines serving a variety of people hence unhygienic. Water was found to be from a communal stand pipe. There is little water pollution from this area into the sewerage system. In the present state an outbreak of diseases would have a devastating effect in this area.

(viii) Lake Nakuru:

Lake Nakuru National Park occupies an area of 188 sq. Km. 1/4 of which is Lake Nakuru itself with a shoreline of 27 Km. It is home for key species of both birds and animals including:- Rothschild giraffe - 22 introduced in 1977 and now numbering 150, 33 No. Rhinos - 31 black and 2 No. of the endangered white Rhino.

In 1952 Tilapia fish was introduced into the lake. In 1960, the lake was designated a bird sanctuary. It is the home of the flamingoes and a variety of other birds that migrate from Europe during Winter Season in the Northern hemisphere.

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In recognition of the importance of this late RAMSAR Convention has designated Lake Nakuru as a wet land of International importance hence a world Heritage of mankind.

Ecological:

Lake Nakuru is an Alkaline lake with water Ph of 10.5 to 10.8. It is an enclosed ecosystem. Land use around the lake and the park has changed greatly in the recent past.

Harmful chemicals, including Copper, Zinc, Lead, have been finding their way into the lake resulting in change in the quality of the lake. Pesticides also due to use.

Siltation has interfered with the Natural water seepage in the lake. Increase in the number of grasses is also bound to change the ecology of the park.

Volume of water in the lake could interfere with the growth algae and weeds leading to disappearance of the flamingoes hence disappearance of aquatic life that depend on the flamingoes.

Both the quality and quantity of water into the lake is of paramount importance.

Observations:

Water enters Lake Nakuru through:-

- Sewerage effluent from the Municipality
- Njoro River which also contains effluent from the town and Egerton University up stream.
- Makalia River
- Nderit River
- Ngosur River which enters the lake through 3 main springs at river Nderit near Sorova Hotel and at Hippo Point 2.
- Storm water during rain season
- Rainfall.

Sewerage effluent was noted to be major contribution of pollution into the lake, hence importance to expand the treatment works.

Rivers Njoro, Nderit and Makalia are seasonal rivers hence permanent water source into the lake is River Ngosur through the springs.

PH for all sources of water into the lake was observed to be about 9 while the PH of the lake is constantly between 10.5 and 10.8. River Makalia was said to have high levels of Lead and Chromium, on entry to the lake, the source of which has not been established.

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River Njoro has sediments with high concentration of heavy metals viz: copper, lead and chromium.

In spite of the water flowing into it, Lake Nakuru was observed to be receding creating a deep shore line. As check on the quality of water in the lake, KWS has established 18 sampling points. Water samples from these points are analysed for BOD, COD, dissolved oxygen and conductivity on a weekly basis. There are also 4 rainfall gauging stations within the lake.

(IX) Solid Waste Disposal Area:

The solid waste disposal area has been in use since 1974. It is situated in a crater which seemend to be getting filled up. Initially, garbage was dumped into the crater and surface run-off would not carry it away. In the present situation it is likely that during rain season storm water would carry some garbage and toxic substances out of it through the Town near the offices of Union Carbide and into River Njoro.

(X) General Information:

Nakuru Town occupies	78 sq. km.
Population about	300,000
Volume of water in town	26,000m <sup>3</sup> /day
Population under sewer	40%

Water distribution:-

Sewered area	60%
Unsewered area	40%

Effluent:

Domestic	60%
Industrial	<u>40%</u>

Lake Nakuru:

Area	42 sq. km
Average dept	1m
Shore line	27 km
Current No. of Flamingoes (Est.)	1.5 million.

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COMMENTS

In view of the observations made and the general information received during the brief survey on Nakuru sewerage project a follow up should be taken by the Interministerial Working Group to arrest the ecological degradation of Lake Nakuru which has been designated a wet land of International acclaim. Problems facing this lake are of different types and magnitude. Hence to arrive at appropriate solution(s), it is important to address to all factors contributing to the same as well as factors that are seen to have a potential of contributing to disruption of the Ecological balance of the lake. Use of effluent for irrigation would be one way of avoiding discharge into the Lake, but no suitable farm land was identified. More studies are required in this area.

From the observations made and general information received during the brief field survey the following areas of concern should be addressed to, and their long term effect be established.

a) Sanitational:

- i) Adequacy of water to Nakuru Municipality
- ii) Water situation in the unsewered area of the Municipality
- iii) Sanitation situation in the unsewered area
- iv) Appropriateness of current sewerage treatment works
- v) Capacity of sewerage system
- vi) Effluent disposal and handling methods
- vii) Optimum effluent purity before discharging into the lake
- viii) Effluent quality monitoring
- ix) Storm water collection and disposal

b) Ecological:

- i) Source of pollutants into Lake Nakuru
- ii) Possible methods of dealing with the sources of pollution into the lake
- iii) Optimum water level for Lake Nakuru
- iv) Long term effect on accumulated earth metals in the lake
- v) Necessity of long term ecological monitoring programme

ANNEX 2

LIST OF PARTICIPANTS

JAPANESE TEAM

DR. K. SATO	- LEADER, JICA STUDY TEAM
MR. I. NUTO	- MEMBER, JICA TEAM (MIN. OF FOREIGN AFFAIRS)
MR. M. YAMADA	- " "
MR. Y. TERANISHI	- " "
MR. S. SATA	- " "
MR. T. ARIYASU	- EMBASSY OF JAPAN
MR. K. MAKINO	- JICA, KENYA
MR. HASHIMOTO	- OECF - NAIROBI

KENYAN TEAM

MR. K. RUCHIAMI	- LEADER OF KENYAN TEAM (MOLG)
MR. F. J. MULLI	- MINISTRY OF LOCAL GOVERNMENT
MR. M. MACHARIA	- " " "
MR. G. MATHENGE	- " " "
MR. J. N. MAINA	- MINISTRY OF WATER DEVELOPMENT
MR. P. W. KARANI	- " " "
MR. KIBUNGA	- " " "
MR. C. I. SHAKABA	- MINISTRY OF FINANCE
MR. J. M. NYANUMBA	- " "
MR. M. M. MAHAMOUD	- NATIONAL WATER CONSERVATION & PIPELINE CORPORATION
MR. I. O. ORONJE	- "
MR. S. A. NG'ENO	- NAKURU MUNICIPAL COUNCIL
MR. G. J. MBUTHIA	- "
MR. M. FUJITA	- JICA, MINISTRY OF WATER DEVELOPMENT
MR. H. MORITA	- " "
MR. J. M. MBURUGU	- K.W.S.

添付資料3. 面談者リスト

面談者リスト

大蔵省

Mr. Ongaro	海外資金局長
Mr. C. I. Shakaba	海外資金局日本担当課長
Mr. J. M. Nyanyumba	// 日本担当課長補佐

地方自治省

Mr. R. K. A. Siele	次官
Mr. K. Ruchiami	次官補
Mr. F. J. Mulli	都市開発部下水担当課長
Mr. M. Macharia	技師
Mr. G. Mathenge	技師

水資源開発省

Mr. E. K. Mwongera	水資源開発局長
Mr. J. M. Maina	水資源開発局
Mr. P. W. Karani	水資源開発局
Mr. Kibunga	水資源開発局

水保全・パイプライン公社 (NWCP)

Mr. M. M. Mohamoud	サービスマネジャー
Mr. I. O. Oronge	技師
Mr. F. Mutai	技師

ケニア野生生物公社 (KWS)

Mr. J. M. Mburugu	コンサルタント (元副総裁)
Dr. F. K. Waweru	
Mr. A. M. Mayori	ナクル湖国立公園所長
Mr. R. M. Ndeti	ナクル湖国立公園研究員

ナクル市役所

Mr. S. A. Ng'eno	助役
Mr. J. A. Mbacio	次長
Mr. G. J. Mbuthia	技師長
Dr. C. Maundu	保健士
Mr. Omendo	下水処理場長
Mr. Muraya	下水処理技術者

WWF東アフリカ事務所

Dr. Ramesh Thampy

ナクル湖環境保全・開発プロジェクトマネージャー

在ケニア日本大使館

佐藤 ギン子

特命全権大使

堀江 正彦

公使

有安 敬

一等書記官

O E C F ナイロビ駐在員事務所

瀬山 修平

所長

橋本

所員

J I C A 専門家（水資源開発省所属）

藤田 眞

森田 裕之

J I C A ケニア事務所

森本 勝

所長

青木 澄夫

次長

牧野 耕司

所員

添付資料 4. ナクル市地区別人口統計 (1979年)

MUNICIPAL COUNCIL OF NAKURU

POPULATION CENSUS 1979

WARD No	NAME	POPULATION	%SEWERED
1	Nakuru East	11,717	10
2	Menengai	1,811	0
3	Misonge	3,542	100
4	Kisulisuli	20,742	100
5	Kivumbini	7,070	100
6	Shauri Yako	9,577	100
7	Bondeni	8,146	50
8	Baharini	8,116	100
9	Langalanga	2,440	100
10	Afraha	7,337	50
11	Central	3,393	100
12	Biashara	3,684	100
13	Hospital	7,125	10
14	Viwanda	2,085	80
15	Shabab	4,184	80
16	Nakuru West	15,988	0
		<u>98,290</u>	

NB: The Population has been growing at a rate of more than 10% per year due to greater rural urban migration.





LABORATORY ANALYSIS 1991

SEWAGE WORKS (MCN)

DATE	LOCATION OF THE SAMPLER	TEMP. °C	PH	SETTLABLE SOLIDS ML/L	BODS MG/L	TOTAL D FLOW (M		
		INLET	OUTLET	INLET	OUTLET	INLET	OUTLET	
7/1/91	Conventional	24.2	7.5	7.6	0	580	21	3568
14/1/91	Njoro	24.2	20.3	7.6	8.0	520.	5failed	2606
21/1/91	Conventional	23.5	23.1	7.1	7.6	130F	39	3740
28/1/91	Njoro	24.2	21.4	7.0	8.7	140F	9F	5365
4/2/91	Njoro	24	20.3	7.0	7.6	180F	2F	4529
11/2/91	Njoro	24.8	21.8	7.2	8.1	720	40	5532
18/2/91	Njoro	24.6	21.3	7.6	8.0	880	40	5332
25/2/91	Conventional	25	22.6	7	7.4	800	70.5	3160
4/3/91	Conventional	27	27	7.4	7.7	760	39	3280
11/3/91	Njoro	24.2	20	6.6	7.7	380	19	4515
18/3/91	Conventional	22.6	23.5	6.8	6.9	720	34	3581
8/4/91	Njoro	21.7	20.5	7.5	7.5	700	25	4581
6/5/91	Conventional	24.2	25.5	6.9	7.3	360	21	3280
13/5/91	Njoro	22.7	22.2	7	7.5	680	53	6386
20/5/91	Conventional	24.1	23.7	7.2	7.4	480	10F	3191
27/5/91	Njoro	22.8	22.8	7.1	7.4	420	19	8014
1/7/91	Njoro	24.5	19	6.6	7.3	760	42	7823
8/7/91	Njoro	23	18.2	6.9	7.7	400	7F	6399
15/7/91	Conventional	21.6	21.5	6.7	7.0	440	65.5	3549
22/7/91	Njoro	23.5	18.2	6.9	7.4	460	34	8389
29/7/91	Conventional	21.2	21.5	7.1	7.4	440	45.5	3765

下水処理場水質資料 (1991年1月~1992年12月)

F - Failed.

LABORATORY ANALYSIS 1991

SEWAGE WORKS (MCN)

DATE	LOCATION OF THE SAMPLE	TEMP °C	PH	SETTLABLE SOLIDS MG/L	BOD5 MG/L	TOTAL DAILY FLOW (M)		
		INLET	OUTLET	INLET	OUTLET	INLET	OUTLET	
5/8/91	Njoro	23.2	7.2	7.3	13	480	33	10929
12/8/91	Conventional	21.8	7.2	7.3	20	580	57	3668
19/8/91	Njoro	24	19.7	6.9	16	600	54	7646
26/8/91	Conventional	22	21.8	7.1	11	620	55	3827
2/9/91	Njoro	22.5	19.6	7.1	14	600	44	7282
16/9/91	Conventional	20.4	20.6	-	6	500	51	2987
23/9/91	Njoro	23	19.8	-	20	620	51	5929
30/9/91	Conventional	-	-	-	11	640	46	3249
14/10/91	Conventional	23	22	-	14	500	19F	3033
4/11/91	Njoro	23.3	22	-	12	440	22	5640
11/11/91	Conventional	21.5	21.6	-	10	760	53	3173
18/11/91	Njoro	22.4	22.5	-	16	600	56	5440
25/11/91	Conventional	21.6	21	0	8	600	13F	3442
2/12/91	Njoro	23.3	22.8	-	22	600	56	4932

LABORATORY ANALYSIS 1992

SEWAGE WORKS (MCN)

S.D.A.S

DATE	LOCATION OF THE SAMPLE	TEMP. °C	PH	SEWAGE WORKS (MCN)			SETTLABLE SOLIDS ML/L	BODS. MG/L	TOTAL DAILY FLOW (Q)
				INLET	OUTLET	INLET			
6/1/92	Conventional	26	7.4	7.6	30	0	860	86	4320
13/1/92	Njoro	23.6	7.7	8.3	6	0	630	54	3646
20/1/92	Conventional	22.1	7.5	8.1	12	0	630	65	4153
27/1/92	Njoro	24.3	7.2	8.1	12	0	560	69	6813
23/2/92	Conventional	24.3	7.5	7.7	12	00	600	70	3844
10/2/92	Njoro	25	7.1	8.4	8	0	640	28	4551
17/2/92	Conventional	26	6.8	7.7	12	0	820	37.5	3991
24/2/92	Njoro	24.5	6.9	8.2	14	0	740	13.75	4469
2/3/92	Conventional	24.1	6.9	8	9	0	830	68	4108
9/3/92	Njoro	24.1	6.9	8.2	10	0	725	42	3264
16/3/92	Conventional	25.3	7.1	8.2	0.05	0	585	29	4144
23/3/92	Njoro	24	7.6	8.3	12	0	1000	58.5	8949
30/3/92	Conventional	24.5	6.9	7.9	12	0	770	85	2785
8/6/92	Njoro	23.6	7.2	8.2	12	0	590	48	1942
15/6/92	Conventional	23.4	7.0	7.2	17	0	700	57	4590
23/6/92	Njoro	23.6	7.1	7.9	18	0	935	55	6076
13/7/92	Conventional	20.1	7.2	7.5	16	0	475	64	4243
20/7/92	Njoro	22.1	19.6	12	12	0	580	32.5	8285
27/7/92	Conventional	20.5	20.6	7.4	7.3	20	585	55.5	3833
21/9/92	Njoro	22	21.5	7.1	8.3	16	700	61	6734
28/9/92	Njoro	24	20	7.5	8.1	22	840	36.5	3630

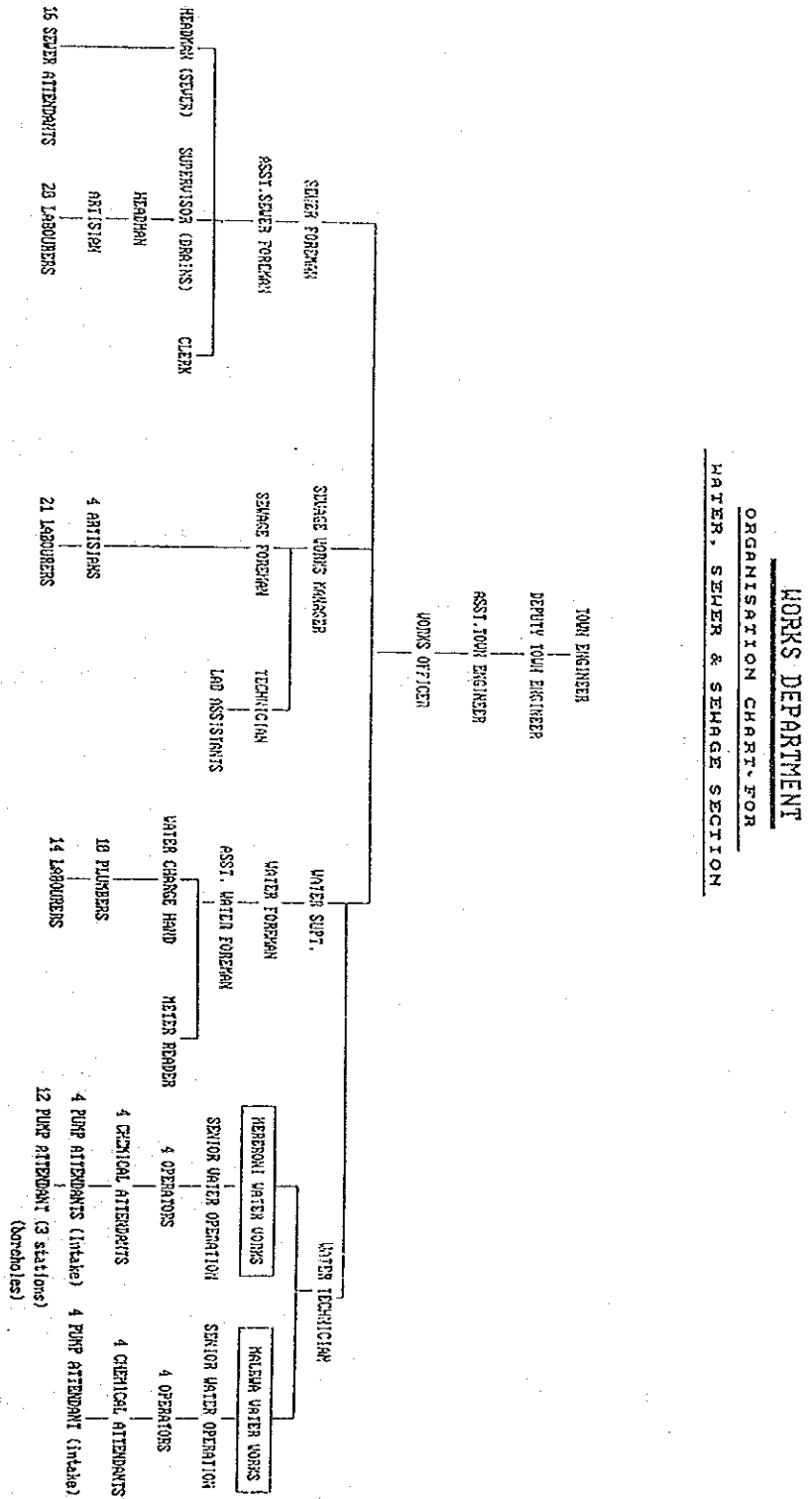
LABORATORY ANALYSIS 1992

SEWAGE WORKS (MCN)

5 DAYS.

DATE	LOCATION OF THE SAMPLE	TEMP. °C	PH	SETTLABLE SOLIDS ML/L	BODS MG/L	TOTAL FLOW (MG)				
		INLET	OUTLET	INLET	OUTLET	INLET	OUTLET			
5/10/92	Conventional	23.3	22.7	7.2	7.2	18	0	665	65.5	38
12/10/92	Njoro	23.6	23.7	7.2	8.5	11	0	650	23.75	398
26/10/92	Conventional	22.6	22.4	7.2	7.3	18	0	700	70	49
2/11/92	Njoro	23	20.6	7.3	8.4	19	0	700	15	33
9/11/92	Conventional	24	23.4	7.6	7.4	14	0	740	54.5	350
16/11/92	Njoro	22.4	20.2	7.5	8.9	13	0	640	18	456
23/11/92	Njoro	23.5	20.4	7.6	8.3	18	0	710	54	418
30/11/92	Conventional	23.8	23.4	7.0	7.9	20	0	740	56	47
7/12/92	Njoro	23	21.5	8.9	8.5	10	0	940	56.5	
14/12/92	Njoro	22.5	20.4	7.5	8.7	13	0	790	45	572
21/12/92	Conventional	23.6	23.4	7.2	7.4	17	0	720	57.5	463

添付資料 6. ナクル市役所上水・下水道部組織図





添付資料 7. ローカルコンサルタント資料

LIST OF CONSULTING ENGINEERS

1. M/s Runji and Partners  
P.O. Box 68053 Phone 717213  
NAIROBI.
2. MultiConsult  
Box 54021 Phone 564985/6  
NAIROBI.
3. Wanjohi Consulting Engineers  
Box 21714 Phone 560964  
NAIROBI.
4. Kaburu Okelo & Partners  
Box 47437 Phone 727551  
NAIROBI.
5. East African Engineering Consultants  
Box 30707 Phone 721910  
NAIROBI.
6. Gath Consulting Engineers  
Box 14279 Phone 444837  
NAIROBI.
7. Howard Humphreys (Kenya) Ltd.  
Box 59763 Tel. 729668  
NAIROBI.
8. Uniconsult (Kenya) Ltd.  
Box 59763 Tel. 330403  
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9. Norconsult A.S.  
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10. Sir Alexander Gibb & Partners  
Box 30020 Tel. 338992  
NAIROBI
11. H. P. Gauff  
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12. Mangat I. B. Petel & Partners  
Box 48674 Tel. 444491/2  
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13. Kitololo Consultants  
Box 48388 Tel. 339823  
NAIROBI.
14. SAMEZ Consultants  
Box 67939 Tel. 711220  
NAIROBI.





添付資料 8 . 參考資料

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14. "Final Design Report, Volume 1 Main Text, Greater Nakuru Water Supply Project, Eastern Division Stage 1," August 1988, prepared by Nippon Koei Co., Ltd. and Nihon Suido Consultants Co., Ltd., Japan.
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